

# Review

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# THIS

# ISSUE

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**Cover:** *HSRC researchers conducted an informal innovation survey to find out more about the challenges and opportunities of the local business environment in Mpumaza, Sweetwaters, KwaZulu-Natal.*

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# EDITOR'S NOTE

By Antoinette Oosthuizen, editor

Science, technology and innovation (STI) are among the primary drivers of economic growth, job creation and socioeconomic reform in South Africa. But are we fully benefitting from the potential of STI to help address our socioeconomic problems? The [2019 White Paper on Science, Technology and Innovation](#) emphasises the need for a focus on inclusivity, policy coherence, budget coordination, and creating an enabling environment for innovation. This includes supporting local innovation systems and developing human capabilities. To move forward, we need to keep abreast of STI activity in various formal and informal economies in the country, continuously refining our measurement tools to be locally applicable.

In 2001, the [HSRC's Centre for Science, Technology and Innovation Indicators \(CeSTII\)](#) was established to support this research and monitoring. The centre conducts national research, development and innovation surveys on behalf of the South African Department of Science and Innovation, producing national indicators and analyses as a basis for international comparisons and to inform policymaking.

In this edition of the *HSRC Review*, we feature a selection of articles that profile some of CeSTII's projects and expertise. We start with an article that demonstrates how STI measurement and the development of new indicators can provide evidence for innovation aimed at some of the country's most demanding challenges – for example, food and nutrition insecurity. Recent work includes the baseline

[South African Agricultural Business Innovation Survey, 2016–2018](#) and the [Survey of Innovation in the Informal Economy](#).

Some of the other articles look at the importance of research-and-development (R&D) investment in the manufacturing sector and the efforts of three state-owned enterprises to gear up research, development and innovation. Based on a 2017/2018 baseline survey, researchers also describe innovation in the informal sector in Sweetwaters, KwaZulu-Natal.

Commemorating World AIDS Day on 1 December, this edition also features two articles on HIV/AIDS and tuberculosis, conditions overshadowed by the COVID-19 pandemic but still counting among South Africa's most serious health challenges. Andrea Teagle writes about an HSRC paper on the feasibility of the universal test-and-treat approach to manage the HIV epidemic. She also speaks to the HSRC's Dr Sizulu Moyo about the results of South Africa's first national tuberculosis survey, which was commissioned by the Department of Health.

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# Designing new science, technology and innovation indicators for South Africa's developmental challenges

The era of COVID-19 has sharpened our focus on harnessing science, technology and innovation (STI) to address our most demanding social and economic challenges. Researchers at the HSRC's [Centre for Science, Technology and Innovation Indicators](#) (CeSTII) explore how indicators and STI measures can provide evidence to promote innovation for inclusive and sustainable development.

By **Glenda Kruss, Moses Sithole, Nazeem Mustapha, Il-haam Petersen, and Gerard Ralphs**

**Photo:** Neal Markham, Unsplash

Measurement of science, technology and innovation (STI) in South Africa is based on a global standard set by the Organisation for Economic Cooperation and Development (OECD), which is strongly influenced by highly developed economies. Over the past few years, the HSRC's Centre for Science, Technology and Innovation Indicators (CeSTII) has grappled with maintaining the core OECD approaches for global comparability, while designing new measures and indicators more appropriate to the Southern African context.

To illustrate what is possible, we focus here on the African Union's STI Strategy for Africa (STISA) goal to eradicate hunger and ensure food and nutrition security – a goal made more salient by the impact of COVID-19.

What measurement resources and data can we draw on to assess how well our STI system and activities are oriented to support this goal?

The most well-established trend data and the dataset most widely used in South Africa to measure STI is derived from CeSTII's national survey of [research and development \(R&D\)](#), which strictly follows the OECD's [Frascati Manual](#), to measure the country's R&D expenditure and personnel.

We can interrogate this data in new ways in relation to agriculture research fields, agricultural industrial sectors or agriculture-oriented R&D activity. For example, we can analyse the relative proportion of expenditure allocated to promote the socioeconomic goals of 'plant and animal production and primary products' and track the spend over time to identify areas for policy intervention. We can assess if the levels of expenditure are sufficient, relative to peer-country benchmarks or national policy commitments and which institutional sectors could potentially increase their proportional spend.

This, however, is only focused on the 'input' dimension of growing the potential of the national R&D system to create knowledge and technology targeted at the specific developmental challenge. This R&D data does not allow insight into how knowledge and technology are used to promote innovation and productivity in agricultural firms or to promote better public-sector support to the agricultural and food-security enterprise.

For this purpose, South Africa also has well-developed capacity to measure how firms innovate. The recently released [Business Innovation Survey 2014–16](#) and baseline [Agricultural Business Innovation Survey 2016–18](#) provide vital data on the scale of innovation, the nature of firms' main innovation activities, the outcomes of innovation, and the factors that facilitate or constrain innovation at firm level.

### **How enterprises innovate in South Africa's agricultural sector**

The OECD's Oslo Manual, on which innovation surveys are based, was initially designed to measure innovation activity in manufacturing firms and later extended to firms in the services sector. There is no widely accepted approach to measuring the nature of innovation in agricultural firms. CeSTII adapted the core innovation survey methodology to design and conduct a baseline survey of innovation in South Africa's [commercial agricultural firms](#).



Photo: Neal Markham, Unsplash

The data show that a high proportion (61.7%) of agricultural enterprises reported being innovative, meaning they had introduced a new or significantly improved product, process, organisational method, or marketing method to their enterprise.

To identify policy spaces to improve innovation in agricultural firms, we need to understand the nature of this innovation, and valuable insight can be gained from disaggregating the different ways firms implemented and invested in innovation.

The data show that in aggregate, across the agricultural firms, the most common innovation activities in order were training; acquisition of new forms of equipment and machinery, computer software and hardware; and R&D.

The data also show that innovation-active agricultural enterprises adopted advanced technologies for innovation, such as precision agriculture technologies (49.4%), air and

soil sensors (35.9%), and crop sensors (31.8%).

What stands out is the different patterns of innovation evident in the three main agricultural sub-sectors. Innovation in the fisheries sub-sector is more strongly focused on R&D, and 78% of firms adopted livestock biometric technologies. In the forestry sub-sector, innovation is focused more on upgrading technology and capability building, and firms are less likely to adopt advanced technologies; only 19.3% of innovation-active forestry businesses adopted smart breeding, drones and precision agriculture, for example.

Further policy-useful insights can be gleaned from analysing the most important barriers that agricultural firms reported as constraining innovation. Knowledge barriers related to capacity and skills suggest the need for collaboration with higher education, technical vocational education and training (TVET) colleges and science councils. The importance of resource factors such as access to land, water and finance underscores the importance of alignment with the policy objectives of the departments responsible for agriculture;



Ploughing a field in Gauteng

**Photo:** Graeme Williams, Brand South Africa

the environment; and trade, industry and competition. Analysing these innovation data trends raises new questions for STI policy, which must be addressed in coordination with other policy actors in agriculture.

### Measuring innovation in informal-sector enterprises

In a highly unequal society like South Africa, there is considerable economic activity in the informal-sector at the local level, where many individuals and micro-enterprises grow, prepare and sell food. This supports the goal of eradicating hunger, while creating livelihoods.

The distinctive experiences of economies of the Global South drive a growing recognition that innovation takes place not only in formal-sector firms, but also in a wide range of other settings.

CeSTII recently completed initial research to [measure innovation](#) in informal enterprises, given their important contribution to the livelihoods and survival of millions of South Africans. Such measurement is complex since national and regional informal business registers do not exist.

The most significant difference is that in the informal sector, economic activity is localised and typically takes place in small- and micro-enterprises, often with a single owner. Hence, innovation measurement needs a spatial lens and must be sufficiently fine-grained to capture the nature of economic and innovation activities in these enterprises.

A baseline innovation survey conducted in Sweetwaters, KwaZulu-Natal, provides useful new insights. The survey found that, in informal food-services, firms' demand and supply is local: 44.3% of informal food-services firms reported that their customers and 59.8% of their suppliers were from the local neighbourhood. These firms were typically in the owner's home (41.3% with and 21% without their own dedicated space) or in no fixed location (18.1%), some from a taxi rank (4.4%) or footpath (4.1%), and very few at a market.

In contrast to the 61.4% of commercial agriculture firms that reported being innovation active, a very high proportion (85.6%) of informal food-services microenterprises reported being innovation active, with 67.2% having reported product innovation and 81.5% process innovation.

The most frequent innovation activities reflect the prevalence of forms of local learning and capability building from customers and suppliers. The most frequently reported innovation activity was responding to customer demand, based on their feedback (71.7%) at the local level, followed by acquiring tools, machinery and equipment (56.2%) such as buying a fryer to sell hot chips. Finding new suppliers of raw materials and tools (50.2%) was also important. Suppliers are typically wholesale shops near the business locale, but businesses may source new suppliers from the nearest big city, or a cheap supplier in a larger metropole. Finally, a common innovation activity is 'happy accidents' – unexpected discoveries made during production (37.5%).

