

Management of Research Infrastructures: A South African Funding Perspective

Rakeshnie Ramoutar-Prieschl · Sepo Hachigonta

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Foreword by Daniel Adams

The successful provision of infrastructure for science, technology and innovation (STI) in South Africa is at three levels of engagement, viz. (i) government and policy level; (ii) the funding agency level; and (iii) the implementation level, at research-performing institutions. Adequate levels of funding and effective support and coordination at all levels are a prerequisite for establishing and maintaining research infrastructure (RI) platforms, which is a critical enabler to the knowledge triangle and a vibrant research ecosystem. Central to the provision of RI is the adoption of appropriate mechanisms geared towards enhancing partnerships between the public and private sectors, that aid the development of a vibrant STI ecosystem. The success to sustaining such vibrancy hinges on the development and retention of the scarce, yet highly skilled and trained scientists, operators, technicians, engineers and specialists. Such human resources must receive priority attention and investment in order to maintain research and development activities at the globally competitive level.

This book provides an overview of the STI landscape in South Africa and succinctly outlines how the provision of RI has the potential to play a catalytic role in the advancement of STI endeavours. In addition, this book acts as a useful resource to ignite collaborative discussions and strengthen partnerships with sister countries on the African continent through the sharing of good practices and learnings of the National Research Foundation and the Department of Science and Innovation (DSI), in the management of RI grants.

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Foreword by Clifford Nxomani

Science, technology and innovation is a key part of the national developmental agenda and has been identified as a driver for socio-economic transformation in South Africa. Essential to realising a transformed society is the need to strategically invest in STI and effectively implement programmes that support research excellence and human capacity development.

Research equipment and infrastructures play an important part in the STI value chain. Considering this imperative role, the South African government, through the DSI and the National Research Foundation (NRF), invests and coordinates RI platforms in support of the STI agenda. For example, the establishment of the South African Radio Astronomy Observatory (SARAO) consolidates South Africa's investments in radio astronomy, further reinforcing the country and the continent as a key player in the field.

Faced with limited financial, human and infrastructural resources, the regional coordination of research infrastructure is becoming particularly vital in Africa. This book is relevant to stakeholders with an interest in the investment and management of research infrastructure and equipment in Africa. In addition, the book showcases lessons, gaps and opportunities at the strategic and operational levels, for regional governments, research funding agencies and the scientific community.

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Preface

This book provides an overview of the building blocks necessary for managing, steering and guiding the establishment of a RI. It acts as a reference tool for RI investment, access and management at the academic, grants management, agency and policy level. This book is also useful for the research community, students, research-performing entities and the private sector who have a keen interest in understanding the approaches and opportunities linked to the establishment, maintenance and management of RI platforms.

Although RI investments over the past ten years have improved in South Africa, the system is still overwhelmed by challenges which not only require continued financial investments but also strong governance, skilled human resources, management and monitoring and evaluation structures. A holistic view of RI investment is presented in this book by mapping the granting cycles from a funding agency perspective. The strides undertaken and lessons learnt over the past decade within the science and technology sector in South Africa are further highlighted, while taking account a more dynamic and sustainable RI ecosystem in the future.

An emergent observation over the past decade, is that the investment into research equipment cannot be considered in isolation. Parallel investments in (i) human capital development, including the upskilling and training of the next generation of researchers; (ii) operational costs; and (iii) costs relating to sustainability which includes upgrades and maintenance, as well as building and/or renovating suitable physical infrastructures to house the research equipment, are critical for enhancing impact.

This book therefore provides a tool for the (i) development of STI policies that enable the provision of RI funding and (ii) the establishment and management of relevant RI funding instruments. Furthermore, this book defines the requirements for the sustainable management of research equipment across its life cycle and is structured as follows:

Chapter 1 provides an overview of how the investment in RI contributes to the realisation of a vibrant national system of innovation and also describes the South African higher education landscape, which remains differentiated. It further makes

reference to the RI funding strategy of the National Research Foundation and maps the infrastructure requirements and investment across the innovation value chain.

Chapter 2 provides a contextual background to the approaches employed to investing in RIs. Subsequently, this chapter zooms into the approaches adopted in South Africa for the identification of categories of RI funding, with due acknowledgement to the principles of the innovation value chain.

Chapter 3 focuses on processes employed by public funding agencies in the awarding of RI grants across the granting life cycle, spanning the pre-grant award to post-grant award and project closeout phases.

Chapter 4 explores some of the conditions that are linked to RI grants, using the National Research Foundation as a case study. This extends to how RI grants will be used and the roles and responsibilities of the research institution at which the equipment will be housed. The tail end of this chapter presents some key considerations from ethical issues and intellectual property management, to data storage, usage and management.

Chapter 5 maps the skills required to optimally and sustainably manage research equipment. This chapter defines the scarce skills and qualifications that are critical for managing and maintaining research equipment. Central to this chapter is the development of a robust succession plan to ensure that the pipeline for the development of critical scarce skills is maintained.

Chapter 6 explores activities linked to monitoring and evaluation, from risk management to reporting, site visits and technical audits. This chapter also makes the proposition for establishing a database which will serve as a central repository for information relating to the investment in RI within a specific country.

Chapter 7 defines the essential elements for the sustainable management of RI, including the human resources required to manage and maintain research equipment; ensuring that the infrastructural requirements are addressed to support access by various users; as well as the data and financial management of research equipment.

