

Centre for Science,
Technology and
Innovation Indicators

2021/22

Annual Review Report



**Harnessing data for
growth and recovery**



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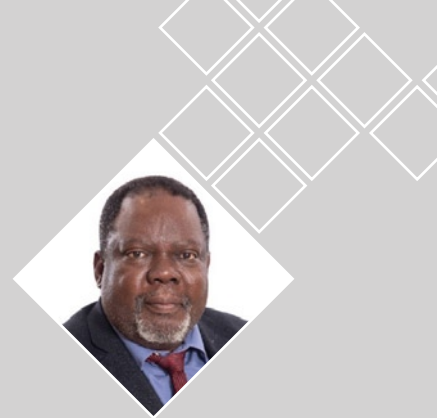
ABBREVIATIONS



ACTS	African Centre for Technology Studies
AOSTI	African Observatory for Science, Technology and Innovation
ARC	Agricultural Research Council
ASTII	African Science Technology and Innovation Indicators
AUDA	African Union Development Agency
CeSTII	Centre for Science, Technology and Innovation Indicators
DSI	Department of Science and Innovation
ECOWAS	Economic Community of West African States
GERD	Gross domestic expenditure on R&D
HSRC	Human Sciences Research Council
IDRC	International Development Research Centre
IERI	Institute for Economic Research on Innovation at TUT
ISESCO	Islamic World Educational, Scientific and Cultural Organization
NACETEM	National Centre for Technology Management (Nigeria)
NCRST	National Commission on Research, Science and Technology (Namibia)
NACI	National Advisory Council on Innovation
NEPAD	New Partnership for Africa's Development
NESTII	Working Party of National Experts on Science and Technology Indicators
NRF	National Research Foundation
NSI	National system of innovation
OECD	Organisation for Economic Co-operation and Development
PINTEC	Brazilian Innovation Survey
R&D	Research and development
RDSMS	R&D Survey Management System
RedeSist	Research Network on Local Productive and Innovation Systems
SASQAF	South African Statistical Quality Assessment Framework
SADC	Southern African Development Community
SDGs	Sustainable Development Goals
STATS-SA	Statistics South Africa
STI	Science, technology and innovation
STISA	Science, Technology and Innovation Strategy for Africa 2024
TIPC	Transformative Innovation Policy Consortium
UIS	UNESCO Institute for Statistics
UJ-TRCTI	University of Johannesburg – Trilateral Research Chair in Transformative Innovation, the 4th Industrial Revolution and Sustainable Development

FOREWORD

Measuring science, technology and innovation for growth and inclusion



Prof. Leickness Simbayi

Acting Chief Executive Officer: Human Sciences Research Council

Despite the many challenges associated with COVID-19, and the remote and hybrid working conditions imposed on us, in 2021/22 CeSTII worked hard to deliver against its specific mandate and the objectives of the HSRC more broadly. This Annual Review Report bears testimony to this, reflecting a significant volume of published work by the research team and the successful rollout of survey fieldwork. CeSTII's focused approach reflects its achievements as a leading centre for the measurement of science, technology and innovation in Africa and globally.

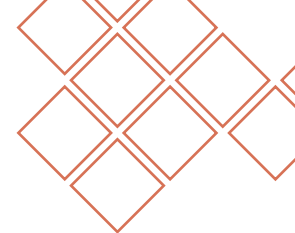
The Human Sciences Research Council and CeSTII are important participants and stakeholders in South Africa's national system of innovation (NSI). Where the HSRC as a whole aims to deploy cutting-edge research in service of eradicating poverty and inequality, CeSTII plays a leading role in the NSI through its established annual R&D Survey, regular Business Innovation Surveys, and other sectoral surveys and research projects that contribute robust data to aid our understanding of innovation.

This makes a substantial contribution to South Africa's innovation scholarship, research and the development of government policy. As global best practice demonstrates, R&D and innovation are essential to achieve inclusive economic growth. The rigour that CeSTII applies to its research ensures that South African data are comparable internationally and provide policymakers with vital insights.

In the year in review, CeSTII also made a significant contribution to Africa's community of practice in innovation, through its participation in the Transformative Innovation Policy Consortium and the Evidence for Policy project (Evi-Pol) within the Science Granting Councils Initiative. These initiatives align innovation policy with the social, economic and developmental needs of Africa, particularly the continent's most vulnerable and marginalised communities.

CeSTII's work forms part of the HSRC's contribution to a global community of practice and adheres to the methodological guidance published by the Organisation for Economic Co-operation and Development for comparative analysis and benchmarking internationally. As South Africa embarks on its post-COVID recovery, CeSTII is positioned to contribute by providing timeous, high-quality research evidence for robust policy development.

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 and innovation 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.

2021/22 IN REVIEW

Celebrating 20 years of R&D surveys at the HSRC



Dr Glenda Kruss

Executive Head: CeSTII, Human Sciences Research Council

2021 marked 20 years since the HSRC's Knowledge Management research programme took responsibility for delivering South Africa's national R&D Survey. This marked the start of a time series providing data and insight about a central aspect of our economy. Soon after, the Centre for Science, Technology and Innovation Indicators was born as a small but impactful Centre, and custodian of South Africa's annual R&D Survey.

From 2003/04, CeSTII has conducted South Africa's annual R&D Survey every year on behalf of the Department of Science and Innovation. Even the COVID-19 pandemic did not disrupt the survey, which is now firmly established and makes an important contribution to South Africa's official statistics.

Since its founding CeSTII has cemented its place in South Africa's national system of innovation. In addition to the annual R&D Survey, the regular Business Innovation Survey as well as other surveys on innovation in South Africa have been undertaken. These survey programmes generate an array of published research and analysis based on our data, and the development of new indicators relevant to South Africa's developing economy and social context.

Training and supporting a new generation of talented young researchers is also an important part of our mission. In 2021/22, as this report reflects, the CeSTII team collectively produced and published a significant body of academic research, policy briefs and fact sheets, contributing to a growing body of scholarship and policy.

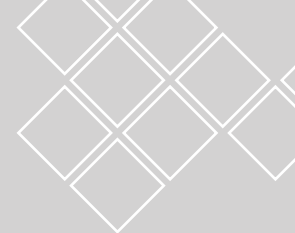
When CeSTII was founded, it was conceived of as a national resource that would interact with its peers

in the region, in Africa and across the world. Since then, CeSTII has taken its place within a diverse global network and has nurtured productive partnerships with colleagues across the developed world and the global South. By adhering to the international methodology encoded by the OECD, our data is comparable with that of other countries and achieves high standards of quality assurance.

Looking back, we can trace the evolution of a robust institution that makes a measurable contribution to achieving the HSRC's research aims and South Africa's development goals. CeSTII's journey has encompassed both highs and lows, and has demanded hard work, dedication and creativity from its team. Building a sustainable institutional presence remains our goal and we will continue to support South Africa's national system of innovation through our regular contributions to the global knowledge commons, to African scholarship and to creating a culture of excellence in our part of South Africa's science council landscape.

COVID-19 has changed our institutions and impacted us as individuals. New ways of working are here to stay, but the need for capacity building, productive team-work and strong organisations has never been greater.

INTERNATIONAL ADVISORY COMMITTEE



Measurement needed to support policy development, monitoring and evaluation

Prof. Fred Gault

Outgoing Advisory Committee Chair

An independent advisory committee, including experts from South Africa, India, Spain, Costa Rica, UK and USA, 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 Executive Head, responsible for CeSTII, Dr Glenda Kruss. The Committee met in February 2022 to review topics of importance to CeSTII and to provide independent advice. The minutes of the committee provide a record of the advice of the committee available to the CeSTII staff.

Substantive topics discussed in 2022 included:

- The improvement of the quality of R&D Survey
- The institutionalisation of the South African Agricultural Business Innovation Survey.

Some topics were introduced for consideration in the longer term:

- The policy interest in STI is changing and requires discussion with the Department of Science and Innovation (DSI)
- The influence of the Decadal Plan for Science, Technology and Innovation (second draft) for STI measurement
- The policy relevance of innovation in the informal sector.

In addition to the members of the committee, CeSTII staff participate actively in the meetings, making presentations, providing information, 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 (NACI). The presence of DSI and NACI 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 was 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. The initiative to make the committee sustainable was that of the chair, who followed his own advice and resigned. His case for this was that the committee was performing well in an electronic environment. Prof. Susan Cozzens is the new chair.

In summary, in 2022, the committee focused on the measurement needed to support policy development, monitoring and evaluation. The importance of the informal sector is an ongoing discussion for future meetings.

ADVISORY COMMITTEE MEMBERS

In the year in review Prof. Fred Gault stepped down as chair of the committee after serving diligently for many years. Dr Susan Cozzens, Professor Emerita at the School of Public Policy, Georgia Institute of Technology, was appointed as the new chair.

Dr Susan Cozzens (Incoming Chair)

Dr Cozzens is Professor Emerita in the School of Public Policy at the Georgia Institute of Technology, USA 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).

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.

Prof. Fred Gault

Prof. Gault is Professor Extraordinaire at the Tshwane University of Technology (TUT) 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 4th Industrial Revolution and Sustainable Development.

