



### From crisis to learning

Measuring R&D and innovation despite COVID-19



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# ABBREVIATIONS

<b>ACTS</b>	African Centre for Technology Studies
<b>AOSTI</b>	African Observatory for Science, Technology and Innovation
<b>CCA</b>	Council of Canadian Academies
<b>CCI</b>	Cultural and creative industries
<b>CeSTII</b>	Centre for Science, Technology and Innovation Indicators
<b>DSI</b>	Department of Science and Innovation
<b>DST</b>	Department of Science and Technology (now DSI)
<b>ECOWAS</b>	Economic Community of West Africa States
<b>GERD</b>	Gross domestic expenditure on R&D
<b>HSRC</b>	Human Sciences Research Council
<b>IERI</b>	Institute for Economic Research on Innovation at TUT
<b>ISESCO</b>	Islamic World Education, Scientific and Cultural Organization
<b>NACI</b>	National Advisory Council on Innovation
<b>NEPAD</b>	New Partnership for Africa's Development
<b>NRF</b>	National Research Foundation
<b>OECD</b>	Organisation for Economic Co-operation and Development
<b>PINTEC</b>	Brazilian Innovation Survey
<b>R&amp;D</b>	Research and development
<b>RedeSist</b>	Research Network on Local Productive and Innovation Systems
<b>SADC</b>	Southern African Development Community
<b>Stats SA</b>	Statistics South Africa
<b>STI</b>	Science, technology and innovation
<b>STISA</b>	Strategy for Technology, Innovation and Science in Africa
<b>TUT</b>	Tshwane University of Technology
<b>UNESCO</b>	United Nations Educational, Scientific and Cultural Organization



# FOREWORD



## Innovation and COVID-19: From crisis to learning

**Prof. Leickness Simbayi**

Acting Chief Executive Officer: Human Sciences Research Council

If the global COVID-19 pandemic has demonstrated the vulnerability and interconnectedness of human populations around the world, it has also revealed their resilience and ingenuity in the face of adversity. The double-edged nature of the pandemic—encompassing devastating losses in human health and well-being among affected individuals and communities, coupled with rapid advancements in science, technology and innovation and profound instances of human solidarity—represents an opportunity for deep learning and reflection.

In this context, the Human Sciences Research Council (HSRC) has actively participated in South Africa's COVID-19 response, through supporting policy with evidence on the economic, political and social impacts, as well as through participating in the wide-ranging activities of the National COVID-19 Command Council. The HSRC has continued to deliver on its purpose statement of delivering 'social science that makes a difference' through the activities of its divisions and centres.

The Centre for Science, Technology and Innovation Indicators (CeSTII) in 2020/21 demonstrated both the determination and resolve to achieve its mandate, and employed the required adaptability to do so under unfamiliar remote work conditions. Over and above addressing its mandate, CeSTII was uniquely positioned to collaborate with Statistics South Africa to undertake unscheduled research on the COVID-19 business impact

survey. In addition to several policy-oriented outputs, this work will continue in the R&D Survey 2019/20, and the Business Innovation Survey that will roll out in 2021.

Another significant result in 2020/21 included its joint work with the National Advisory Council on Innovation (NACI) to catalyse a high-level policy forum on the state of innovation in South Africa, at which national STI indicators were probed from different sectoral vantage points. This work too, highlighted the opportunities and challenges in the COVID-19 era.

Going forward, the Centre faces the substantial task of continuing to deliver South Africa's official R&D statistics, as well as advancing the study and practice of measurement of science, technology and innovation in the context of South Africa's White Paper on STI and the new STI Decadal Plan.



# ABOUT CeSTII

The Centre for Science, Technology and Innovation Indicators is a statistical and policy research unit located within the Human Sciences Research Council.



## OUR VISION

The Centre for Science, Technology and Innovation Indicators seeks to be a leading Centre for the measurement of science, technology and innovation, with a growing national, continental and global footprint, impact and reputation rooted in high-quality research evidence, strong networks of researchers, policy makers and practitioners, and the deployment of cutting-edge research technologies that improve the quality and quantity of output. The work of CeSTII is supported by an ethos of teamwork and inclusive diversity, shared learning, creativity, and a commitment to sustainability.



## OUR MISSION

To become the leader in the field of national surveys that underpin benchmarking, planning and reporting on R&D, innovation and technology transfer in South Africa. We adapt best practice international methodologies for measurement of science, technology and innovation (STI) indicators, within a framework of innovation for inclusive and sustainable socio-economic development.



## OBJECTIVES

- 1 Build the institutional capabilities of CeSTII researchers to achieve its mandate.
- 2 Undertake statistical surveys that support measurement and analysis of STI indicators in South Africa to national and international quality standards.
- 3 Contribute to and deepen analysis of STI indicators in relation to challenges of economic growth and inclusive development, through scientific publications, data-sharing, technical briefs and international benchmarking studies.
- 4 Contribute to data sharing, knowledge sharing and exchange with national, regional and global STI measurement and policy communities and other actors in the national system of innovation.
- 5 Lead a new research agenda to inform the design of measures and indicators that can support and promote a strategy of innovation for inclusive development, in line with the HSRC organisational research focus, Department of Science and Innovation's White Paper and towards national development goals.





## Progress despite unprecedented challenges

**Dr Glenda Kruss**

Executive Head: CeSTII, Human Sciences Research Council

As with many statistical research organisations around the world, the Centre for Science, Technology and Innovation Indicators (CeSTII) faced unprecedented challenges in the 2020/21 year as a result of the national response to the COVID-19 pandemic.

Rapid shifts to remote working conditions, changes in the modalities of survey administration to accommodate respondents, and the necessary adjustments in course these gave rise to, were defining features of the year in review.

In facing up to these challenges, we engaged our counterparts around the world, as well as our advisory committee and Statistics South Africa, to share answers, advice and approaches. The spirit of cooperation and mutual interest we encountered in maintaining our hard-earned statistical time series provided a sense of encouragement to the CeSTII team that we were not going it alone.

Some of the key results delivered by the Centre in 2020/21 included the release of the South African Business Innovation Survey, 2014-2016 and the South African R&D Survey, 2017-2018. The results of two new baseline surveys that provide innovation data appropriate to our context were released: the Survey of Innovation in the Informal Sector and the Agricultural Business Innovation Survey, 2016-2018.

The Innovation in the Informal Sector Survey was conducted in Sweetwaters, KwaZulu-Natal in 2019. The finalisation of this pioneering research in the year in review included a publication for the community and stakeholders and a report back to the informal traders in the Sweetwaters community on our findings. We are grateful to our colleagues at the Department of Science and Innovation for their consistent encouragement and support of our work.

The year in review also provided an opportunity to deepen the Centre's work on the digitalisation of survey business processes, a process innovation we will continue to work toward in 2021/22. We anticipate that as organisations—from businesses and universities to government departments and non-profits—change their ways of working with data so too must we aspire to minimise respondent burden and fatigue, and develop novel forms of communication and dissemination.



# INTERNATIONAL ADVISORY COMMITTEE

Providing relevant advice from different countries and disciplines in STI

**Prof. Fred Gault**  
Advisory Committee Chair

An independent advisory committee, comprising experts from all over South Africa and globally, provides CeSTII with advice on the conceptualisation and implementation of its research agenda.

## CHAIR'S REFLECTION

The CeSTII Advisory Committee consists of eight appointed members from six countries and the HSRC Deputy-Executive Director, responsible for CeSTII, Dr Glenda Kruss. The committee met in November 2020 to review topics of importance to CeSTII and to provide independent advice. The minutes of the committee record its advice which is available to the CeSTII staff.

Substantive topics discussed in 2020 included:

- The R&D Survey and plans to deal with the impact of COVID 19; and
- The Agri-business Innovation Survey and how the survey could be institutionalised.

Some topics were introduced for consideration in the longer term:

- The White Paper on Science and Technology and implications for CeSTII;
- The involvement of CeSTII with the Southern African Development Community (SADC);
- The role of CeSTII in its work for the Department of Science and Innovation (DSI) and with the National Advisory Council on Innovation (NACI); and
- The policy relevance of innovation in the informal sector.

In addition to the membership of the committee, CeSTII staff participate actively in the meetings, making

presentations, providing information to the committee and responding to questions. The DSI is present as an observer, and one of the members of the committee represents the secretariat of the National Advisory Council on Innovation. The presence of DSI and the NACI representative ensures that matters relevant to CeSTII are shared with other agencies engaged in supporting science, technology and innovation in South Africa.

The committee, which works electronically, established its way of doing business in 2017 and 2018. In 2019 the committee considered how to renew its membership so that it could continue to provide relevant advice to CeSTII from different countries and disciplines within the domain of science, technology and innovation. Following discussion in 2018, members of the committee were invited to consider their membership in 2019 so that two or three could be replaced in 2020. The objective is a renewal of one-third of the membership each year. This was implemented in 2020 for the first time and two members became members of the alumni of the committee and two new members were added.

In summary, in 2020 the committee focussed on the measurement challenges faced by CeSTII, including the consequences of COVID-19, and on the importance of involvement with SADC and communities of practice in South Africa.





## ADVISORY COMMITTEE MEMBERS



### **Prof. Fred Gault (Chair)**

Prof. Gault is Professor Extraordinaire at the Tshwane University of Technology (TUT) in South Africa and a member of the TUT Institute for Economic Research on Innovation (IERI). He served on the Council of Canadian Academies (CCA) Panel on the State of Science and Technology in Canada, the CCA Panel on the Socio-Economic Impacts of Innovation Investments, and the U.S. National Academy of Sciences Panel on Developing Science, Technology and Innovation Indicators for the Future. He is a Visiting Professor at the University of Johannesburg and DST/NRF/Newton Fund Trilateral Research Chair in Transformative Innovation, the 4<sup>th</sup> Industrial Revolution and Sustainable Development.



