MCom

Infrastructural development and Economic growth: A Case study of the SADC region

A **Dissertation**

Presented to

The **Development Finance Centre (DEFIC)**
Graduate School of Business
University of Cape Town

In partial fulfilment
of the requirements for the Degree of
Master of Commerce in Development Finance

by

Tafadzwa Munatsi

MNTTAF001

March 2021

Supervisor: Assoc. /Prof. Abdul Latif Alhassan

University of Cape Town

EFMD EQUIS ACCREDITED ASSOCIATION of MBAs ACCREDITED AACSB ACCREDITED

To find out more about our world-class academic programmes, executive education short courses and customised programme offerings contact 0860 UCT GSB (828 472) | INTL +27 (0)21 4061922 | info@gsb.uct.ac.za or visit www.gsb.uct.ac.za

The copyright of this thesis vests in the author. No quotation from it or information derived from it is to be published without full acknowledgement of the source. The thesis is to be used for private study or non-commercial research purposes only.

Published by the University of Cape Town (UCT) in terms of the non-exclusive license granted to UCT by the author.

University of Cape Town

Plagiarism Declaration

COMPULSORY DECLARATION:

1. I certify that I have read and understand the Commerce Faculty Ethics in Research Policy. http://www.commerce.uct.ac.za/Pages/ComFac-Downloads
2. I certify that I have read the General Rules and Policies Handbook (Handbook 3) regarding Student Rules of Academic Conduct: RCS1.1 to RCS3.2 and Rules Relating to examinations G20.1 to G22.2.
3. I certify that I have read and understand the document, "Avoiding Plagiarism: A Guide for students".
4. This work has not been previously submitted in whole, or in part, for the award of any degree in this or any other university. It is my own work. Each significant contribution to, and quotation in, this dissertation from the work, or works of other people has been attributed, and has been cited and referenced.
5. I authorise the University of Cape Town to reproduce for the purpose of research either the whole or any portion of contents in any manner whatsoever.

Student number	MNTTAF001
Student name	TAFADZWA MUNATSI
Signature of Student	Signed by candidate
Date:	22-02-2020

Acknowledgements

My appreciation goes to God who saw me through this period. Special thanks go to Mr and Mrs Munatsi, Tavonga, Tanatswa, Tatenda, Addi, Anthony, Desmond, the rest of my family and friends for being a great support system.

I am very grateful to my supervisor for assisting me throughout this research.

Table of Contents

Abstract

The development of services and the infrastructure may bring about the sustainability of regional trade, investment, and economic development. Adequate infrastructure is a key element required in growth and productivity (Cesar & Serven, 2004). The availability of sound regional infrastructure will support the SADC to attain a minimum of 7% economic growth. Consequently, opportunities are then created for exports and imports, markets, labour, and high-quality services and products through infrastructural development in SADC economies. Insufficient infrastructure pressures trade, which in turn surges the price of executing business, causing the region to be unappealing to potential investors, which then discourages economic growth (Dube, 2013). The infrastructure has been responsible for over half of sub-Saharan Africa's latest increased growth and accomplishment; and it has additional untapped possibilities (Gutman et al., 2015).

The issue then is why the SADC members are experiencing low economic growth and weak competitiveness, when so many infrastructural development projects have been implemented. Consequently, the study then is seeking to examine the impact brought in by infrastructural development in SADC on its economic growth. To accomplish this a Panel Autoregressive Distributed Lag model was used on a sample of five countries, covering the period of 2003 to 2020, based on the availability of the data.

The findings of the study highlighted the fact that infrastructural development is an enabler of economic growth and development. The results concluded that infrastructural development enhances the economic growth in the SADC region; and these findings are in line with those of Kodongo and Ojah (2016), who found that infrastructural development positively affects economic growth. Furthermore, from these findings, it may be noted that the different types of infrastructure (that comprise Transport, Electricity. ICT and WSS) all have a positive impact in relation to economic growth, such as the findings, supported by Estache and Wren-Lewis (2016).

Given the findings of the study, the possible recommendation is that SADC member state governments must put in place policies that would attract more infrastructural development funding and make budgetary provisions for infrastructural development. Lastly, future studies on infrastructural development and economic growth need to factor in the role of quality in institutions, as well as an interaction term, between institutional quality and infrastructure, in order to capture the various country-specific effects.

List of Figures

List of Tables

List of acronyms

ADB-	African Development Bank
ADF-	Augmented Dickey–Fuller
AIC-	Akaike Information Criteria
AICD-	African Infrastructural Country Diagnostic
AIDI-	African Infrastructural Development Index
ARDL-	Autoregressive distributed lag model
ASGI-SA	Accelerated and Shared Growth Initiative – South Africa
DRC-	Democratic Republic of Congo
ECI-	Electricity Composite Index
ECM-	Error-Correction Model
ECOWAS-	Economic Community of West Africa
FDI-	Foreign Direct Investment
FIFA-	Federation International de Football Association
GDP-	Gross Domestic Product
GMM-	Generalized Methods of Moment
HCS-	Human Capital Stock
ICT-	Information and communications technology
ICTCI-	Information and communications technology Composite Index
IMF-	International Monetary Fund
INF-	Inflation Rate
IRRN-	Inter-Regional Railway Network
MIC-	Middle-Income Country
OLS-	Ordinary Least-Squares
PARDL-	Panel Autoregressive Distributed Lag Model
PPP-	Public-Private Partnership
PSIP-	Public Sector Infrastructural Investment Programme
RGDP-	Real Gross Domestic Product
RIDMP-	Regional Infrastructural Development Master Plan
RISDP-	Regional Indicative Strategic Development Plan
RTRN-	Regional Trunk-Road Network
SADC-	Southern African Development Community
SADCC-	Southern African Development Co-ordination Conference

SAPOA-	South African Property Owners' Association
SAPP-	Southern African Power Pool
TCI-	Transport Composite Index
TO-	Trade Openness
USD-	United States Dollars
WEF-	World Economic Forum
WSSCI-	Water-Supply Scheme Composite Index

Chapter 1

Introduction

1.1 Background to the study

Short-term thinking too often governs the world today (World Economic Forum, 2019). The system initiative on long-term investment, infrastructure and development is dedicated to changing this (World Economic Forum, 2019). The sustainability of regional trade, investments, and economic development comes about through the development of infrastructure and services. Adequate infrastructure is the key element required in growth and productivity. More attention has been devoted to the infrastructure, as such (Cesar & Serven, 2004). Infrastructural development ensures that resources are available, which would feed into an economy, thereby resulting in economic growth.

This research will be carried out to determine whether infrastructural development affects economic growth in the SADC region. The SADC (2012b) in 1992 head of governments in the region, consented to change the SADCC to SADC, which was to focus on the integration of economic growth with Angola, Botswana, the Democratic Republic of the Congo, Lesotho, Madagascar, Malawi, Mauritius, Mozambique, Namibia, Seychelles, South Africa, Swaziland, Tanzania, Zambia and Zimbabwe, as members of the community. The aim of the community was to encourage development and economic growth for the individual economies.

Interestingly, all the 15 member states had growing populations; and the governments needed to cater for their citizens' basic needs, development was crucial to ensure the provision of public goods and services to their citizens. Therefore, this study will focus on infrastructural projects that were devoted to the region, in addition to their effect on economic growth.

Infrastructural development is a key component of the Southern African Development Community's (SADC) objectives, as found in the SADC treaty. The objectives of the regional integration in the treaty include food security, land, and agriculture, infrastructure and services, industry, trade, investment, and finance, as well as human-resource development, science, and technology, natural resources and environment, social welfare, information, culture and, politics, diplomacy, international relations, peace, and security.

All these objectives are driving towards economic growth and the regional integration for the SADC region (Carbone & Ewen, 1998).

In order to increase regional integration and to reduce poverty in a sustainable way, the SADC's blueprint for development shows the interventions, which are needed to achieve this. The SADC approved the Regional Indicative Strategic Development Plan (RISDP), which was based on the objectives, vision, and mission, as stipulated in the Southern African Development Community (SADC), 2017). In the RISDP, there are four major priorities; and priority two clearly stipulates what is involved in infrastructure. These should include Energy, Transport (surface, air and intermodal), Tourism, ICT, Meteorology, and Water Supply.

These priorities were set; and they are implementable, based on the availability of resources in SADC (Southern African Development Community (SADC), 2017). Investing in infrastructure is of great importance in the region as it is part of the priority number two on the list. Having sound infrastructure in the region would assist the SADC to achieve at least 7% economic growth. Infrastructural development creates opportunities for access to markets, labour, as well as to the export and import of quality services and goods, which assist in the growth of the economies in the SADC region.

Infrastructural project implementations have slowed down; but there are some achievements that are worthy of mention. In tourism, the SADC has embarked on being marketed, as a single destination; and it has seen even more tourists visiting places, which they never knew existed. This was boosted by the FIFA 2010 World Cup. This event helped to fund infrastructural projects that would not have ideally been considered. This increased tourism in the region brought the numerous regional opportunities to the fore within the global community.

According to the Deputy Minister of Finance, the government expected that the World Cup would bring infrastructural development, create jobs and bring economic growth (Aragao, 2015).

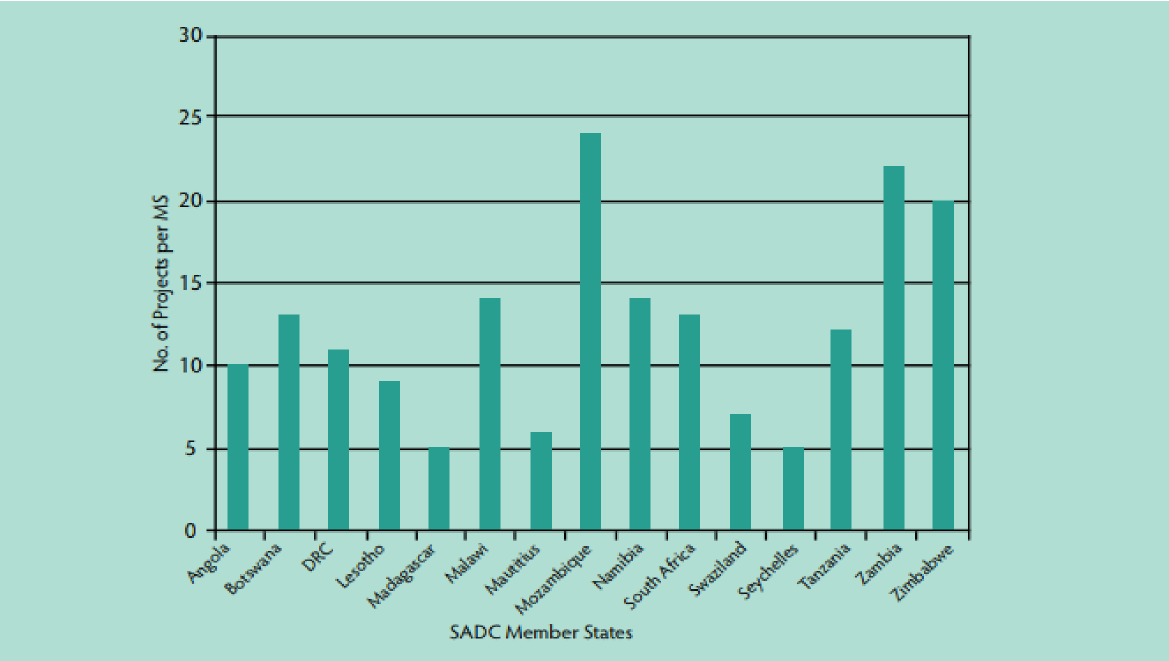
In energy, the SAPP was established in August 1995, when member states agreed to form a power pool for the region. Energy ministers in all the member states signed the amended document in February 2006. In 2016, the capacity commissioned was 4,180 MW (Southern African Power Pool, 2017). Such an initiative has helped to meet the demand in the region; and it has helped to reduce the cost of electricity generation (in isolation) for these member states.

The information communication technology infrastructure has also experienced significant growth. As much as 60% of the population took up mobile services. More people are also now using phone-voice services. While more than 4% of the citizens have become internet users; even though this differs from country to country. The total estimated cost for infrastructural development in ICT has amounted to US $21.4 billion (SADC, 2012b). The above statistics have since increased; as more private players have continued to provide ICT infrastructure, thereby enabling the ease of conducting business; as they have transformed the world into a global commercial village. The SADC has also commissioned sea cables.

In the water sector, studies have shown that the SADC recollects 14% of water for re-use; while the rest goes back into the oceans. The largest amount thereof of that is retained in Kariba and Cabora-Bassa lakes, which are the largest man-made lakes, both being along the Zambezi River. The rest goes back into the oceans. There are 34 water infrastructural projects that have been implemented, and which are to be implemented between 2013-2021, which would see an increase in the supply of water.

The estimated cost of these projects is US $16billion (SADC, 2012a). The World Bank has already commenced the deepening of the pool on the Kariba dam wall, in order to ensure maintaining its integrity with high water-retention levels. The Zambian and Zimbabwean locals are benefitting from this calculated initiative. Below is a figure showing the infrastructural projects that have been carried out in the region.

Figure 1.1: Regional Infrastructural projects



Source: Southern African Development Community (2009)

Infrastructural development will help to transform SADC'S economic environment. This will give rise to easier ways to operate businesses, to reduce the tariffs that are required at border posts, to reduce operational costs; to improve the quality of goods and services, thereby creating affordable products. It also increases global competitiveness. If all these factors are properly implemented, they will help to realise the growth of economies in the SADC region. The infrastructural development needed by the SADC is one that should reduce production costs significantly for businesses, so that they may be more profitable.

The use of alternative energy and power, improved transport network, value addition on raw materials will realise more value on the global market. A cost-effective infrastructure would assist the SADC to achieve all the methods of doing business more easily. The creation of the competitive edge for SADC would draw the right level of attention and resources from potential investors.