Dr Almamy Konté

Dr Konté has over 16 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 Konté was Director of Technological Research at the Ministry in charge of scientific research in Senegal. Dr Konté 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 4th 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 has 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 Lecturer: Technology and Innovation Management at the University of Pretoria. 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.



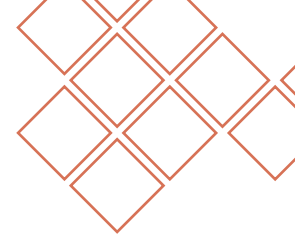
Dr Pedro Mendi

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 an 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.



RESEARCH THEMES AND CROSS-CUTTING SUPPORT

CeSTII's core programme is divided into three thematic research areas and one cross-cutting support theme that provides services to the research projects. A significant body of research and analysis was produced in the 2021/22 reporting period and circulated widely to stakeholders and policymakers.

THEME 1: MEASURING R&D CAPACITY IN SOUTH AFRICA



Dr Nazeem Mustapha
Theme leader

2019/20 R&D Survey

The work of the annual South African National Survey of Research and Experimental Development Inputs (R&D Survey) conducted by CeSTII, on behalf of the Department of Science and Innovation, is organised in such a way that as one survey goes into the field, researchers are simultaneously engaged in data analysis and report writing for the previous survey year. This involves the entire R&D Survey team in an intensive and continuous overlapping cycle, and enables CeSTII to maintain South Africa's national database of historic unit-level survey responses and analyse them timeously to inform policy priorities.

Fieldwork was completed for the 2019/20 R&D Survey in the year in review. The ongoing coronavirus pandemic did, however, impact response rates and the time series analysis of data using the 2019/20 R&D Survey's estimates should be read within this context. The R&D Survey's 2019/20 Statistical Report was released by CeSTII and the Department of Science and Innovation on 15 December 2021.

SOUTH AFRICAN NATIONAL SURVEY OF RESEARCH AND EXPERIMENTAL DEVELOPMENT

STATISTICAL REPORT
2019/20

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

HSRC
Human Sciences Research Council

stats SA
Department of Statistics
REPUBLIC OF SOUTH AFRICA

<https://bit.ly/3AZ6iZj>

Policy-oriented analysis of the results of the 2019/20 R&D Survey was also provided through a range of materials including fact sheets, policy and research briefs, and academic articles on R&D performance in strategic sectors.¹ These aimed to inform policy development in the areas of state-owned enterprises, health, green R&D, agricultural R&D and manufacturing R&D. These knowledge products were disseminated to survey respondents, stakeholders across South Africa's national system of innovation, as well as shared with partners in Africa and the world.



R&D Survey citations

The South African R&D Survey provides long-term trend data that forms the basis of detailed insight into South Africa's R&D landscape.

Survey results and their datasets are available for use by scholars in South Africa and internationally. A recent scan of citations recorded by Scopus, an abstract and citation database, surfaced 94 citations of 29 R&D Survey reports. A scan of Google Scholar revealed 22 citations based on eight R&D Survey reports.

Maintaining the quality of R&D research outputs

Ensuring the quality of data collection and programme outputs is central to the compilation of credible statistics. Maintaining the focus on quality underpinned several project plans and activities in 2021/22 including:

- Improving the quality of the R&D Survey's processes and data with the implementation of a new digital data collection and user interface system design for the 2020/21 R&D Survey (see page 11)
- Implementing a coordinated quality improvement programme including preparation for and implementation of the South African Statistical Quality Assessment Framework (SASQAF) self-assessment process
- Investigating recommendations for quality improvements identified by the statistical data Clearance Committee chaired by Stats SA.

¹ Available at <http://rdisurveys.hsrc.ac.za/research>

Understanding how SOEs are geared for innovation

State-owned enterprises (SOEs) are important national assets with a mandate to contribute to sustainable economic growth and South Africa's broad developmental goals. The White Paper on Science, Technology and Innovation (2019) recognises the importance of SOEs in the South African economy and the need to revitalise them to play a meaningful role in South Africa's science, technology, innovation and economic development.

As key institutions for human capital development and international and national knowledge sharing, the White Paper also contemplates SOEs as innovation-driven for the knowledge economy. But to what extent and how are South African state-owned enterprises geared to perform R&D and innovation? Based on in-depth case study research with three SOEs—SANEDI, ATNS and SAFCOL—as well as analysis of the academic literature, CeSTII identified dimensions key to effective R&D and innovation 'gearing' by these SOEs, including: human capabilities; technological capabilities; networks; research infrastructure; and governance. Out of this research, indicators on R&D and innovation are also proposed to guide national policy discussion on the future of SOEs in South Africa.



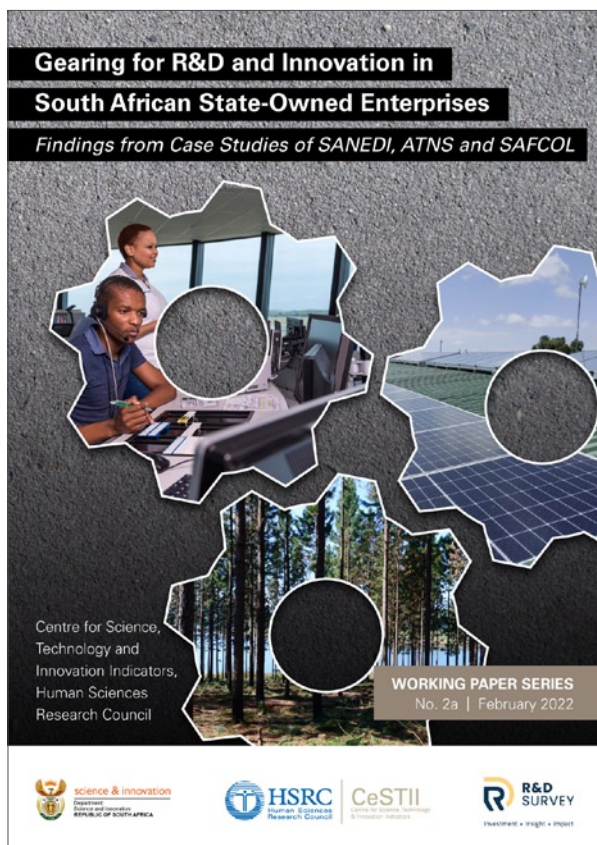
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The SOE research project concluded in 2020/21 with dissemination of the findings in 2021/22. The published research reports are available in the CeSTII Working Paper Series.

Digitalisation of the 2020/21 R&D Survey

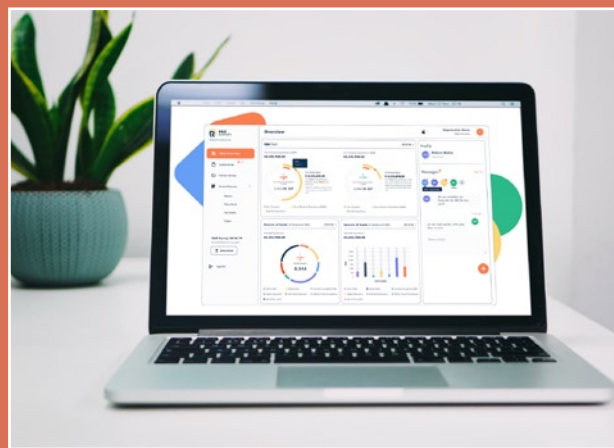
Previous Annual Review Reports reflected on the initiation of a process to digitalise the R&D Survey's data collection. This forms part of CeSTII's work to improve the quality of the fieldwork through the digitalisation of data collection. In preparation for the 2020/21 survey fieldwork the new online data collection system was embedded in a user experience interface, and integrated with the survey's data bank—the RDSMS. A dedicated advocacy process was also initiated to prepare respondents for the transition to a digital survey and the active use of new survey tools. In the 2020/21 survey cycle, all R&D Survey questionnaires for all sectors were made available to respondents in an online format, with data widgets and downloadable PDFs for respondents to view their historic data.



Reflections on CeSTII's digital leap

Gerard Ralphs, Digitalisation Project Coordinator (2021/22)

In February 2022, CeSTII took a 'digital leap' by introducing its custom-built, online platform to R&D Survey respondents in the 2020/21 survey round. The moment was anticipated by the CeSTII team with a sense of both trepidation and excitement: trepidation because of the many 'moving parts' that the system contains; excitement because of the substantial effort and attention of the CeSTII team over the 2020 and 2021 calendar years to build an in-house technical team and to craft a technology vision to meet the changing user needs of respondents and researchers.



Learn more about CeSTII's data collection tech at rdisurveys.hsrc.ac.za

As this publication was going to press, CeSTII had successfully onboarded more than 100 R&D Survey respondents to the new platform, who had collectively entered thousands of data points. While this result represents a significant achievement, there is more work envisaged in preparation for the 2021/22 survey to improve the feature sets in line with user feedback.