### **Prof. Sunil Mani (Vice Chair)**

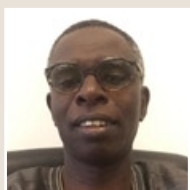
Prof. Mani is Director and Professor at the Centre for Development Studies (Trivandrum, Kerala, India) and visiting professor at the National Graduate Institute for Policy Studies (Tokyo, Japan). He has been a visiting professor at Bocconi University (Italy), the University of Toulouse-Jean Jaurès (France) and the Indian Institute of Management (Calcutta). Prof. Mani also worked at the United Nations University – Merit (Maastricht) as a researcher and head of graduate studies. He specialises in the economics and policy study of innovation, and his recent publications include a book with Franco Malerba and Pamela Adams, *The Rise to Market Leadership: New Leading Firms From Emerging Countries* (2017). Prof. Mani holds a PhD in Economics from Jawaharlal Nehru University (New Delhi), and completed post-doctoral research at the University of Oxford.



### **Dr Susan Cozzens**

Dr Cozzens is Professor Emerita in the School of Public Policy at the Georgia Institute of Technology and recently served as the Vice Provost for Graduate Education and Faculty Development for the campus. Her research interests are in science, technology and innovation policies in developing countries, including issues of equity, equality and development.

Dr Cozzens is active internationally in developing methods for research assessment, and science and technology indicators. She served as Chair of Public Policy and was Associate Dean for Research in the Ivan Allen College of Liberal Arts. From 1995 through 1997, she was Director of the Office of Policy Support at the National Science Foundation, and spent 11 years on the faculty of Rensselaer Polytechnic Institute. Her PhD is in sociology from Columbia University (1985) and her bachelor's degree is in sociology from Michigan State University (1972, summa cum laude).

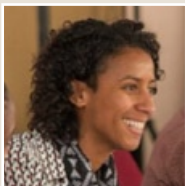


### **Dr Almamy Konte**

Dr Konte has over 15 years of experience in science policy and innovation, and expertise in higher education and scientific research. He worked for eight years as senior expert in innovation policy at the African Observatory for Science, Technology and Innovation (AOSTI) at the African Union Commission. There he led the AOSTI programme to build the capacity of African Union member states to collect STI indicators and develop evidence-based policies. In this period, he worked with 42 of the 55 member countries of the African Union. He has offered his services to several international organisations including UNESCO, NEPAD, ECOWAS, and ISESCO. He also provided his expertise to Mali and the Democratic Republic of Congo in designing their science policies.

From 2006 to 2012, Dr Konte was Director of Technological Research at the Ministry in charge of scientific research in Senegal. Dr Konte holds a PhD in physics and currently works at Cheikh Anta Diop University in Dakar, Senegal.





### **Prof. Erika Kraemer-Mbula**

Prof. Kraemer-Mbula is Professor of Economics at the University of Johannesburg and holds the DST/NRF/Newton Fund Trilateral Research Chair in Transformative Innovation, the 4<sup>th</sup> Industrial Revolution and Sustainable Development. Initially trained as an economist, she holds a master's in Science and Technology Policy from the Science and Policy Research Unit (University of Sussex), and a doctorate in Development Studies from the University of Oxford. She specialises in science, technology and innovation policy analysis and innovation systems in connection with equitable and sustainable development.

In the United Kingdom Prof. Kraemer-Mbula held various research positions at the Centre for Research in Innovation Management (CENTRIM) and at the Science and Policy Research Unit (SPRU) at the University of Sussex. In South Africa, she has been senior lecturer at the Institute for Economic Research on Innovation (IERI) at Tshwane University of Technology. She co-authored *The Informal Economy in Developing Nations: Hidden Engine of Innovation?* published in 2016 by Cambridge University Press.



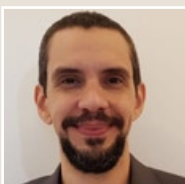
### **Dr Petrus Letaba**

Dr Letaba is Senior Specialist: STI Measurements and Evaluation at the National Advisory Council on Innovation (NACI) secretariat. NACI is a statutory body that advises the Minister of Science and Technology, and through the Minister, the Cabinet. He has extensive experience in data and information management, policy analysis and technology management. He participates in several local and international expert committees on a wide range of issues including science, technology and innovation policy analysis, and standards development. He holds an MBA from the University of the Witwatersrand in strategic management of innovation and a PhD in technology management.



### **Dr Pedro Mendi**

Dr Mendi is associate professor in the Department of Business, Universidad de Navarra, Spain. He holds a BA in Economics (1996) from Universidad de Navarra, and a PhD in Economics (2001) from Northwestern University. He has been a faculty member at Universidad de Navarra, both at the School of Economics, where he is currently Vice Dean, as well as at the Navarra Center for International Development. His research focuses on the economics of innovation and technology transfer and other topics in industrial organisation. His research has been published in journals including the Journal of Economics and Management Strategy, Research Policy, and Technological Forecasting and Social Change.



### **Dr Flávio Peixoto**

Dr Peixoto is senior economist at the Brazilian Institute of Geography and Statistics where he currently coordinates the Brazilian Innovation Survey (PINTEC) and is a member of the working group for the Sustainable Development Goals indicators. He recently coordinated a pilot survey for the development of sustainable indicators in manufacturing firms in partnership with the Economic Commission for Latin America and the Caribbean. He is also associate researcher at the Research Network on Local Productive and Innovation Systems (RedeSist) at the Institute of Economics, Federal University of Rio de Janeiro, Brazil.

Dr Peixoto holds an MSc and a PhD in Economics from the Federal University of Rio de Janeiro. He has worked on the convergence of Latin American structuralist and innovation system approaches, nanotechnology systems of innovation and innovation policy in Brazil. His current research work is on the interaction and co-evolution of innovation indicators and measurement and innovation policy.



# DATA COMMITTEE



## Making CeSTII data available on request

Dr Yasser Buchana

The Data Committee is the custodian of CeSTII's data archive and performs a vital role in the timeous processing of data requests from the public and stakeholders.

The focus of the Data Committee in the year in review was in two primary areas. First, the Committee worked steadily to make sure that CeSTII's data response to data requests was of a high standard in terms of integrity and quality. Second, Committee members demonstrated commitment to ensure all requests were responded to on time, even when the requests were sometimes not possible for us to execute because our protocols could not permit us to do so. Overall, our focus remained squarely on making sure that we executed all the requests that were received in the financial year on time as well as with within the agreed framework and standards.

The primary challenge experienced was the high number of requests. We had far more requests in the year in review than previous financial years, which is a positive sign.

Another challenge was the prioritisation of requests. Some requests the Committee received demanded very urgent responses, while many other requests were also being processed, presenting a considerable challenge. Requests were thus prioritised to meet the needs of core stakeholders as well as other parties requesting data.

Finally, the Committee's members faced the challenges of COVID-19 and remote working. This necessitated a completely different way of collaborating. Whereas

previously the Committee would meet face-to-face to deal with all the necessary requests and taking resolutions immediately, in the 2020/21 financial year it proved more challenging to convene meetings, with some members of the committee not available for some meetings and virtual meetings the order of the day.

I would like to take this opportunity to thank the Committee's members for their work, as well as to encourage members of the academic and policy communities to continue to lodge their data requests with CeSTII.

	2018/19	2019/20	2020/21
<b>% of all HSRC datasets produced by CeSTII</b>	47.0	18.6	21.0
<b>Total HSRC dataset downloads</b>	469	609	556
<b>Total CeSTII dataset downloads</b>	223	113	117
<b>R&amp;D Survey dataset downloads</b>	208	97	108
% of all HSRC dataset downloads	44.3	15.9	19.4
% of all CeSTII dataset downloads	93.3	85.8	92.3
<b>Innovation Survey dataset downloads</b>	15	10	8
% of all HSRC dataset downloads	3.2	1.6	1.4
% of all CeSTII dataset downloads	6.7	8.8	6.8
<b>IP &amp; TT dataset downloads</b>			1
% of all HSRC dataset downloads			0.2
% of all CeSTII dataset downloads			0.9
<b>Number of published errata</b>	6	3	2

Colour scale snapshot of CeSTII data downloads from the HSRC's Research Data Curation website. Data and data analysis courtesy of the HSRC's eKnowledge Research Centre & CeSTII.



# RESEARCH THEMES

CeSTII's research is divided into three thematic areas: measuring R&D capacity in South Africa, measuring innovation capacity in South African firms and new indicator development. Despite the challenges presented by the COVID-19 pandemic a substantial body of work was completed in the 2020/21 reporting period.

## THEME 1: MEASURING R&D CAPACITY IN SOUTH AFRICA



**Dr Glenda Kruss and Dr Moses Sithole**  
Acting Theme Leaders

### 2018/19 R&D Survey Statistical Report

On 18 February 2021 CeSTII, together with the Department of Science and Innovation, and Statistics South Africa, released the R&D Survey's 2018/19 Statistical Report and dataset.

The importance of a well-resourced science, technology and innovation system was highlighted in 2020/21 as the challenges presented by COVID-19 came into focus. South Africa is currently benefitting from past investments made by the DSI in research and development in health and medical research, but also in modernising industries like mining and renewable energy technologies.

The R&D Survey provides important information for stakeholders across all sectors regarding the trends in national R&D expenditure and human resources devoted to R&D.

Delivered by CeSTII, under challenging fieldwork conditions as a result of COVID-19, the full R&D Survey 2018/19 statistical report can be downloaded from the HSRC website: R&D Survey Statistical Report 2018/19.



 <https://bit.ly/3hNiq6d>



## The impact of COVID-19 on R&D and innovation in South African businesses

Level 4 restrictions, gazetted in terms of South Africa's Disaster Management Act, were in place from 1 to 31 May 2020. They included strict measures to limit community transmission of COVID-19, while allowing some business activities to resume after the preceding, even harsher, level 5 restrictions that severely curtailed business activities.

In June 2020, Statistics South Africa conducted a dedicated business impact survey on the COVID-19 pandemic in South Africa. Researchers from CeSTII contributed to the survey instrument design, drafting questions on R&D and innovation.