R&D or formal knowledge and technology-led types of innovation activity are used very infrequently, so the policy mechanisms driving these at the national level are not likely to be valuable to informal firms.

Sourcing of new forms of knowledge and technology in other ways by informal firms included searching for new knowledge (7.5%), bringing in know-how or other types of knowledge (7.2%), and using indigenous knowledge (7.1%). Innovation was also in the form of learning, through training staff (8%), on-the-job learning (4.1%), and formal apprenticeships (3.9%).

For these firms, which constantly sought ways to improve and diversify, barriers to innovation did not impact their innovation significantly. The factors we found that negatively impact informal firms point to opportunities for policy intervention by national and local government: to provide basic infrastructure, to offset high compliance costs, and to create new innovation-funding mechanisms.

### Using existing data to create new indicators

By focusing on eradicating hunger and food security, we contend that new kinds of data can be used to interrogate the distinctive nature of innovation in different settings to raise new policy questions. Different 'pictures' of innovation emerge if we consider larger commercial or microenterprises, or enterprises based in urban economic hubs and major cities and those in peri-urban local areas, on the margins.

CeSTII's new surveys contribute to efforts to expand STI indicators and create data to support the inclusive national system of innovation promoted in the White Paper 2019, and required to address our country's major social, health and environmental challenges.

An all-encompassing range of new forms of STI measurement and indicators is needed and can be created with new analysis of existing R&D and innovation datasets and through the creation of new datasets.

Going forward, the exercise can expand to address other STISA developmental priorities and other settings. For example, we could examine how health R&D and innovation promote the goal of 'preventing and controlling diseases and ensuring well-being', or we could experiment with new measures of innovation in the public sector to address the goal of 'living together and building society'.

The approach is of equal value for partners across sub-Saharan Africa as we strive to develop appropriate measurement models to achieve inclusive and sustainable development goals.

**Authors:** Dr Glenda Kruss, executive head, Dr Moses Sithole, research director, Drs Nazeem Mustapha and Il-haam Petersen, chief research specialists, and Gerard Ralphs, programme manager and policy analyst, at the HSRC's Centre for Science, Technology and Innovation Indicators (CeSTII)

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# R&D in South African manufacturing:

A sector in deep crisis?



Workers in a Sasol plant. Sasol is South Africa's petrochemicals giant, having pioneered technology to produce oil, petrol and other chemicals from coal.

**Photo:** Sasol



Globally, the manufacturing sector is changing as the use of artificial intelligence, robotics and advanced technology grows at a rapid rate. To compete, companies must adapt and continually engage in research and innovation. Companies in developing countries like South Africa face a growing crisis if they do not keep up.

By **Luthando Zondi** and **Kgabo Ramoroka**

South African companies in the manufacturing sector are confronted with declining productivity and outdated infrastructure, while stiff competition is mounting from companies in newly industrialised economies like China. As a result, sub-sectors within South Africa's manufacturing sector have shrunk over the years.

Research by [Lawrence Edwards and Rhys Jenkins](#) (2015) shows that in 2010, South African manufacturing was 5% lower than it would have been had Chinese imports not been available on the South African market. More recently, Statistics SA recorded a 3.5% decline in manufacturing production from 2019 to 2020. In a recent [paper](#), Deepak Nayyar writes that industrialisation has been the driver of economic growth and structural transformation in a group of Asian countries. The manufacturing sector provides high levels of employment, and its deterioration worsens developmental challenges such as unemployment. This has prompted at least a couple of questions: Is South Africa's manufacturing sector in a deep crisis? And what innovation capability exists in this sector, given the widely accepted notion that experimental research and development (R&D) plays a significant role in generating innovations, growth and productivity in manufacturing industries?

In a world rapidly becoming more technologically advanced, science, technology, and innovation (STI) must be viewed in the context of sustainable development. STI can play a fundamental role in achieving the Sustainable Development Goals, specifically [goal 9](#): to promote inclusive and sustainable industrialisation and foster innovation. STI is considered a primary driver of economic growth and job creation and supports the general socioeconomic reform envisaged by [South Africa's National Development Plan 2030](#). According to South Africa's [White Paper on Science, Technology, and Innovation 2019](#), STI can also help to modernise potentially high-impact

sectors such as agriculture. At the same time, South Africa's innovation policy environment faces several challenges, including the exclusion of small-, micro-, and medium enterprises as well as slow growth in the local development of technological innovations. Amid these challenges, the government is committed to increased levels of R&D investment in the economy, aiming to reach the target of 1.5% of gross domestic product in the next decade.

R&D increases knowledge and technology capabilities, enabling a country to gain a comparative advantage over other economies. R&D and technology have enhanced the competitiveness of BRICS countries such as China and India: China has moved up the technology ladder, particularly in the defence sector and robotics, and India is competitive in information technology, [writes Nayyar](#).

Looking at other activities that typify innovation, manufacturing's largest expense in South Africa is the acquisition of machinery instead of R&D, according to the HSRC's [Business Innovation Survey 2014–2016](#). Such innovation activity has a negative effect on employment when workers are replaced by assembly-line machinery, for example. Furthermore, firms often import technology that is used for production without the accompanying skills transfer that would ultimately benefit domestic businesses. Equally,

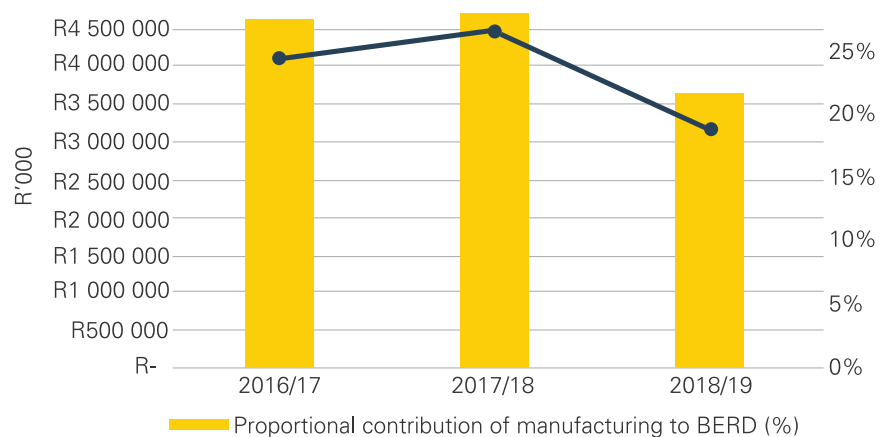
R&D done by small and medium enterprises is important for generating knowledge and capabilities, since multinationals tend to have very little effect in South Africa in the transfer of technological capabilities, according to [this 2015 paper](#) by Nazeem Mustapha and Pedro Mendi.

To sum up, investment in R&D is vital for businesses to generate innovative products of high novelty, manufacturing processes and materials that create new competitive opportunities and allow for economies of scale.

### Private-sector R&D spend in manufacturing

South Africa's manufacturing sector is the second-largest contributor to business expenditure on R&D, after the financial intermediation, real estate, and business services industries, according to the [SA National Research and Experimental Development Statistical Report 2018/19](#). In the private sector, manufacturing firms have developed R&D capacity for different sectors of products, including food processing, meal refinery and others. Against the strategic necessity of investment to propel innovation, expenditure on R&D declined in the period 2016/17 to 2018/19 from 27.8% (R4.108 billion) to 2018/19 (R3.166 billion) in 2018/19 (Figure 1).