The project follows an agile methodology, which has as its core an idea of continuous improvement based on regular feedback loops, and values people as much as the technology they contribute to building. I would like to congratulate all team members, including those who contributed feedback and ideas in design thinking and demonstration sessions, for the grit, spirit, and creativity in building a 'new system for a new time'.

THEME 2: MEASURING INNOVATION CAPACITY IN SOUTH AFRICAN FIRMS



Dr Moses Sithole

Theme leader

New directions in innovation measurement

Improving the quality and extending the focus of business innovation measurement is a core research priority for CeSTII. Over the past few years there has been a shift in the aims and approaches to innovation measurement, drawing on new directions globally.

Previously, the main aim was to benchmark South African performance against comparator countries and global front runners, using scorecard-type approaches. Our shift in approach aims to enhance our understanding of the scale and nature of innovation, and the capabilities for innovation in the South African context, so that the data gathered can provide evidence that is useful to national STI policy goals.

As Anthony Arundel, Professor of Innovation at the University of Tasmania and a contributing author of the Oslo Manual (2018), has stressed, it is now vital to profile the patterns of innovation and innovation capabilities in priority sectors and sub-sectors, which may require additional qualitative research to complement traditional quantitative survey data. This allows for fine-grained micro-data reflecting contextual conditions. In 2021/22 CeSTII's research continued to reflect this shift, with the expansion of this theme to include a wider range of contextually appropriate business innovation surveys for commercial agricultural enterprises and informal enterprises.

Refining methodology, strengthening practice

In 2021/22 we worked to critically evaluate the strategies and mechanisms adopted in the Business Innovation Survey 2014-16, to inform the design and practice of future fieldwork, including the implementation of changes in line with the revised Oslo Manual 2018.

This included refining and institutionalising the design and methodology of the survey of innovation in commercial agricultural enterprises and the mixed-methods design and methodology of the survey of innovation in informal enterprises.

Mechanisms to build relationships with firm respondents were also explored with the rollout of the fieldwork for the Business Innovation Survey 2019-21.

Rolling out the national Business Innovation Survey

South Africa's national Business Innovation Survey is rolled out in three-year cycles, covering firms in the formal manufacturing, mining and services sectors. A major challenge is convincing firms of the value of participation to achieve the high response rate recommended by the Oslo Manual. In 2021/22 the focus of activities was:

- Finalisation of survey performance strategies and implementation of Oslo Manual 2018 guidelines in collaboration with StatsSA
- Design and implementation of a new cost and results-effective team model for implementation of the survey in partnership with survey support agency GeoScope
- Design and implementation

of quality indicators and processes that build on and improve the experience of BIS 2014-16

- Rolling out the fieldwork for the BIS 2019-21 cycle, for completion in 2022/23, including a media briefing and knowledge sharing webinar (see box on P13).

“ It is now vital to profile the patterns of innovation and innovation capabilities in priority sectors and sub-sectors, which may require additional qualitative research.”


**BUSINESS INNOVATION
SURVEY 2019 - 2021**

For a more innovative South Africa



Learn more about the BIS 2019-21

Watch this informative video featuring interviews with the DSI, CeSTII, and GeoScope research and management team.

<https://youtu.be/O-1LI5YoV9Q>



Read the feature article by Schalk Burger of *Engineering News* "Business innovation survey to evaluate opportunities, barriers and challenges" (24 February 2022)

<https://bit.ly/3eaaSv4>

Institutionalising the AgriBIS Survey

AGRICULTURAL BUSINESS INNOVATION SURVEY 2016 - 2018



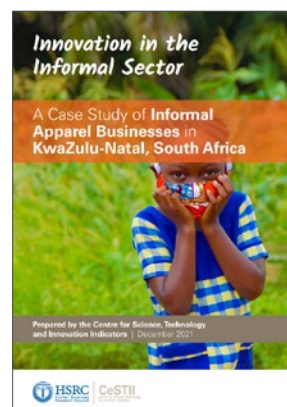
FOR A MORE INNOVATIVE SOUTH AFRICA

***INCLUDING FARMING, FORESTRY AND FISHERIES**

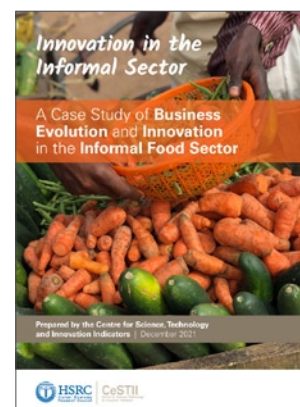
The baseline Agricultural Business Innovation (AgriBIS) Survey 2016-18 initiated a new contextually appropriate longitudinal data series for South Africa and a proposal for its continuation and institutionalisation was developed. Dissemination of results continued in 2021/22 including a stakeholder dialogue in partnership with the Department of Science and Innovation; Department of Forestry, Fisheries and Environment and Department of Agriculture, Land Reform and Rural Development (see page 22).

Disseminating the Innovation in the Informal Sector Survey reports

The Innovation in the South African Informal Sector Survey, 2017-2018 (IIS) was first released in March 2021 at a workshop jointly organised by the HSRC's Centre for Science, Technology and Innovation Indicators (CeSTII) and the HSRC's Centre for Community-based Research (CCBR), based in Sweetwaters, KwaZulu-Natal (see CeSTII Annual Review Report 2020/21). Case study reports on the food and apparel sub-sectors were produced and disseminated, alongside other survey-related materials in the 2021/22 review period.



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



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

THEME 3: POLICY-RELATED INDICATOR DEVELOPMENT



Dr Il-haam Petersen
Theme leader

As the implementation plan for South Africa's White Paper on Science, Technology and Innovation (2019), the Decadal Plan (2022-2031), aims to create a new policy approach and places strong emphasis on monitoring, evaluation and learning, implying a clear need for new evidence. Theme 3 aims to inform the design of contextually appropriate measures and indicators that can contribute such evidence.

In 2021/22 Theme 3 focused on meeting one of CeSTII's broad objectives, namely contributing to data sharing, knowledge sharing and exchange with national, regional and global STI measurement and policy communities as well as other actors in the national system of innovation. CeSTII worked to strengthen the partnership with DSI, enhance the uptake and use of STI measures and indicators, and systematically inform the design of new measures and indicators.

Strengthening Africa's Science Granting Councils

The Evidence for Policy (Evi-Pol) project initiated in November 2020 works to strengthen the capacity of Africa's science granting councils in the use of evidence for STI policy development and decision-making.

The project is led by the African Centre for Technology Studies (ACTS) based in Nairobi, Kenya, and funded externally by Canada's International Development Research Centre (IDRC) under the second phase of the Science Granting Council Initiative (SGCI). This is a multi-funder initiative to strengthen the capacities of 15 science granting councils in sub-Saharan Africa to contribute to economic and social development.

In addition to CeSTII, the Evi-Pol project consortium includes the Université Cheikh Anta Diop de Dakar (UCAD) in Senegal, the University of Johannesburg (UJ) and the Science Policy Unit (SPRU) at the University of Sussex. Drawing on its expertise, CeSTII leads Work

Package 3: Science, technology and innovation policy reviews and Work Package 6: Data management systems; as well as participates in other cross-cutting work packages.

The technical assistance provided is demand-driven and customised to the needs and capabilities of each science granting council. In 2021/22 CeSTII ran interactive training workshops, masterclasses, peer-to-peer learning opportunities and one-on-one coaching sessions supporting science granting councils in mapping intended change pathways informing their STI policies, improving STI policy implementation and building sound data management systems that align with science granting council mandates and capabilities.

Contributing to the TIPC

CeSTII's contribution to the Transformative Innovation Policy Consortium (TIPC) research agenda in 2021/22 was an important mechanism for engagement. The TIPC is a global consortium of STI policymakers, funders, researchers, practitioners and investors. It aims to mobilise the power of innovation to address societal and environmental challenges towards the achievement of the Sustainable Development Goals (SDGs).

CeSTII undertook two focal activities:

- Participation from a South African perspective in the process to design a multi-media TIPC resource platform to generate learning materials for use by stakeholders
- In partnership with colleagues at UJ, CeSTII co-led the design and implementation of the South African TIPC colloquium in October 2021, themed towards building a South African community of practice around transformative innovation policy.

 SA TIPC Colloquium Report: <https://bit.ly/3wSjuxe>



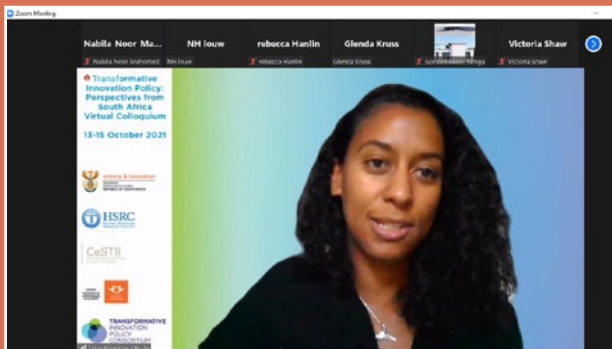
Learn more about the TIPC

Transformative Innovation Policy (TIP) is a new way of doing science, technology and innovation (STI) policy with global reach, research and co-creation of knowledge. The South African TIPC Community of Practice (COP) is spearheaded by Imraan Patel (DSI), Prof. Erika Kraemer-Mbula (UJ) and Dr Glenda Kruss (CeSTII). Learn more about TIPC:

www.tipconsortium.net

Learn more about the South African TIPC COP via the UJ website:

<https://bit.ly/3pW5XQP>



Africa-focused STI measurement, networking and engagement

Working in collaboration with the African Union Development Agency – New Partnership for Africa’s Development (AUDA-NEPAD) and other partner organisations, CeSTII is now a leader in sharing expertise and providing training for SADC member states and other African countries. Our shared goal is the development of national R&D and innovation indicators, in line with OECD manuals and contextually-specific policy needs.