**COVID-19 IMPACTS ON SOUTH AFRICAN BUSINESS R&D AND INNOVATION**

*R&D spend is one indicator of the health and resilience of a business. Despite the unprecedented challenge posed by COVID-19, some businesses in South Africa continued to invest in research and development while making tough choices. Equally, businesses with innovation activity—including R&D but also other types of activity—quickly adapted to the challenging context of the global coronavirus pandemic with new coping and survival strategies. A Statistics South Africa business impact survey in 2020 highlighted key trends which remain significant as the country confronts the challenges of COVID-19's second wave.*

*For government policy makers, business leaders, and business support groups concerned to promote R&D and innovation, this fact sheet points to the necessity of national and sector support mechanisms for R&D-performing and innovation-active businesses whose turnover, and very survival, under stringent lockdown conditions are threatened.*

**IN THIS FACT SHEET:**

- How R&D expenditure was affected by the level 4 lockdown
- How R&D performers survived the impact of COVID-19
- Different approaches by big and small R&D and innovation-active businesses
- Surviving without turnover: a matter of months or days?
- Snapshot of South Africa's R&D performers, by province

**FACT SHEET NO. 25**

science & innovation  
Department of Science and Innovation  
REPUBLIC OF SOUTH AFRICA

HSRC  
HUMAN SCIENCES  
RESEARCH COUNCIL

stats SA  
STATISTICS SOUTH AFRICA  
REPUBLIC OF SOUTH AFRICA

For more information see: <https://bit.ly/3zazE3g>

Data was analysed from a total of 1 079 businesses. The sample included businesses in all nine provinces, from various industries as well as size classes ranging from one to ten employees, to more than 250 employees. Many of these businesses (740) reported conducting innovation activity during this period, as defined by the OECD's Oslo Manual, while 440 businesses reported conducting R&D as defined by the OECD's Frascati Manual.

The survey found that despite the unprecedented challenges posed by COVID-19, many businesses in South Africa continued to invest in research and development while having to make tough choices. Businesses with innovation activity—including R&D but also other types of activity—quickly adapted to the challenging context adopting new coping and survival strategies, such as reducing staff or working hours.

## Modelling R&D investment for DSI's Decadal Plan

In 2020/21 CeSTII undertook a joint project with the Department of Science and Innovation, to model the requirements to meet the R&D investment target in South Africa. Informing the drafting of the DSI's Decadal Plan, the project aimed to understand why South Africa struggles to meet national investment and knowledge intensification targets, as well as how, and in which institutional sectors, there are opportunities to grow R&D investment, to achieve the targets.

The team initiated and presented advanced statistical analysis and modelling to assess firm-level determinants of R&D investment, and to identify the rate of investment growth required from priority government departments. The work points to the need for a new research agenda to consider the issues impacting on the achievement of national GERD/GDP targets in 2021/22. This could extend to other countries in the SADC region who have expressed an interest in this work to inform shared regional challenges.



## SPECIAL PROJECT: DIGITAL SURVEYS A STEP CLOSER FOR CeSTII

In the spirit of innovation CeSTII used the year in review to initiate the development of a new digital survey interface for the annual R&D Survey. Now in its 19th cycle within CeSTII, the annual survey is the primary instrument for measuring R&D progress in the country across key sectors. This data is used by government leaders and policy-makers as part of a suite of economic performance indicators.

To date CeSTII surveys have mostly been administered in hard copy and via email. Data collectors gather the data and the research team compile and analyse it for annual release. Looking to the future CeSTII aims to reduce the lead time between when data is collected and when it is released for public use, thus providing clients and stakeholders with fresh data to inform policy and decision-making. An online survey interface will also assist users to complete the survey and assess their data against country or sector trends. In developing this project, our theory of change is that an intuitive and easy-to-use online interface retains respondents and helps grow response rates. Our new survey completion instrument should also therefore be easier for users to complete with helpful tools for team collaboration and access to previous submissions.

### A multi-disciplinary team

To achieve this vision a skilled team spanning the HSRC's internal resources, specialist service providers, including software developers, a solution architect and a UX/UI specialist together with a CSIR systems engineering consultant helped drive the special project. Progress toward project objectives was rapidly advanced in the course of the year, and lessons documented for the next phase of the project.

### Technical challenges

Three major technical challenges were at the heart of the project. The first was exploring interoperability between REDCap and the R&D Survey Management System (RDSMS), and developing a feasible solution on the basis of research. REDCap and RDSMS are two existing survey data collection and information management technologies in use and supported by the HSRC.

The second challenge was to design new user interfaces for the R&D Survey respondents and the research teams to use, accounting for the diversity of sectors that participate in the survey. The third technical challenge was to develop a change management strategy and business process reengineering approaches to accommodate the new system.

implementation, defined-timeframe survey digitalisation project. The goal? To improve survey performance by interoperating existing tech stacks and developing a new interface. Join us?

**WE'RE HIRING**  
CLOSING DATE: 8 OCTOBER 2020

**SOLUTION ARCHITECT**  
To apply, go to: [t.ly/qbtb](https://t.ly/qbtb)

**SENIOR FULL STACK DEVELOPER**  
To apply, go to: [t.ly/bQ5H](https://t.ly/bQ5H)

**JUNIOR FULL STACK DEVELOPER**  
To apply, go to: [t.ly/h1g2](https://t.ly/h1g2)

**UX/UI SPECIALIST**  
To apply, go to: [t.ly/hfbj](https://t.ly/hfbj)

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CeSTII recruited a multi-disciplinary team to work on the digitalisation of its R&D Survey business processes in 2020/21.

A different way of working using the principles of design thinking and agile development enabled the project to progress and meet key milestones despite time and budget constraints.

## First phase achievements

The first phase of the project completed an in-depth technological investigation into the potential for data interoperability between RDSMS and REDCap. This was followed by a participatory design thinking processes involving members of the R&D Survey team and other CeSTII stakeholders to understand system and user needs, challenges, requirements, and desired future states.

This was followed by the rapid establishment of continuous development, test and production environments for the creation of the new digital services, within the dynamic context and constraints of the HSRC's IT landscape.

On the basis of these activities and the information gathered, the user experience (UX) design process resulted in the articulation of high-fidelity wireframes as the basis for the new front-end user interface (UI) as well as testing of a rapid prototype of the UI. The UI is where members of the public can access R&D Survey information, and respondents can log on to submit survey data directly to the RDSMS. It also allows for CeSTII researchers to monitor submissions with a user-friendly dashboard. Back-end microservices and authentication or security architecture were also designed.

As the project progressed, a library of technical documentation was drafted to support both the maintenance of the new tools by HSRC IT, and the design of CeSTII team training tools.



## Project achievements

- **November 2020**  
Solution Architect and user experience and user interface specialist join team
- **December 2020**
  - A series of design thinking workshops develop the brief
  - Full stack developers join the team
  - User experience and user interface design wireframes developed
- **February 2021:**  
Progress presented to the Department of Science and Innovation
- **March 2021**  
Project review
- **April 2021**  
Digital survey prototype completed for User Acceptance Testing by R&D Survey team

## Next phase

The digitalisation special project enters Phase 2 in the 2021/22 financial year building on the achievements of Phase 1. It is widely acknowledged that adoption of new software may require several iterations, improved on the basis of user feedback, to achieve its ambitions. Using the new software in the field will provide important feedback for the refinement of the R&D Survey respondent experience, the new user interface and the overall goal of end-to-end digitalisation.



## Key project objectives

- Enable online survey participation
- Reduce the manual data capture burden
- Enhance the user experience of respondents
- Provide value-added data services for users
- Improve survey participation
- Enhance survey reputation
- Document learning and new business processes



A different way of working using the principles of design thinking and agile development enabled the project to progress and meet milestones despite time and budget constraints.”



## THEME 2: MEASURING INNOVATION CAPACITY IN SOUTH AFRICAN FIRMS



**Dr Moses Sithole**  
Theme Leader

### National innovation survey results released

Minister of Higher Education, Science and Innovation, Dr Blade Nzimande, released the results of the 2014-2016 Business Innovation Survey on 8 July 2020. Produced by CeSTII for the Department of Science and Innovation (DSI), the survey analyses national data on the formal business sector's innovation performance in the three-year reference period.

To respond to current economic, ecological and health challenges, policy actors and decision-makers need to understand what kinds of innovation firms can implement, and whether the benefits accruing from these forms of innovation can contribute to firms' business strategies and to inclusive and sustainable growth. The survey results provide evidence for users to reflect on the distinctive nature of innovation in South Africa, and point to areas for policy intervention to encourage more firms to innovate.

Alongside the annual R&D Survey, the HSRC has performed national innovation surveys since CeSTII was established in the early 2000s. South African innovation surveys follow the widely-adopted OECD Oslo Manual methodology to enable international comparisons. The surveys are conducted using a random sample of businesses stratified by size class and across the industrial and services sectors. Data is weighted to reflect innovation performance across the national population of businesses in those sectors, providing a unique snapshot of innovation performance in the formal economy.

The results of the South African Business Innovation Survey, 2014-2016 also provide insightful data on the barriers that prevent more firms from innovating, whether these relate to cost, market, knowledge or institutional factors.

While islands of excellence exist within the small number of firms that innovate at the technology frontier in ways that are 'new to the world', most firms utilise incremental innovations that marginally modify their existing products and processes, or that are new to the firm and local market. This underscores the need to design policy support to mitigate the constraints innovation across the business sector.



<https://sabizinnovationsurvey.blog/>



## First CeSTII Agri-BIS report well received

A comprehensive survey of business innovation in the agricultural sector was completed during the year in review. The survey gathered and analysed data on three sub-sectors, namely farming, forestry and fisheries and identified key trends. New insights into innovation in the sector were well received by stakeholders laying the basis for further work in this important area. The report's findings were presented at the annual National Council on Innovation (NACI) policy forum (see page 23 for more).



Thank you for the email on this exciting piece of work."

**Qonde, Gwebinkundla Department of Higher Education and Training**



Thanks for this report. What consideration was taken into the survey of small and medium enterprises, particularly smallholder farmers? – were these stakeholders contacted to participate in the survey? What has been the role of provincial departments of agriculture in assisting you access a greater number of small agricultural enterprises, particularly in former homeland areas and other rural provinces to participate in the survey? I'm asking these questions to gain insights on the suggested implications of the outcome of the report."

**Dr Shadrack Moephuli, Agricultural Research Council**



A step forward for understanding in detail what goes on in African agriculture."