Infrastructural projects are usually for the long term. There are gaps that need to be filled, in order to cover the distance between the short term and long term. The table below shows the required resources by the sectors that are needed to fill in this gap.

Table 1.1: Financial resources

Regional Trunk-Road Network (RTRN)	USD 8.00 billion
Inter-Regional Railway Network (IRRN)	USD 18.00 billion
Ports and Inland Waterways Development	USD 18.00 billion
Power Infrastructure (SAPP Plan)	USD 47.00 billion
ICT, Communications and Postals (SRII & SAPOA Plan	USD 4.00 billion
Water-Infrastructural Priority Projects (SWIDP)	USD 5.00 billion
Total Estimate	USD 100.00 billion

Source: Southern African Development Community (2009)

The Public Sector, alone, may not have the adequate resources needed to fund all the required infrastructural projects. Instead, there is a need for Public-Private Partnerships (PPPs). These collaborations would increase the potential success of these projects, which would have the down-stream effect of increased funding, technical skills, and knowledge, land, and buildings, working towards the achievement of this vision.

The formulation of protective policies and regulations is of paramount importance, in order to safeguard the assets of those who have invested their resources – without losing them through any loopholes that may occur.

The Southern African Development Community (2017) has a priority list of *"Regional Economic Integration"* in addition to *"Infrastructural Support for Regional Integration and Poverty Reduction"*. It was committed to the implementation of integration. Achieving all these goals, it is imperative for the region to catalyse infrastructural development projects that are efficient, cost effective, as well as those that are reliable. The Southern African Development Community (2009) states that Infrastructural development becomes a catalyst in regional development and for the integration of SADC; and consequently, the focus on this would ensure the achievement thereof and stimulate economic growth in all the SADC regional economies.

Strides have been made to achieve the goals of the SADC treaty throughout the years; but the economies have not significantly grown. Some of the challenges include infrastructural financing and policy loopholes that have brought challenges to financial projects and to the protection of these investments. It is, therefore, in the face of all these factors that the research is being conducted, in order to determine the influence of infrastructural development on the growth of these economies.

1.2 The Research Problem

Infrastructural development helps to supply the equipment and the machinery that provides quality products, which may add value, thereby improving trade and contributing to economic growth. It may also have the effect of improving the wellbeing of individuals in different countries. Countries that have invested in infrastructural development have brought change to their economies; but this has not been the case in the Southern African Development Community. For instance, between the period of 2019 to 2020, in the DRC, economic growth decreased by 3.95%; whilst infrastructural development increased by 7.75%, Mauritius' economic growth decreased by 19.51; whereas the infrastructural development increased by 2.04%. As for South Africa, Zambia, and Zimbabwe, they experienced 11.22%, 16.88% and 37.01% respective decreases in economic growth; whilst 1.15%, 3.12% and 4.37% increases in the infrastructure were recorded in these countries, respectively.

The biggest challenge that has come in terms of the infrastructural development has been that of a lack of funding, be it from foreign direct investments, or from donor funding (Dube, 2013). Markowitz et al., (2018) pointed out that the continent's infrastructure needs approximately US $130 to US $170 billion a year, with an annual financing gap of US$67.6 to $107.5 billion. With respect to Sub-Saharan Africa, the infrastructure has been responsible for more than half of the recent improvements in growth; and it still has considerable untapped potential (Gutman et al., 2015).

The question then becomes why the SADC members have low economic growth and poor competitiveness, given that the region has had many infrastructural developments projects.

1.3 The Research Questions

The research seeks to answer the following research questions:

1. Is infrastructural development a catalyst for economic growth?
2. Does development in infrastructure increase the growth of economies in the short term?
3. Does infrastructural development increase or decrease the long-term growth of economies?

4. Do the different types of infrastructure have an impact on economic growth in the Southern African Development Community?

1.4 The Research Objectives

The objectives of the study are:

1. To investigate the relationship between infrastructural development and economic growth in the Southern African Development Community.
2. To determine the short-term effect of infrastructural development on economic growth in the Southern African Development Community.
3. To determine the long-term effect of infrastructural development on economic growth in the Southern African Development Community.
4. To investigate the impact of different types of infrastructure on economic growth in the Southern African Development Community.

1.5 Limitations of the study

The following limitations are anticipated to interfere with the process, as well as the findings of the research: Limited data availability would prevent the researcher from presenting a comprehensive and qualitative picture of the challenges affecting the financial organisations in infrastructural development.

1.6 Justification of the study

The researcher chose this topic, based on his interest in the infrastructural issues. The research seeks to show how infrastructure plays a major role in economic growth by highlighting the successes and the failures of infrastructural development in the region, thereby enlightening policymakers on the areas, on which to focus. However, there are other factors, as will be demonstrated in the study, that will show that economic growth is not only based on infrastructural development; since there are examples of 'white elephants' that have developed from underutilisation of the infrastructure that was invested in, to promote economic growth.

The study hopes to shed more light on the importance of infrastructural development in enhancing economic growth, and also to which specific infrastructural areas, one needs to give more attention. The research will focus on the SADC region; and it will investigate how all the infrastructural inflows have, in most cases, influenced economic growth.

1.7 The Scope of the study

The study seeks to investigate the influence of development on the infrastructure in terms of the economic growth in the SADC region, from the period of 2003 to 2020, covering the five countries, which comprise the Democratic Republic of Congo, Mauritius, South Africa, Zambia and Zimbabwe. These countries were the top-five performing countries in terms of economic growth and data availability, for all the variables within the study period. With respect to this infrastructural development, it refers to improvements in health, education, power, water sanitation, affordable housing, transport networks, and ICT. Controversy, in terms of economic growth, refers to an increase in GDP, economic activity and productivity of the economy in the SADC region.

1.8 Organisation of the Study

The research covers five chapters. These include Chapter 1, which is the introductory chapter, and the chapter, which outlines the background of the study, a statement of the problem, the research objectives and the important questions. It also presents the scope of the study, as well as the limitations and the justification for the study. The theoretical and the empirical literature was thoroughly discussed in Chapter 2; whilst Chapter 3 presented the research methodology covering the research design, the model specifications, the econometric-estimation technique and the diagnostic tests. As for Chapter 4, it presented and discussed the results of the study. The study ended with the conclusion and the recommendations of the study in Chapter 5.

Chapter 2: The Literature Review

2.0 Introduction

This chapter reveals the theoretical foundations of economic growth in relation to infrastructural development; and it does so by outlining the economic growth theories, such as the neoclassical growth model, amongst other theories. Furthermore, it details the empirical findings of the same topic that have been conducted on a global and national scale by various researchers. The chapter closes by detailing the causes of economic growth that will be utilised in this study.

2.1 The Historical Background of the SADC

In 1992, the heads of the then frontline states held a summit in the city of Windhoek, Namibia, in which they signed the SADC Declaration and Treaty, which successfully changed the Southern African Development Coordination Conference, (SADCC) to the SADC region. These countries were classified as frontline states because of their geographical proximity to South Africa, and their collective objective to end apartheid in South Africa (Mupimpila & Funjika, 2010). Article 2 of the SADC Treaty recognizes the SADC as a leader of fiscal integration in Southern Africa (Southern African Development Community, 2009). Four countries joined the SADC in the nineties: South Africa in 1994, Mauritius in 1995, and the DRC and Seychelles in 1997.

Later in 2005, Madagascar joined the community. The membership of SADC has since grown to constitute fifteen countries. The main purposes of the SADC are to accomplish economic growth and sustainable development, thereby reducing poverty, improving the living standards for the people of Southern Africa, while supporting the generally disadvantaged groups through regional integration.

In 2001, the SADC Treaty was to include a 15-year program; the Regional Indicative Strategic Development Plan (RISDP). This program was accepted in 2003; and it was implemented in 5-year phases (SADC, 2012). Since infrastructure is the key component of the RISDP, the Regional Infrastructural Development Master Plan (RIDMP) was established in 2012. This plan was to be executed over three five-year periods, namely, short term 2012-2017, medium term 2017-2022 and long term 2022-2027.

2.1.1 Infrastructure and Economic Growth in the SADC

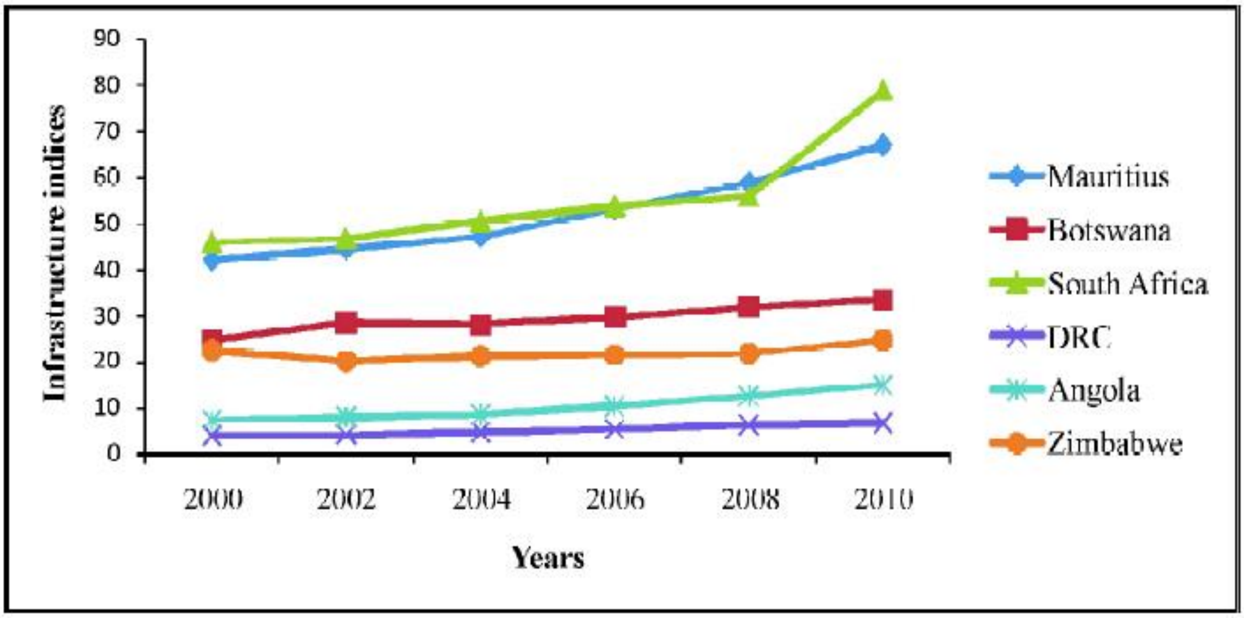
The SADC region consists of a mix of small, large and isolated economies, as well as island states, which are either low-income or middle-income economies. The development of infrastructure in the region has been regarded as a critical component for economic growth, trade and investment, as well as to alleviate poverty and to improve the social conditions (SADC, 2012) Regional infrastructural development has made noteworthy progress in various sectors, such as transport, energy, water and sanitation, in addition to meteorology. It is estimated that during 1995-2005, the improvements in infrastructure boosted growth in the SADC by 1.2% per capita annually (World Bank, 2005).

This was primarily due to access to mobile telephones and improved road networks; while insufficient power supply, unfortunately, eroded growth in the region. Figure 2 below shows the infrastructural development indices for selected SADC countries, grounded on the four chief infrastructural subsectors, namely: transport, electricity, ICT, and water and sanitation.

Mauritius has a well-developed transportation and telecommunication infrastructure, by the regional standards as compared to other SADC members, followed by Botswana and South Africa. The accumulation of transport infrastructure, particularly ports and air transport, provides the essential infrastructure for tourism in Mauritius. Despite relatively good infrastructure, the private sector in Mauritius considers the infrastructure to be inadequate, particularly in the energy, transport and water sectors (Schwab, 2014).

Botswana, as a middle-income country, has made noteworthy development in infrastructural development; covering the mobile telephony, transport, water and sanitation, and power sectors (Briceo-Garmendia, 2011). The key challenge lies in the power sector, where the country is exposed to power-supply deficiencies. This leaves the economy vulnerable to load-shedding and electricity price shocks. Furthermore, the country still lags behind in the international transport networks and internet connectivity, compared to other SADC members. Although South Africa has an excellent infrastructure, it has some infrastructural gaps, notably insufficient power supply, weak domestic demand, and anaemic investment rates.

Figure 2.1: Infrastructural Development Index and Country Scores, 2000–2010



Source: Mighty et al., (2013) computation from AIDI

Notably, Angola, DRC, and Zimbabwe recorded the lowest scores, due to some recent political instability and conflicts that left networks severely damaged. From Figure 2 above, it is evident that the DRC has the least-developed infrastructure. Additionally, the infrastructural development of networks in DRC is complicated by low population density, vast geography, extensive forestlands, and overlapping rivers. However, the country has secured the external funding to rebuild the road network and to improve the domestic air transport sector. The main setback in the country's infrastructure is the failure to increase the power-generation capacity.

The ranks for SADC's infrastructure are constantly beyond the other Sub-Saharan African regions on all aggregate infrastructural indicators. However, in other zones, access to enhanced sources of water and sanitation, in addition to electricity, the differences amongst the SADC and the Economic Community of West African States (ECOWAS), the following-best participants in terms of aggregate presentation, are not substantial.

With regard to power generation and mobile and mainline density, the SADC performs altogether better than any of the other regions. The aggregates for the SADC, however, mask any country differences within the region. Ranganathan & Foster (2011) noted that although the SADC region is leading in Africa, in terms of generating electricity at low rates, access for that electricity is limited. Moreover, although ICT services are the most reachable among the SADC countries, they are, nevertheless, expensive.