**Figure 1:** Business enterprise expenditure on R&D (BERD) in the manufacturing sector (2016/17 to 2018/19)



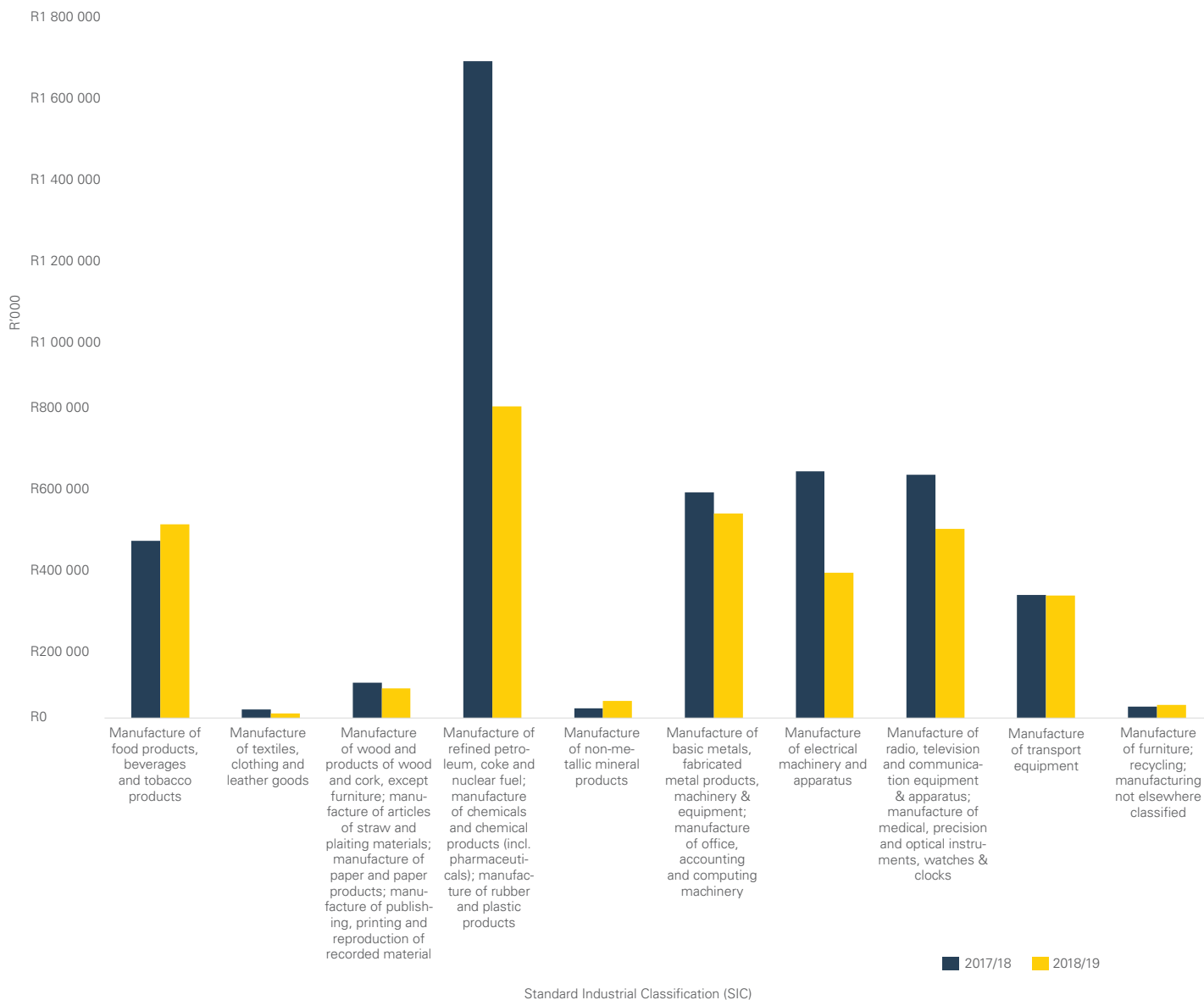
**Source:** National Survey of Research and Experimental Development, 2016/17 to 2018/19

### R&D spend declining in some industries

A closer analysis shows that several industries have reduced their expenditure in R&D (Figure 2). Manufacturers of refined petroleum and chemical products – Standard Industrial Classification (SIC) 33, which also includes pharmaceuticals – had the largest share of R&D spend in the manufacturing sector. In 2018/19, their R&D expenditure declined significantly, from R1.692 billion (10.7%) to R802 million (5.6%).

Within this sector, South African firms such as Sasol have led the way by investing R&D in coal-to-liquid fuel technology and gas-to-liquids research. The decline is concerning as this division is the largest contributor to overall R&D expenditure in the manufacturing sector. By contrast, R&D expenditure by the manufacturers of food products, beverages, and tobacco products (SIC 30) increased from R455 million to R498 million.

**Figure 2:** Business enterprise expenditure on R&D (BERD) by manufacturing divisions (R million), 2017/18 to 2018/19



**Source:** National Survey of Research and Experimental Development, 2017/18 and 2018/19



In the manufacturing sector, South African firms such as Sasol have led the way by investing R&D in coal-to-liquid fuel technology and gas-to-liquids research.

**Photo:** Sasol, Brand South Africa

## R&D employees in manufacturing companies

Human resource capacity forms a critical part of a firm's research and development activity. This is supported by [Deloitte's Manufacturing Competitiveness Report](#), which found that skilled human capital (which includes its availability and productivity) drives industrial competitiveness and is essential to enhancing the competitiveness of the

domestic manufacturing sector. As presented in Table 1 below, in the past three years, we observe a decline in the number of researchers, notably by the chemicals division (288) and electrical machinery division (219), while basic metals employed more researchers (270) during the same period.

**Table 1:** Researcher headcount by Standard Industrial Classification (SIC) in the manufacturing sector

Manufacturing subsector (SIC)	Headcount 2016/17	Headcount 2017/18	Headcount 2018/19
Manufacture of food products, beverages and tobacco products	189	176	182
Manufacture of textiles, clothing and leather goods	11	47	11
Manufacture of wood and products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials; manufacture of paper and paper products; and manufacture of publishing and printing and reproduction of recorded material	37	39	28
Manufacture of refined petroleum, coke and nuclear fuel; manufacture of chemicals and chemical products (including pharmaceuticals); and manufacture of rubber and plastic products	648	688	400
Manufacture of non-metallic mineral products	40	33	42
Manufacture of basic metals, fabricated metal products, machinery and equipment; and manufacture of office, accounting and computing machinery	565	334	604
Manufacture of electrical machinery and apparatus	491	680	461
Manufacture of radio, television and communication equipment and apparatus; and manufacture of medical, precision and optical instruments, watches and clocks	323	360	363
Manufacture of transport equipment	64	82	93
Manufacture of furniture; recycling; and manufacturing not elsewhere classified	26	26	30
<b>Grand Total</b>	<b>2 395</b>	<b>2 465</b>	<b>2 214</b>

**Source:** National Survey of Research and Experimental Development, 2016/17 to 2018/19

**Note:** Industry classification is based on Stats SA's five-digit SIC codes, which classify businesses according to economic activities.

## Conclusion

R&D investment plays a crucial role in economic growth and enhances knowledge intensity and technology capabilities for national economies. In the manufacturing sector, however, R&D expenditure dropped from 27.8% in 2016/17 to 21.9% in 2018/19. The near halving of spending by the chemicals sector from 10.7% (2017/18) to 5.6% (2018/19) had severe effects on the overall sectoral performance. Other subsectors need to increase investment in manufacturing R&D activity to gain a competitive advantage globally.

The role of the government has been crucial to the success of industrialisation in several countries in East Asia, including South Korea, Taiwan, and Singapore, according to [Nayyar](#). Similarly, the South African government must play a critical role in improving R&D activity in manufacturing and other sectors. Policy should concentrate on all manufacturing industries and support traditional manufacturing firms in using R&D to close the technological gap between South Africa and industrialised countries. Our findings indicate that R&D in the manufacturing sector is not entirely in crisis, but all firms must play their part in enhancing research and innovation at large.

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**Photo:** Sasol, Brand South Africa

# Innovation and firm performance in South African manufacturing and services businesses

Ever since the German political economist Joseph Schumpeter [highlighted the importance of innovation in economic development in 1934](#), innovation has been widely regarded as the key factor influencing firm performance. In fact, many firms seek ways to achieve greater profits and productivity through different types of innovation. As global market competition and constantly changing technologies continue to erode the value-add of existing products and services, firms need to find new ways to keep up with the market.

By **Amy Kahn** and **Atoko Kasongo**

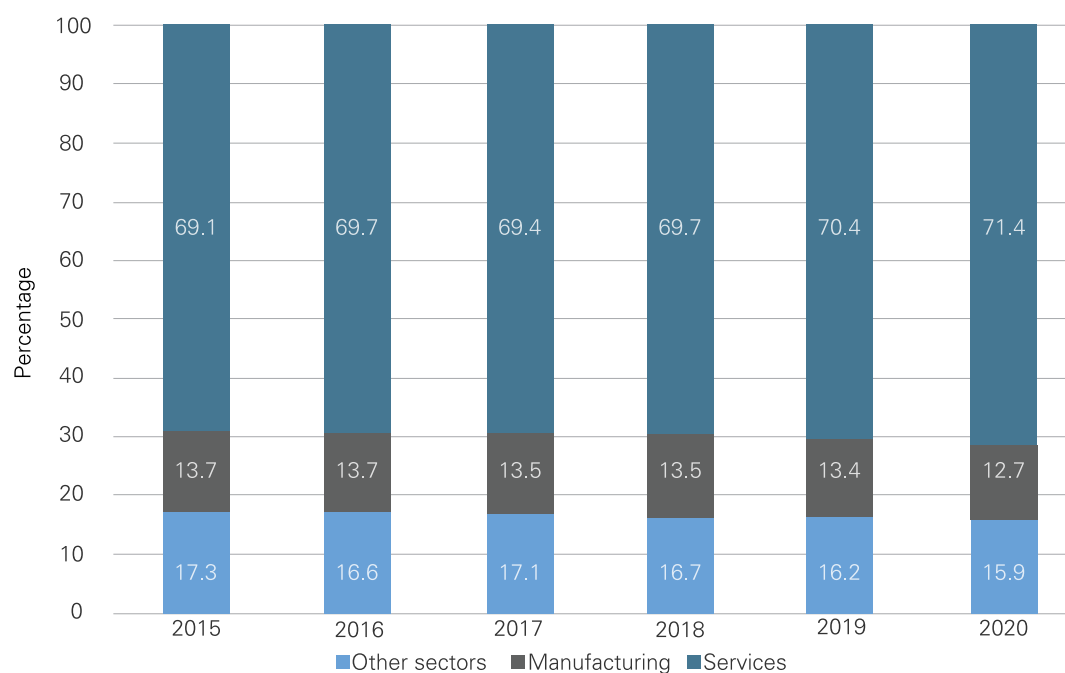
To remain competitive, firms must treat innovation as a vital component of their corporate strategy as they seek to develop more productive manufacturing processes, perform better in the market and earn a positive reputation among customers.