**Abiodun Egbetokun, National Centre for Technology Management, Nigeria**



Great conversations... Let's continue the dialogue so that we move away from (the) current fragmented system of innovation to a functional and effective one."

**Rendani Mamphiswana, 4IR Commissioner**



Insightful, kudos CeSTII HSRC. It would be interesting to also make the data available for more empirical exploration."

**Dr Elvis Avenyo, College of Business and Economics, University of Johannesburg**



Such important work CeSTII HSRC to uncover the nuances and discuss innovation from the perspectives of the performers. Well done."

**Dr Gillian Marcelle, Managing Member, Resilience Capital Ventures**



This looks fascinating, and I'd like to share this with the 5 000 members of the KoiGroup for Entrepreneurs & Innovators on Facebook, as many of our members are innovating in agriculture."

**Neil Hinrichsen, KoiQuest**



Thank you for sharing this important work, particularly, on economic sub-sector innovation performance."

**Tichaona Mangwende, New Partnership for African Development**



Fascinating research insights and policy propositions for agriculture. I will share with colleagues in the agriculture space."

**Stephen Monamodi, Manager: Communications, National Agricultural Marketing Council**

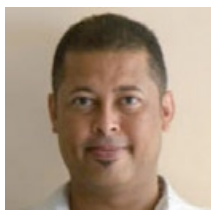


This is great. Thank you very much for sharing."

**Chani Macauley, [www.tothedots.com](http://www.tothedots.com)**



## THEME 3: NEW INDICATOR DEVELOPMENT



**Dr Nazeem Mustapha**  
Theme leader

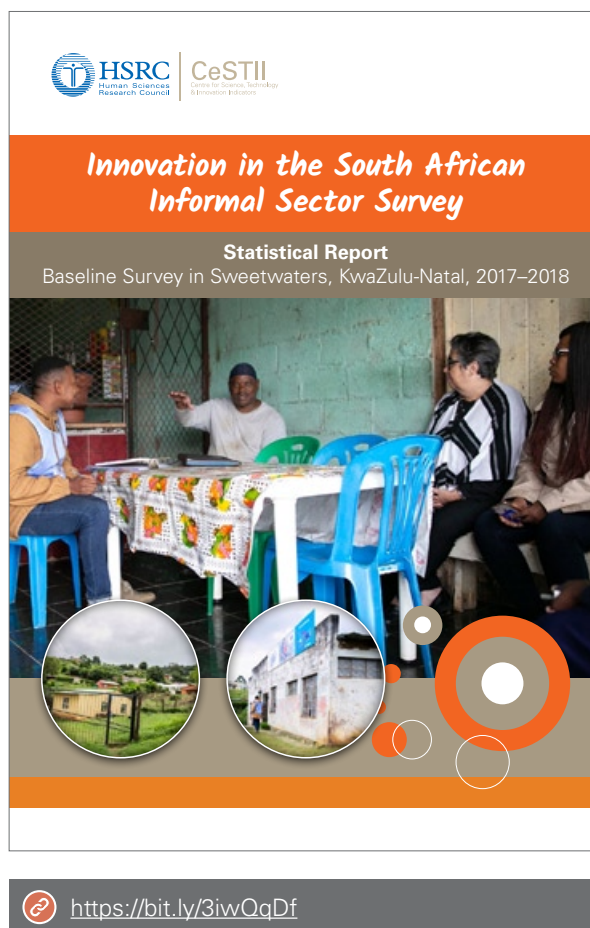
### Understanding innovation in the informal sector

With the fieldwork concluded for the baseline study of Innovation in the Informal Sector (IIS), the focus for 2020/21 was on dissemination. The team sought to create a platform to disseminate the findings from the study to the local community participants and engage with various stakeholders on ways to promote innovation in the informal sector, which plays a key role in the survival of informal businesses.

The financial year concluded with a hybrid webinar on 30 March 2021, jointly organised by CeSTII and the HSRC's Centre for Community-based Research, in Sweetwaters (Mpumzuza), KwaZulu-Natal. A total of 75 participants attended the event, including HSRC researchers, policy makers from national and provincial government, NPOs supporting informal traders and informal traders themselves, to explore the research findings and their policy implications.

To facilitate their participation, informal traders were invited to attend the event in-person at the Sweetwaters venue. The group of 21 informal business owners engaged with the research content and shared their experiences and the challenges of protecting their livelihoods in the context of the COVID-19 crises. The event also promoted a linkage between business owners and the South African Informal Traders Alliance (SAITA).

Our goal is to create a standardised measure of innovation in the informal sector that could inform policy for transformative change. The full report can be downloaded from the HSRC website: Statistical Report: Innovation in the South African Informal Sector Survey — Baseline Survey in Sweetwaters, KwaZulu-Natal, 2017-2018.

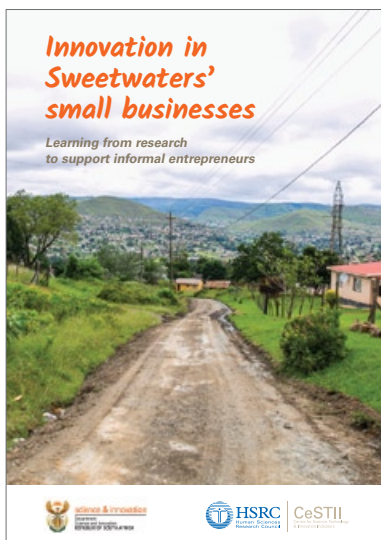


The IIS survey report is complemented by case studies using additional data collected through key informant interviews and digital storytelling workshops. One case study deals specifically with the nature of growth through innovation.

### Growth through innovation in informal businesses

A long-held view has been that informal sector firms need to be coaxed to become formal enterprises. However, we found the situation is not straightforward: the growth trajectory of an informal enterprise takes place along several developmental paths. These could be through acquiring technical abilities, through changed organisational structures, employee upskilling, etc. Formality/informality are therefore better conceptualised as interchangeable stages along a continuum, as opposed to binary opposites on a linear, uni-directional trajectory. Considering that innovation tends to be motivated by necessity-driven strategies, in response to a need or a trigger event to keep the enterprise operational, and understanding of this multiplicity of (in)formality levels can provide policy insights into the role of innovation in business evolution in the informal sector.

Following the successful completion of the first baseline survey of innovation in the informal sector, a focus of the past year was to capture lessons learnt to inform future potential surveys including possible replication in other areas in South Africa. We have also begun to curate the methodology and instruments to share with others interested in measuring innovation in the informal sector elsewhere on the continent. The methodology and instruments were shared with CeSTII's counterparts in Nigeria, who completed their first IIS survey in 2019 and 2020. In 2021/22 CeSTII aims to build a community of practice around the measurement of innovation in the informal sector in Africa.



<https://bit.ly/3rk093A>

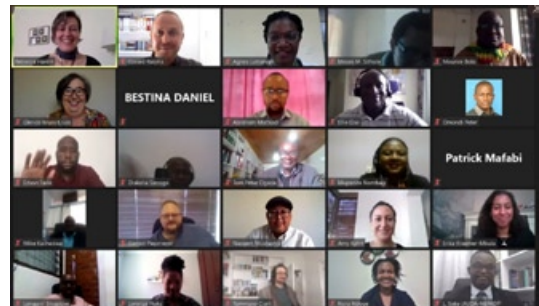
### Evidence for policy project in Africa

In November 2020, the team started the Evidence for Policy project, as part of a consortium of partners led by the African Centre for Technology Studies (ACTS) in Kenya. The project is funded by the National Research Foundation (NRF) and the International Development Research Centre (IDRC) under its Science Granting Council Initiative (SGCI). The SGCI aims to strengthen the capacity of science granting councils in Africa to support research and evidence-based policies that contribute to economic and social development on the continent.

The project started in November 2020 to end in February 2023. The CeSTII team is responsible for two of the main work packages:

- Work Package 2 aimed at supporting councils to conduct reviews of national science technology and innovation policies
- Work Package 5 aimed at supporting councils to develop data management systems and frameworks, and to systematically collect, analyse and use relevant data and evidence.

The Councils are located in Southern Africa, East Africa and West Africa with 15 targeted for support over the 28-month project.



Project partners in online discussion in early 2021.

# CONFERENCES, PAPERS & REPORTS

Members of the CeSTII team authored or co-authored eight papers, five book chapters, articles, a policy brief and several reports during the year in review.

## Papers

Kruss, G. (2020) Aligning knowledge, skills and capabilities across South Africa's health innovation system to combat COVID-19. *HSRC Review*. 18(2):11-13. <http://hdl.handle.net/20.500.11910/15363>

Kruss, G. (2020) Catching up, falling behind: the need to build upgrading coalitions for innovation and inclusive development in South Africa. *Nova Economia*. 30:1115-1144. <http://hdl.handle.net/20.500.11910/15959>

Kruss, G.E., Lee, K., Joseph, K.J. & da Motta e Albuquerque, E. (2020) Breaking middle income traps in a post COVID-19 world: an introduction to the special issue. *Nova Economia*. 30:1063-1088. <http://hdl.handle.net/20.500.11910/15958>

Kruss, G., Sithole, M. & Buchana, Y. (2020) Towards an R&D indicator and human development. *Development Southern Africa*. October: Online. <http://hdl.handle.net/20.500.11910/15475>

Mavi, S., Zondi, L., Ramoroka, K., Bailey, C. & Mustapha, N. (2020) Surviving a fierce destruction: how the COVID-19 lockdown affected research and development in South African businesses. *HSRC Review*. 18(4):12-15. <http://hdl.handle.net/20.500.11910/16027>

Mustapha, N., Petersen, I., Jegede, O., Bortagaray, I. & Kruss Van Der Heever, G. (2021) Measurement of innovation in the informal sector in Africa: the importance to industrial policy. *Innovation and Development*. February: Online. <http://hdl.handle.net/20.500.11910/15800>

Petersen, I. & Kruss, G. (2021) Universities as change agents in resource-poor local settings: an empirically grounded typology of engagement models. *Technological Forecasting & Social Change*. 167:Online. <http://hdl.handle.net/20.500.11910/15848>

Sithole, M.M. & Buchana, Y. (2020) Effects of innovation activities on employment growth in upper-middle-income countries with high unemployment rates. *Development Southern Africa*. July: Online. <http://hdl.handle.net/20.500.11910/15446>

## Book chapters

### Published

Petersen, I. and Kruss, G. (2020) Towards a coherent and inclusive NSI: building network alignment through strengthening dynamic interactive capabilities, pp. 48-59 in Cele, M. B. G., Luescher, T. M., and Wilson, A Fadji (eds), *Innovation policy at the intersection: Global debates and local experiences*. Cape Town: HSRC Press.