Table 2.1: Benchmarking the SADC region against other regions

Infrastructure Indicator	*Regions*			
	Eastern	*Central*	*Southern*	*Western*
Paved roads density	29	4	92	38
Fixed-line telephone density	6	13	80	28
Mobile telephone density	46	84	133	72
Internet density	2	1	4	2
Generation capacity	16	47	176	31
Electricity capacity	6	21	24	18
Improved water	71	53	68	63
Improved Sanitation	42	28	46	35

Source: Africa Infrastructure Country Diagnostic (AICD, 2013)

2.1.2 Infrastructure and economic growth in Zimbabwe

Zimbabwe gained critical ground in infrastructure in its initial period, as and when it gained independence. The country established regional interconnection, as it set up a national electricity network; it was also set to construct a wide network of roads for national accessibility and incorporation into the regional transport networks; it also wanted to lay the water and sewerage system; and to gain ground in building dams and tapping the critical potential in irrigation. Sadly, the current cross-cutting matter in all those sectors is Zimbabwe's incapability to preserve and restore the current infrastructure; since the nation became submerged in monetary and political disturbance in the last part of the 1990s. The country has experienced a generalised lack of new investments, due to the crisis it has continued to experience, specifically in the power and water sectors, and the build-up of a large restoration agenda.

There has been a deterioration in the quality of service experienced across all sectors (Briceo-Garmendia & Nataliya, 2011).

The provision of power has turned out to be excessively costly, inconsistent, and unpredictable. The state of the Zimbabwean roads has deteriorated to the point that it has become a bottleneck in the North-South transport corridor. Rural Zimbabwe hardly has any connectivity. In 2008, there was a massive spread of Cholera, which was attributed to the failure of treating drinking water. Most areas in the country were affected by Cholera by 2010; and it posed a threat to the surrounding countries. Zimbabwe may still face several challenges in infrastructure – even in the future (Briceo-Garmendia Nataliya, 2011). Zimbabwe's greatest challenges are found in the water and power sectors. The economy is faced with a major risk, due to unreliable and inefficient power supply; although the upgrading and maintenance of the existing infrastructure seems no longer to be affordable. At the same time, renovating the sewerage and water system is critical for decreasing the public health catastrophe.

2.1.3 Infrastructure and Economic growth in Zambia

The population and economic activities in Zambia are intensely concentrated along the Copper Belt, which runs from Lusaka in the south to Ndola in the north, along the Congolese border. The poverty rates in Zambia show a frequency of less than 40% among the major population centres of the Copper Belt, increasing to more than 70% for all the additional regions in the country. Zambia’s power and ICT networks reflect this economic layout, with restricted east-west spurs and strong north-south backbones.

The road network gives a more extensive inclusion of the country; however, the remote segments in the far-east and west of the country tend to be those in the poorest condition, with traffic flows heavily concentrated in the north-south axis. Zambia has an urbanisation rate of over 50% which is one of the more urbanised countries in Sub-Saharan Africa (Foster & Carolina, 2010).

For the period from 2003 to 2007, Zambia had a moderately strong economic performance; in 2007 it was close to a 7% rate of growth, making a meaningful impact on the reduction of poverty. The general input of infrastructure to fostering growth in Zambia in the early 2000s stood at 0.6 percentage points, considerably below that of other countries in the region. The ICT sector was responsible for the greater part of this growth, as it added an extra 0.47 percentage points to the per capita growth rate, however, the power sector reduced per capita growth by 0.13 percentage points. If Zambia improves its infrastructure, to the point of middle-income countries in the region, its performance could grow by up to 2.6% per capita (Vivien, Foster & Carolina, 2010).

2.1.4 Infrastructure and economic growth in the DR Congo

The Democratic Republic of Congo (DRC) is recognised as being counted among the richest natural resource countries worldwide, with forestry, hydro-electric and mining sectors that have substantial development potential. The country has a population of more than 50 million; and this local market is substantial, however, they have experienced ten years of war; and this has brought strain to their economy, infrastructure and social elements. The DRC was lacking political consistency, and recurring armed battles caused a recession during the 1990s. After the war, the situation was reversed and they experienced a growth rate of 3.5% in 2007, and 5.7% in 2003. According to the accessible data, the economic growth had increased to 6.8 % in 2004; and it could increase to 7.0 percent in 2005 and 2006; this can be attributed to the recovery in investments nationally and from foreign investments (IMF, 2005).

The problem of infrastructure, in the transport sector, has taken on significant importance in the DRC; as it is the prerequisite for any opportunity to return to normality. There are 2,800km that are paved in the DRC, out of the 57,700km of roads in the country; this is attributed to poor maintenance, which is the main contributory factor to the poor road network. There was a risk that goods and travellers to the Congo would be held up for ransom; and this reduced the traffic (IMF, 2005).

The river in Congo was cut off from the north-western, north-eastern and northern regions, because of its closure to traffic, even though they were significant supporters to the capital's food supply. There is no deep-water port; and there are inadequate port facilities.

2.1.5 Infrastructure and economic growth in Mauritius

Mauritius has recorded moderate, but consistent, real growth in recent years. The GDP growth increased to 3.9% in 2017 from 3.8% in 2016; and this has been supported by growth in ICT, manufacturing output and financial services. The GDP per capita in Mauritius has also steadily increased in the same period, at a regular annual rate of 3.6%, attaining an estimated USD of 9 672 in 2017, using present dollars. In Africa, Mauritius has the third highest per capita income after the Seychelles and the Equatorial Guinea; this places Mauritius as an upper middle-income country (MIC). Mauritius' economy is mainly based on services, which constituted 74% of the GDP in 2017.

Industry comprises 22% and Agriculture 4%; and these are the next largest sectors in Mauritius. Throughout the years, Mauritius has successfully transformed and diversified its economy from that of a sugar-centred monocultural economy to services and various manufacturing activities (African Development Bank, 2018).

There are stakeholders that include the government, bilateral and multilateral partners, as well as the private sector, which have been identifying projects, which could improve the country's ICT infrastructure, transport and power sources. The funding of infrastructural development is a major challenge attributed to the high levels of debt, particularly public debt; and this is certainly likely to exacerbate the considerable sovereign debt. The government is aggressive when it comes to executing national-energy strategies to spread energy assets and move in the route of a sustainable future.

The government is also working towards having renewable energy contributing 35% by 2025 to the energy mix, decreasing the country's reliance on imported fossil fuels, thereby reining in future oil import bills. Mauritius has a relatively well-developed road network; there are 1,910km of roads, with 1,834km thereof that is paved.

However, there is great congestion in the island in several of the road corridors. The road transport congestion cost the economy approximately 1.4%, and road accidents 1.6% of GDP in 2016. The challenges in the transport sector are experienced, due to the lack of a clear strategy, poor management of the road network; and there is a lack of alternative modes of transport. There are limited bus services in the capital; and no railway networks are available for the upgrading of the road network that is part of the public sector infrastructural investment programme (PSIP) (African Development Bank Group, 2018).

Mauritius is among the few Sub-Saharan countries that have decent access to water and sanitation services. In 2016, 99.9% of the population had access to water services; and 93.1% had access to sanitation services. However, the island has a high demand for water; and this may in the medium to long term lead to water shortages; since the demand may exceed the supply, due to a reduction in the mean annual rainfall. The ICT sector has appeared as the main column of the economy; and it has a significant number of employees. The division benefits from a robust enabling environment; and this has produced high development in recent years. This has yielded a yearly turnover of USD 1 billion.

The 2016 version of the WEF Global Information Technology Report ranked Mauritius 49 out of 139 economies in the 'network readiness index. Mauritius was the only African country to rank in the top 50 economies overall, performing particularly well in the 'political and regulatory environmental sub-index, where it was ranked 30 out of 139 (African Development Bank, 2018).

2.1.6 Infrastructural and economic growth in South Africa

The Fast-tracked and Shared Growth Initiative – South Africa (ASGI-SA) has recognized insufficient infrastructure, as one of the six most significant constraints to growth in South Africa. The National Treasury assigned R416 billion to expenditure on infrastructural development and maintenance, broadly distinct, in the current three-year budget cycle (National Treasury, 2007). This period from 1976 to 2002 when annual infrastructural investment fell from 8.1% to 2.6% of GDP, the knock-on effect was a reduction in the per capita expenditure from R1,268 to R356 (Johannes & Rob, 2008).

The concept of infrastructural development is one of the crucial paramount issues in economic development that needs to be taken into consideration; since it improves road networking, borders and ports, energy supply, water, sanitation and sewerage and the telecommunication industry, at large. Consequently, infrastructural development has an impact on the factors of production; and this relationship is tackled in most economic-growth theories.

2.2 The concept of Infrastructural Development

Infrastructural development is the investment in physical structural clinics, power, highways, state connections, airports, as well as in the educational facilities that are necessary for the efficient functioning of an economy. It is also agreed upon that it is a long-term capital-intensive system, together with its various facilities (Stupak, 2018). A 10% rise in investment in infrastructure shows an increase in the gross domestic product of 1%, according to the World Bank. Theoretical literature is outlined in the growth models established by Harrod (1939), Domar (1946) and Solow (1956).

2.3 Economic Growth Theories

Economic growth theories explain the various models of growth, which include the Harrod-Domar theory, the Neo-classical growth theory, and the New Endogenous growth theory.

2.3.1 The Harrod-Domar Growth Theory

The Harrod-Domar growth model offers a long-term theory of output. Harrod and Domar started focusing their attention on economic stability after the Great Depression of the 1930s and the economic ruin caused by World War II. They provided a model that focused on the necessities required for stable economic growth. They pointed out that; capital build-up appreciably affects the growth of an economy. They also highlighted that capital accumulation not only produces income; but it also surges the production capability of the economy. An example would be that when a construction plant is built, it can produce income for suppliers of diverse resources, such as steel, cement, bricks and machinery, with a concurrent increase in capital and the production capability of the economy.

This generated income from capital accumulation increases the demand for goods and services. In the Harrod-Domar theory, the most essential condition for economic growth is that the increased demand due to the income newly generated, should be sufficient, so that the productivity created by the new investment (increase in capital) can be completely absorbed.

Idle production capacity would be available if the excess output is not fully utilised. This condition must be satisfied successively, in order to preserve a full employment level; and it should attain stable economic growth in the long term.

The following are the key assumptions of the Harrod-Domar model:

(a) Constant Capital-Output Ratio – Assuming that the relationship between output and capital remains constantly similar, then according to this assumption, the national output, which is equal to the national income is directly comparable to the capital stock.

(b) Constant Saving-Income Ratio – this assumes that society serves a continuous proportion of the national income. Therefore, saving as a function of income, determines the growth rate.

The calculation of the warranted growth rate is as follows:

$$G_w = \Delta Y / Y_t = k.s$$

As the previous equation of warranted growth rate demonstrates, the growth rate is equal to the output/capital ratio (k) multiplied by the constant propensity to save (s). The growth rate, $\Delta Y/Y_t$, is connected to the equilibrium condition, where I = S; therefore, the growth rate in such conditions can be viewed as the equilibrium growth rate. The equilibrium growth rate demonstrates the capability of consuming capital stock. The warranted growth rate equates to the growth rate, at which the amount of production is precise – neither too muchm nor too little.

In discussion, the Harrod-Domar model of economic growth with respect to capital accumulation has been explained. However, these circumstances cannot always be satisfied; therefore, the warranted growth may not be equivalent to the actual growth rate continuously. This renders the model idealistic.

2.3.2 The Neoclassical Growth Model

The neoclassical growth model is commonly identified as the Solow growth model, which is an extension of the Harrod-Domar (1946) growth model. The difference being that it only regards capital stock as being the individual factor in output production. Solow and Swan (1956) improved the Harrod-Domar Model to contain labour, as a production function. It tries to expound on the long-term economic growth, by observing increases in the productivity, capital accumulation, labour or population growth; and, it is usually referred to as the technological progress. The model at its core is the neoclassical (aggregate) production function which was frequently detailed to be of the Cobb–Douglas category, which permits the model to relate to micro-economics.

The neo-classical model was an addition to the Harrod–Domar model (1946), which comprised a new term that is referred to as the productivity growth. Solow and Swan made important contributions to the model emanating from their research undertaken in 1956. They independently developed simple growth models. The neoclassical model assumes that capital is subject to diminishing returns to scale. Where output $Y(t)$ is produced from capital stock $K(t)$ and augmented labour $A(t)L(t)$, the neoclassical model can be summarized as follows.

$$Y_t = f[K_t^{\propto}(A_t L_t)]^{\beta}$$

Where $\alpha + \beta = 1$ thereby depicting constant returns to scale.

According to the neoclassical growth model, in the short term, the rate of economic growth is influenced by the capital build up, as determined by the saving rate and the depreciation rate. Over the long haul, economic growth is exogenously determined by the growth rate in population and the technological-development growth rate. A significant expectation of this model is international convergence in production levels: poor countries are presumed to grow more quickly than richer countries. Another forecast is that when capital is versatile, developed economies ought to invest in poor countries; since there is scarce capital and the marginal proceeds from investment are significantly higher.

The neoclassical growth model assumes that technological development influences long-term growth; and the workforce grows, as the population increases. So, changes in the infrastructure stock would temporarily affect the revenue in the model. The likelihood of the infrastructure affecting output in the long term, is dependent on the endogenous growth theory, which posits that increasing or decreasing returns to scale can raise the steady state of income per capita (Sahoo et al., 2010).

2.3.3 The New Endogenous-growth theory

The endogenous-growth theory states that economic growth is predominantly the outcome of endogenous, rather than external, forces. The Endogenous-Growth Theory also states that investment in innovation, knowledge, and human capital, are major contributors to economic growth. The theory also emphasizes positive externalities and the spill-over effects of an information-based economy, which would promote economic development. The model was developed by Romer (1986) and Lucas (1988); it focused on the human-capital role, as a major source of expanding returns, as well as a divergence in the growth rates amid developed and developing countries.

The endogenous growth theory also principally holds that the long-term growth rate of an economy depends on the measures put in place on policies.