The final chapter concludes by drawing on challenges and presenting recommendations based on the National Research Foundation's journey over the past decade in the management of RI grants.

In summary, the book provides guidance on the building blocks necessary for steering and guiding the establishment and management of RI frameworks from a South African perspective. The book will also be a useful resource for public funding agencies in Africa linked to the Science Granting Councils Initiative in sub-Saharan Africa (SGCI).

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Sepo Hachigonta

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- Dr. Daniel Adams, Chief Director, Department of Science and Innovation
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- Prof. Jannie H. Neethling, Nelson Mandela University
- Ms. Georgiet Hammond, National Research Foundation

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About the Authors



Dr. Rakeshnie Ramoutar-Prieschl obtained her doctorate in business management and her master's in biotechnology. As an academic, she has lectured, tutored and mentored both undergraduate and postgraduate students. In addition, she has served on various committees including the National Science and Technology Forum Awards and the Nanotechnology Public Engagement Programme, and has served on various advisory boards and steering committees including the Centre for High Resolution Transmission Electron Microscopy. She is Member of the Executive Committee for the Organisation of Women in Science in Developing Countries and Chair of the Board of Trustees for Child Welfare South Africa. She previously led the research infrastructure (RI) portfolio for over 11 years, as a Director at the National Research Foundation. While at the NRF, she developed a number of policies, strategies and frameworks that has provided the foundation for establishing, nurturing and sustaining a number of RI platforms in the country. She has also worked in vaccine development and has held various management positions including working at the Desmond Tutu TB and HIV Centre. She currently is Head of Research Capacity Development at the University of Pretoria where she is accountable for the full portfolio of grant support and strategic interventions for early career academics (ECAs). She has been the recipient of numerous grants to develop and strengthen the track record of ECAs at the university.



Dr. Sepo Hachigonta holds a master's and a doctoral degree in environmental science from the University of Cape Town. He is currently Director of Strategic Partnerships at the National Research Foundation (NRF) of South Africa. His interests span a number of trans-disciplinary fields from environmental and agriculture systems, to research policy that impact the continent's science, technology and innovation landscape. He has extensive networks with over 20 countries on the African continent. This is evident by his contributions in developing system analysis expertise aimed at addressing current global challenges through various programmes such as the Southern African Systems Analysis Centre (SASAC), a multi-year initiative that takes cognisance multi-level system analysis capacity interventions and a comprehensive approach to policy-related activities in Southern Africa. Additionally, he has been instrumental in spearheading South Africa's participation in regional and international bodies including the Science Granting Council Initiative (SGCI), the International Science Council (ISC) and the International Institute for Applied Systems Analysis (IIASA). Prior to joining the NRF, he was Programme Manager at FANRPAN, a regional policy analysis network on food security and agricultural based in Pretoria.

Abbreviations

AGI	Access to Global Infrastructure
BAC	Bid Award Committee
BEC	Bid Evaluation Committee
BSC	Bid Specification Committee
CERN	European Organisation for Nuclear Research
CHPC	Centre for High Performance Computing
CoG	Conditions of Grant Award
Co-PI	Co-Principal Investigator
CPA	Consumer Protection Act
CPI	Consumer Price Index
CV	Curriculum Vitae
DHET	South African Department of Higher Education and Training
DIRISA	Data Intensive Research Initiative of South Africa
DSI	South African Department of Science and Innovation
ERM	Enterprise Risk Management
EU	European Union
FIB-SEM	Focused Ion Beam–Scanning Electron Microscope
GRI	Global Research Infrastructure(s)
GSO	Group of Senior Officials on GRIs
HCD	Human Capital Development
HDI	Historically Disadvantaged Institutions (or Individuals)
Hons	Honours Degree (Year 4, post a three-year undergraduate degree)
HRTEM	High-Resolution Transmission Electron Microscope
ICT	Information and Communications Technology
IP	Intellectual Property
IT	Information Technology
JCC	Joint Coordinating Committee
JINR	Joint Institute of Nuclear Research
KPI	Key Performance Indicator
LHC	Large Hydrogen Collider

M&E	Monitoring and Evaluation
M.Sc.	Master of Science
NCA	National Credit Act
NDP	South African National Development Plan 2030
NF	National Facility
NICIS	National Integrated Cyber-infrastructure Strategy
NMR	Nuclear Magnetic Resonance
NSI	National System of Innovation
OECD	Organisation for Economic Co-operation and Development
PFMA	Public Finance Management Act
Ph.D.	Philosophiae Doctor (Doctor of Philosophy)
PI	Principal Investigator
PPPFA	Preferential Procurement Policy Framework Act
R&D	Research and Development
RDI	Research, Development and Innovation
RED	Research Equipment Database
RI	Research Infrastructure(s)
SA	South Africa, the Republic
SA-GRID	South Africa GRID Computing
SALT	Southern African Large Telescope
SANReN	South African National Research Network
SARS	South African Revenue Service
SCM	Supply Chain Management
SDG	Sustainable Development Goals of the United Nations
SKA	Square Kilometre Array
STI	Science, Technology and Innovation
STISA-2024	Science Technology and Innovation Strategy for Africa 2024
TEM	Transmission Electron Microscope
UPS	Uninterrupted Power Supply
USA	United States of America
VAT	Value-Added Tax