Kruss, G. & Ralphs, G. (2021) The value of a fixed mandate for the knowledge commons: a history of the HSRC's role in R&D and innovation measurement (1966-2018). In Soudien, C., Swartz, S. & Houston, G. (eds). *Society, research and power: a history of the Human Sciences Research Council from 1929-2019*. Cape Town: HSRC Press. 327-345.  
<http://hdl.handle.net/20.500.11910/15976>

### Forthcoming

Harnessing Innovation in the Informal Food Services Sector: Insights for Public Policy in the Age of COVID-19. Submitted to the UJ book project, *Harnessing innovation for transformative change in the age of COVID-19: theoretical and policy responses in Africa*, SARChI Transformative Innovation, 4IR and Sustainable Development, University of Johannesburg.

Towards an inclusive measurement programme for innovation to serve the development needs of South Africa. Submitted to the book project, *Innovation for Inclusive Development and Transformation Change*, edited by Chux Daniels, Cyril Adonis, Konosoang Sobane, and Charles Hongoro.

Towards a transformation agenda for academic engagement in South Africa. Submitted to the HSRC-SPU book project, *The Role of Universities in Society: Mapping University Community Engagement in Secondary Cities*.

## Policy brief

Buchana, Y. & Sithole, M. (2020) Innovation and employment growth in South Africa: effects and implications. *HSRC Policy Brief*, December 2020.  
<http://hdl.handle.net/20.500.11910/15654>

## Reports

CeSTII (2020) *Innovation in the South African Informal Sector Survey – Statistical Report Baseline Survey in Sweetwaters, KwaZulu-Natal, 2017–2018*. Human Sciences Research Council: Cape Town.

CeSTII (2020). *South African national survey of research and experimental development: statistical report 2018/19*. Human Sciences Research Council: Cape Town.

CeSTII & TIPS (2020). *Measurement of green economy research and development 2010/11-2016/17*.

Sithole, M., Moses, C., Kruss, G., Ralphs, G., Buchana, Y., Kahn, A. & Kasongo, A. (2020) Innovation performance in South African businesses, 2014-2016: activities, outcomes, enablers, constraints. Pretoria: Human Sciences Research Council.  
<http://hdl.handle.net/20.500.11910/15473>

McKenzie, K. Innovation in Sweetwaters' small businesses. Learning from research to support informal entrepreneurs. Human Sciences Research Council: Cape Town.



## Workshops and seminars

Petersen, I. Internal HSRC seminar on engaged research. 7 August 2020.

Petersen, I. Presentation to Parliament's Select Committee on Appropriations on Food Security in South Africa as part of HSRC delegation. 2 September 2020.

Petersen, I. Harnessing innovation in the informal food services sector for inclusive change in the age of COVID-19. Book project led by the DST/NRF/Newton Fund Trilateral Research Chair in Transformative Innovation, the 4<sup>th</sup> Industrial Revolution and Sustainable Development. The draft working paper was presented at a workshop held on 7 December 2020.



From L-R: Dr Amy Kahn, Dr Il-haam Petersen and Dr Glenda Kruss participate in a blended virtual in-person CeSTII workshop.



## Measuring innovation in South Africa's cultural and creative industries

Cultural and creative industries (CCI), also known as the 'orange' economy, contributed 2.9% of South Africa's GDP in 2013/14, or R90.5 billion—exceeding the contribution of agriculture at 2.2%. By 2011 creative goods and services accounted for one-fifth of world trade next to minerals and oil, electronic equipment, machinery, and vehicles.

At an online seminar in June 2020 Gerard Ralphs, CeSTII programme manager and policy analyst, discussed the methodological challenge of measuring innovation in this growing sector which has much to offer South Africa's economy while also nurturing the social and cultural fabric of our society.

South Africa has typically been a net importer of CCI goods and services. Between 2002 and 2010, South African CCI exports increased from R2.42 billion to R3.12 billion, while imports grew from R4.13 billion in 2002 to R15.62 billion in 2010. A key question for cultural, innovation, and industrial policy makers is how to grow the sector and enhance its global competitiveness.

Traditional innovation surveys are a useful tool to assess the innovation performance of economic sectors, through the lens of firm-level activity. However, much innovation in the cultural and creative industries takes place outside of the formal sector. The seminar explored whether traditional approaches are appropriate in the South

African context, and provided an overview of South Africa's orange economy in the global context.

Ralphs argued that an innovation measurement agenda is critical to the future of the CCI and posed several questions for discussion with participants: Are 'creativity' and 'innovation' synonymous in the CCI? Is it possible to measure 'creativity' and 'culture'? What kinds of adaptations to existing research instruments, tools or approaches are needed to develop context-specific measurement of innovation in the CCI? How can the CCI occupy a greater position in South African innovation policy discourse? In what ways does COVID-19 compel a rethink of policies and approaches to the sustainability of the cultural and creative industries?

 Listen to the podcast

<https://bit.ly/2VSAmUs>



L: South African musicians Hannes Coetzee and David Kramer. R: Using a teaspoon, Coetzee demonstrates his innovative 'optel and knyp' guitar technique. Images used with kind permission from Barney Burke, burkedigitalpix.com

## Assessing the state of innovation in South Africa

Every year the National Advisory Council on Innovation publishes the South African Science, Technology and Innovation Indicators Report, a detailed reflection on the state of innovation in the country. Working together, NACI and CeSTII arranged a high level virtual forum on 28 August 2020 to debate key aspects of South Africa's innovation performance, and highlight opportunities and challenges in the COVID-19 era.



<https://bit.ly/371UNRr>

“ We need to expand our vision from the limited view of innovation, as a market introduction of a profit-bearing activity in a large formal firm—the picture that tends to hold us captive.” – **Dr Glenda Kruss**

The NACI report uses key indicators, ranging from R&D expenditure to the number of patents granted, student enrolments and many more, to provide a profile of progress in science, technology and innovation (STI). It also benchmarks South Africa against peers in the developed and developing world. The report is an important resource for policy makers from the Department of Science and Innovation, other parts of government, civil society, universities and the private sector.

In addition to event mobilisation, CeSTII's contribution to the policy forum, presented by Executive Head, Dr Glenda Kruss, highlighted the need to expand existing innovation indicators and interpret existing datasets in ways that contribute to inclusive and sustainable development.

### Developing new indicators

Kruss presented new datasets being created by CeSTII in the agricultural and informal sectors, sparking discussion on what counts as 'innovation'. She noted that while the approach to STI measurement in South Africa is based on global standards set by the Organisation for Economic Co-operation and Development, she cautioned participants to remember “these are shaped by the nature and dynamics of highly developed economies, as opposed to our developing economy status.” She asked: “How do we use these core OECD approaches—that are critical for global comparability—with indicators that reflect our challenges and developmental priorities?”

An important starting point for CeSTII is the African Union's Science and Technology Strategy for Africa 2024 (STISA) with its six developmental priorities, Kruss noted. The importance of the first priority, to eradicate hunger and ensure food and nutrition security, informed the first Agricultural Business Innovation Survey, 2016-2018 and the Innovation in the Informal Sector Survey, 2019.



As the world moves toward the post-COVID-19 era Kruss argued “we need to free up our thinking about what counts as innovation.” She proposed using the expanded Oslo Manual definition of an innovation “as a new product or process being put into use by potential users. We need to expand our vision from the limited view of innovation, as a market introduction of a profit-bearing activity in a large formal firm—the picture that tends to hold us captive.”



Dr Kruss addresses the NACI policy forum.

## Measuring innovation in agriculture

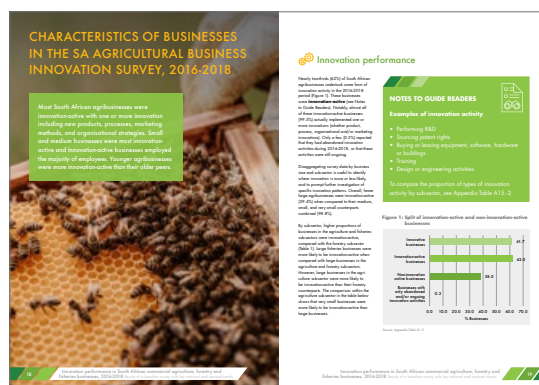
The first Agricultural Business Innovation Survey demonstrated that there are high levels of innovation within the sector. Of formal agri-businesses, 61.9% introduced a new or significantly improved product, process, organisational method, or marketing method. All 100% of small and very small agricultural businesses tried to innovate, while 29,4% of large agricultural businesses tried to innovate.

The major barriers to innovation identified were resource factors (including access to water, finance and land) and knowledge factors including access to managerial and engineering skills and a lack of technicians. Notable, however, were the different patterns of innovation in the three agricultural sub-sectors of farming, forestry and fisheries.

Innovation activity in the agricultural sector included marketing innovative products, purchasing computer hardware and software, making use of engineering solutions, leasing machinery and undertaking training.

Policy questions arising from the research include:

- Would a more coordinated response across government, industry associations and universities address barriers and constraints more effectively?
- Are there types of innovation that do not occur on a wide enough scale that should be systematically promoted?
- Are new funding instruments needed to support R&D and technology-led innovation in agriculture?



<https://bit.ly/2V3BhKM>

## Innovation and the informal sector

In a highly unequal society like South Africa, many households and communities depend on the informal sector for work, livelihoods as well as goods and services. A significant number of individuals and very small enterprises contribute to the STISA goal of eradicating hunger and ensuing food and nutrition security by growing, preparing and selling food in local neighbourhoods.

There has been recognition in the global STI measurement field that innovation takes place in a wider range of settings that includes informal enterprises, the public sector, indigenous knowledge systems or even households. This has led to experimentation to extend the core models and processes in innovation scholarship.