2.3.3.1 The AK Model

The AK model production function is a unique case of a Cobb–Douglas production function:

$$Y = AK^{\alpha}L^{1-\alpha}$$

The above equation demonstrates a Cobb–Douglas function, where Y signifies the total production in an economy. A denotes the total-factor productivity, $in\ which K$ is the capital, L is labour, and the parameter α measures the output elasticity of capital. For the special case in which $\alpha = 1$, the production function becomes linear in capital, thereby giving continuous returns to scale:

$$Y = AK$$

The endogenous-growth model assumes that the growth rate of the economy depends positively on the savings/investment rate; therefore, any public policy portion that grows the savings rate accentuates economic growth permanently. The model suggests a discrepancy in the international income. If two economies begin with diverse initial stocks of capital, then the absolute gap increases as time proceeds. In the event that two economies also have different savings rates, thereby leading to different growth rates, the ratio of the international income level collapses.

2.3.3.2 The Production Function

Central to the growth theory, using the production function, when it establishes the causes of growth of nationwide output in an economic system, the production function links the quantity of production created in an economy to the inputs of the factors of production and the state of technical knowledge (Dornbusch et al., 1994). The production function explains that the GDP relies on technology and different macro-economic inputs. At the point when technology advances or inputs decrease, it would, therefore, increase the creation of products. The typical neoclassical model states that output levels depend on two inputs, which are capital and technology that is accessible. The relationship is generally identified as the Cobb-Douglas function.

$$Q = f(AK, L)$$

Where Q is the aggregate output, K is capital inputs, L is labour inputs; and A shows the state of technology or technological progress. The conventional neoclassical model assumes that technological progress is exogenously determined; and the law of diminishing returns then applies. When tested empirically, the Cobb-Douglas function produces estimates of the responsiveness of output to the variations in inputs. The relationship can be shown as follows.

$$Y = Af(K, L)$$

Both endogenous and exogenous growth theories do not explicitly specify the role of infrastructural capital in the production process, whether it represents an extra input factor in the production function; or it impacts the technology, with which other inputs are combined. The infrastructure role is implied, on the proof of the underlying assumptions of the growth theories. Investments in infrastructure feature short-term growth effects; when there are diminishing returns to capital under the exogenous theory, then there is an improvement in the effectiveness of all the additional input factors causing long-term productivity growth.

2.4 The Determinants of Economic Growth

As implied by the above economic growth theories, the following factors will be considered by the study, as the determinants of economic growth. These include infrastructural development, inflation, trade openness, foreign-direct investments, and human capital.

2.4.1 The Infrastructural Development Index

Infrastructural investments account for more than half of the recent improvements in economic growth in Africa; however, they have the potential to contribute more significantly. The Infrastructural Development Index is a composite index of the major infrastructural indicators, which have been developed to examine the impact of the infrastructure on economic growth. The infrastructural index, when taking six major infrastructural indicators into consideration, comprises: (i) Air transport, registered carrier departures worldwide; (ii) Roads, paved (% of total roads); (iii) Roads, total network (km) (iv) Telephone lines (v) Improved water sources (% of population with access); and (vi) Energy production (kt of oil equivalent) (ADB, 2018).

The greater the investment in the infrastructure, the higher the economic growth that is catapulted by having the cost of production and the cost of transportation of goods and services reduced; by increasing the productive levels of the input factors; and by creating indirect positive externalities (Palei, 2015).

2.4.2 Inflation

One of the macro-economic indicators of economic stability is the real rate of inflation. Fatma and Zouhaier (2014) emphasized that among the chief macro-economic contributors to economic growth is having a stable inflation rate; and as such, this should be in the study. Deidda et al., (2005) supported the concept that inflation clarifies the macro-economic steadiness of an economy. The effect of inflation is a controversial issue. Some studies claim that inflation has a positive impact on growth (Dornbusch et al., 1996), while there are other studies that suggest that this outcome is characterized by a non-linear relationship (Fischer, 1993; Kremer et al., 2009). The rate of change in price levels, is consequently, proxied by Inflation (Zahonogo, 2017).

2.4.3 Trade Openness

Trade openness evaluates the integration of an economy with world trade; and it is also an indicator of the economic situation. Huchet-Bourdon et al., (2013) expected that there is a non-linear relationship between growth and trade openness, provided the quality and the variability of imports is adequate. This implies that countries that have great quality export products are most likely to experience growth up to a certain threshold of dependence on trade. Nonetheless, economies with poor quality exports are most likely to have a disposition decreased impact on growth, as a result of trade. It is contended that trade openness brings numerous economic benefits, including an increased transfer of skills, technology transfer, increased labour and total factor productivity, in addition to increased economic growth and development (Economics Online, 2019).

2.4.4 Foreign-Direct Investment

The new growth theories emphasise the importance of investments, physical and human capital in the long-term economic growth. The policies, that affect the level of growth and the investment efficiency, also determine the long-term economic growth. Theoretically, the foreign direct investment affects the economic growth – either by increasing the physical capital stock in the domestic economy directly (Plosser, 1992), or by encouraging the technology indirectly, (Levine & Renelt, 1992). The neoclassical theory suggests that there is a correlation between investment and economic growth. Solow (1956) confirmed that investment induces economic growth, according to the capital-accumulation equation.

2.4.5 Human Capital

Human resources are a significant feature for economic growth, as explained by the New Endogenous growth theory, which suggests that human capital is a key determinant of economic growth. Adam Smith identified that the wealth of a country is determined by the efficiency, attitude and skill, of the labour found in a country. A number of countries had the option to develop themselves, because of their will, capacity and the skill of their human capital. Human resources positively influence economic growth; and they can assist with the building up an economy by extending the information and skills of its increased productivity.

Additionally, the concept of human capital is the comprehension that people have different skill sets. Also, the quality of work can be enhanced by investing in the education of the human capital.

2.5 An Empirical Literature Review

The influence of the infrastructure on economic growth has been studied comprehensively in the literature. The basic theoretical framework of the influence of public capital on economic growth was established first by Arrow and Kurz, (1970). The empirical research on the role of the infrastructure in economic growth started after the seminal work by Aschauer and David

(1989). Various estimation methodologies linking the infrastructure to the economic performance by using a variety of data, which are panel and time-series data, and the measures of the infrastructure have been adopted over the years.

In all societies, every member wants an improvement in their standard of living; and so, they aim for an increase in the revenue from production, which is definitely a formation of utility. Conveying products to the end-user, in most cases, includes different forms of transportation. Enhancement in infrastructural systems is actually a means of preserving or progressing economic opportunities, improved standards of living, as well as improved revenues within the economy. The citizens in a country and the guests can benefit directly from numerous types of infrastructure within an economy (Weisbrod & Weisbrod, 1997).

Income generation and the acquisition of personal goals is highly reliant on transportation. The transport of raw materials and the output of production depends on a reliable transport system. Businesses would not be able to function efficiently without reliable forms of transportation.

In his Balanced Growth theory of Rodan (1943), discouraged partial developmental strategies; since they are insufficient to take an economy in the direction of development; and consequently, simultaneous, postulated and harmonious development of all the sectors of the economy due to connections, accomplish positive externalities in the of use of resources, thereby encouraging collective economic action and development in the economy. In a similar manner, Rodan (1947) emphasised in his Big-Push theory, the necessity of having a minimum level of investment in sectors and in the infrastructure, as an essential prerequisite for development and growth.

These two schools of thought require the maintenance of an essential infrastructure on the ground, in order to improve societal development.

Jerome and Ariyo (2004) explored the impact on reducing poverty through the liberalisation and the privatisation of non-governmental investment in the telecommunication infrastructure. Their work pointed that the needs of the poor were not considered for infrastructural reforms and privatisation in Africa; and they did not meet the set policy preconditions that are crucial for their usefulness. The consequence of such matters is that infrastructural privatisation, would have a negative impact on the under-privileged in Africa. They argued that the objectives of infrastructural reforms could only be accomplished, provided the reforms are implemented in the framework of a suitable market and in regulatory frameworks.

Canning and Pedroni (2004) used the production-functional approach founded on the growth model, developed by Barro (1990), to explore the long-term impact of infrastructural delivery on the *per capita* income. When using panel data, they regarded the infrastructural stocks, which include tarred roads, the generation of electricity and telephone lines, as an input into the aggregate-production function. In their conclusion, they were of the opinion that, there is an optimal level of the infrastructure, which maximizes the growth rate, so that when infrastructure levels are set too high, they deter investment, to the point where income growth is thereby reduced.

Their research also revealed that, in most circumstances, the infrastructure does encourage long-term growth effects, even though there may be variations in the outcomes across individual countries. As a whole, their outcomes demonstrated that telephones, the capacity to generate electricity and tarred roads are provided when close to the growth-maximizing level on average; but there is an inadequate supply in some countries; they are over-supplied in other countries.

The results of Canning and Pedroni (2004) helped to explain why cross-section and time-series studies have, in previous studies, found contradictory results of any causal connection between infrastructural provision and long-term growth.

The study by Lumbila, (2005) quoted by Estache (2006), discovered that African countries with larger infrastructure stocks attain considerably more Foreign Direct Investment (FDI) and domestic investment than countries with lower stock levels. Lumbila (2005) estimated infrastructural stock by telephone connections. The study showed that countries with a more developed infrastructure, experience a disproportionately larger impact of the infrastructure on FDI and of the domestic investment on growth.

Countries however, with poor, under-developed infrastructure experience a statistically insignificant effect of the infrastructure of investment on growth. According to Estache (2006), this suggests that a poor level of the infrastructure could be a disablement to the country getting more investment; while it could be one of the measures of the poverty-trap argument; as it appears that a critical mass of the infrastructure is required, in order to attract investors to invest, thereby leading to improved economic growth.

Calderón (2009) cited in Bosede et al. (2013) delivered a detailed assessment of the effects on growth of infrastructural development in African countries, based on econometric estimations from 1960-2005 for a sample of 36 countries. He assessed the impact on the *per capita* growth of quicker build-up of infrastructural stocks and advancements in infrastructural quality services for 39 countries in Africa in three crucial infrastructural sectors: transportation, electricity and telecommunications.

When using the econometric technique suitable for dynamic panel models and possible endogenous repressors, the researchers found that service quality and infrastructural stocks enhance economic growth. The results show that there is a positive correlation between growth, the volume of infrastructural stock and the quality of infrastructural services. The models demonstrate that observed findings are important, both statistically and economically.

Egert et al. (2009) critically studied the infrastructure and economic growth, as well as the relationship between them. The time series results showed, among others, a positive effect of infrastructural investment on growth. The results differed across countries and sectors; and they further showed that infrastructural investment in the electricity and telecommunication sectors has vigorous positive effects on the long-term growth, unlike railways and road networks.

Ozoh (2010) suggested that the balance-growth theory does not presume identical distribution of resources across all the sectors; instead, a proportionate distribution of resources is capable of supporting all the compulsory interdependence factors among sectors, so as to have the existence of complementary issues and externalities in the economies-of-scale, from across the various sectors, in order to acquire and secure optimal patterns of the investment of resources.

Adequate investment in the various constituents in transportation (rail, air, waterways and road) in Nigeria is a *sine qua non* for economic development.

Rahut et al, (2010), examined the role of infrastructure in stimulating economic growth for the period of 1975 to 2007 in China, using the GMM (Generalized Methods of Moment) and ARDL (Autoregressive distributed lag model) techniques; and the outcomes showed that infrastructure and investment have made significant positive contributions to economic growth in China.

Ogun (2010) investigated the impact of infrastructural development on poverty reduction in Nigeria. Specifically, the relative effects of physical and social infrastructure on living standards, or poverty indicators, were examined, with a view to providing empirical evidence on the implications of increased urban infrastructure, to cater for the under-privileged in these areas. The paper employs secondary data for the period 1970 to 2005; and the Structural Vector

Autoregressive (SVAR) technique is adopted in the analysis. The study unequivocally finds that infrastructural development leads to poverty reduction, which in turn leads to an increase in economic growth. The results also show that although the infrastructure, in general, reduces poverty and increases economic growth, social infrastructure explains a higher proportion of the forecast error in poverty indicators relative to the physical infrastructure. This suggests that massive investment in social infrastructure in cities would drastically reduce poverty and increase growth in the urban areas.

Donaldson (2010) examined the effect of infrastructural development on economic growth. The study exposed that an extension of the rail infrastructure by the great British Empire has had a positive statistical impact on the economic state of India. The results showed that rail-road extension led an increase in the real agricultural income, up to 16% to an average per district of India; while the impact on the overall economy was simply enormous. This study strongly supported the phenomenon that development in the country's infrastructure is one of the main sources of economic activity, and the ultimate source of economic growth.

Faridi et al., (2011) showed in their study of telecommunication, transportation, and economic development of Pakistan, that it employed the technique of an auto-regressive model in the analysis of time-series data. The results showed a relationship in terms of labour and telecommunication, labour and capital, as well as in capital and telecommunication. Bivariate relations were shown between capital and GDP, and between telecommunication and GDP.

Multivariate examination showed that capital (gross fixed capital formation) and transport infrastructure (roads) are an important cause of higher GDP in Pakistan. A study by Straub and Terada-Hagiwara (2011) highlighted the fact that in Asian developing economies, infrastructural development has a direct and positive effect on diverse sectors of the economy, such as improvement in the communication technologies, which reduce the time wastage and better educational and health facilities, which reduce the level of stress of the workers, and which improves their level of working efficiencies.

Onakoya and Fasanya, 2012) explored the impact of infrastructure on the economic growth of Nigeria, by using a multivariate model of simultaneous equations. The outcomes revealed that infrastructural investment has a substantial impact on output of the economy directly, through its industrial output, and indirectly through the output of other sectors. The agricultural sector was not affected by the infrastructure; but there was a bi-directional causal relationship between infrastructure and economic growth.

2.6 Chapter Summary

This chapter has discussed the various theories of economic growth, a snapshot of infrastructural *status quo* in the SADC region, mainly focusing on the Democratic Republic of the Congo, Mauritius, South Africa, Zambia and Zimbabwe. It has also highlighted the determinants of economic growth, based on the underpinnings of the economic growth theories. The next chapter explains the methodology used, the data and the data types, justification of the variables and the diagnostic tests that need to be carried out.