South Africa lags behind other emerging markets in terms of technological progress and there is insufficient innovation in private firms. Increased competition from other countries, including those in East and South Asia, means that we must invest more in innovation to stop falling further behind.

To design effective instruments to promote innovation, policymakers need to better understand what drives innovation in South African firms at the sectoral level. There is also a need to understand how innovation can improve firms' productivity and competitiveness in the world economy, in turn benefiting the South African economy and society at large.

Data from a Statistics South Africa (Stats SA) [report for 2020](#) show that the manufacturing and services sectors emerged as the major contributors to gross domestic product (GDP) in South Africa.

**Figure 1:** Sectoral contribution as a share of GDP



**Source:** Stats SA (2020) Statistical Release

**Note:** Other sectors include agriculture, fishing, and forestry; mining; electricity, gas and water; and construction. The services sector includes trade, catering and accommodation services; transport and storage; communication; finance and real estate; business services; general government services; and personal services.

South Africa needs skilled labour for technological innovation in the manufacturing sector. The shortage of engineering practitioners as well as artisans and technicians with tertiary education underscores the need for investment in post-school education and training, including technical vocational education and training colleges, with a focus on the science, engineering and technology fields.

**Photo:** [Pexels](#)





Photo: Alexander Little, Freepik

Both sectors are regarded as highly important for economic growth and employment. In South Africa, manufacturing is particularly important in creating jobs for the unskilled working population. In addition, manufacturing can generate an increased demand for services inputs, thus helping to grow the services sector. However, while manufacturing accounts for, on average, 13% of GDP, it has declined over the last two decades, and faster than in South Africa's BRICS counterparts, according to a [2018 paper](#) by Carl Friedrich Kreuser and Carol Newman. By contrast, the services sector on average contributes 65% of GDP, a significant increase from nearly 60% in 2000. In addition to its significant contribution to GDP, the services sector accounts for 63% of employment and 74% of capital formation in South Africa, according to Stats SA.

Although it makes a lower contribution to GDP in comparison with services, manufacturing accounts for most of the R&D in the South African economy. At the same time, manufacturing firms' spend on R&D in South Africa is low by international standards.

Given the significance of these two sectors, it is imperative to investigate the role of innovation in a bid to boost economic growth. This is emphasised in the [White Paper on Science, Technology, and Innovation 2019](#), which points to innovation as a means to modernise and grow South Africa's manufacturing sector. Research using Business Innovation Survey (BIS) data collected by the HSRC's Centre for Science, Technology, and Innovation Indicators (CeSTII) highlights how innovation can be promoted in manufacturing and services firms.

### **Measuring innovation and CeSTII's Business Innovation Survey**

Innovation is a difficult concept to measure. The [Oslo Manual](#), first published by the OECD in 1992, aims to formalise and standardise the measurement of innovation, as well as allow for international comparability of data between countries. The manual provides a set of guidelines to collect and interpret data on business innovation and has been adopted by innovation surveys in over 80 countries, including emerging economies.



practices or workplace organisation.

Recent research using [CeSTII's BIS data](#) investigated the role of innovation in stimulating productivity in South African firms in the manufacturing and services sectors. Both sectors contribute significantly to the economy and therefore deserve particular attention when researching innovation and productivity in South Africa's business sector.

The research on the manufacturing sector highlights some important policy issues. For example, the data show that public financial support for innovation can help to stimulate a firm's investment in innovation. The results of this research can in turn guide policymaking. For example, the DSI could consider expanding the suite of public financial instruments, such as incentive grants, tax incentives or new kinds of subsidies, to enhance innovation efforts to support manufacturing firms' increased productivity.

The research also investigates the importance of skilled labour as an input into technological innovation in the manufacturing sector. This is particularly relevant in the South African labour market where there is [a big shortage](#) of engineering practitioners as well as artisans and technicians with tertiary education. This underscores the need for investment in post-school education and training, including technical vocational education and training colleges, with a focus on the science, engineering and technology fields. We also need strategies to retain highly skilled workers in the country.

The services-sector investigation shows that both technological (product and process) innovation and non-technological (marketing and organisational) innovation improve productivity in firms. However, non-technological innovation has a larger impact than technological innovation. Policymakers in the relevant departments (DSI; Department of Trade, Industry and Competition; and Department of Higher Education and Training) should design instruments that take this distinction into account. In addition, the results lend support to the use of market sources of information. As such, demand-side intervention such as the promotion of public procurement contracts are vital to boosting innovation in services firms.

In conclusion, the importance of innovation to firm performance and economic growth at large cannot be overemphasised. Further innovation research at the sectoral level is important to develop targeted policies to support firms and encourage innovation if South Africa is to meet its developmental goals.

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The [South African BIS](#) is one example and has been conducted by CeSTII since 2005 on behalf of the Department for Science and Innovation (DSI), formerly the Department of Science and Technology.

The latest edition of the Oslo Manual, published in 2018, defines 'innovation' as 'a new or improved product or process (or combination thereof) that differs significantly from the unit's previous products or processes and that has been made available to potential users (product) or brought into use by the unit (process)'. A product innovation, which is categorised as a technological innovation, includes new or improved goods or services, such as improvements in technical specifications, components and materials; user-friendliness; or other functional characteristics. A process innovation is the implementation of a new or significantly improved production or delivery method and includes marketing and organisational changes, which are considered non-technological innovations. A marketing innovation can include new packaging, product promotion and pricing, while an organisational innovation can include new business



# Gearing up: R&D and innovation capabilities in three South African state-owned enterprises

State-owned enterprises (SOEs) are an integral part of South Africa's economic development. In recent years, there has been widespread public scrutiny concerning the public value of SOEs and their place in the economy. But what about their potential for generating new knowledge, delivering innovation and promoting economic transformation? Do SOEs have research, development and innovation capabilities and how can these be nurtured? The HSRC's Centre for Science, Technology and Innovation Indicators (CeSTII) studied three of these enterprises to find out.

By **Jerry Mathekga**

SANEDI has R&D programmes dedicated to cleaner fossil fuels, smart grids, working for energy, data and knowledge management, cleaner transport, and renewable energy.

**Photo:** Tom Swinnen, Pexels



In a June 2021 edition of his weekly newsletter, President Cyril Ramaphosa [wrote](#) that ‘state-owned enterprises (SOEs) should be at the forefront of South Africa’s economic and social transformation’. This is because they provide infrastructure and services on which the economy depends, such as electricity, transport, freight logistics, water, and telecommunications, Ramaphosa argued. Such services also help to ensure that the basic needs of all South Africans, particularly the poor, can be met. But does this mean that SOEs are sufficiently geared to leverage research and development (R&D) and innovation to meet their mandates while supporting all citizens and fostering inclusive economic growth?

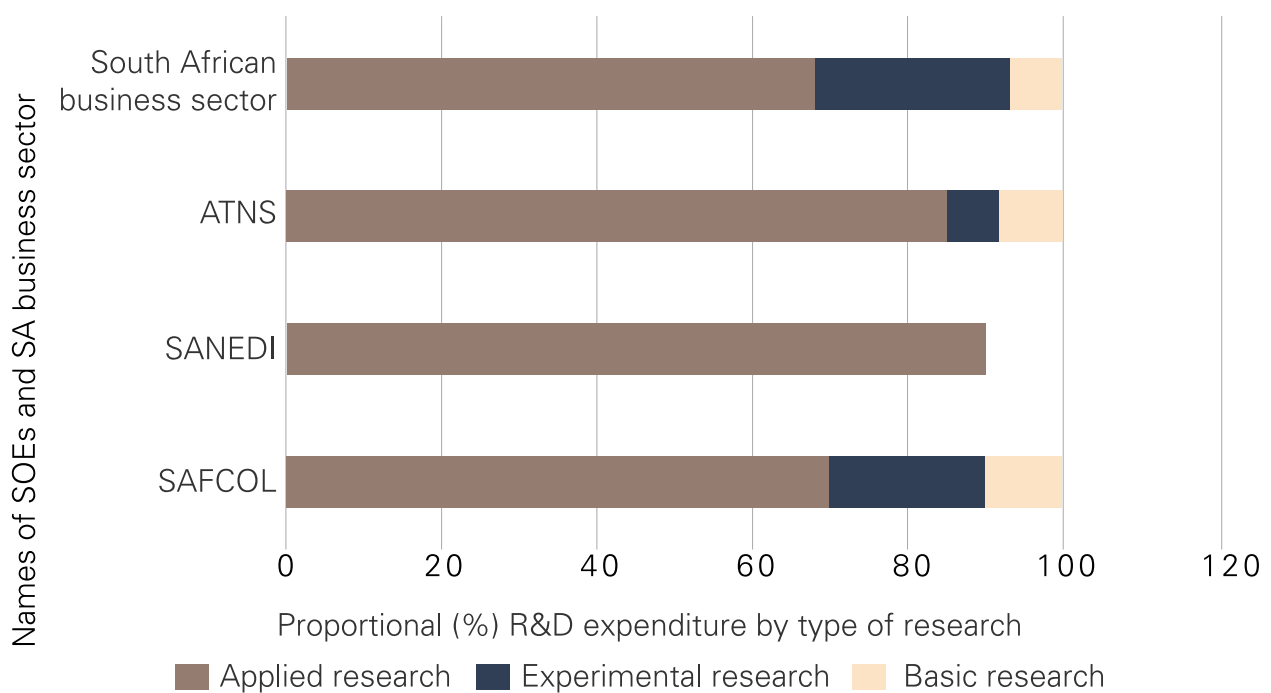
Using a case study approach, the HSRC’s Centre for Science, Technology and Innovation Indicators (CeSTII) explored how three SOEs – Air Traffic and Navigation Services (ATNS), the South African National Energy Development Institute (SANEDI) and South African Forestry Limited (SAFCOL) – were geared to perform R&D and innovation.