In 2021/22 CeSTII focused on playing a proactive role in the development of indicators and measures appropriate to African contexts, to promote STISA and the SDGs, including experimentation in developing an indicator framework for a single development goal, food security. Formal memoranda of understanding with Nigeria’s National Centre for Technology Management (NACETEM) and Namibia’s National Commission on Research, Science and Technology (NCRST) supported the promotion of new survey methodologies in other African contexts. NACETEM also implemented the CeSTII-designed Innovation in the Informal Sector (IIS) instrument for its own survey of informal enterprises.

THEME 4: CAPACITY BUILDING, DIGITALISATION AND DATA MANAGEMENT



Gerard Ralphs
Theme leader

Theme 4 is a new thematic area introduced in the 2021/22 reporting year. It is composed of three projects that promote the cross-cutting skills and expertise required to support, coordinate and advance the research undertaken within themes 1 to 3.

Staff retention and sustainability

The dearth of senior South African researchers with field-specific expertise, and competition from other employers, has brought into focus the need to support career progression within the CeSTII team, and develop a strong cohort of mid-level researchers with significant intellectual and project leadership responsibilities. To fill the gap in senior expertise, in 2021/22 CeSTII strengthened its research and capacity development networks with freelance experts and partners in universities, both locally and globally. The Centre also recognises the need to build senior leadership and management capacity, as part of its succession planning.

Writing and publishing

The HSRC expects the majority of researchers to publish at least one academic article in a DHET-accredited journal per year. Capacity development to support researchers to submit papers for scholarly and peer-reviewed journals was provided in 2021/22 including through the development of shorter articles for the *HSRC Review*. Going forward, targeted support for groups of researchers at similar stages of their career development will continue to be a priority. Where possible, journal articles will form the basis of new value-add outputs on core STI measurement projects, by being converted to research or policy briefs.

Networking

COVID-19 necessitated creative approaches to network building using digital platforms which provided a strong basis to strengthen existing networks and grow new ones.

The CeSTII Advisory Committee, a key networking platform, includes experts from South Africa and internationally, and provides valuable oversight of and input into, the centre's STI measurement work.

Linkages and collaborations with researchers in the global South remain a priority, with the aim of exposing CeSTII researchers to thinking and practice in other developmental contexts. This includes CeSTII's involvement in the Global Network for the Economics of Learning, Innovation, and Competence Building Systems (Globelics and its regional chapter Africalics). These networks bring together scholars who study innovation and economic development from all continents and different academic disciplines and are platforms for north-south and south-south interactive learning. CeSTII participated virtually in the Globelics biennial conference in 2021 held in Costa Rica as well as in the Africalics PhD academy in 2021.

Cross-cutting digitalisation and data management

The data team led by Dr Atoko Kasongo provided data management, extraction and analysis support, as well as statistical analysis expertise, across all themes and projects. The team worked to further enhance coordination and planning across projects and ensure the rapid turnaround of data requests, including improved data access for external users. Data curation for the HSRC, OECD, UIS and NEPAD was another core responsibility carried out by the team. A vital focus of 2021/22 was the improvement of data management and data sharing processes between CeSTII and NACI, as well as ensuring compliance with South African legislation on the protection of personal information.

A key technical point is that systems like CeSTII's R&D Survey Management System (RDSMS) are in a continuous development cycle, and require constant maintenance. The data team will increasingly play a role in the implementation of new systems to digitalise data collection (see page 11).

DATA COMMITTEE

Responding timeously to data requests



Dr Yasser Buchana

The Data Committee of the Centre for Science, Technology and Innovation Indicators performs a vital role in the processing of data requests from researchers and the general public.

We aim to ensure that the confidentiality of our respondents' information is protected at all times and, at the same time, ensure that the data we collect through our surveys is accessible for users with legitimate data requests. In 2021/22, we responded to numerous requests for data, as well as worked toward the promotion of our public datasets through email marketing and at events organised or attended by the CeSTII team.

Through a recruitment drive, CeSTII also strengthened its internal data team's capabilities to conduct data management, extraction and analysis support, as well as statistical analysis.

A year-on-year increase in the number of dataset downloads was recorded for 2021/22. I am pleased to report that all aggregated CeSTII datasets are now available for download from the HSRC's Research Data portal. For more advanced requests, I invite you to review our public data access guidelines (see box below), and to follow the steps outlined there.

	2018/19	2019/20	2020/21	2021/22
% of all HSRC datasets produced by CeSTII	47.0	18.6	21.0	50.0
Total HSRC dataset downloads	469	609	556	574
Total CeSTII dataset downloads	223	113	117	227
R&D Survey dataset downloads	207	97	108	197
% of all HSRC dataset downloads	44.3	15.9	19.4	34.3
% of all CeSTII dataset downloads	6.7	8.8	6.8	86.8
Innovation Survey dataset downloads	15	10	8	29
% of all HSRC dataset downloads	3.2	1.6	1.4	5.1
% of all CeSTII dataset downloads	6.7	8.8	6.8	12.8
IP & TT dataset downloads			1	1
% of all HSRC dataset downloads			0.2	0.2
% of all CeSTII dataset downloads			0.9	0.4
Number of published errata	6	3	2	1

CeSTII data downloads from the HSRC's Research Data Curation website (datacuration.hsrc.ac.za). Data and data analysis courtesy of the HSRC's eKnowledge Research Centre and CeSTII.

CeSTII welcomes data requests

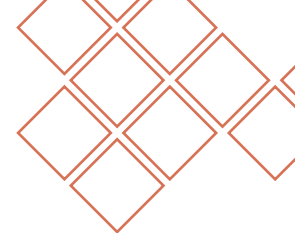
If you would like to obtain specific data that are not available through the HSRC's Data Curation Unit, please review the CeSTII Guidelines for Public Data Access.

 www.hsrc.ac.za/en/departments/cestii/cestii-data

We facilitate data use by preparing comprehensive metadata and disseminating data and related documents to appropriate target audiences.

Contact the Chair of the CeSTII Data Committee, **Dr Yasser Buchana** ybuchana@hsrc.ac.za for more information.

CONFERENCES, PAPERS AND REPORTS



2021/22 was a productive year for members of the CeSTII research team with a significant body of new work published.

HSRC Review articles

Buchana, Y. (2021) First survey to measure innovation in South African agribusinesses. *HSRC Review*. 19(3): 24-27.

Clayford, M. (2022) Foreign funding of R&D in South Africa: A growing potential. *HSRC Review*. 20(1): 38-41.

HSRC Review 19(4) included a special focus on the work of CeSTII:

Kahn, A & Kasongo A. (2021) Innovation and firm performance in South African manufacturing and services businesses. *HSRC Review*. 19(4): 12-15.

Kruss, G & Petersen, I. (2021) Paradigm shift: The value of transformative innovation policy for South Africa. *HSRC Review*. 19(4): 24-25.

Kruss, G., Sithole, M., Mustapha, N., Petersen, I & Ralphs, G. (2021) Designing new science, technology and innovation indicators for South Africa's developmental challenges. *HSRC Review*. 19(4):4-7.

Mathekga, J. (2021) Gearing up: R&D and innovation capabilities in three South African state-owned enterprises. *HSRC Review*. 19(4): 16-19.

Mustapha, N. & Van Rheede, N. (2021) Informal businesses catalyse innovation in Mpumaza, Sweetwaters. *HSRC Review*. 19(4): 20-23.

Petersen, I. & Kruss, G. (2021) Deepening evidence-based policy capability in Africa's science granting councils. *HSRC Review*. 19(4): 26-27.



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

Ralphs, G., Plantinga, P. & Madisa, G. (2021) Surveys as a public service: The need for a two-way flow of data *HSRC Review*. 19(4): 28-29.

Ralphs, G. (2021) After 2021: Reimagining South African shopping malls *HSRC Review*. 19(4): 30-31.

Zondi, L. & Ramoroka, K. (2021) R&D in South African manufacturing: A sector in deep crisis? *HSRC Review*. 19(4): 9-11.

Peer-reviewed journal articles

Joseph, K.J., Cozzens, S., De Fuentes, C., Dutrenit, G., Kruss, G. & Lema, R. (2021) A decade of innovation and development. *Innovation and Development*. 11(2-3):173-187.
<http://hdl.handle.net/20.500.11910/19337>

Kahn, A., Sithole, M. & Buchana, Y. (2022) An analysis of the impact of technological innovation on productivity in South African manufacturing firms using direct measures of innovation. *South African Journal of Economics*. February: Online

Kasongo, A., Sithole, M. & Buchana, Y. (2021) Empirical analysis of innovation and productivity in services firms: the case of South Africa. *African Journal of Science, Technology, Innovation and Development*. December: Online.