Chapter 3

The Research Methodology

3.0 Introduction

This chapter explains the research method and the process utilized to examine the relationship between infrastructural development and economic growth. The econometric model that is employed by the study for the data analysis is defined in this section of the study. Lastly, it examines numerous diagnostic tests, such as, the unit root, co-integration, serial correlation, heteroscedasticity, that will be used to verify the dependability and the authenticity of the econometric model used.

3.1 The Research Approach

The research is based on the positivist research philosophy, also called the scientific method. Grix (2004) notes that the choice of the underlying research philosophy brings to the fore the ontological and epistemological assumptions held about the reality. The positivist position taken assumes that the concept of reality is objective; and the researcher is able to examine the relationship between economic growth and infrastructural development in the SADC region by employing predominantly quantitative methods – without becoming involved in the work routine, as promoted by phenomenologists (Saunders et al., 2012).

The positivist stance is based on the "hard facts," or the reality on the ground concept in the form of numbers and figures, instead of qualitative information, which, as Jerie (2013) argues, is untainted by the interpretative skills of the researcher. Furthermore, positivism stresses a high measure of structured methodology, with objectives that can be quantified, in order to enable statistical analysis.

3.2 Sample size and Data

The study is centred on the Southern African Development Community, using five countries as the sample: the Democratic Republic of the Congo, Mauritius, South Africa, Zambia and Zimbabwe. This covers the period of 2003 to 2020, due to the availability of – mainly for infrastructural development. The study has utilised secondary annual data; and the data were collected from the World Bank and the African Infrastructural Development Bank.

3.3 Model Specification

The empirical model to be estimated is based on the Solow growth theory and on studies by Romer (1990) and Barro (1991), who stated that the development of the infrastructure enhances the increase in productivity and economic growth. To empirically investigate the relationship between infrastructural development and economic growth, the following model was estimated:

$$LnRGDP_{it} = \alpha_i + \sigma_i t + \beta_1 lnAIDI_{it} + \beta_2 lnINF_{it} + \beta_3 lnHCS_{it} + \beta_4 lnTO_{it} + \beta_5 lnFDI_{it} + e_t$$

(i)

where, RGDP is the real Goss Domestic Product; AIDI is the Infrastructural Development; INF is the Inflation Rate; HCS is the Human Capital Stock; TO is Trade Openness and FDI is the Foreign Direct Investment.

Finally, the infrastructure was disaggregated into four main pillars, which comprise transport, electricity, ICT and lastly WSS; therefore equation (i) transforms to become:

$$LnRGDP_{it} = \alpha_i + \sigma_i t + \beta_1 lnTCI_{it} + +\beta_2 lnECI_{it} + \beta_3 lnICTCI_{it} + \beta_4 lnWSSCI_{it} + \beta_5 lnINF_{it} + \beta_6 lnHCS_{it} + \beta_7 lnTO_{it} + \beta_8 lnFDI_{it} + e_t$$

where, RGDP is the real Goss Domestic Product; AIDI is the Infrastructural Development; TCI is the Transport infrastructure; ECI is the Electricity infrastructure; ICTCI is the ICT infrastructure; WSSCI is the WSS Composite Index; INF is the Inflation Rate; HCS is the Human Capital Stock; TO is Trade Openness; and FDI is the Foreign Direct Investment; and β_1,β_2,β_3, $\beta_4$and β_5 are the parameters to be estimated; whilst e is the error term.

3.4 Justification of the Variables

The measurement and description of the variables that were included in the model are discussed in this section of the study.

3.4.1 Gross Domestic Product (RGDP)

Gross Domestic Product (GDP) is the total value of goods and services produced by the citizens of a nation. Real GDP indicates the GDP that has been adjusted to the base year by applying the GDP deflator. Therefore, the changes in GDP reflect the growth rate of an economy.

3.4.2 Infrastructural Development (AIDI)

Infrastructural development enhances the economic growth by reducing the cost of production and the transport costs by increasing the productivity of the input factors, and thereby creating indirect positive externalities (Palei, 2015). Therefore, a positive relation is expected; and the African Infrastructural Development Index was used, as a proxy for infrastructural development. Additionally, the study takes a step further to disaggregate infrastructural development, which comprises transport, ICT, WSS and the electricity segments. As a proxy for transport, the study used the Transport Composite Index (TCI); whilst for electricity the Electricity Composite Index (ECI) was employed.

To measure ICT, the ICT composite index was used. Lastly, the Water Supply Scheme Composite Index (WSSCI) was utilised, as a proxy for WSS in this study.

3.4.3 Inflation (INF)

Inflation is an indicator of the macro-economic environmental stability and policy consistency. Fatma and Zouhaier (2014) pointed out that inflation is one of the key determinants of economic growth. A high inflation rate is an indicator of economic instability, thereby discouraging capital formation and investor confidence, and hampering growth; whereas a low inflation rate encourages investment and boosts investors' confidence - resulting in a surge in economic growth, (Zahonogo, 2017). Therefore, a negative relationship can be expected.

3.4.4 Human Capital Stock (HCS)

Human capital stock entails the degree of skilled labour in a country; and a skilled labour force is more efficient, when compared to unskilled labour; consequently, a highly skilled workforce results in increased productivity. Adam Smith opined that the prosperity of a nation depends on the skill, efficiency and attitude of its labour force. A skilled workforce enhances economic growth, since it provides economic value through increased productivity. The perception of human capital is the comprehension that everyone has a different skill set or knowledge, hence investing in education and training is key for the growth of an economy. As a result, a positive relationship can be expected.

3.4.5 Trade Openness (TO)

Trade openness reviews the exposure of a country to international markets; and it is an indicator of this effect. If the irregularity of imports is high, there exists a non-linear relationship between trade openness and economic growth, (Huchet-bourdon et al., 2013), thereby meaning that countries with quality export goods are more likely to experience growth to a certain level of dependency on trade; while those with poor quality export goods are likely to experience negative effects on growth, as a result of diminished trade. Also, trade openness enhances technology transfer and skills transfer, which promote economic growth; therefore, a positive link is expected between economic growth and trade.

3.4.6 Foreign Direct Investment (FDI)

Foreign direct investment is loosely defined as investment made in a foreign country by either an individual, or a company; and it is asserted that it brings economic benefits, such as the transfer of skills, technology transfer; and it fosters domestic investment. The Solow growth theory and the Neo-Classical growth theory posit that there is a positive direct relationship between economic growth and FDI inflows; consequently, a positive relationship would be expected by the study.

The variables are expected to yield relationships consistent with the literature, based on previous expectations. All the variables are expected to be positively related with economic growth, except for inflation.

3.5 Estimation approach

To investigate the relationship between infrastructural development and economic growth, a panel Auto-Regressive Distributed Lag model was employed. One of the chief issues raised in the study was that of endogeneity; since it raises the question of whether infrastructural development results in economic development, or, whether economic growth necessitates infrastructural development. Based on the reverse causality and on the possibility of more than one endogenous variable, the ARDL model was found to be more appropriate, as argued by Pesaran et al., (2001) unlike other panel data estimators, such as those of Pooled Ordinary Least

Squares, Random Effects, Fixed Effects, Generalised Method of Moment, among other techniques.

Another advantage of the ARDL model is its ability to generate the short-term and the long-term coefficients, thereby enabling the researcher to understand the short-run and the long-run dynamics of infrastructural development relating to economic growth. Lastly, it is applicable under a mixed order of integration, thus incorporating I(0) or I(1) variables. Therefore, the general ARDL model is given as:

$$\Delta Y_{it} = \alpha_0 + \sum_{i=1}^{m} \beta_1 \Delta Y_{i,t-1} + \sum_{i=0}^{n} \emptyset_i \Delta EC_{i,t-1} + \sigma_1 EC_{i,t-1} + \varepsilon_{i,t}$$

where, $\Delta \; and \; \varepsilon_{it}$ are the first difference operator and the error term, respectively, Y is the endogenous variable, EC is the equilibrium correction term. The ARDL model follows a number of regression estimations, to obtain an optimal lag length; consequently, the Akaike Information Criterion (AIC) is utilised to address this issue. This technique has the ability to test for the presence of cointegration, by applying the bounds, test based on the Wald or F-statistic. Following the above equation, the null hypothesis for the bounds test for cointegration will be given as: $H_0: \sigma_1 = \sigma_2 = 0$, against the alternate hypothesis $H_1: \sigma_1 \neq \sigma_2 \neq 0$. If the bounds test establishes the presence of co-integration, the ARDL long-term model can then be estimated, as follows:

$$Y_{i,t} = \alpha_0 + \sum_{i=1}^{m} \alpha_1 Y_{i,t-1} + \sum_{i=0}^{n} \vartheta_i EC + \mu_{i,t}$$

To obtain the short-term coefficients, there is a need to estimate an Equilibrium Correction Model (ECM) related to the long-term estimates, as follows:

$$\Delta Y_{i,t} = \beta_0 + \sum_{i=1}^{m} \beta_i \Delta Y_{i,t-1} + \sum_{i=0}^{n} \theta_i \Delta EC_{i,t-1} + \delta ECM_{i,t-1} + \omega_{i,t}$$

where $\omega_{i,t}$ is independently and normally distributed, thus with a zero mean and a constant variance, $where \; EC_{i,t-1}$ is the equilibrium-correction term, δ is the speed of adjustment parameter to the equilibrium position after experiencing a shock in the economy; as a result of which, it must be negative and statistically significant.

3.6 Diagnostic tests

The following diagnostic tests will be performed to check the consistency and the reliability of the econometric model employed and the results; these would include the descriptive statistics, the unit root test, the co-integration test, and the multicollinearity test. Finally, to check the direction of causality between the variables, a Granger-causality test will be conducted for the given key variables.

3.6.1 The Descriptive Statistics

In order to understand the behaviour and the properties of the data. a descriptive statistics analysis will be conducted; since, it presents the mean, the maximum, the minimum, the standard deviation, kurtosis and the skewness of the data, which are measures of the central tendency of the data.

3.6.2 Multi-collinearity

Multi-collinearity is a situation, whereby some of the explanatory variables are highly related, thereby indicating that they can be used to serve the same purpose, consequently making the coefficient to be estimated to be indeterminate. Gujarati (2004) argued that multicollinearity is common, but what matters is the degree thereof. Therefore, to check for the presence of multicollinearity, the Pearson Correlation Matrix analysis was conducted (Nachtsheim et al., 2004).

3.6.3 Panel Unit-root tests

The use of non-stationary data will result in misleading conclusions to be made, in order to avoid the inference of spurious results and misleading conclusions; and consequently, a unit-root test was conducted. The Levine-Lin-Chu (LLC) test was employed and the Im-Pesaran, as well as a Shin (IPS) test was also conducted, in order to confirm the findings of the LLC test. The LLC test is based on the Augmented Dickey Fuller regression for examining the unit-root problem and the null hypothesis are constructed as follows:

$$H_0: \rho = 1, \textit{implying that all the series in the panel have a unit root}$$
$$H_1: \rho < 1, \textit{thereby implying that all the series are stationary}$$

The decision rule is to reject H_0, if the probability value is less than 0.05, and to conclude that the variable is stationary.

3.6.4 The Panel co-integration test

In the absence of cointegration thus long-run relationship between the variables the forecasting power of the ARDL model weakens, hence Pedroni test will be carried out to reinforce the self-ability of the ARDL model to check the presence of cointegration through the Error Correction Term.

The Pedroni test holds the condition that the calculated statistics must be smaller than the tabulated critical values to reject the null hypothesis of no cointegration. It holds the following hypothesis:

H_0: No co-integration

For the panel v-statistics the decision rule is that for large positive values reject H_0; while for panel rho and t- statistics, large negative values highlight rejection of H_0 and conclude that cointegration is present.

3.6.5 The Granger-Causality Test

Granger (1969) defined the existence of a causal relationship, as follows: if the lagged values of a variable, have explanatory power on another variable; then, the assumption is that the cause precedes the effect, and in our case, if infrastructural development is the cause of economic growth, then infrastructure development should precede economic growth. As a result, the test uses the following bivariate equations:

$$AIDI_t = \alpha_0 + \alpha_1 AIDI_{t-1} + \cdots + \alpha_i AIDI_{t-1} + \beta_1 GDP_{t-1} + \cdots + \beta_i GDP_{t-1}$$
$$GDP_t = \alpha_0 + \alpha_1 GDP_{t-1} + \cdots + \alpha_i GDP_{t-1} + \beta_1 AIDI_{t-1} + \cdots + \beta_i AIDI_{t-1}$$

The reported F-statistics are the Wald exogenous statistics for the joint hypothesis, thus $\beta_1 = \cdots \beta_i = 0$ for each equation, and the null hypothesis is that infrastructure development does not granger cause economic growth in the first regression whilst for the second regression the null is that economic growth does not granger cause infrastructure development.

3.7 Conclusion

The chapter has discussed the research design, the sample size and the data properties and sources, as well as the model specifications and econometric estimation technique that were employed by the study. The issues of justification and measurement of the variables included in the regression model were also elucidated. The next chapter presents the discussion of the research findings.

Chapter 4

Data Presentation, Analysis and Discussion of the Results

4.0 Introduction

The chapter presents a thorough data analysis and discussion of the results of the research. The chapter is sub-divided into four segments, the first part presents the descriptive statistics, and the diagnostic tests for the model utilised by the study. The second and third parts discuss the ARDL long-term results and the Error-Correction Model results, respectively. Lastly, the fourth chapter presents the results of the estimated causality between infrastructural development and economic growth.

4.1 Descriptive Statistics

The behaviour of both the dependent and the independent variables, which comprise the mean, the standard deviation, as well as the maximum and minimum values, among other indicators, are presented in the summary of descriptive statistics in Table 4.1.