### R&D and innovation in SOEs

A key finding was that ATNS, SANEDI and SAFCOL all have relatively well-established R&D programmes and teams. All three consistently reported spending more than 65% of their R&D budget on applied research (Figure 1), which the Organisation for Economic Cooperation and Development’s [Frascati Manual](#) 2015 describes as ‘original investigation undertaken to acquire new knowledge’. This research is directed at specific, practical aims. Moving beyond applied research, experimental development then draws on existing knowledge aimed at introducing new or improved products or processes. Researchers may also perform basic research, which may be more theoretical without any particular application in view – often the domain of universities researching fundamentally new knowledge.

ATNS conducted applied research focused on aviation and non-aviation technology, enabling the SOE to modify its existing equipment to suit its special requirements as well as its operational and environmental conditions. SANEDI’s R&D programmes focused on applied energy research and demonstration, with six sub-programmes dedicated to cleaner fossil fuels, smart grids, working for energy, data and knowledge management, cleaner transport, and renewable energy. SAFCOL’s R&D programmes were focused on aspects of the forestry business, mainly timber harvesting, processing, and related activities.

**Figure 1:** Proportional (%) R&D expenditure by type of research: SAFCOL, SANEDI, ATNS and South African business sector, 2017/18 and 2018/19



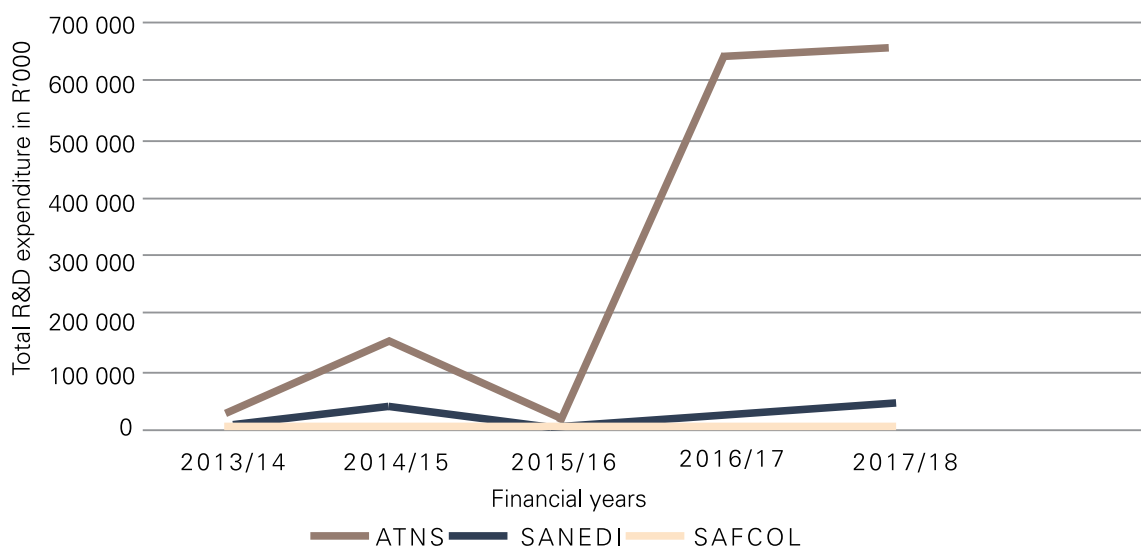
**Source:** CeSTII Annual Survey, 2017/18 and 2018/19

SOEs tend to perform applied research more than experimental development, when compared with the South African business sector (Figure 1). This is not too surprising because one function of SOEs is to support private-sector businesses through providing services rather than generate innovations in the form of artefacts through experimental development. The question is whether the governance requirements for SOE mandates are sufficiently flexible to allow them to focus on innovation as a key strategy. Typically, many SOEs have used R&D for infrastructure maintenance.

### Three case studies

We found some quantitative evidence to support the argument that the three SOEs were well geared to perform R&D and innovation effectively. A common proxy used to indicate R&D activity is R&D expenditure, which is the sum of expenditure on R&D-relevant vehicles, plant, machinery and equipment; land, buildings and other structures; labour; and other current expenditure. The three SOEs' expenditure on R&D has gradually increased over recent years, with ATNS significantly ramping up R&D activity in 2016/17 – see Figure 2.

**Figure 2:** Total R&D expenditure: ATNS, SANEDI and SAFCOL (R'000), 2013/14 to 2017/18



**Source:** CeSTII Annual Survey 2013/14 to 2017/18; SANEDI 2017/18

After considering the attributes of SOEs and the literature on innovation systems, we examined five qualitative dimensions of R&D and innovation: governance, human capability, technological capability, research infrastructure, and networking and collaboration.

#### Governance

As it was key to their respective businesses, the three SOEs reported continuous investment in R&D and innovation activities, which were investments incorporated in the innovation portfolios of each SOE's executive structure. Sound strategies were also in place to promote, manage and execute R&D and innovation activities. For instance, SANEDI had reported a small but capable workforce driving its research and innovation, while SAFCOL illustrated how it had incorporated R&D and innovation within its executive structure and had made a strong effort to drive business revenue growth and efficiencies. ATNS strategically identified R&D and innovation as key drivers of growth. Its management promoted an R&D strategy to respond to the challenges that face the aviation industry in the context of the Fourth Industrial Revolution.

#### Human capabilities

All three SOEs employed a cohort of internal R&D personnel, ranging from technicians to researchers. Though maintaining in-house capacity to perform R&D remained a challenge, the SOEs overcame this through collaboration and training. ATNS had a training academy providing aviation-related and safety-related courses to its staff. SAFCOL worked with the University of Pretoria to build capacity in the field of forestry-related research and other forestry activities, and SANEDI had networks with universities and other organisations as part of capacity building in the engineering and IT fields, among others.

#### Technological capability

It was evident that, over time, the three SOEs had built technological capabilities within their respective areas of research and development. For example, ATNS's technological capability building was characterised by capital investments in new air-navigation infrastructure sites (for example the control tower at King Shaka International Airport), technology acquisitions (high-frequency radio), systems for information and communication (NAFISAT), training programmes (AMDP), and collaborative networks. These investments, together with the human capacity developed to operationalise the associated technologies, represented a substantial track record of technological capability within the organisation.

SAFCOL had timber and non-timber technological capabilities. Its timber capabilities spanned the entire timber value chain, from genetic engineering and breeding to sawmilling and beneficiation of timber products. SAFCOL demonstrated substantial capabilities across the value chain. Its non-timber capabilities encompassed community-based forestry and cooperatives, training, and eco-tourism.

SANEDI's technological capability in its research programme and project architecture included carbon capture; a utilisation and storage project; smart-grid projects to improve municipalities' capacity to operate sustainable electricity distribution; financial models; and several community-focused renewable-energy initiatives targeting poor rural communities.

#### Research infrastructure

For all three SOEs, research infrastructure presented a challenge, though for different reasons. SAFCOL had a dedicated research centre with a research team, but ATNS

and SANEDI only had research teams. To address gaps, the SOEs collaborated with different organisations and universities to access research infrastructure. There was, however, a need for more research infrastructure such as laboratories, demonstration equipment and software programs.

### Networking and collaboration

While the three SOEs performed other functions in addition to R&D and innovation, the positive effects of their collaborations with universities and other organisations were evident. This suggests that efforts to promote collaboration could be valuable for other SOEs and help improve their R&D and innovation capabilities. Existing partnerships benefited the three SOEs by deepening the expertise in their respective sectors – energy for SANEDI, forestry for SAFCOL and aviation for ATNS. Furthermore, these partnerships provided research infrastructure, solving sector-specific problems, building capacity, and providing funding, among others.