Kruss, G., Lee, K., Joseph, KJ, Albuquerque, E. Breaking middle income traps in a post Covid-19 world: an introduction to the Special Issue, *Nova Economia* DOI: <http://dx.doi.org/10.1590/0103-6351/6794>

Ramoroka, K.H., Soumonni, O. & Muchie, M. (2022) Nature and composition of rural innovation actor networks in South Africa: the case of agro-processing enterprises in the Mopani District, *Innovation and Development*. DOI: <https://doi.org/10.1080/2157930X.2022.2053815>

CeSTII Working Paper Series

CeSTII (2022) Working Papers 2a-d:
—2a: Gearing for R&D and innovation in South African state-owned enterprises: Findings from case studies of ATNS, SANEDI and SAFCOL.
—2b: R&D and innovation capabilities in South African state-owned enterprises: The case of the South African National Energy Development Institute (SANEDI).
—2c: R&D and innovation Capabilities in South African state-owned enterprises: The case of Air Traffic & Navigation Services SOC Ltd.
—2d: R&D and innovation capabilities in South African state-owned enterprises: The case of South African Forestry Company SOC Ltd (SAFCOL).

Book chapter

Mathekga, M. J. (2021) Reflections on powers of trade union federations in democracies: A comparative discourse. In E. Ernest and T. Falola (eds.) *Rethinking institutions, processes and development in Africa*. Rowman and Littlefield Publishers.

Conference papers

Glenda Kruss presented a paper and led a Zoom discussion for the launch of a special issue of the Brazilian journal, *Nova Economia*, focused on “Development, lock-ins, traps and catch up” at the V National Meeting of the Industrial Economics and Innovation (V ENEI), organised by the Brazilian Association of Industrial Economics and Innovation (ABEIN) and the University of Minas Gerais, Brazil, on 11 May 2021.

Glenda Kruss participated via Zoom in a panel at a United Nations Science, Technology and Innovation Forum side event, “Inclusive pathways for steering STI for SDGs – evidence, tools and policies” hosted by the international comparative research project, Steering Research and Innovation for Global Goals (STRINGS), on 4 May 2021.

Glenda Kruss and Il-haam Petersen were guest speakers on “Understanding innovation in the informal sector: Implications for innovation and Intellectual Property policies” at the NIPMO-WIPO training workshop on Intellectual Property and Innovation Policy, on 27 July 2021.

Glenda Kruss presented as panellist on “South Africa and BRICS: Designing new STI policy mixes to promote sustainable and inclusive development” at the BRICS Virtual Economic Conclave “Reshaping global economic cooperation and role of BRICS: Exploring synergies and complementarities”, on 26-27 November 2021.

Glenda Kruss presented a paper at a Globelics-Indialics webinar on “Reimagining Innovation Systems for Covid-19 and a post-Covid-19 world” hosted by the Punjabi University’s Centre for Development Economics and Innovation Studies (CDEIS) on 12 October 2021.

Yasser Buchana and Moses M. Sithole presented their paper “Towards a conceptual framework for measuring innovation in the agricultural sector in sub-Saharan developing countries context” virtually at the 17th International Globelics Conference held in Heredia, Costa Rica, 3-5 November 2021.

Il-haam Petersen presented the paper “Innovation in the informal sector: A case study of informal apparel businesses in South Africa” virtually at the 17th International Globelics Conference held in Heredia, Costa Rica, 3-5 November 2021.

A special session chaired by Glenda Kruss on “Designing new science, technology and innovation indicators appropriate to developmental challenges: The case of STI oriented to eradicate hunger and ensure food security in South Africa” included panellists Yasser Buchana, Nazeem Mustapha, Il-haam Petersen, at the 17th Globelics Conference held in Heredia, Costa Rica, 3-5 November 2021.

Glenda Kruss participated on an online panel at the Transformative Innovation Policy Consortium (TIPC) Conference 2022 on 18 January 2022.

Glenda Kruss was invited to present a paper on “Developing new measures and indicators for STI oriented to SDGs in the South African context”, at a STRINGS project virtual workshop focused on “Perspectives and policies to steer science, technology and innovation for the SDGs”, on 1 March 2022.

HSRC policy briefs

Kasongo, A. & Mustapha, N. (2021) R&D the Biggest Casualty of COVID-19? *HSRC Policy Brief*, June 2021.

Buchana, Y., Sithole, M. & Majokweni, P. (2022) Adoption and diffusion of advanced ICTs in South Africa’s agricultural sector: Policy issues and implications. *HSRC Policy Brief*, January 2022.

Kahn, A. (2022) Policy levers to boost innovation and productivity in South African manufacturing firms. *HSRC Policy Brief*, March 2022.

Mustapha, N., Petersen, I., Kruss, G. & Van Rheede, N. (2022) From crisis to survival: How informal enterprises harness the power of innovation. *HSRC Policy Brief*, March 2022.

Reports

CeSTII (2021) Innovation in the Informal Sector: A Case Study of Informal Apparel Businesses in KwaZulu-Natal, South Africa. Human Sciences Research Council: Cape Town.

CeSTII (2021) Innovation in the Informal Sector: A Case Study of Business Evolution and Innovation in the Informal Sector. Human Sciences Research Council: Cape Town.

CeSTII (2021) South African National Survey of Research and Experimental Development: Statistical Report 2019/20. Human Sciences Research Council: Cape Town.

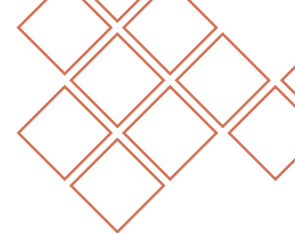
CeSTII (2021) South African National Survey of Research and Experimental Development: Main Report 2018/19. Human Sciences Research Council: Cape Town.

CeSTII (2021) Innovation Performance in South African Commercial Agriculture, Forestry and Fisheries Businesses, 2016-2018. Human Sciences Research Council: Cape Town.

UJ-TRCTI Working Paper Series

Petersen, I., Mustapha, N., Van Rheede, N. and Kruss, G. Harnessing Innovation in the Informal Food Services Sector: Insights for public policy in the age of COVID-19. UJ-TRCTI Working Paper Series P 2021-06 December 2021. <https://bit.ly/innovationinformalfoodsector>

HSRC SEMINAR SERIES



The impact of innovation on productivity in South African manufacturing and services businesses: New empirical evidence

Manufacturing makes an important economic and social contribution to South Africa and many of its communities. The ability of the sector to grow and innovate is of concern to policymakers and leaders alike.

The South African manufacturing and services sectors sit squarely in the crosshairs of economic and industrial policymakers and, equally, business leaders and sector analysts. Whether to stimulate much-needed growth, as in the case of the manufacturing sector, or to adapt to widespread technological change, as in the case of services firms, the argument for a reimagined industrial strategy is both compelling and urgent.

In this context, innovation is centrally positioned as both a key engine of development and a catalyst for growth. However, little is known about the impacts of innovation on productivity in manufacturing and services businesses in South Africa, with studies focussed mainly on the role of R&D.

Showcasing new econometric modelling, using data from the South African Business Innovation Survey, 2014-2016, an HSRC policy seminar, hosted online on 23 June 2021, delved into the relationships between different types of technological and non-technological innovation and business productivity.

Policy issues and questions discussed with national and sector stakeholders included: what factors or firm characteristics influence the decision to innovate? What support mechanisms incentivise innovation? Is the relationship between innovation and productivity always positive?

The seminar was presented by CeSTII's Dr Atoko Kasongo, Statistician and Dr Amy Kahn, Research Specialist. It was moderated by Godfrey Mashamba, Deputy Director-General: Evaluation, Evidence and Knowledge Systems, Department of Performance Monitoring and Evaluation (DPME) and Saul Levin, Director at Trade and Industrial Policy Strategies (TIPS) was the discussant.

The seminar was funded by the Department of Science and Innovation.