Table 4.1: Descriptive Statistics Summary

	Mean	Maximum	Minimum	Std Dev	Skewness	Kurtosis	Obs
LGGDP	3.2658	4.0876	2.2400	0.5384	-0.1038	1.6638	90
LGAIDI	1.3965	1.9011	0.6045	0.3815	-0.4256	2.1891	90
LGTCI	1.0042	1.5758	0.1734	0.4523	-0.6739	2.4119	90
LGECI	1.1724	1.9158	0.2590	0.5388	-0.3651	2.1403	90
LGICTCI	-0.2811	1.8562	-4.9124	1.7493	-0.5805	2.1930	90
LGWSSCI	1.7897	1.9991	1.5278	0.1722	-0.2284	1.4620	90
LGFDI	0.3497	1.1044	-1.1782	0.4283	-0.9848	4.2795	90
LGHCS	0.8719	1.0170	0.5911	0.0963	-0.6387	3.2993	90
LGINF	0.8629	2.7505	-0.1599	0.5778	1.3511	5.6301	90
LGTO	1.8611	2.1040	1.6244	0.1152	0.3839	2.2425	90

Source: Researcher Calculations using Eviews 9.
Note: L is Natural logarithm; GDP is Economic Growth, AIDI is Infrastructure Development Index, TCI is Transport Infrastructure, ECI is Electricity Infrastructure, ICTCI is ICT Infrastructure, WSSCI is Water, Sanitation and Sewerage Infrastructure, HCS is Human Capital Stock, INF is Inflation, FDI is Foreign Direct Investment, TO is Trade Openness

The mean value for the log of Gross Domestic Product (GDP) is 3.2658, which is an indicator of the average adjustment ratio, with a standard deviation of 0.5384; whereas the log of the infrastructural development had an average value of 1.3965 and a standard variation of 0.3815. Moreover, the LGGDP has a maximum value of 4.0876, and minimum value of 2.2400; whilst the LGAIDI had a maximum value of 1.9011, and minimum value of 0.6045. The Log of the Foreign Direct Investment (FDI) had a mean value of 0.3497, and a standard deviation of 0.4283.

Furthermore, the Log of the Human Capital Stock (LGHCS), the Log of the Trade Openness (LGTO) and the Log of Inflation (LGINF) had mean values of 0.8719, 1.8611 and 0.8629, respectively.

Interestingly, the log of the ICT infrastructure had a negative mean value of -0.2811; and this means that there is still low-quality ICT infrastructure in the SADC region. The Transport Infrastructure (LGTCI) had an average variation of 1.0042, and maximum and minimum values of 0.1734 and 1.5758 respectively; whereas Electricity infrastructure (LGECI) had a mean, minimum and maximum values of 1.1724, 0.259 and 1.9158, respectively.

Lastly, the water, sanitation and sewerage (LGWSSCI) had an average value of 1.7897, with a maximum value of 1.9991 and a minimum value of 1.5278.

The skewness is zero in symmetric distributions, when comparing the skewness values of the different variables under analysis. From Table 2, it is quite obvious that all the variables are negatively skewed, except for inflation and trade openness, which are both positively skewed. The measure of flatness or the peak of the economic data, thus kurtosis, showed that GDP, aggregated infrastructural development, disaggregated infrastructure (thus, transport, electricity, water, sanitation and sewerage, and ICT), as well as trade openness are all normally distributed; whilst Foreign Direct Investment, Human Capital Stock, and inflation are all leptokurtic.

4.2 Diagnostic Test Results

To check whether the model is handy, pre-diagnostic tests, which include the unit root and the co-integration test, were done; and then the post diagnostic test follows, to validate whether the results are not possibly spurious for analysis.

4.2.1 The Multi-collinearity Results

The study used the pair-wise correlation matrix to test for multicollinearity with the rule-of-thumb that a correlation value above 0.8 indicates the presence of multicollinearity; whilst a value below the 0.8 threshold, is deemed as acceptable; and it included a regression analysis (Gujarati, 2004). The results of the correlation analysis are presented in Table 4.2.

Table 4.2: Pearson Correlation Matrix Results

Variable	LGGDP	LGAIDI	LGFDI	LGHCS	LGINF	LGTO
LGGDP	1.0000					
LGAIDI	-0.4791	1.0000				
LGFDI	0.2457	-0.4341	1.0000			
LGHCS	-0.5249	0.9142	-0.4072	1.0000		
LGINF	0.2600	-0.2051	-0.1487	-0.2590	1.0000	
LGTO	0.1541	0.2689	0.1362	0.0624	-0.0434	1.0000

Source: Researcher's Calculations using Eye views 9

From Table 3, the results indicated that the correlation values between the variables lie below 0.8, thereby implying that the variables do not suffer from a multi-collinearity problem, hence all the variables were included in the regression analysis.

4.2.2 The Panel Unit-root Test

The Levine-Lin-Chu (LLC) was used to confirm the stationarity status of the variables; and the Im-Pesaran and Shin (IPS) tests were then conducted, to confirm the findings of the LLC test. The main reason was to check whether any of the variables were integrated to the order of two (that is I(2), so as to avoid any spurious results under the ARDL model. Even though the ARDL approach considers a mixed order of integration, the unit-root test could assess whether the ARDL model should be employed, or not, since it is applicable under I(2) or under a higher order of variables.

The LLC test has the null hypothesis of a unit root (thus non-stationary); and by implication, it is rejected – if and only if the corresponding probability values are less than the 5% significance level. Table 4.3 presents the unit-root results.

The results highlighted that Foreign Direct Investment (LGFDI), Trade Openness (LGTO) and Transport Infrastructure (LGTCI) were stationary at all levels; and therefore, they are integrated to the order of zero. However, the variables were stationary after the first differencing, which comprises the Infrastructural Development (LGAIDI), Economic Growth (LGGDP), Energy Infrastructure (LGECI), Human Capital stock (LGHCS), ICT Infrastructure (LGICTCI), Inflation (LGINF), and WSS Infrastructure (LGWSSCI) variables, which became stationary after the first differentiation; thus, they are integrated to the order of one.

Table 4.3: The Unit-root Results

Variable	**Levin-Lin-Chu**			**Im-Pesaran and Shin**			**Order of Integration**
	Level	**1st difference**		**Level**	**1st difference**		
LGGDP	-1.4668	-9.417**		1.4442	-3.6242**		I(1)
LGAIDI	-0.8035	-2.6915**		0.7711	-3.0521**		I(1)
LGECI	0.8372	3.7423**		0.3025	3.4479**		I(1)
LGFDI	-4.4383**	-10.3161**		-3.0483**	-5.64754**		I(0)
LGHCS	2.4689	-2.9970**		2.8661	-1.9420**		I(1)
LGICTCI	2.2611	-3.8524**		-0.2309	-1.6356**		I(1)
LGINF	0.0369	-6.4124**		0.7804	-2.8262**		I(1)
LGTCI	8.7846**	13.4258**		3.3338**	-4.9073**		I(0)
LGTO	4.2929**	8.2471**		1.6922**	3.7251**		I(0)
LGWSSCI	0.3906	3.1914**		3.0298	-3.0557**		I(1)

Source: Researcher’s Calculations using Eye views 9

The results of the LLC test concur with those of the IPS test; and this confirms that the ARDL model is applicable; since the variables all have a mixed order of integration; and none of the variables is integrated to the order of two. Consequently, the study proceeded with the ARDL model, as the estimation technique.

4.2.3 The Co-integration Test

The Pedroni test and the Westerlund test are generally used to check the presence of any long-run relationship between the variables; hence, the Pedroni test serves as a confirmation; since the ARDL estimator caters for this simultaneously. The Pedroni test results are presented in Table 4.4, and the results highlight the existence of cointegration, thereby confirming the presence of a long-run relationship between the variables.

Table 4.4:The Pedroni Co-integration Test

	Statistic	Prob.	Conclusion
Panel v-Statistic	-0.9362	0.8254	Presence of co-integration
Panel rho-Statistic	2.1832	0.9855	
Panel PP-Statistic	0.2390	0.5945	
Panel ADF-Statistic	0.1900	0.5753	

Source: Researcher Calculations using EViews 9

4.3 The Regression Results

As for the aggregated infrastructural development, an ARDL ((1, 1, 1, 1, 1, 1)) model was used; while the ARDL (1, 1, 1, 1, 1, 1, 1, 1, 1) model for the disaggregated infrastructure was selected, based on the Akaike Information Criteria (AIC) for optimal lag length. The cointegration equation provides the means of reconciling the short-term behaviour of an economic variable with its long-term behaviour. Its presence implies the estimation of the error-correction term (ECT) to determine the dynamic behaviour of the equation. The results are presented in Table 6.

4.3.1 The long-term results

The ARDL model yields the long-term coefficients that highlight the long-term impact of the Infrastructural Development, the Human Capital Stock, the Foreign Direct Investment, and the Trade Openness. These are illustrated in Table 4.5.

Infrastructural Development

Infrastructural development has a positive coefficient; and it is statistically significant. Consequently, as the Infrastructural Development increases, so does economic growth. A 1% increase in infrastructural development resulted in a 1.78% increase in economic growth. The results explain that infrastructural development in the SADC region plays a pivotal role; and it improves the condition of the economy, as supported by Calderon (2009), cited in Bosede (2010), who found that the volumes of infrastructural stock, and the quality of the infrastructural services positively relate to economic growth. These results are also supported by those of Onakoya and Fasanya (2012; and by those of Kodongo and Ojah (2013).

Additionally, infrastructural development was disaggregated into four main components (transport, electricity, ICT and Water Sanitation and Sewerage) with the motive of examining each sector's contribution to economic growth. Transport Infrastructure (TCI) was found to be statistically significant and positively related to economic growth. Estache and Wren-Lewis, (2016) pointed out that supranational energy and transport projects can have significant payoffs at all stages of development; consequently, investments in these sectors can make a substantial impact in connecting markets.

The United Nations (2009) argued that Africa needs to invest in roads, in order for it to catch up with the rest of the world; since roads are essential for reducing the differences across the different regions within countries (Estache and Fay, 2010). Wilson et al., (2003) found that increasing the port capacity for nations with below capacity average could result in a surge in APEC average per capita GDP; consequently, the port quality is key, in enhancing economic growth.

Table 4.5: Long-term ARDL Results

	Long-run dynamics					
	Model 1			Model 2		
	Aggregated Infrastructural Index			Disaggregated Infrastructural Index		
	Coefficient	Std. Error	t-Statistic	Coefficient	Std. Error	t-Statistic
LGAIDI	1.7814***	0.5732	3.1081			
LGECI				2.3779***	0.2993	7.9453
LGICTCI				1.1684***	0.344	3.3965
LGTCI				3.8446***	1.1778	3.2642
LGWSSCI				2.4595*	1.3852	1.7756
LGFDI	0.3573***	0.0855	4.1789	0.1712***	0.0202	8.4712
LGHCS	6.9705***	1.7106	4.0749	10.9637***	1.6722	6.5566
LGINF	-0.5033***	0.1254	-4.0152	-0.1770***	0.0208	-8.5281
LGTO	1.9730**	0.909	2.1704	2.1063***	0.4921	4.2801

*Source: Researcher's Calculations using EViews 9; *** ** (*) denotes rejection of the null hypothesis at 1%, 5% and 10% levels of significance*

As for the electricity infrastructure (ECI), the results show that there was a positive relationship between electricity infrastructure and economic growth, consistent with the findings of Garsous (2010) who found a robust positive effect greater than that in any other infrastructural sector. A percentage increase in the electricity infrastructure results in a 2.3779% increase in economic growth. Ongono Patrice (2009) argued that energy is a key factor in determining economic growth; since it is one of the most important resources used in all production processes; and it has increased the foreign earnings for countries that export energy products.

Therefore, the findings of this study are in line with those of Ansgar et al. (2010); Gbadebo et al. (2009) who found a positive link between economic growth and electricity infrastructural development.

From Table 4.5, it can be noted that the ICT infrastructure (*ICTCI*) is positively and statistically related to economic growth, with a 1% improvement in ICT infrastructure, resulting in a 1.17% increase in economic growth, as supported by Estache and Wren-Lewis (2016; Chakraborty and Nandi (2011; Andrianaivo and Kadar (2011), as well as by Garsous (2010). This is so because, information and technology, and telecommunications enable businesses entities to transact easily through digital platforms; and this improves efficiency in the decision-making process, as argued by Chakraborty and Nandi (2011); Andrianaivo and Khodir (2011); Qiang and Pitt (2004).

Water, Sanitation and Sewerage (WSSCI) had a positive statistically significant effect on economic growth, where a 1% change in WSS would result in a 2.46% change in economic growth. These findings are similar to those of Bhattacharyya (2012), who found a positive association between water, sanitation and sewerage, as well as economic growth. The role of WSS does not strongly spring to researchers when compared with those of other sectors; however, WSS drives health, which in turn, drives labour productivity and labour productivity. WSS itself drives growth; and consequently, the link between WSS and economic growth is an indirect relationship.

From a panel of Sub-Saharan African countries, Estache et al., (2005) found a positive relationship between water and sanitary infrastructure, as well as economic growth. Generally, it can be noted that infrastructural development is positively related to economic growth; and this is also the case for infrastructural segments (thus, this applies to transport; water, sanitation and sewerage; ICT; and electricity infrastructure).

Foreign Direct Investment

The coefficient for FDI was positive and statistically significant, thereby implying that a surge in FDI inflows increases economic growth, as argued by Bessonova et al. (2002). In most emerging economies, FDI is relatively preferred, rather than other external income sources, such as Official Developmental assistance (ODA). External debt is perceived to be more stable, in the long-term; and it is not quickly withdrawn in response to adverse circumstances, such as economic meltdown (Markowitz et al., 2018; Longans & Razin, 2001). Therefore, the major benefit of FDI is that of bridging the capital and technological gap that has been discouraging economic growth in Africa. As a consequence, it boosts domestic investment and capital inflow in the recipient country, thereby increasing production.