### Strengthening SOE R&D to contribute to inclusive economic growth

Many opportunities exist within South Africa's SOEs to use R&D and innovation activities and capabilities to achieve their developmental and economic goals. It was evident that the three SOEs were gearing up to perform R&D and innovation more efficiently and effectively in the future. It was positive that all three enterprises demonstrated tangible efforts to improve their internal capabilities and strengthen collaboration and partnerships with complementary organisations to retain and build sustainable and effective R&D and innovation capabilities. More research in this vein could assist broader policy monitoring and evaluation efforts as part of broader SOE reform.

### Research reports on SOEs

In 2017/18, CeSTII completed a research report commissioned by the Department of Science and Innovation entitled Research & Development Trends in State-owned Enterprises in South Africa: A Baseline Research Report. The findings were validated at a workshop, which suggested CeSTII further assess the R&D and innovation capabilities of South African SOEs. This was taken forward as a dedicated case-study research project. The reports from this project are now in preparation, with a report for each SOE studied and a synthesis report covering findings from the three SOEs. This article is based on the synthesis report.

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SAFCOL's capabilities spanned the entire timber value chain, from genetic engineering and breeding to sawmilling and beneficiation of timber products.

**Photo:** SAFCOL

# Informal businesses catalyse innovation in Mpumzuza, Sweetwaters

Conventional thinking sees formal and informal businesses as binary opposites. But a recent study by the HSRC's Centre for Science, Technology and Innovation Indicators reveals that informal traders engage in dynamic processes to catalyse innovation and contribute to the growth of their micro- and small-scale enterprises.

By **Nazeem Mustapha** and **Nicole van Rheede**

Innovation is typically associated with high-tech multinational corporations at the forefront of technology, algorithms, and artificial intelligence, but a growing body of literature shows that innovation can take different forms in a variety of contexts. We found the definition of 'innovation' provided in the latest version of the Organisation for Economic Cooperation and Development's [Oslo Manual](#) to be suitably comprehensive to not only research, but also measure innovation in the informal business sector:

*...innovation is a new or improved product or process (or a combination thereof) that differs significantly from the unit's previous products or processes and that has been made available to potential users (product) or brought into use by the unit (process). (OECD, 2018, p.32)*

Businesses in the informal sector are by necessity very innovative. For that reason, innovation may even be considered a characteristic of informal businesses. In general, innovation in the informal sector is non-technological and takes place at the level of the individual or household. The main innovation activity that informal enterprises undertake involves using new equipment and tools to develop capability.

Much innovation activity also lies in imitating and even copying the products and services of formal and informal competitors. The types of economic activity engaged in may rapidly change within a single informal enterprise, as it adapts to changes in customer demand. Such agility

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The informal sector is not the last refuge of the marginalized and dispossessed, but a site of considerable entrepreneurial agency, energy, and innovation (*Crush & Young, 2019, p.5*)

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is necessary for informal-sector enterprises to survive, given the socioeconomic context in which they operate, characterised by low household incomes and limited support. Despite this, the spirit of the informal business owner represents a willingness to adapt to changing circumstances and grasp new opportunities.

In 2017 and 2018, our team conducted a baseline survey to measure innovation in the informal sector. Based on an analysis of the full study sample of close to 1 000 businesses operating in Sweetwaters (Ward 1, Mpumzuza, Msunduzi Municipality, KwaZulu-Natal), we found that most innovation activity occurred in the day-to-day activities of an informal business.

The most prevalent innovation mode was when employees 'learn by using' (83.6%), followed by doing everyday work tasks (57.6%) and imitating the products of formal businesses (44.4%). Businesses notably added new products quickly to their existing offerings, based on anticipated customer needs or as a result of customer requests – a common practice in food retail or food-service informal businesses.



HSRC researchers conducted a baseline survey to measure innovation in the informal sector in Sweetwaters, KwaZulu-Natal.

Photo: HSRC

Using the survey results to understand the informal food sector, our team conducted a digital storytelling workshop and casestudy interviews to explore the dynamics of innovation in the informal food sector in more depth.

### Degrees of informality

There is a rich range of informality in Mpumaza's informal food sector, with the level of informality depending on many factors such as firm size, registration status, the keeping of financial records, business premises and access to finance. A formal, sustainable microenterprise is characterised by its strengths with regard to each of these factors. The process of innovation supports the business evolution required to build and strengthen local food-sector value chains serving low-income and impoverished households.

The dynamics of the informal sector are such that conceptualising informality as the binary opposite of the formal sector belies the diversity of shape, size and resilience strategies to be found in the informal sector. Rather, formality is better conceptualised as a process encompassing varying degrees. It is also not progressive or linear, as businesses can fall and rise with varying degrees of formality multiple times in their business lifecycle. Based on this, we need to understand the pathways through which informal businesses evolve and become sustainable in order to inform policies with the aim of supporting transformative and inclusive change in this important sector.

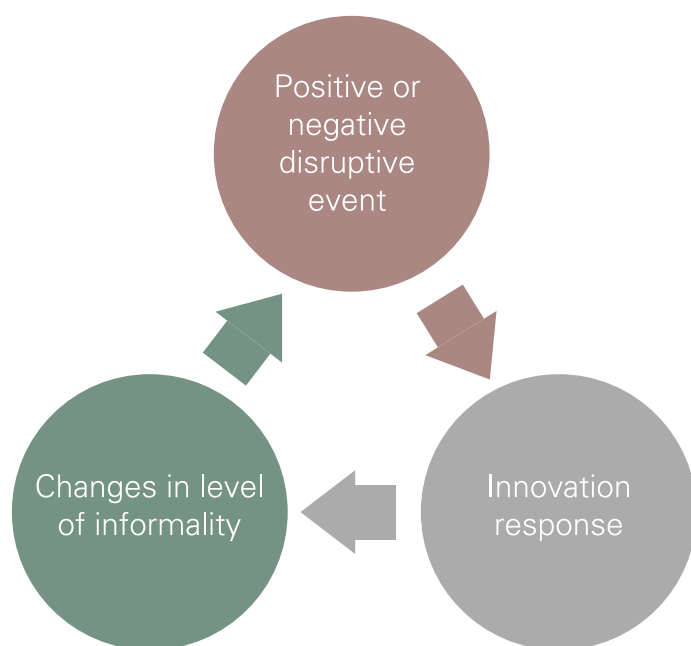
Our study mapped the degrees of formality of 271 food businesses in accordance with a framework described by Ahmadou Aly Mbaye and Fatou Gueye in [Formal and Informal Enterprises in Francophone Africa: Moving Toward a Vibrant Private Sector](#) (2020), which includes criteria like enterprise size, registration status, maintenance of financial statements, access to business premises, and access to finance.

Criteria are cumulative and their fulfilment gives rise to different levels of informality. When no criteria are fulfilled, the business is considered totally informal. When one criterion is fulfilled, the business increases in formality and moves to a higher level. Criterion 1 is fulfilled if the business employs more than five people, thereby attaining a higher degree of formality. Registration with a tax authority or the department responsible for trade and industry or any other official registration results in criterion 2 being fulfilled. If the business maintains regular, accurate accounts and financial statements, then criterion 3 is met and a higher degree of formality is achieved. If the business has premises it operates from and has received any external finance in the previous five years, the last two criteria will be met, resulting in a lower degree of business informality.

Reframing formality as a process rather than a state means that the interaction between the business and other actors can be considered as enhancing informal-business capabilities.

### Innovation within degrees of formality

The study enabled us to explore whether innovation contributes to changes in formality. What we found was that a change of formality was attributed to innovation and that this often occurred in response to a disruptive event that the business owner experienced. Disruptive events ranged from financial difficulties to illness or crime, where the owner's response brought about a change in the business to ensure its survival.



Source: Innovation in the Informal Sector Food Case Study, CesTII 2020

Innovation by the owner in response to a crisis aligns closely with the degrees of formality and informality [depicted by Mbaye and Gueye \(2020\)](#), such that owners may move premises for more security as a result of crime, close a bank account to reduce costs or implement new systems to manage finances when faced with financial difficulty. We found that these innovative 'adaptive' capabilities of informal businesses meant that disruptive events could result in lower or higher degrees of informality and have a transformative impact. The box below contains a vignette from our case study contextualising this relationship (a pseudonym is used).

### **Mandla's flowers and vegetables**

A key asset of Mandla's business was a vehicle, which was lost after the owner was involved in an accident. The vehicle had been used to transport produce from the owner's dwelling to various customers.

After the accident, the vehicle was scrapped, leaving the owner stranded, and preventing the business from carrying out deliveries and providing transport. This event compelled the owner to diversify the business beyond the delivery of flowers and vegetables, and to seek out alternative opportunities for the sale of products.

This process resulted in new sales at a weekend flea market in addition to undertaking deliveries when the owner was eventually able to purchase another vehicle. The outcome was business growth and new market opportunities.

### **Understanding informality for better policy development**

Innovation is characteristic of informal enterprises and takes many different shapes in the informal sector. It is frequently triggered by disruptive events that help businesses to survive, stabilise and grow. By shifting the focus from business formalisation to innovation, policy could more realistically improve the development of businesses in the informal sector. If the goal is to have informal-businesses formally registered, then understanding formality as a process reveals multiple leverage points for policy intervention to not only facilitate business registration, but also to help businesses become sustainable and equip owners with knowledge, networks and tools for growth.