INVITATION HSRC Seminar Series

The impact of innovation on productivity in South African manufacturing and services businesses:
New empirical evidence

Presenters: Dr Atoko Kasongo and Dr Amy Kahn, Centre for Science, Technology and Innovation Indicators, HSRC

Aspen Pharmacare sterile manufacturing facility in Gqeberha, Eastern Cape. (Image credit: GCIS)

Moderator: Godfrey Mashamba, Deputy Director-General: Evaluation, Evidence and Knowledge Systems, Department of Performance Monitoring and Evaluation (DPME)
Discussant: Saul Levin, Director: Trade and Industrial Policy Strategies (TIPS)

Date: 23 June 2021 | **Time:** 12h30 – 14h00 | **Hosted on:** Zoom

Listen to the podcast

<https://bit.ly/3wQeRm8>

Podcast courtesy of the Policy Action Network, a project of the HSRC Impact Centre. Learn more at www.policyaction.org.za

Strengthening innovation measurement practice in firm-level surveys: New methodological imperatives

Tackling measurement error risks in firm-level innovation surveys

Business innovation surveys are commonly used by both state and non-state actors to understand firm dynamics and to generate evidence in support of economic and innovation policy mixes. Where business innovation surveys follow the subject-based approach (OECD, 2018), as is predominantly the case, representative information on both the scale and types of innovation at firm-level as well as the drivers of and barriers to innovation, can be produced and analysed. Recent analysis, however, points to substantial measurement error risks in firm-level innovation surveys (Cirera & Muzi, 2020; Arundel et al, 2013). With a focus on recent empirical work using World Bank (WB) Enterprise Survey data, as well as a recent WB technology adoption survey, this seminar delved into the issue of innovation measurement error, as well as key methodological imperatives that performers of firm-level innovation surveys can consider in improving survey performance. Presenters included Dr Xavier Cirera, Firms, Innovation and Entrepreneurship Unit, World Bank and Dr Silvia Muzi, Enterprise Analysis Unit, World Bank.

Discussant reflections by Dr Amy Kahn and Dr Moses Sithole from CeSTII incorporated the experiences from South African Business Innovation Surveys, performed by the Centre for Science, Technology and Innovation Indicators (CeSTII), since the early 2000s. This seminar was moderated by Dr Glenda Kruss, Executive Head of CeSTII and included remarks by Kgomotso Matjila-Matlapeng, Senior Policy Analyst, Department of Science and Innovation, Michael Ehst, Senior Private Sector Specialist, World Bank as well as Prof. Fred Gault, UNU-MERIT/Tshwane University of Technology & Chair: CeSTII Advisory Committee Survey practitioners, scholars of innovation indicators, users of innovation data for policy making or programming attended.

This seminar was funded by the Department of Science and Innovation.

INVITATION

HSRC Seminar Series

Strengthening innovation measurement practice in firm-level surveys: New methodological imperatives

Moderator: Dr Glenda Kruss, Executive Head: Centre for Science, Technology and Innovation Indicators, HSRC

Concluding remarks by: Prof. Fred Gault, UNU-MERIT/Tshwane University of Technology & Chair: CeSTII Advisory Committee



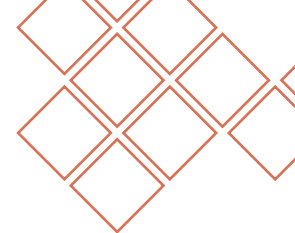
Presenters: Dr Xavier Cirera, Firms, Innovation and Entrepreneurship Unit, World Bank
Dr Silvia Muzi, Enterprise Analysis Unit, World Bank

Discussants: Dr Moses Sithole and Dr Amy Kahn, Centre for Science, Technology and Innovation Indicators, HSRC

24 November 2021 | 15h00 – 17h00 (SAST)

HSRC POLICY FORUM: AGRICULTURAL INNOVATION



CeSTII data provides insight into innovation in agriculture

South Africa's first survey on innovation in agriculture, undertaken by CeSTII, found diverse patterns of innovation activity across the sector. At a policy forum on 29 November 2021, jointly arranged by the HSRC, ARC and DSI, the findings catalysed rich debate among academics, farming councils and government about how to foster and direct innovation. Better data, a more coordinated policy approach for innovation, and incentives for technologies that promote sustainability and benefit small-scale farmers were identified as priorities.

The agriculture and manufacturing sectors are cornerstones of a more inclusive, equitable and resilient future South Africa. Yet, instead of growing over time and absorbing unemployment, both sectors are contracting. In 2021, agriculture contributed just 3% of GDP, down from 7.7% 50 years ago.

Innovation is critical for the sector to develop and withstand external shocks like COVID-19. "Some people talk about technological innovation, social innovation, etc. I put everything under one umbrella, as a complex process of continuous learning," said Judith-Ann Francis, an international policy advisor on innovation in agriculture and the keynote speaker.

How can the agricultural sector and public and private stakeholders foster effective innovation? First, said Francis, we need data on the kinds of innovation taking place in the sector. Then, stakeholders should agree on the problems we want agriculture to prioritise, so that we can devise targeted funding instruments for innovation activities that are most likely to solve them.

South Africa's White Paper on Science, Technology and Innovation (2019) aims to achieve inclusive development and food security, said CeSTII's Dr Glenda Kruss. She

asked if current innovation activities in the agricultural sector contributed towards these goals and, if not, where the obstacles lay.

The South African Agricultural Business Innovation Survey, 2016-2018, demonstrates that almost two-thirds of agribusinesses undertook some form of innovation activity between 2016 and 2018. However, the type and amount differed within and between sub-sectors.

For example, while 76% of crop farmers have innovated, among livestock farmers, who constitute a smaller percentage of agricultural farmers, this figure is just 47%. Fisheries reported the highest levels of both technological and non-technological innovation, while the survey revealed little innovation activity in forestry.



Although the survey report suggests a degree of innovation, it found that the sector faced stumbling blocks. Agricultural stakeholders who spoke at the forum identified issues related to a lack of coordination, and conflicting policy goals.

“Sometimes there are not proper synergies between the [agricultural] trade mandate and what is good for producers,” said Marinda Visser of Grain SA, adding that what is good for the farmer is not always aligned with what is important for trade and for the country.

Inclusive innovation?

What counts as innovation? Of the 42% of agri-businesses that reported engaging in product innovation, 90% reported innovating to significantly improve existing goods, while a much lower 54% innovated to create entirely new goods.

In the future, CeSTII is interested in assessing whether innovation activities foster inclusive development. One way of doing this might be to break inclusivity into three components: social inclusiveness referring to inclusion of marginalised communities; territorial inclusivity to consider whether innovation extends to isolated rural areas, for example; and industrial inclusiveness relating to whether we are modernising sectors and including small and medium enterprises.

Although small-scale farmers are often celebrated as critical to sustainability and food security, the benefits of most technologies are only enjoyed by large-scale commercial farmers. For instance, farmers in the fruit and wine sectors believe that the fourth industrial revolution poses a threat to the competitiveness of smaller players, said Dr Albert Strever, an agri-informatics expert. However, technologies like blockchain could help with issues such as traceability—making the supply chain transparent—and benefiting small-scale farmers.

“We have to find mechanisms of bringing in new entrants and ... developing farmers into the main value chains,” said Dr John Purchase, CEO of the Agricultural Business Chamber. The speakers highlighted the need for data on innovation activities among small-scale farmers. (While small-scale commercial farmers were included in the

survey, it did not capture inputs by subsistence and emerging small-scale farmers.)

Policy coherence and holistic solutions

Innovation could be enabled by aligning the innovation agendas of different stakeholders, including government departments, academic institutions and industry associations. “I think there is a need for a much more coordinated approach from the government in respect of innovation in agriculture,” said intellectual property and innovation expert Dr McLean Sibanda.

In addition to funding, the government should coordinate non-financial support, such as negotiating licensing and navigating intellectual property rights, Sibanda said.

Sustainability

Agriculture also has an opportunity to lead societal shifts towards greener, more sustainable living. For example, energy is a major obstacle in agriculture, but also presents an opportunity for growth. In addition to aiming to be carbon neutral, agribusinesses could position themselves as future energy producers for urban sectors, Strever said. “Agri-photovoltaics [the simultaneous

use of land for food production and solar power generation] ... has not reached the potential it could in Africa.”

Source: This article is summarised from “Data drives strategic dialogue around innovation in agriculture” by Andrea Teagle, science writer in the HSRC’s Impact Centre in *HSRC Review* 20(1) March 2022.

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

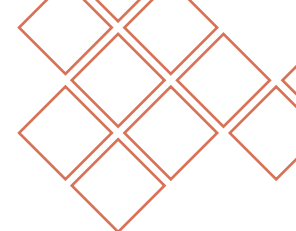


More analysis of the AgriBIS Survey Results

See: Buchana, Y. (2021) First survey to measure innovation in South African agribusinesses. *HSRC Review*. 19(3): 24-27