Human Capital Stock

The positive coefficient of Human Capital Stock means that countries that have high Human Capital Stock (skilled labour forces) are more likely to experience economic growth compared with those with low human capital stock. It follows that a more educated population is anticipated to make a higher contribution to the growth of the economy due to its collectively acquired expertise. Smith [1986 (1776)] argued that, human capital impacts an economy through two channels: firstly, as a factor of production, thereby participating in the direct generation of output, and secondly through technological improvements.

Wang and Wong (2009) and Bengoa and Sanchez-Robles (2003) argued that for Human Capital Stock to impact an economy, it has to first reach a certain level in the host country, since this critical level is important in maintaining the increased levels of economic growth.

Inflation

Inflation is an indicator of macro-economic stability and policy consistency; and the results reveal that there is an inverse relationship between inflation and economic growth, which in turn implies that macro-economic instability and policy inconsistency hamper the growth of the economy; since they signal an unpredictable economic environment, which discourages the capital formation. A study by Fatma and Zouhaier (2014) found a negative association between economic growth and inflation. However, Serafein (2015) argued that inflation is not detrimental to growth, provided it is controlled; and it does not exceed a certain threshold.

Trade Openness

Trade openness was found to be statistically and positively related to economic growth; consequently, the more open an economy is, the more likely it is to experience high growth levels; since it would then be exposed to the international market; and technological gains through the comparative and the absolute advantages it is more likely to enjoy. These results comply with the theoretical arguments of the Endogenous Growth Theory. The study supports the move of trade liberalization policy of the SADC member states, which played an important role in improving economic growth within the region. Furthermore, SADC exports are usually primary products, which have fluctuating pricing constantly, showing downward movements. This diversification policy has increased revenues from those exports, which have positively impacted GDP growth.

4.3.2 Short-term Results

The Error-Correction Term (ECT) captures the short-term behaviour of the system; whilst its coefficient measures the speed of adjustment – from a point of disequilibrium – to a point of equilibrium, in the case of shocks in the economy. The results of the Error-Correction Model

(ECM) are presented in Table 4.6. With respect to the ECT, it is negative and statistically significant, as is desirable, thereby indicating the presence of a long-term relationship and causality between the explanatory (thus, infrastructure development, trade openness, inflation, human capital stock, foreign direct investment) and endogenous variables (that is, economic growth).

The findings explain that in the event of a shock, the economy would automatically adjust to an equilibrium position at a rate of 52.87%.

Table 4.6: Short-term ARDL Results

	Short-run dynamics					
	Model 1			**Model 2**		
	Aggregated Infrastructural Index			**Disaggregated Infrastructural Index**		
Variable	Coefficient	Std. Error	t-Statistic	Coefficient	Std. Error	t-Statistic
ECT	-0.5287**	0.2415	-2.1892	-0.4348**	0.1638	-2.6541
D(LGAIDI)	0.2157	22.6227	0.0095			
D(LGECI)				-2.4086***	0.721	-3.3405
D(LGICTCI)				0.0669	0.0469	1.4278
D(LGTCI)				-0.4651***	0.1655	-2.8103
D(LGWSSCI)				-42.1756	27.8095	-1.5166
D(LGFDI)	1.5238	1.5376	0.991	0.0242	0.0611	0.3963
D(LGHCS)	3.0202	3.9865	0.7576	5.7570	5.3904	1.0679
D(LGINF)	-0.8138***	0.3012	-2.7021	-0.6559***	0.2113	-3.1041
D(LGTO)	0.3759	6.2768	0.0599	0.2758**	0.1049	2.6292
Constant				-3.5196	12.1784	-0.289

*Source: Researcher's Calculations using EViews 9; *** ** (*) denote rejection of null hypothesis at 1%, 5% and 10% level of significance*

The short-term results emphasised the effects of infrastructural development, trade openness, human-capital stock, foreign-direct investment on an economy that are realised in the long term; since they take time to be experienced.

4.4 The Granger-Causality Results

To determine whether one variable can be used to predict economic growth, a Granger-Causality test was conducted; and the results are presented in Table 4.7. It can be noted that a unidirectional relationship exists between infrastructural development and economic growth, running from infrastructural development to economic growth. We concluded that infrastructural development Granger causes economic growth. Additionally, on a sector basis, the results showed that a unidirectional relationship also exists for ICT, water, sanitation and sewerage, electricity and transport infrastructure, running from the latter to economic growth at the conventional 5% statistically significant level.

Table 4.7: Granger-Causality Results

Null hypothesis	Obs	F-statistic	Prob
LGAIDI does not Granger-cause LGGDP	85	6.30710***	0.0014
LGGDP does not Granger-cause LGAIDI		0.07396	0.7863
LGECI does not Granger-cause LGGDP	85	4.80335**	0.0312
LGGDP does not Granger-cause LGECI		0.79386	0.3755
LGICTCI does not Granger-cause LGGDP	85	5.82271**	0.0181
LGGDP does not Granger-cause LGICTCI		2.85226	0.095
LGTCI does not Granger-cause LGGDP	85	1.86938**	0.0175
LGGDP does not Granger-cause LGTCI		1.78004	0.1858
LGWSSCI does not Granger-cause LGGDP	85	4.46331**	0.0377
LGGDP does not Granger-cause LGWSSCI		3.11745	0.1812

*Source: Researcher Calculations using the Eye views iews 9; *** ** denote rejection of null hypothesis at 1%, and 5% level of significance*

4.5 Chapter Summary

This section of the study presented the descriptive statistics, unit-root test results and the multi-collinearity results. The ARDL results highlighted the fact that infrastructural development positively impacts economic growth for the sampled SADC countries; and the same result was reached with respect to the infrastructural sectors; consequently, transport, electricity, water sanitation, and sewerage and the ICT infrastructure are relevant in this context. Moreover, the Error-Correction Model indicated that there exists a long-term relationship; and this conclusion was also reached by the Pedroni test. As for the Granger-causality results, it was recorded that there exists a unidirectional relationship running from the infrastructure to economic growth. The last chapter presents a summary of the major findings, conclusions and recommendations of the study.

Chapter 5

Summary, Conclusions and Recommendations

5.0 Introduction

An earlier chapter of the study presented, analysed and discussed the findings of the study. This chapter of the study focuses on the summary, conclusion, recommendations and proposals for additional study that have been derived from the results given in Chapter four. The recommendation section outlines the possible measures that could be implemented in the SADC region, in order to boost the relationship between economic growth and infrastructural development within the region.

5.1 Summary of the findings

The main aim of the study was to analyse the impact of infrastructural development on economic growth in the SADC region – for the period of 2003 to 2020. To achieve this goal, a Panel Auto-Regressive Distributed Lag model was adopted ;and to validate the results, a series of tests were performed: the unit-root test, the multi-collinearity test, and the co-integration test. The panel unit-root results highlighted the fact that there is a mixed order of integration between the variables; whilst the Pearson correlation-matrix results indicated that the variables do not suffer from a multi-collinearity problem. The Pedroni co-integration test results signified the existence of long-term relationships between the variables.

The results highlighted that the speed of adjustment, from a point of disequilibrium to the equilibrium position, as a result of a shock, was 52.87%. This indicates that shocks that resulted in a disequilibrium in previous years would be corrected at a rate of 52.87% in the current year. Additionally, the results indicated that there is a unidirectional relationship between infrastructural development and economic growth, running from infrastructural development to economic growth.

The PARDL results signposted that there is a positive relationship between infrastructural development and economic growth in the SADC region. The short-term coefficient for infrastructural development was 0.2157; and it was statistically significant at the 1% level of significance. This means that in the short term,, a 1% increase (or decrease) in infrastructural development would result in a 0.2157% increase (or decrease) in economic growth.

Furthermore, electricity, transport and water, sanitation and sewerage infrastructure were found to be statistically significant in explaining economic growth in the short term. The coefficient value for electricity infrastructure was found to be -2.4086. This means that electricity negatively affects economic growth in the short term, thereby implying that a 1% increase (decrease) in the electricity infrastructure would result in a 2.4086% decrease (or increase) in economic growth. Additionally, the coefficient for transport infrastructure was 0.4651, meaning that a 1% increase (or decrease) in the transport development in the infrastructure would result in a 0.4651% decrease (or increase) in economic growth within the SADC region.

In the case of Water, Sanitation and Sewerage, it was found to be statistically significant at 10% - with a coefficient of -42.1756. This implies that there is an inverse relationship between water, sanitation and sewerage infrastructural development and economic growth in the SADC region, thus a 1% increase in the WSS infrastructure would result in a 42.1756% decrease in economic growth.

Moreover, ICT infrastructural development was found to be statistically insignificant in explaining economic growth in the short term; and regardless of its insignificance, it has a positive effect on economic growth with a coefficient value of 0.0669. Most interestingly, Electricity, Transport and WSS infrastructural development were found to have a negative relationship with economic growth; whilst ICT had a positive effect. Nevertheless, overall. infrastructural development proved to have a positive impact on economic growth in the short term.

In the long term, the results highlighted that infrastructural development has a coefficient value of 1.7184. This means that infrastructural development has more impact in the long term, when compared with that of the short term, as witnessed by a higher coefficient value. The same applies for the disaggregated infrastructural development composites (Electricity, WSS, Transport and ICT infrastructure), which all had positive effects on economic growth, as was expected by the study. Furthermore, the ICT infrastructure was found to be statistically significant in the long term, which means that the ICT infrastructural development plays an important role in enhancing economic growth in the long term.

Lastly, the control variables (which are: trade openness, human-capital stock, inflation and foreign direct investments) were found to be statistically insignificant, in explaining the variations in economic growth in the short term. Foreign Direct Investment, Human Capital Stock, Trade Openness were all found to have a positive impact on economic growth; whilst inflation was found to have a negative impact on economic growth. However, these variables were statistically significant in explaining economic growth in the long term; and they maintained their short-term relationship with economic growth.

5.2 Conclusions

In addressing the research questions in this study, the following conclusions were reached:

Is infrastructural development a catalyst for growth in economies?

The findings of the study highlighted that infrastructural development is a catalyst for economic growth and development. The results concluded that infrastructural development enhances economic growth in the SADC region; and these findings are in line with those of Kodongo and Ojah 2016) who found that infrastructural development positively affects economic growth; and it is one of the tools that can be used to enhance economic growth.

Does development in infrastructure increase growth in economies in the short term?

The findings of the study conclude that infrastructural development increases economic growth in the short term; and it has a positive impact on growth. This can be noted by the statistically significant coefficient of 0.2157 at the % level. This indicates that a percentage increase in infrastructural development would result in a 0.2157% increase in economic growth in the short term. This conclusion is in line with those of Onakoya and Fasanya (2012) who found that infrastructural development is the key for economic growth.

Does infrastructural development increase or decrease the long-term growth of economies?

From the findings of this study, it may be concluded that infrastructural development increases economic growth in the long term, as indicated by a positive coefficient of 1.7814, thereby implying that in the long term, infrastructural development positively relates to economic growth; thus, a percentage increase in infrastructural development would result in a 1.7814%

increase in economic growth. The findings of this study came to the same conclusion as those of Calderón (2009) cited by Bosede (2010).

Do the different types of infrastructure have an effect on economic growth in the SADC?

The ARDL results indicated that the different types of infrastructure (that is, Transport, Electricity. ICT and WSS) positively impact economic growth in the SADC region. Furthermore, the findings highlighted that these four different types of infrastructure positively affect economic growth. This means that an increase in transport infrastructure would result in an increase in economic growth; and the same applies for all the types of infrastructure. Therefore, it was concluded that the different types of infrastructure positively associated with economic growth, as supported by Estache and Wren-Lewis (2016), (Garsous, 2010) and (B. N. Bhattacharyya, 2010).

5.3 Recommendations of the study

Considering the above conclusions, the following recommendations were made: infrastructural development investments, increases in human development stock, and reforms in the infrastructural sector. The SADC member states' government must take initiatives to boost the existing infrastructure, and to improve its quality through infrastructural-development funding. Moreover, the governments and the SADC board must take initiatives, such as infrastructural development boards that focus mainly on assessing and attracting investments, in order to boost the infrastructure.

The SADC region could also practise more internal trade, which would enhance and improve road networking, as a result of increased road networking activity within the region; and this would boost domestic investments.

The positive relationship between economic growth and infrastructural development strongly in the long term could infer an increase in aggregate demand in the economy through large-scale public works expenditure. As a consequence, public spending on infrastructure would help improve aggregate demand for increased job opportunities for the public works. It is, therefore, important for authorities and other responsible agencts to consider local contractors, when giving out tenders for projects in the infrastructure. The economies would benefit better if tenders were given to locally based businesses, thereby reducing the risk of capital flight.

The SADC members can achieve their infrastructural goals, if they could reduce inefficiencies by raising public sector receipts, and thereby attracting more public funding. In addition, the region needs more public-private partnership funding. These policies would enable the SADC countries not to depend only on external funding to develop their infrastructure. Therefore, SADC economies should be prevented from being economically and financially exposed to power-supply deficiencies, poor international transport networks and internet connectivity.

SADC members, with a lack of access to clean water and limited telecommunications, should invest in water-system rehabilitation programs and cost-reduction policies in the telecommunications sector, respectively. The latter could enhance the accessibility to the Global System for Mobile networks in the region. Consequently, SADC members would be able to achieve some millennium development goals, including improved access to drinking water and unlimited access to information and communication services.

Reforms to increase power tariffs and to improve electrification in rural areas, should be implemented. Theoretically, tariffs determine import substitution; because an increase in tariffs for selected import-competing sectors, would protect the domestic industry. Thus, the domestic production of electricity would expand, causing electricity imports to become more expensive. This would be beneficial for the potential net exporters of electricity, such as Mozambique and Zambia.

Therefore, this recommendation could help the SADC to achieve better integration. Also, improved integration would be achieved through an increased investment, improved efficiency, and cost-reducing innovations in the infrastructure sector.