Our study looked at informal business as the access point to understand its location and interactions within a local innovation and production system. Future research will seek to understand how the innovator or informal-business owner promotes their own location and interactions within that system.

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Researchers conducting an informal innovation survey meet Mr Gwala at his business premises in Mpumuza, Sweetwaters, to learn more about the challenges and opportunities of the local business environment.

**Photo:** HSRC



# Paradigm shift: The value of transformative innovation policy for South Africa

Harnessing innovation can help us achieve inclusive and sustainable development goals, but it requires system-wide transformation, write **Glenda Kruss** and **Il-haam Petersen**



Policymakers globally agree that innovation is critical to addressing our societal and environmental challenges, in line with the Sustainable Development Goals set out in the 2030 Agenda, 'Transforming our World'. Doing so across different countries requires systemic transitions and transformative change – and this means new ways of doing things and new ways of framing policy problems and their solutions. System-wide transformation requires innovative solutions beyond technological interventions alone. Piecemeal, short-term and partial policy interventions can quickly reinforce persistent challenges, or even create new complexities.

The debate in South Africa is now about how innovation is best harnessed to achieve inclusive and sustainable development goals. 'Transformative innovation policy' is a new approach that builds on the potential of citizen movements, firms, governments and knowledge organisations to co-create solutions using participatory approaches.

South Africa has participated actively over the past four years in the [Transformative Innovation Policy Consortium](#), which brings together policymakers, academics and practitioners to experiment with new approaches to policy design, implementation and evaluation.

Local policymakers are no strangers to designing implementation plans using a logical framework model, now established practice in many government departments. Many have learned to set clear goals for their interventions, using a logframe or linear theory of change to define input activities and their expected outputs, outcomes and impacts. Despite this, many policy interventions fail to

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The Transformative Innovation Policy Consortium is a five-year transdisciplinary research and action programme where STI policymakers from the Global North and South worked with a research team to articulate the concept of transformative innovation policy, explore how to use it in practice, and build capabilities around it. (Ghosh et al., 2021)

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achieve their intended outcomes and impact. Monitoring, evaluation and learning tend to focus on managing objectives and compliance. Typically, policy actors do not coordinate their efforts; there is insufficient consideration as to what works (or doesn't) and why, or interventions are not adequately designed to achieve the intended outcomes and impact.

What transformative innovation policy does differently is to focus attention on the conditions and dynamics that prevent the desired changes from taking place. It draws on sustainable-transitions theory to shift our focus to socio-technical systems change to enable change in the desired directions. It also tries to bring together academic and policy knowledge through intentional and reflexive praxis (a way of learning that explores one's understanding of oneself to improve how one carries out especially work tasks) in settings where collaborative learning (co-learning) takes place.

Globally, the transformative innovation policy approach is evolving gradually, driven by a range of country teams, through a set of learning journeys, each adapting a 'reflexive action framework' and tools to contextualise real-world policy experiments. There is no step-by-step blueprint to achieve transformation. Instead, what is needed is intense commitment to working with complex concepts, making clear how to open up dominant ways of doing things (regimes) and fostering change as shown by new kinds of emerging practices (niches).

For transformative innovation policy to add value in South Africa, a foundation for reflexive policy action and a supportive community of practice are required. To this end,



the South African Transformative Innovation Policy (TIP SA) working group – located at the HSRC’s Centre for Science, Technology and Innovation Indicators (CeSTII) – and the DST/NRF/Newton Fund Trilateral Chair in Transformative Innovation, the 4IR and Sustainable Development at the University of Johannesburg are testing out together with the Department of Science and Innovation ways to address priorities such as promoting sustainable and inclusive human settlements, shifting to a hydrogen and sustainable-energy economy, adopting sustainable and inclusive sanitation technologies, and seeing to a transformed and innovative public sector.

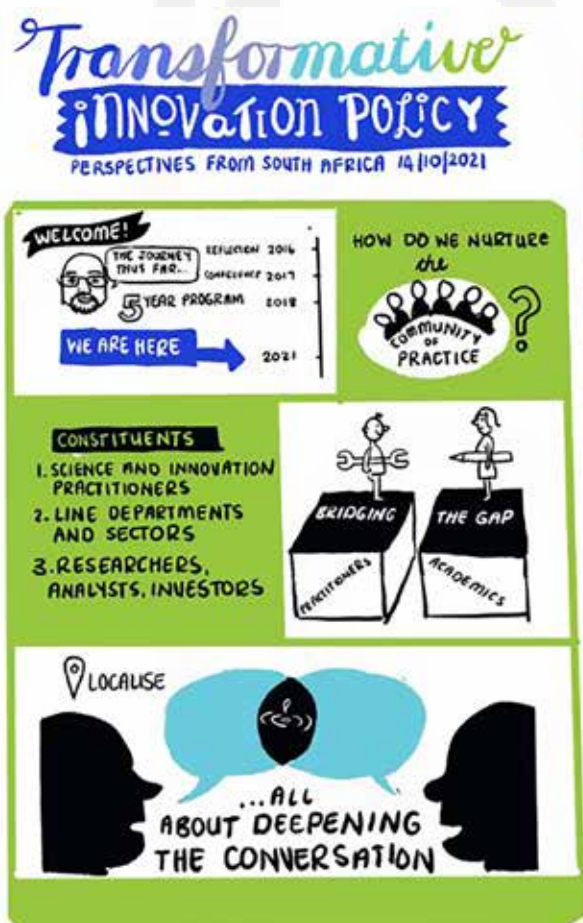
Many of these efforts are aimed at bringing about system change by introducing something that ‘does not exist yet’ and to stretch the thinking of policymakers. A team working on [the Living Catchments Project](#) has systematically used co-learning and co-creation to implement a planned policy intervention more effectively. By bringing together the efforts of different water and environmental networks working in the same fragile ecosystems, they are better able to align each of their policies and desired new practices. In 2021, the TIP SA working group hosted a series of online

learning engagements to encourage local policy teams to reflect on their experience. They looked at the value and challenge of defining [transformative outcomes](#), defining a transformative theory of change, and strategies to open and shift dominant socio-technical systems in a field of practice. The engagements preceded a colloquium in October 2021 ([‘Transformative Innovation Policy: Perspectives from South Africa’](#)) aimed at strengthening synergies among stakeholders and addressing local needs. The aim is to engage critically with the main concepts and practical tools, to serve as a foundation for building a reflexive community of practice.

Read more: <https://www.tipconsortium.net>

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Credit: Nicolene Louw (Fine Line Illustrations, 2021)





## Deepening evidence-based policy capability in Africa's science granting councils

In sub-Saharan Africa, national systems of innovation take distinctive forms, and science granting councils play a central role, balancing multiple mandates to direct, coordinate and monitor national research and innovation activity. The HSRC's Centre for Science, Technology and Innovation Indicators leads a project aiming to strengthen the capacity of these councils.

By **Il-haam Petersen** and **Glenda Kruss**

Gender equality is a key strategic goal promoted at the national, regional and global levels, but STI policy reviews seldom cover national gender policies.

**Photo:** [Freepik](#)

Typically, African science granting councils work with limited funding, human resources and organisational capacity. In this context, the HSRC's Centre for Science, Technology and Innovation Indicators (CeSTII) is part of an international consortium to enable more effective use of evidence in policy and decision making by science granting councils. Known as Evi-Pol, this continental project sees CeSTII adopting a participatory approach in leading participants towards achievements of the project goals.

Science, technology and innovation (STI) are key to addressing deep-rooted social and economic challenges. Science granting councils play a crucial role in a country's national STI landscape: they set national research agendas, manage funds for research and innovation activities, gather evidence on STI, and advise on STI policy. To strengthen their capacity to perform these functions, the [Science Granting Councils Initiative \(SGCI\)](#) was launched by a consortium of international funding agencies, led by the International Development Research Centre (IDRC). Currently, 16 sub-Saharan African countries participate in the SGCI from east, west and southern Africa.

The Evi-Pol project, which was launched in November 2020 and runs to February 2023, responds to a theme under the second phase of the SGCI focused on strengthening the role that science granting councils play in identifying, managing and using evidence in policy and decision making. In collaboration with the consortium lead at Kenya's African Centre for Technology Studies and partners at the Université Cheikh Anta Diop de Dakar in Senegal, CeSTII leads two Evi-Pol work packages: one on strengthening capacity to conduct reviews of national STI policy, and the other on sound data management.