In 2019 CeSTII began to focus its efforts on measuring innovation in the informal sector, an extremely complex task as there is no national register of informal businesses. Despite the methodological challenges a successful local survey was conducted in Sweetwaters, KwaZulu-Natal laying the basis for more local surveys to build up a bigger picture of innovation in South Africa's informal sector.

Dr Kruss noted that a significant feature of informal sector economic activity is its very localised nature which requires a spatial lens and fine-grained approach to measure innovation within very small and micro enterprises. The survey demonstrated that demand and supply is very local with 44% of customers and 60% of suppliers coming from the local neighbourhood.

Informal enterprises are typically in owner's homes and 85% of informal food entrepreneurs are innovation-active – with most undertaking process innovations. The most frequent innovation activities reflected the prevalence of local learning and capacity-building from customers, suppliers and other local actors.

A number of policy considerations for stimulating innovation in the informal sector were highlighted:

- How do we design new context-specific policy instruments to support the main kinds of innovation activity in informal micro-enterprises, focused on learning, capacity building and accessing different types of formal and informal knowledge sources?

- How can we promote economic inclusion by linking local-level informal sector value chains more effectively to formal value chains?
- How can the Department of Science and Innovation align its support to innovation in informal enterprises with the business support offered by other government departments?
- Are different strategies required to promote the distinctive patterns of innovation in different informal sub-sectors?

## The STI Decadal Plan

In concluding the policy forum Prof. Crain Soudien, NACI councillor and then CEO of the HSRC, underscored the need to continue debating the appropriateness of the reporting framework and instruments for STI measurement in South Africa as the country finalises a new decadal plan for science, technology and innovation. Important questions included whether South Africa was producing the right graduates to meet the needs of the country and whether the design of the STI landscape was responsive to our country's social challenges. Prof. Soudien highlighted the important role of universities in finalising the decadal plan and called on them to participate actively in this conversation.

Reflecting on the national system of innovation over the past 25 years, Dr Phil Mjwara, Director-General of the Department of Science and Innovation, highlighted the strategic role STI policy had played in positioning South Africa to meet the challenges of COVID-19. Investments the country had made early in the democracy, as a result of the first generation of STI policy, had borne fruit making an important and visible contribution to South Africa's response to the pandemic. Lessons from this would also help to inform the development of the next generation of STI policy, now being developed as part of the STI Decadal Plan 2021-2031.



Find out more

**The South African Science, Technology and Innovation Indicators Report 2020**

<https://bit.ly/3rIHuUR>

**NACI policy forum, 28 August 2020**

<https://bit.ly/3zbTjzQ>

# COLLABORATION & NETWORKING

## Transformative Innovation Policy Consortium

The Transformative Innovation Policy Consortium (TIPC) is a global consortium of science, technology and innovation policymakers, funders, researchers and investors. Its goal? To mobilise the power of innovation to address societal and environmental challenges for the race to net zero and towards a sustainability transition for the world. The Consortium was founded by a team at the Science Policy Research Unit at the University of Sussex Business School led by Johan Schot, Professor of Global History and Sustainability Transitions. South Africa is among TIPC's formal members, which also includes China, Colombia, Ghana, Finland, Kenya, Norway, Senegal and Sweden. Its four main programme areas are:

1. Policy experiments and formative evaluation
2. Learning for transformations and transitions to sustainability
3. Research agenda for Transformative Innovation Policy
4. Regional hubs to support implementation and delivery of the Sustainable Development Goals

As part of the TIPC activities, CeSTII team members (Glenda Kruss, Il-haam Petersen, Nazeem Mustapha, Gerard Ralphs and Xolisa Magawana) acted as evaluation observers for the South African pilot policy experiment on 'living catchments' comprising six 2.5-hour workshops. Through co-creation and co-learning, a group of academics, policy makers and practitioners applied a transformative innovation policy lens to develop a monitoring, evaluation and learning plan to guide the implementation of the Living Catchments project.

Funded by the DSI and led by the South African National Biodiversity Institute (SANBI) in partnership with the Water Research Commission, the project aims to "create an enabling environment for integrating built

and ecological infrastructure to support water security, economic development and livelihood improvement". "A key and persistent theme evident in the discussions in this policy experiment was how the Living Catchments team could articulate their programmatic objectives in ways that gave substance to its aspiration toward transformative change in water systems management," says Kruss. "This approach challenged the team to question their assumptions, and to consider how to orient their theory of change toward a wider set of local and global concerns." CeSTII will continue to support the work of TIPC in 2021/22.



Find out more

For more information on TIPC see  
<https://www.tipconsortium.net/>

## STI measurement capacity building in Africa

CeSTII staff supported a range of activities and virtual exchanges of information as part of its work on strengthening capacities for STI measurement on the African continent. **Dr Moses Sithole** and **Dr Glenda Kruss** participated in AUDA-NEPAD workshops on refining R&D and innovation survey instruments with African Member States in September and November 2020, contributing learning from the South African context. Also in November 2020, **Dr Nazeem Mustapha** participated in a dissemination event of the Nigerian pilot survey of innovation in the informal sector, which adapted CeSTII's survey questionnaire for use in collecting data from a sample of approximately 1,500 informal businesses in Abuja, Ile-Ife, and Enugu.



# OUTREACH

## CeSTII in the media

CeSTII actively promotes its research through a dedicated outreach strategy. We respond to calls from the media for comment and we position our research findings for broad public awareness through opinion editorials.

HEADLINE	DATE	PUBLICATION	LINK
South African research intensity plummets	25 February 2021	Research Professional	<a href="https://bit.ly/2UK9LZo">https://bit.ly/2UK9LZo</a>
South African science was slipping before the pandemic	3 September 2020	Research Professional	<a href="https://bit.ly/3zbaC6n">https://bit.ly/3zbaC6n</a>
South African R&D investment insufficient to transition to a green economy – study	5 June 2020	Engineering News	<a href="https://bit.ly/3epOtaC">https://bit.ly/3epOtaC</a>
The pace and direction of innovation is critical to South Africa’s economic recovery	28 July 2020	The Daily Maverick	<a href="https://bit.ly/3hEG7xG">https://bit.ly/3hEG7xG</a>
Survey shows South African firms in some sectors are highly innovative	20 July 2020	The Conversation	<a href="https://bit.ly/3r8ntBj">https://bit.ly/3r8ntBj</a>
Innovation key to rebuilding SA’s economy post Covid-19, says dti deputy minister	10 July 2020	IOL	<a href="https://bit.ly/3ei5B1Q">https://bit.ly/3ei5B1Q</a>
Few SA companies aware about innovation support tools	9 July 2020	Research Professional	<a href="https://bit.ly/3AZDHBg">https://bit.ly/3AZDHBg</a>
Minister Blade Nzimande releases results of Business Innovation Survey	9 July 2020	Department of Science and Innovation	<a href="https://bit.ly/3AYy1aR">https://bit.ly/3AYy1aR</a>
Concerns about declining investment in Research & Development	22 February 2021	SABC News	<a href="https://bit.ly/36DD0Qf">https://bit.ly/36DD0Qf</a>
Innovation and competitiveness feature: The state of innovation in SA	6 August 2020	Classic Business	<a href="https://bit.ly/3eqHyxE">https://bit.ly/3eqHyxE</a>



Dr Glenda Kruss was interviewed in February 2021 by the South African Broadcasting Corporation on the decline in South Africa’s R&D investment.

[https://youtu.be/tXnVYhBD-\\_c](https://youtu.be/tXnVYhBD-_c)

# KEY STAKEHOLDERS

STAKEHOLDER ORGANISATION	HOW CeSTII ENGAGES
<b>CORE PARTNERS</b>	
Department of Science and Innovation	<ul style="list-style-type: none"> <li>Work closely at the research-policy nexus to conduct the annual R&amp;D survey and bi-annual innovation survey and the production of official STI statistics in partnership with Statistics South Africa, the OECD and NESTI.</li> </ul>
National Advisory Council on Innovation	<ul style="list-style-type: none"> <li>Collaboration on research and advocacy, hosting the NACI indicators provincial roadshow, as well as a standing arrangement for regular data and outputs sharing, to contribute to the creation of a national STI portal.</li> </ul>
Statistics South Africa	<ul style="list-style-type: none"> <li>Ensuring compliance with SA Statistical Quality Framework through the R&amp;D Survey Clearance Committee, and provision of the Business Register and survey sample for the surveys and associated methodological support.</li> </ul>
<b>REGIONAL PARTNERSHIPS</b>	
African Union-NEPAD National Planning Commission	<ul style="list-style-type: none"> <li>Collaboration with the ASTII programme to provide training on STI indicators and in the writing of the African Innovation Outlook. Training network includes partnership with the African Observatory on Science, Technology and Innovation, and the UN Institute of Statistics.</li> <li>Provision of national R&amp;D and innovation data and indicators according to required templates.</li> </ul>
Southern African Development Community SADC Secretariat	<ul style="list-style-type: none"> <li>Technical expert advisers on the implementation of science, technology and innovation policies and indicators in the region.</li> </ul>
NACETEM, Nigeria	<ul style="list-style-type: none"> <li>Share expertise and co-author comparative papers on R&amp;D and innovation in SA and Nigeria.</li> </ul>
NCRST, Namibia	<ul style="list-style-type: none"> <li>Training, share expertise and co-author comparative papers on R&amp;D and innovation in SA and Namibia.</li> </ul>
<b>GLOBAL PARTNERSHIPS</b>	
OECD/NESTI	<ul style="list-style-type: none"> <li>Provision of national R&amp;D and innovation data and indicators according to required templates.</li> <li>Participation in discussions to revise and implement changes to Frascati and Oslo manuals.</li> </ul>
UNESCO	<ul style="list-style-type: none"> <li>Provision of national R&amp;D and innovation data and indicators according to required templates.</li> </ul>
REDESIST, Federal University of Rio de Janeiro, Brazil	<ul style="list-style-type: none"> <li>Research collaboration on local innovation and production systems, and innovation measurement.</li> </ul>

*Continues overleaf...*



STAKEHOLDER ORGANISATION	HOW CeSTII ENGAGES
<b>PROJECT-BASED COLLABORATIONS</b>	
Science Councils (Council for Scientific and Industrial Research and Agricultural Research Council)	<ul style="list-style-type: none"> <li>• Share expertise and co-author analytical papers drawing on R&amp;D and innovation datasets to address new questions.</li> </ul>
BRICS Research Centre, HSRC	<ul style="list-style-type: none"> <li>• Provision of national R&amp;D and innovation data and indicators according to required templates.</li> </ul>
Business Unity South Africa	<ul style="list-style-type: none"> <li>• Advocacy partner on BIS and R&amp;D surveys / STI measurement.</li> </ul>
Trade and Industrial Policy Strategies	<ul style="list-style-type: none"> <li>• Green R&amp;D data and analysis.</li> </ul>
Transformative Innovation Policy Consortium	<ul style="list-style-type: none"> <li>• Evaluation of policy experiments in South Africa.</li> </ul>
African Centre for Technology Studies	<ul style="list-style-type: none"> <li>• Partner in the Science Granting Councils Initiative Evidence for Policy (EviPol) Consortium.</li> </ul>
Université Cheikh Anta Diop de Dakar - Sénégal	<ul style="list-style-type: none"> <li>• Partner in the Science Granting Councils Initiative Evidence for Policy (EviPol) Consortium.</li> </ul>



# HONORARY RESEARCH FELLOWS

CeSTII's honorary research fellows are international scholars of significant academic standing and play an important role in the organisation's research programmes.