5.4 Suggestions for future studies

The research's main limitation was that it was done on a short timeframe, due to the availability of data; hence it is recommended that future studies must look at a larger timeframe and study sample, for instance, at one covering all the 16 SADC countries. Moreover, the study did not factor in the aspect of institutional quality, in order to capture the country-specific effects towards infrastructural development. Therefore, it is recommended that future studies could consider the role of institutional quality in the relationship between economic growth and infrastructural development, as well as an interaction term between institutional quality and infrastructure, in order to capture the country-specific effects. Finally, future studies must also focus on a comparison basis, to check whether the effects of infrastructural development in the SADC region are the same for low-, middle- and high-income nations, or if they vary, depending on the economic level of the country.

References

African Development Bank Group. (2018). African Development Bank Group 2013. *Annual Report 2018*. http://www.afdb.org/en/countries/central-africa/madagascar/madagascar-economic-outlook/

Andrianaivo, M., & Khodir, K. (2011). ICT, Financial Inclusion, and Growth: Evidence from. *IMF Working Paper*, *1*(WP/11/73).

Ansgar, Z., Tench, R., Verhoeven, P., Vercic, D., & Moreno, A. (2010). *The European Communication Monitor 2010*. 122. http://www.communicationmonitor.eu/

Aragao, M. M. De. (2015). Economic Impacts of the FIFA World Cup in Developing Countries. *Honours Theses*, 2609. http://scholarworks.wmich.edu/honours_theses

Arrow, K. J., & Kurz, M. (1970). *Optimal Growth with Irreversible Investment in a Ramsey Model Author (s): Kenneth J . Arrow and Mordecai Kurz Published by : The Econometric Society Stable URL : http://www.jstor.org/stable/1913014 Accessed : 07-06-2016 13 : 36 UTC*. *38*(2), 331–344.

Aschauer, David. (1989). *public investment.pdf*.

Bengoa, M., & Sanchez-Robles, B. (2003). Does foreign direct investment promote growth? Recent evidence from Latin America. *Universidad de Cantabria, Mimeo*, 1–19. http://ecomod.net/sites/default/files/document-conference/ecomod2003/Sanchez-Robles.pdf%0Ahttps://econpapers.repec.org/paper/ekd003307/330700013.htm

Bhattacharyya, B. (2012). Estimating Demand for Infrastructure in Energy, Transport, Telecommunications, Water, and Sanitation in Asia and the Pacific: 2010-2020. In *SSRN Electronic Journal*. https://doi.org/10.2139/ssrn.1678417

Bhattacharyya, B. N. (2010). *Asian Development Bank Institute* (Issue 248).

Binswanger P. (1992). *Risk-aversions are interpretaions.pdf*.

Bosede, A. (2010). Transport infrastructure and economic growth in Nigeria. *Journal of Research in National Development*, *7*(2), 1–8. https://doi.org/10.4314/jorind.v7i2.50973

Bosede, Abalaba, & Afolabi. (2013). Transport infrastructure and economic growth in Nigeria. *Journal of Research in National Development*, *7*(2), 1–8. https://doi.org/10.4314/jorind.v7i2.50973

Briceño-Garmendia, C. (2011). *Botswana's Infrastructure: A Continental Perspective*. *November*.

Briceño-Garmendia, C. M., & Nataliya, P. (2011). *Zimbabwe's Infrastructure: A Continental Perspective*. *September*.

Calderón, C. (2009). Infrastructure and Growth in Africa. *Infrastructure and Growth in Africa, April*, 1–61.

Canning, D., & Pedroni, P. (2004). The effect of infrastructure on long-term economic growth. *Harvard University*, 1–30.

Carbone, P., & Ewen, S. (1998). *Declaration__Treaty_of_SADC.pdf* (pp. 28–38). https://doi.org/10.1109/IC2EW.2016.56

Cesar, C., & Serven, L. (2004). *effects of infrastructural development on growth.pdf*.

Chakraborty, C., & Nandi, B. (2011). ‘ Mainline ’ telecommunications infrastructure , levels of development and economic growth : Evidence from a panel of. *Telecommunications Policy*, *35*(5), 441–449. https://doi.org/10.1016/j.telpol.2011.03.004

Deidda, L., Studies, M., Fattouh, B., & Studies, M. (2005). *Banks, Financial Markets and Growth £*.

Dornbusch. (1996). *Debt and Monetary policy: The policy issues*.

Dube, M. (2013). *PERISA Case Study 3 Infrastructure Analysing the Development Process for Infrastructure Projects in SADC*. *August*.

Egert, Kozluk, & Sutherland. (2009). Infrastructure and Growth. *Economic Studies in Inequality, Social Exclusion and Well-Being*, *1*, 5–45. https://doi.org/10.1007/978-3-319-03137-8_2

Estache, A. (2006). Africa’s infrastructure: challenges and opportunities. *Realizing the Potential for Profitable Investment in Africa Organized by the IMF Institute and the Joint Africa Institute*, 0–5.

Estache, A., & Fay, M. (2010). Globalization and Growth Implications for a Post-Crisis World. In *Implications for a Post-crisis World*. http://gen.lib.rus.ec/search.php?req=Globalization+and+Growth%3A+Implications+for+a+Post-Crisis+World&open=0&view=simple&column%5B%5D=title&column%5B%5D=author&column%5B%5D=series&column%5B%5D=periodical&column%5B%5D=publisher&column%5B%5D=year%0Apapers3:

Estache, A., Perelman, S., & Trujillo, L. (2005). Infrastructure performance and reform in developing and transitional economies: evidence from a survey of productivity measures. *World Bank Policy Research Working*, *3514*, 27. http://www-wds.worldbank.org/servlet/WDSContentServer/WDSP/IB/2005/03/06/000090341_20050306101429/Rendered/PDF/wps3514.pdf

Estache, A., & Wren-Lewis, L. (2016). *On the Theory and Evidence on Regulation of Network*

Industries in Developing Countries (Issue November). https://doi.org/10.1093/oxfordhb/9780199560219.003.0016

Faridi, M. Z., Bashir, F., & Malik, M. S. (2011). *Transportation , telecommunication and economic development in Pakistan Transportation , Telecommunication and Economic Development in Pakistan*. *January 2011*.

Fatma, & Zouhaier. (2014). Debt and Economic Growth. *International Journal of Economics and Financial Issues*, *4*(2), 440–448.

Fischer, J. (1993). *Vegetation pattern in a south-eastern salt marsh : the role of disturbance and the importance of scale*.

Foster, V., & Carolina, D. (2010). *Zambia's infrastructure.pdf*.

Garsous, G. (2010). *Job Creation through Infrastructural Investment in the Middle East and North Africa*. *August*.

Gbadebo, Odularu, O., & Okonkwo, C. (2009). Does energy consumption contribute to economic performance? Empirical evidence from Nigeria. *Journal of Economics and International Finance*, *1*(2), 44–58. http://www.academicjournals.org/JEIF

Grix, J. (2004). *THE FOUNDATIONS OF RESEARCH (PALGRAVE STUDY GUIDES) BY*.

Gujarati, D. N. (2003). *Basic Econometrics*.

Gutman, J., Sy, A., & Chattopadhyya, S. (2015). *Financing Africa Infrastructure*. *March*, 1–76.

Huchet-Bourdon, M., Mouël, C. Le, & Vijil, M. (2013). *Acknowledgements : Authors thank Miao-Miao Wang for statistical assistance. They also thank Anne-Célia Disdier, Akiko Suwa-Eisenmann, Julien Gourdon and Marcelo Olarreaga for helpful comments. This version has benefited from the financial support of the p*. 1–27.

IMF. (2005). *Democratic Republic of the Congo : Selected Issues and Statistical Appendix International Monetary Fund Washington , D . C . 05*.

Jerome, A., & Ariyo, A. (2004). *Infrastructural Reform and Poverty Reduction in Africa Afeikhena Jerome and Ademola Ariyo* (Issue January 2004).

Johannes, & Rob. (2008). Infrastructure Development and Economic Growth in South Africa : A Review of the Accumulated Evidence. *University of Cape Town Policy Paper Number*, *12*, 1–28.

Kodongo, O., & Ojah, K. (2013). Journal of Economics and Business Real exchange rates , trade balance and capital flows in Africa. *Journal of Economics and Business*, *66*, 22–46. https://doi.org/10.1016/j.jeconbus.2012.12.002

Kodongo, O., & Ojah, K. (2016). Does the infrastructure really explain economic growth in

Sub-Saharan Africa? *Review of Development Finance*, *6*(2), 105–125. https://doi.org/10.1016/j.rdf.2016.12.001

Khodir, K., & Andrianaivo, M. (2011). ICT, Financial Inclusion, and Growth Evidence from African Countries. *IMF Working Papers*, *11*(73), 1. https://doi.org/10.5089/9781455227068.001

Kremer, S., Bick, A., & Nautz, D. (2009). Inflation and growth: new evidence from a dynamic panel-threshold analysis. *Empirical Economics*, *44*(2), 861–878. https://doi.org/10.1007/s00181-012-0553-9

Levine, R., & Renelt, D. (1992). A sensitivity analysis of cross-country growth regressions. *American Economic Review*, *82*(4), 942–963. https://doi.org/10.2307/2117352

Loungani, P., & Razin, A. (2001). How beneficial is foreign direct investment for developing countries? *Finance and Development*, *38*(2), 6–9.

Markowitz, C., Wentworth, L., & Grobbelaar, N. (2018). *Operationalising the SADC Regional Development Fund*. *July*, 1–8. http://www.au-pida.org/project-stages-and-key-milestones/,

Mupimpila, C., & Funjika, P. (2010). Growth and Regional Integration: The Case of the Southern African Development Community. *Zambia Social Science Journal*, *1*(2), 5.

Nachtsheim, C., Kutner, M., & Neter, J. (2004). *Applied Linear Regression Models*. *2009*, 1–9.

National Treasury. (2007). National Treasury Annual Report 2007/08. In *National Treasury*.

Ogun, T. P. (2010). Infrastructure and poverty reduction: Implications for urban development in Nigeria. *Urban Forum*, *21*(3), 249–266. https://doi.org/10.1007/s12132-010-9091-8

Onakoya, A. B. ., & Fasanya, I. O. (2012). *Does Foreign Aid Accelerate Economic Growth ? An Empirical Analysis for Nigeria*. *2*(4), 423–431.

Ongono Patrice. (2009). *Munich Personal RePEc Archive Religion and Economic Performance*. *85582*.

Palei, T. (2015). *Assessing the impact of infrastructure on economic growth and global competitiveness*.

Peaseran, Shin, & Smith. (2001). Bound Test and ARDL co-integration Test. *Journal of Applied Econometrics*, *January*.

Plosser. (1992). The Search for Growth. *Best's Review*, *113*(6), 45–47. http://www.kansascityfed.org/publicat/sympos/1992/s92ploss.pdf

Qiang, C., & Pitt, A. (2004). *Contribution of Information and Communication Technologies to Growth Contribution of Information and Communication Technologies to Growth*.

Rodan, R. (1943). *Problems of Industrialisation of Eastern and South-Eastern Europe*.

Sachs, J. D. (1995). *Economic Reform and the Process of Global Integration*.

SADC. (2012a). *Regional infrastructure development masterplan*. *August*, 40. https://doi.org/10.1136/annrheumdis-2014-eular.3300 LK - http://iacs.c17.net/openurl?sid=EMBASE&issn=00034967&id=doi:10.1136%2Fannrheumdis-2014-eular.3300&atitle=Physiotherapy+research+in+people+with+chronic+arthritis%3A+Time+for+improving+quality+of+interventions%3F&stitle=Ann.+Rheum.+Dis.&title=Annals+of+the+Rheumatic+Diseases&volume=73&issue=&spage=&epage=&aulast=Chorus&aufirst=A.&auinit=A.&aufull=Chorus+A.&coden=&isbn=&pages=-&date=2014&auinit1=A&auinitm=

SADC. (2012b). *Southern African Development Community - towards a common future.pdf*.

Saunders, M., Lewis, P., & Thornhill, A. (2012). *Research Methods for Business Students* (sixth edit).

Serafim, G. (2015). The Type of Socially Responsible Investments That Make Firms More Profitable. *Harvard Business Review Digital Articles*, 2–4. http://search.ebscohost.com/login.aspx?direct=true&db=bth&AN=118666807&site=ehost-live

Solow, R. M. (1956). A contribution to the theory of economic growth: Old and New. *Journal of Economics and International Finance*, *6*(3), 47–61. https://doi.org/10.5897/jeif2013.0518

Southern African Development Community (SADC). (2017). *Summary of the SADC Revised Regional Indicative Strategic Development Plan 2015-2020*. 1–20.

Southern African Power Pool. (2017). *Contents Sapp Annual Report 2017*. http://www.sapp.co.zw/sites/default/files/SAPP.pdf

Stupak, J. M. (2018). *Economic Impact of Infrastructural Investment*. 1–18. https://fas.org/sgp/crs/misc/R44896.pdf

United nations. (2009). *Economic Development in Africa Report 2009*.

Velde, D. (2001). POLICIES TOWARDS FOREIGN DIRECT INVESTMENT IN DEVELOPING COUNTRIES : EMERGING BEST-PRACTICES AND OUTSTANDING ISSUES Overseas Development Institute , London March 2001 POLICIES TOWARDS FOREIGN DIRECT INVESTMENT IN DEVELOPING COUNTRIES : EMERGING BEST-PRACT. *Development*, *March*, 1–62.

Weisbrod, G., & Weisbrod, B. (1997). *Assessing the Economic Impact of Transportation*

Projects. *477*.

Wilson, J. S., Mann, C. L., & Otsuki, T. (2003). Trade facilitation and economic development: measuring the impact. *World Bank Policy Research Working Paper*, *2988*(2005), 841–869. http://papers.ssrn.com/sol3/Delivery.cfm/SSRN_ID636350_code384013.pdf?abstractid=636350&mirid=1

Zahonogo, P. (2017). Trade and economic growth in developing countries: Evidence from sub-Saharan Africa. *Journal of African Trade*, *3*(1–2), 41. https://doi.org/10.1016/j.joat.2017.02.001