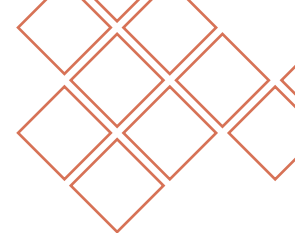
 <https://bit.ly/AgInn>

KEY STAKEHOLDERS



STAKEHOLDER ORGANISATION	HOW CeSTII ENGAGES
CORE PARTNERS	
Department of Science and Innovation	<ul style="list-style-type: none"> Work closely at the research-policy nexus to conduct the annual R&D Survey, Business Innovation Surveys and produce official STI statistics in partnership with StatsSA, the OECD and NESTI.
National Advisory Council on Innovation	<ul style="list-style-type: none"> Collaboration on research and advocacy, hosting the NACI indicators provincial roadshow, as well as regular data and outputs sharing, including the National Science Technology and Innovation Information Portal (NSTIIP).
Statistics South Africa	<ul style="list-style-type: none"> Compliance with SASQAF through the R&D Survey Clearance Committee, and provision of the Business Register, survey samples and associated methodological support.
REGIONAL PARTNERSHIPS	
African Union Development Agency (AUDA-NEPAD)	<ul style="list-style-type: none"> Collaboration with the ASTII programme to provide training on STI indicators and writing of the African Innovation Outlook. Training network includes partnership with AOSTII and the UN Institute of Statistics.
Southern African Development Community Secretariat	<ul style="list-style-type: none"> Technical expert advisers on the implementation of science, technology and innovation policies and indicators in the region.
NACETEM, Nigeria	<ul style="list-style-type: none"> Share expertise and co-author comparative papers on R&D and innovation in SA and Nigeria.
NCRST, Namibia	<ul style="list-style-type: none"> Training, share expertise and co-author comparative papers on R&D and innovation in SA and Namibia.
GLOBAL PARTNERSHIPS	
OECD/NESTI	<ul style="list-style-type: none"> Provision of national R&D and innovation data and indicators. Participation in discussions to revise and implement changes to the Frascati and Oslo manuals.
UNESCO	<ul style="list-style-type: none"> Provision of national R&D and innovation data and indicators.
REDESIST, Federal University of Rio de Janeiro, Brazil	<ul style="list-style-type: none"> Research collaboration on local innovation and production systems, and innovation measurement.
PROJECT COLLABORATIONS	
Science councils (CSIR and ARC)	<ul style="list-style-type: none"> Share expertise and co-author analytical papers.
BRICS Research Centre, HSRC	<ul style="list-style-type: none"> Provision of national R&D and innovation data and indicators.
Business Unity South Africa	<ul style="list-style-type: none"> Advocacy partner on BIS and R&D surveys/STI measurement.
TIPS	<ul style="list-style-type: none"> Green R&D data and analysis.
TIPC	<ul style="list-style-type: none"> Evaluation of policy experiments in South Africa.
African Centre for Technology Studies	<ul style="list-style-type: none"> Partner in the Science Granting Councils Initiative Evidence for Policy (Evi-Pol) Consortium.
Université Cheikh Anta Diop de Dakar - Sénégal	<ul style="list-style-type: none"> Partner in the Science Granting Councils Initiative Evidence for Policy (Evi-Pol) Consortium.
SARChI-Trilateral Research Chair in Transformative Innovation, University of Johannesburg	<ul style="list-style-type: none"> Partner in the Science Granting Councils Initiative Evidence for Policy (Evi-Pol) Consortium and the Transformative Innovation Policy Community of Practice.

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.

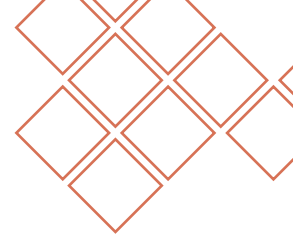
Her experience includes an evaluation of sectoral industrial plans and consortia implemented in Uruguay as a fundamental ingredient of the national industrial policy. Between 2010 and 2013 Dr Bortagaray worked as a Senior Program Officer at the International Development Research Centre – Canada, for 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.

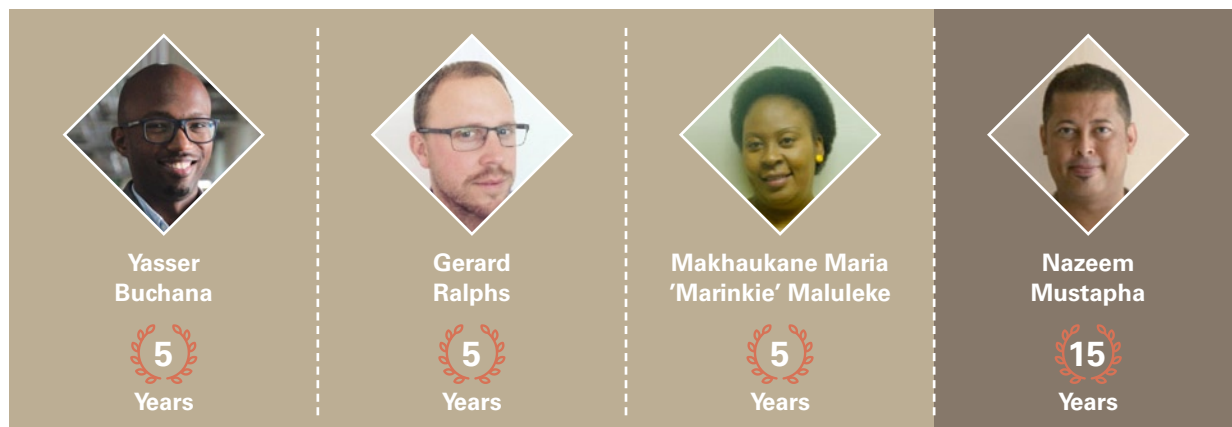
OUR STAFF



Staff development

Staff awards for long service

In 2021/22 the HSRC celebrated these CeSTII staff who have given long service to the organisation:



SERVICE EXCELLENCE AWARD

Delivering top-notch data and supporting the team



CeSTII Fieldwork Manager, Natasha Saunders, was the deserving recipient of an HSRC award for service excellence in 2021. She first joined CeSTII in 2009 on a three-month contract, employed as a data capturer for the annual R&D Survey.

After working on the Business Innovation Survey and Agricultural Innovation Survey, she developed essential skills and was promoted to Fieldwork Manager. Natasha holds particular responsibility in the annual R&D Survey's fieldwork and liaises with respondents from the not-for-profit (NPO) sector, one of the five sectors surveyed annually, to ensure the smooth submission of their data for analysis.

"Quality is our utmost concern and it's my job to ensure that data management protocols and validation checks

are rigorously followed," she says. Other responsibilities include training the R&D fieldwork team, coordinating data capture processes and providing support for junior researchers.

It's been an uphill journey to get where she is today. Raised on the Cape Flats after the family was forced out of District Six, Natasha and her sister are the first generation of university graduates in the family; she holds an honours degree in Integrated Organisational Communication from Unisa. Raised by a supportive single mom, Natasha began her working career in a factory, "but I always knew I was capable of more," she says. After completing part-time computer courses she was employed by Absa Bank as a processing clerk in the home loans division before joining the HSRC and pursuing her university studies after hours.

The HSRC's Service Excellence Award recognises staff members who demonstrate excellence in "leadership, innovation, service, work ethic and upholding the values of the HSRC". A keen sports player and hiker, her love of team sports has translated into workplace teamwork and has helped her to achieve her goals.

Interview: Talking to Dr Glenda Kruss

A transdisciplinary researcher, Dr Glenda Kruss is a pioneer of Innovation Studies in the democratic South Africa. In 2001 she joined the HSRC as a research director and has led the Centre for Science, Technology and Innovation Indicators since 2016, making a notable contribution to scholarship in South Africa and the global South.

You took an interesting path to science, technology and innovation (STI) research. How did that come about?

I always say it was a series of historical accidents! I have landed up being a real transdisciplinary researcher, initially through education. I went to university and did teaching subjects coupled with religious studies at UCT. The religious studies department at the time was a very interesting place. It opened my mind, and I became very involved in studying African religion and worked with various pioneers of Black Theology. I got more and more taken up with the learning and the bright people around me. Also, my colleagues were very focussed on improving our research methodology, so fortnightly a small group of us had a seminar. We read and had research methodology sessions and then we designed a project on the religious life of Athlone in Cape Town. It was a big HSRC project around understanding the social side of the world. I went to church every week to do participant observations and we did a door-to-door survey in Athlone.

That was in the 1980s and I worked for one of the lecturers as a research assistant on a project on People's Education. Then I was offered a job at the University of Western Cape in the Centre for Adult and Continuing Education, to work on their People's Education project where I became very interested in community education and community development. By then I was very involved in the politics of the day—the United Democratic Front (UDF)—and the workplace gave me a way to bring democratic ideas into practice.



[Image credit: A. Erasmus/HSRC]

Then I went to Belfast, Northern Island to do my doctorate at the University of Ulster. My PhD was a historical and sociological study of adult education in African indigenous churches, and I did my field work in Johannesburg. In Belfast I got very involved in community economic development and community education programmes, teaching at the Ulster Peoples' College, across the religious and social divide.

How did this take you to Innovation Studies?

I was then offered a job as a lecturer in comparative education at UWC. That was a very exciting time—1993—and we started a master’s programme in education management and policy. We had a lot of very committed people who wanted to go and change education! I started to get much more involved in education policy and did a programme for preparing a thesis proposal and, at that point, I got very into research methodologies. We taught HUGE classes, our HDEs (higher diploma in education) were a thousand students, and you had to do the same lecture three times.

I put a lot of effort into the generic side of teaching—how to learn, how to write and how to design research. A lot of process stuff. Then I went on a secondment to the HSRC to do full-time research, a big love of mine.

I worked in the Human Resources Development programme, essentially about the sociology of education and work, and got involved in projects on higher education. First on private higher education, and then on higher education and industry linkages. That brought me to the field of Innovation Studies.