**Dr Oluseye O. Jegede**

Dr Oluseye O. Jegede is the Research Manager at Lagos Business School, Pan-Atlantic University, Lagos Island, Nigeria. He worked as specialist researcher at the South African Research Chair in Entrepreneurship Education (SARChI), College of Business and Economics, University of Johannesburg between July 2019 and April 2021. In 2018 Dr Jegede was appointed African Research Fellow at CeSTII. He was also Research Fellow at the African Institute for Science Policy and Innovation (AISPI), Obafemi Awolowo University (OAU), Ile-Ife, Nigeria.

Dr Jegede was awarded his PhD in Technology Management (R&D and Innovation Management) in 2015. His main areas of research include innovation management, entrepreneurial ecosystems, small business management and economic geography. He has published over 40 articles on entrepreneurship, innovation management, technology policy, innovation systems and regional development in different international journals. Dr Jegede has made over 40 presentations in different countries across all the world's continents. He is reviewer to several international journals and co-editor of the book *Firm-Level Innovation in Africa: overcoming limits and constraints* published by Routledge. He is currently an associate editor of the African Journal of Science, Technology, Innovation and Development (AJSTID) published by Taylor and Francis Group, UK. Dr Jegede is a member of the Scientific Board of the Global Network for the Economics of Learning, Innovation and Competence Building Systems (GlobeLICS), a pioneer member of the African Network for the Economics of Learning Innovation and Competence Building Systems (AfricaLICS) and head of research activities at the Nigerian network for the Economics of Learning, Innovation, and Competence Building Systems (NigeriaLICS).



**Dr Isabel Bortagaray**

Dr Isabel Bortagaray holds a PhD in Public Policy – Science and Technology Policy from the Georgia Institute of Technology (US). Her expertise is in the field of innovation, science and technology policy, institutions and technological capabilities in developing countries.

She currently works at the Institute on Sustainable Development, Innovation and Social Inclusion (IDIIS), University of the Republic. Previous experience includes an evaluation of sectoral industrial plans and consortia implemented in Uruguay as a fundamental ingredient of the national industrial policy. Between 2010 and 2013 Dr Bortagaray worked as a Senior Program Officer at the International Development Research Center – Canada, for the Latin America and the Caribbean Regional Office. In that context, Dr Bortagaray was responsible for the program on Innovation for Inclusive Development. Before joining IDRC in 2010, she spent some time at the Higher Council of Scientific Research (CSIC) in Spain as a post-doctoral researcher. She has also worked at the University of the Republic in Uruguay (UdeLar), promoting a research programme on University-Society/Productive Sector linkages.

She is a research associate at the Technology Policy and Assessment Center (TPAC), at the Georgia Institute of Technology. In 2004 she was awarded a dissertation grant from the National Science Foundation, and in 2000 she was awarded a Fulbright scholarship for her PhD studies. She is currently based at Instituto de Desarrollo Sostenible, Innovación e Inclusión Social at UdelaR.



# OUR STAFF

## Building capacity and honouring excellence

Training to enhance the capacity of CeSTII staff is a key component of our core business and integral to the broader HSRC mandate. The HSRC's master's and PhD internship programme aims to provide an environment in which trainees can receive the support they need for professional and career growth as researchers in the South African national system of innovation.

### CeSTII Trainees in 2020/21

- **Yasser Buchana**, Post-doctoral Fellow, completed a PhD Degree at University of Cape Town in 2018
- **Anele Slater**, Master's Intern, completed a Master's Degree at Wits Business School in 2019
- **Xolisa Magawana**, PhD Intern, enrolled for a PhD Degree at University of South Africa
- **Nicole van Rheede**, PhD Intern, enrolled for a PhD Degree at the University of Cape Town
- **Juliet Mokoale**, Master's Intern, enrolled for a Master's Degree at Stellenbosch University
- **Vive Sigenu**, Master's Intern, enrolled for a Master's Degree at Stellenbosch University

### AWARD

#### Passionate about making a difference



A 2020 service award for excellence was given to CeSTII project administrator Zinziswa Hlakula by outgoing HSRC CEO, Prof. Crain Soudien. A member of the CeSTII team since 2017, following her placement at the HSRC as an NRF intern in 2016, Ms Hlakula, who likes to be called Zinzi, finds the diverse range of CeSTII projects a stimulating part of her daily work.

With a B Tech in project management from the Cape Peninsula University of Technology, she is responsible for project and office administration, including travel arrangements, equipment procurement, setting up systems and procedures and providing the wide range of support tasks that "help the CeSTII team to do their jobs".

She says that as a student she knew that she "didn't want to do one thing all the time" and that "supporting the 28 members of the CeSTII team, with different people doing different things" has been a challenging but inspiring experience that she aims to build on. As her career takes shape her mission is to use her project management skills to "make a difference in people's lives".





## NEW PHDS CONTRIBUTE TO STI MEASUREMENT IN SOUTH AFRICA

Four members of the CeSTII team, representing a range of disciplines, were awarded PhDs recently, contributing to South Africa's growing scholarship on science, technology and innovation measurement. Dr Mario Clayford, Dr Amy Kahn, Dr Atoko Kasongo and Dr Kgabo Ramoroka share their thoughts about their research, the opportunities and challenges for STI measurement and getting the work-life balance right.



“ Read hard, write hard, but live life.”

Dr Mario Clayford is a senior researcher who joined the HSRC in 2006 and CeSTII in 2013. He is a scholar in the field of public health and one of the leaders of CeSTII's annual R&D survey.

### **Q: Congratulations on your doctorate! What, in a nutshell, was the focus of your research?**

My study specialised in investigating which socio-demographic, psychosocial and disease characteristics were the best predictors of health-related quality of life and functionality in individuals with hypertension. Hypertension is one of the leading risk factors for heart disease, strokes, and preventable cause of premature deaths in South Africa. It is often a silent condition leading to damage over an extended period. Factors such as marriage, education, employment, coping styles, stress and disability significantly affect an individual's quality of life, and as a result influences how a person functions with a chronic disease.

### **Q: STI measurement is at the heart of CeSTII's mandate: what are your thoughts about it in South Africa today?**

Measurement in any field is instrumental as a basis of where you start, and more importantly, where you intend going. The field of STI is vital because of its contribution to economic and social progress.

As a developing country South Africa has solid policies aimed at closing the disparity gap in varying spheres, especially in poverty, inequality, and unemployment. As a country we constantly need to evaluate all governmental and non-governmental efforts in how we respond to these challenges. This requires constant assessment on progress of indicators. CeSTII has the important task of measuring some of these indicators, equipping

government and other stakeholders with accurate data to enhance decision making.

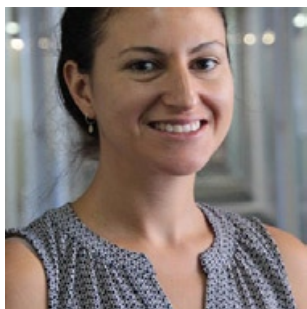
### **Q: Achieving a doctorate requires discipline and hard work, what advice do you have for aspirant doctoral candidates?**

Have a pocket-size notepad just for your studies and carry it around with you. You will be amazed at the places where you have enlightened ideas! The COVID-19 pandemic and resultant lockdown brings many challenges to those working remotely, but to students, a blessing. You have more time now to grind, so use this the best you can. I was always told to dedicate a specific time to write and read, but this never worked for me. For me a computer put on sleep or a paper set out for reading at any time was more useful. Read hard, write hard (even for the bin), but live life. Don't put your friends and family on hold for your studies.

### **Q: The challenges of COVID-19 are many, including balancing our family and work lives. How do you get the balance right?**

A major key to working well remotely is communication. I believe this strategy is vital at home as well. Inform family members that you will be in an important meeting, or when there will be 'do not disturb' times. Before you shut off your computer make a 'to do' list for the next day, and cross-off items as you move through the list. Capture even simple tasks such as emailing someone. This has huge benefits to your working morale. In addition to your work and academic obligation, I reiterate that family and friends are important. So live life.





“ How do we know that technological advancement is stimulating economic growth that is inclusive?”

Dr Amy Kahn is an economist and project manager at CeSTII. She graduated with a PhD in 2020 and has several years of experience running large scale socio-economic surveys in South Africa and East Africa.

**Q: Congratulations on your doctorate! What, in a nutshell, was the focus of your research?**

My research focused on language in South Africa. It included an analysis of the impact of English proficiency on labour market outcomes (employment and wages); an investigation of the trends in mother tongue versus English or Afrikaans instruction in the early grades of schools across South Africa; and, the impact of interviewer and respondent language matching on survey response.