A brilliant researcher, Jo Lorentzen then joined us, an economist, he was very involved in the Innovation Studies community and got me involved in the Globelics network, and we joined a global project funded by Canada’s International Development Research Centre (IDRC). I led the Africa team and there was a Latin American team and an Asian team. These teams have continued to collaborate over the years, publishing books together and so on. That got me into a lot of international research networks. I pursued the higher education-industry linkages work and then I started to look at higher education linkages across four kinds of actors in the system of innovation—government, NPOs, communities, business—and that brought me full circle back to the community development work, because then the NRF asked us to run a project to understand conceptions and practices of universities and community engagement. That led me into the whole idea of innovation as a tool for inclusive and sustainable development, to another IDRC funded projects on universities and inclusive

development in Africa, leading teams in Malawi, Tanzania, Botswana, and Uganda.

I was then asked to apply to lead CeSTII.

The threads through all the historical accidents that shaped my career are education, skills, community, inclusive development and using science and technology for people’s wellbeing. When I came into CeSTII, obviously we contributed the national R&D Survey and business Innovation Survey, but then I started to use the lenses that I had developed to ask questions about the approach to STI measurement and the uses of the datasets. We started to do fact sheets looking at how R&D is oriented to water, green issues, health, agriculture and other issues of socio-economic and human development. There had also been an idea, spoken about for at least five years, to do a survey of innovation in the

informal sector. I said: ‘We’re doing it, we’re trying it, however difficult it is, if we don’t get started, we are never going to know how it will work!’

So, I started to slowly push different kinds of experimental analyses and datasets, and now we are busy focusing on designing new indicators to contextualise STI measurement for the development challenges in South Africa and in Africa.

“ The original impulse to form CeSTII and set up longitudinal data series was part of the new vision for science and technology to be put into the service of the new democratic SA, and confirm that Africa can do the science.”

How have you experienced being a woman leader in the STI sector?

I love what I do, and I find it fascinating. Sometimes I am very aware that I am the only woman in the room. There was a point when I said to myself, I could be a very good academic, but I chose to have children, and I wanted balance in my life. I wasn’t a leader in those days, I held myself back. I had to be ordered to go to international conferences because I didn’t want to leave my children. But once the children were in high school, then I started to become much more of a leader.

When Jo Lorentzen died very suddenly, he was the leader of our team, and between one day and the next I had to take over, and there was a sense that I just had to do it. Before that I had said no, I won’t take on leadership, but then I had to. We had global projects

and I had to step up to make sure that we delivered on them. It was in tribute to everything I had learnt from him that I was determined to make all these projects work and to deliver, and not let him down, as it were. It was a very traumatic time for us, as we were a very close unit. I had to take over, contain the unit and keep things going.



Rajah Rasiah (University of Malaysia), Glenda Kruss (HSRC) and Keun Lee (Seoul National University) at the 8th Globelics International Conference in Kuala Lumpur, 2010. [Image credit: G. Kruss/Personal Archive]

Why are CeSTII's time series data projects so important for South Africa?

The original impulse to form CeSTII and set up longitudinal data series was part of the new vision for science and technology to be put into the service of the new democratic SA, and confirm that Africa can do the science. The OECD and IDRC played quite a big role, coming in and influencing policy in those early days, so SA also decided to do R&D and innovation surveys. Although SA had been conducting R&D surveys since the 1960s, for a couple of years that data series was broken.

The surveys started off in the CSIR with the then HSRC doing the 'human' sciences part. Then it went to FRD and then was outsourced. The HSRC was becoming the DSI entity and reharnessed to priority research areas, so we adopted the OECD standard R&D and innovation surveys. This has meant that one of the main uses of the surveys is that we can measure the proportion of gross domestic expenditure on R&D (GERD) relative to gross domestic product (GDP), an indicator of R&D intensity of the economy. The trend data forms part

of national statistics, and we can compare ourselves globally with other countries, and look at how we are developing in terms of science intensity.

And over the years, CeSTII has worked with teams in the SADC and other African countries to build capacity to enable local statistics offices to do the STI surveys. We are also contributing to DSI's work in Africa and have been strongly brought into the DSI bilaterals, and we work with the SADC STI Indicators groups and collaborate a lot with AUDA-Nepad.

Now, with the new White Paper on Science, Technology and Innovation, and the development goal being inclusive and sustainable development, there is a draft Decadal Plan to orient STI over the next 10 years in South Africa. This creates an even bigger role for CeSTII, to design and populate appropriate new measures and indicators.

The CEO of the HSRC when I first came, Mark Orkin, always used to talk about our challenge in the HSRC between doing short-term work that government needs, and longer-term research that needs more time and more input. He would say we need to do the longer term 'prefigurative research' so that when government needs it, we have already got it done. So that's something that I have always tried to do. I am always reading policy texts to know where we are going. So now, with this shift in the White Paper and what we have been trying to do over the last few years, we can play a bigger role in providing evidence for policymaking. Whether it is evidence for policy design, monitoring progress, or benchmarking.

We have also become more and more involved in the Transformative Innovation Policy Consortium (TIPC) and that helps us to think ahead. South Africa has invested a lot in these STI datasets, so the question is how can we use them to be useful, valuable evidence for the new policy directions.

What are the other opportunities in the STI space at the moment?

Because of global changes in economics and politics, even before COVID, the STI community itself was opening up, to say—we have got to understand innovation in different contexts and with different kinds of orientations and purposes and conducted by different kinds of actors. For example, public sector innovation,

or household innovation. We have done a lot of work on innovation for inclusive development. So those are where our opportunities are, to stretch the boundaries of the measurement field in response to our challenges in SA and Africa and the global South.

The challenge is that this kind of research is very costly and for it to be really valuable you have to establish time series and longitudinal time series. Another challenge is to strengthen the relationship with DSI and its entities so that we can work together to design new indicators.

What is your vision for the future of CeSTII?

My vision for CeSTII is, number one, that it must become sustainable in terms of its longitudinal datasets. This involves building capacity, which is a big challenge and is my current focus. Then the vision is to deepen our relationships with DSI and deepen our analytical capabilities, so that the data is of value to policy actors. That particularly relates to the innovation datasets, and also to digitalise more. If we had more capacity I would want to look at AI and internet trawling to measure innovation and to pull out trend insights. For example, this has been done in Europe, to identify where COVID research was being conducted, during the pandemic. If we had more expertise and more money I would love us to develop some of those skills, and to contribute to the theory and practise of innovation measurement in the global South. We are doing quite well in that, but I need more people to contribute to the massive task.

“ My vision for CeSTII is, number one, that it must become sustainable in terms of its longitudinal datasets. This involves building capacity.”

You recently had a sabbatical, what are you focussing on now?

My pet project is linked to the idea of new STI indicators being harnessed for sustainable and inclusive development. The Sustainable Development Goals give us the framework for this, but as there are 17 SDGs, it makes it impossible to have three or four hundred indicators. I've worked with the STI Strategy for Africa, where there are six development priorities, including Ending Hunger and Ensuring Food Security. I have looked at how we can design innovation indicators that measure our progress towards that broad policy goal. This has included a high-level, iterative process conceptualising and understanding the policy intent, and looking at what data we actually have—because we can design a beautiful system, but then if you haven't got the data then what's the point—so using data that we actually have. And then designing new indicators to map actual patterns of innovation and actual linkages.

Too often, when we do this kind of R&D indicator work, we look at the strongest aggregate trend. but what I am interested in is mapping the complex patterns that actually exist. So that if you have small proportions of

high-technology innovation activity, and you want to grow that, you've got to see where it's happening and think how you can intervene. If you've got most of firms doing innovation by adopting new machinery and equipment from overseas, you've got to think how to promote innovation in relation to that, and in relation to shifting more firms to more sophisticated kinds of innovation. So that's what I am trying to do now.



Inception meeting for the global project, Knowledge for Development: University-Firm Interactions, funded by the International Development Research Centre, Canada, in Ho Chi Minh city, Vietnam, 2007. [Image credit: G. Kruss/Personal Archive]

TEAM CeSTII



Dr Glenda Kruss
Executive Head



Dr Moses Sithole
Research Director



Dr Nazeem Mustapha
Chief Research
Specialist



Dr Il-haam Petersen
Chief Research
Specialist



Dr Yasser Buchana
Senior Research
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**Dr Jacqueline
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Saladin**
Senior Research
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Dr Kgabo Ramoroka
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Dr Atoko Kasongo
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Dr Amy Kahn
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Dr Mario Clayford
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Natalie Vlotman
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Jerry Mathekga
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Pilela Majokweni
Senior Researcher



Theo Sass
Senior Researcher



Audrey Mahlaela
Researcher



Luthando Zondi
Researcher



Nokhetho Mhlanga
Researcher



Setsoheng Mayeki
Researcher



Lindiwe Binda
Database Analyst



Tlangelani Makamu
Data Analyst



Mbali Bongoza
Junior Data Analyst



Natasha Saunders
Fieldwork Manager



Gerard Ralphs
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Nicole van Rheede
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Viwe Sigenu
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Intern



Anele Slater
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Sintu Mavi
PhD Research Intern



Maria Maluleke
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Bongwiwe Ngqaqu
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