**Q: STI measurement is at the heart of CeSTII's mandate: what are your thoughts about it in South Africa today?**

We all know that R&D and innovation is important for economic growth and at the moment we are able to measure the amount of R&D and innovation in the economy quite well, through CeSTII's R&D and business innovation surveys. Through our surveys, we are also able to measure the impact of R&D and innovation on factors such as business productivity.

However, the indicators are currently tailored to the developed world and we need to find ways of measuring factors that are more relevant to the South African context. For example, how do we know that technological advancement is stimulating economic growth that is inclusive, promoting equality, providing jobs to the largely unskilled population, and reducing poverty? We need to be able to measure the impact of R&D and innovation on these socio-economic issues to be relevant in South Africa. This requires developing new indicators. We are already starting to do this successfully, for example, through the first informal innovation survey, but we need to institutionalise this type of new indicator development further.

**Q: Achieving a doctorate requires discipline and hard work, what advice do you have for aspirant doctoral candidates?**

Choose a topic that you are passionate about. Don't worry if your research plans change along the way – that's inevitable. Have a clear research question and always keep it at the forefront of your mind. Set yourself regular goals, such as tasks to complete every two weeks or every month. Work with your supervisor to ensure that you are kept accountable, reach those goals, and keep the momentum going.

Don't feel guilty or unproductive when you are not at your computer. Sometimes the best ideas come when you are outside taking a walk. Doing a doctorate takes time because you need to take in a lot of information. Taking the time to process it and form your own ideas is also very important. Doing a doctorate can be lonely. Take time to be with your family and friends. Being around other people can give you more energy to focus and do your work afterwards.

**Q: The challenges of COVID-19 are many, including balancing our family and work lives. How do you get the balance right?**

One of the challenges of working at home is that there is not much structure in your daily life. There is no clear distinction between work and home. I try as much as possible to create that structure or distinction, by allocating time for different things (work, meals, family, exercise etc.) usually at the beginning of each day. I try to be strict about it and not let some things invade the time of others. It also means considering all things as equally important.





“ Nobody says you have to choose between being a mother and having a career, but you do need a balance.”

**Dr Atoko Kasongo is an economist with a background in econometrics and macro-finance. She was a lecturer at the University of the Western Cape before joining CeSTII as a statistician in 2019.**

**Q: Congratulations on your doctorate! What, in a nutshell, was the focus of your research?**

My dissertation focused on the role of savings as a catalyst for economic growth, and poverty reduction. This entailed looking at how to increase personal or household savings to provide households with a cushion for unexpected future events as well as accumulate capital for investment.

**Q: That seems extremely relevant in the context of COVID-19. How well have South Africans done at managing this unexpected financial event?**

The trend in household savings in South Africa is low and we don't save as a nation. This is about both the willingness and the ability to save. Many who are willing to save don't know enough about which savings route to follow. At the same time many people in South Africa don't make enough to save and those that do also face 'black tax', the responsibility of taking care of parents and family. For many, 'forced savings' in the form of pensions and provident funds take away some of this stress. The pandemic forced many people to rely heavily on their savings, and not many had that cushion in place. This has re-emphasised the need for multiple sources of income and of saving monthly, even in small amounts.

**Q: STI measurements is at the heart of CeSTII's mandate: what are your thoughts about it in South Africa today?**

Technology and innovation are drivers of economic growth. These are reflected in our day-to-day lives, and help us to increase productivity as the effort and input required to do things has been eased by technology. Thus measurements of these factors provide us with a

reflection of how well we are moving towards our goal of sustainable economic growth in the country.

**Q: Achieving a doctorate requires discipline and hard work, what advice do you have for aspirant doctoral candidates?**

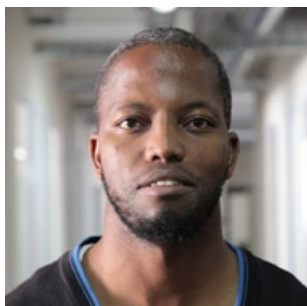
One word: perseverance! The journey is long and hard, and you need a lot of patience and a good support system.

**Q: The challenges of COVID-19 are many, including balancing our family and work lives. How do you get the balance right?**

It is all about routine. I have two kids below the age of three and what works is having a specific routine. My son was born a week before I submitted my PhD dissertation! He came a week earlier than expected and I asked my mom to take the baby and the bottle for one day so that I could submit; I graduated now in the pandemic.

You have to set your mind to doing things and persevere with establishing a routine as it gives you the time to do your work and it gives the kids structure. I think it's very important if you want to get ahead in your career. Many women struggle with this, nobody says you have to choose between being a mother and having a career, but you do need a balance. At the end of the day I do what works for me. It helps that I am a researcher, I read up about child routine and formulated my own schedule that works. My manager knows not to call me between 4pm and 8pm when it's family time and very busy! Send a text or email and I will reply after 8pm. My son (aged two) knows too when its work time, saying "mummy going to work on computer". By 4pm he knows it's his time with mummy and the family.





“ Successful economic development in rural areas requires policies that incorporate the social aspects of innovation.”

Dr Kgabo Ramoroka is an innovation scholar specialising in agriculture and rural innovation. He joined CeSTII in December 2018.

**Q: Congratulations on your doctorate! What, in a nutshell, was the focus of your research?**

The big question explored in my research was on the social dynamics of innovation by rural-based agro-processing enterprises in Limpopo’s Mopani District, with a particular focus on networking and learning for innovation.

Rural and informal economies are important to a country’s growth. Not only are rural-based economic and social actors important drivers of economic growth, but they also provide an important safety net for societies living in deep poverty and compromised food security.

The research suggested a framework of actor networks for innovative learning to understand how small and rural enterprises benefit from networks for effective innovation performance. The research found that successful innovation interventions for social and economic development require policies that incorporate the social aspects of innovation in rural contexts to nurture actor networks for innovative learning.

**Q: STI measurement is at the heart of CeSTII’s mandate: what are your thoughts about it in South Africa today?**

We are living in challenging times, and you will not meet anyone who doesn’t agree. Science, technology and innovation have become critical and more relevant in the changing world. It is about finding the critical path to manoeuvre and address these pressing old

and modern challenges. STI measurement remains at the centre of South Africa’s efforts to expand the role that science, technology and innovation can play to overcome recurring challenges and also in developing inclusive STI policy.

**Q: Achieving a doctorate requires discipline and hard work, what advice do you have for aspirant doctoral candidates?**

I felt honored to be admitted as a PhD student and for that I had to become resilient in the face of all the challenges. My advice is decide on what you are going to do, how you are going to do it and then focus and stay disciplined. What I learnt, and took from my peers, is be in control of who you are and believe in yourself because the process will test your character and strength.

**Q: The challenges of COVID-19 are many, including balancing our family and work lives. How do you balance different demands?**

COVID-19 has led to what is called the new normal with remote working, including many long and virtual interactions and meetings. With these working conditions, some activities extend beyond the normal working hours. What has worked for me so far is time planning and time management. There is time for everything and one should commit to plans and schedule to achieve a balance for productive work, health and good relationships with colleagues, friends and family.



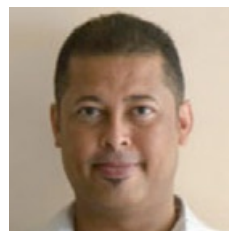
## TEAM CeSTII



**Dr Glenda Kruss**  
Deputy-Executive Director



**Dr Moses Sithole**  
Research Director



**Dr Nazeem Mustapha**  
Chief Research Specialist



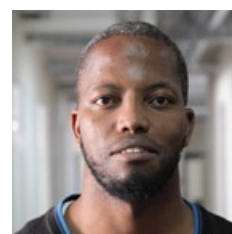
**Dr Il-Haam Petersen**  
Chief Research Specialist



**Dr Neo Molotja**  
Senior Research Specialist



**Dr Yasser Buchana**  
Post-Doctoral Fellow



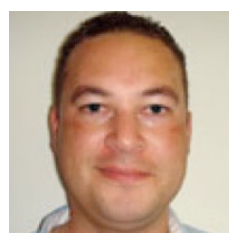
**Dr Kgabo Ramoroka**  
Research Specialist



**Dr Atoko Kasongo**  
Statistician

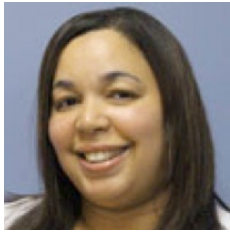


**Dr Amy Kahn**  
Chief Researcher



**Dr Mario Clayford**  
Research Specialist





**Natalie Vlotman**  
Research Manager



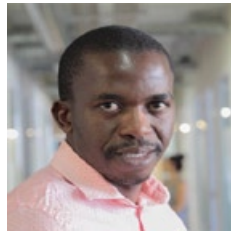
**Jerry Mathekga**  
Senior Researcher



**Audrey Mahlaela**  
Researcher



**Luthando Zondi**  
Junior Researcher



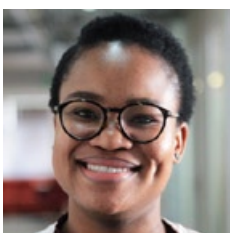
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PhD Research Intern



**Xolisa Magawana**  
PhD Research Intern



**Nicole van Rheede**  
PhD Research Intern



**Juliet Mokoete**  
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**Viwe Sigenu**  
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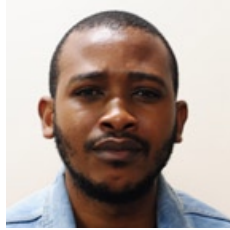


**Anele Slater**  
Master's Research Intern

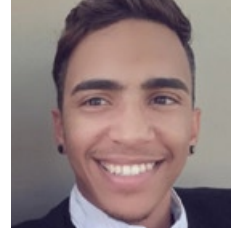




**Lindiwe Binda**  
Database Analyst



**Sibusiso Innocent  
Ziqubu**  
Data Analyst



**Curtis Bailey**  
Data Analyst



**Natasha Saunders**  
Fieldwork Manager



**Gerard Ralphs**  
Programme Manager  
& Policy Analyst



**Maria Maluleke**  
Financial Administrator



**Zinziswa Hlakula**  
Administrator



**Vuyiseka Mpikwa**  
PA to the Deputy-  
Executive Director



**Mieta Klaasen**  
Office Cleaner





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