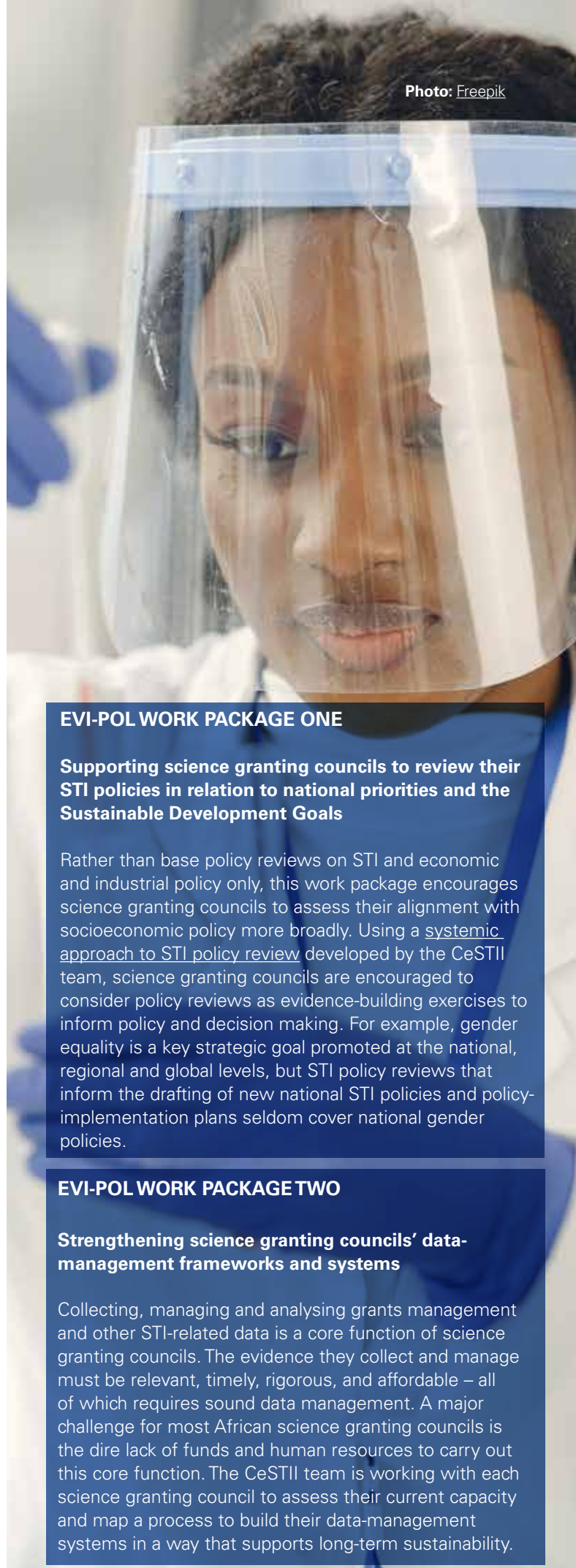
Rather than follow a traditional model of parachuting in experts to transfer skills and knowledge, the Evi-Pol project has taken a participatory approach to technical assistance. The project design emphasised consultation from the start, including the co-creation of solutions, working with local consultants and building local networks. Flexibility in the design and process is encouraged. With this model, much of the project's first year was spent developing work plans, frameworks and instruments through virtual consultative meetings and workshops. Therefore, the technical assistance provided is demand-driven and customised to the needs and capabilities of each science granting council.

Over the next year, the team will work with the science granting councils through interactive training workshops, peer-to-peer learning opportunities and one-on-one coaching. Key deliverables include a set of toolkits to conduct reviews of STI policies, including mapping intended change pathways for policy and building sound data-management systems that align with science granting council mandates and capabilities.

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Photo: Freepik



### EVI-POL WORK PACKAGE ONE

#### **Supporting science granting councils to review their STI policies in relation to national priorities and the Sustainable Development Goals**

Rather than base policy reviews on STI and economic and industrial policy only, this work package encourages science granting councils to assess their alignment with socioeconomic policy more broadly. Using a [systemic approach to STI policy review](#) developed by the CeSTII team, science granting councils are encouraged to consider policy reviews as evidence-building exercises to inform policy and decision making. For example, gender equality is a key strategic goal promoted at the national, regional and global levels, but STI policy reviews that inform the drafting of new national STI policies and policy-implementation plans seldom cover national gender policies.

### EVI-POL WORK PACKAGE TWO

#### **Strengthening science granting councils' data-management frameworks and systems**

Collecting, managing and analysing grants management and other STI-related data is a core function of science granting councils. The evidence they collect and manage must be relevant, timely, rigorous, and affordable – all of which requires sound data management. A major challenge for most African science granting councils is the dire lack of funds and human resources to carry out this core function. The CeSTII team is working with each science granting council to assess their current capacity and map a process to build their data-management systems in a way that supports long-term sustainability.



# Surveys as a public service: The need for a two-way flow of data

Calls for the greater availability, transparency and use of public-interest data have resulted in a plethora of new initiatives aimed at making government and publicly funded research data more accessible.

**Gerard Ralphs, Paul Plantinga** and **Goodluck Madisa** write about the importance of surveys as a public service.

In recent years, South Africa has seen the emergence of ground-breaking portals such as [Municipal Money](#), which provides information on finances for each municipality, and [The Outlier](#), which explores policy issues such as COVID-19 and the elections through the lens of publicly accessible data. We have also seen growth in traditionally private-sector methodologies, such as design thinking, open innovation, and hackathons, to promote participation and innovation around data.

South African organisations [Geekulcha](#), [Open Up](#), and the [SA Innovation Summit](#), are among the leading changemakers in the public data and wider civic technology space. At the same time, the Centre for Public Sector Innovation's regular [Public Sector Innovation Awards](#) is an indication that government is looking to promote these emerging approaches and that formal recognition is important to encourage adaptive cultures of service delivery.

Part of the perhaps unacknowledged contribution of these organisations and their work is to reignite public

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Two-way flows of data between researchers and respondents can foster participation and build shared value

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participation, establish trust, and build shared value between the state and citizens, which is a relationship normally characterised by one-way or top-down data flows.

Considerably less attention has been paid in South Africa to how these one-way data flows could become two-way flows that add value to those who supply the data. This is also true for researchers who tend to stop at the dissemination of findings and research reports. In response, the HSRC, as a large social-science research organisation, has begun exploring routes to foster greater participation and realise new societal benefits.



Photo: HSRC

While this practice has led to necessary public debate over the ownership of data, the principle of two-way data flows has become a foundational transactional principle that users apply in their interactions online.

For researchers and public-sector innovation practitioners working in the data space, these concepts and their applications provide some touchpoints.

### Rethinking HSRC surveys as two-way data flows

Business surveys carried out by the HSRC, such as the annual [R&D Survey](#) and the three-yearly [Business Innovation Survey](#), struggle with response rates.

Where responses *are* received, our concern is that this is mainly because of a 'compliance culture' at the firm or institution. To promote a more meaningful engagement with the survey process, the HSRC's Centre for Science, Technology and Innovation Indicators (CeSTII) has embarked on a new project with internal and external partners to enhance survey-data generation and support respondents' engagement with innovation data and the analytical products produced from the data as a source of firm-level intelligence.

This project adopts the phrase 'Innovation surveys as a service' (ISaaS) to describe its intent. As part of the survey's online data collection, respondents complete survey questions but can also engage with their firm's unit-level and aggregate survey data using the same platform. The vision is of an interactive online-survey methodology that is easy for respondents to use, that saves them time, and that provides them with a service that enables them to engage their data and compare it with the aggregate. The methodology also helps keep personal information safe and data anonymous, as well as enhances cybersecurity. CeSTII's forthcoming R&D Survey will pilot this approach.

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### Data transactions

Rapid and ongoing change in how users interact and transact online can be described using two slightly different business models prevalent in the delivery of web-based services.

[Software as a service](#) (SaaS) refers to services like Google apps that make it possible to work on shared documents in the cloud. [Platform as a service](#) (PaaS), for example Microsoft Azure, allows developers to rapidly build and deploy cloud-based applications on Microsoft data-centre infrastructure.

For PaaS the commercial logic is largely a pay-per-use principle. In contrast, with SaaS, services are often freely available (so-called zero-price products), although the common 'quid pro quo' is that service providers can access user data and user experiences, and use these algorithmically to improve services, launch new products, and develop custom marketing or tools.

# After 2021: Reimagining South African shopping malls

Events in South Africa in July saw shopping malls in Gauteng and KwaZulu-Natal devastated. Beyond restoration and restocking, can these popular places reimagine their identities to be both better and more innovative 'corporate citizens'?  
By **Gerard Ralphs**

In the torrent of media coverage that accompanied the widespread looting and violence in South Africa's Gauteng and KwaZulu-Natal provinces in mid-2021, a key voice to emerge was that of Soweto community leader Nhlanhla 'Lux' Dlamini.

Over the course of one week, Dlamini and others guarded Pimville's Maponya Mall, an established Soweto shopping centre with an assortment of hundreds of restaurants, banking facilities, and both local and global retail stores.

The Maponya Mall was, because of these efforts, one of the few of its kind to be spared in a week of devastation costing hundreds of lives and tens of billions of rands.

A [Daily Maverick 168 interview](#) with Dlamini, published towards the end of the unrest period, shared his account of the significance of the mall beyond simply its economic value.

Photo: HSRC

'The mall has been good to the community, as it employs hundreds of people and feeds many communities, not just Pimville,' Dlamini was quoted as saying. 'If we destroy it, we will be destroying our inheritance from Mr Maponya.'

Although there are now thousands spread across the country's cities and towns, in the South African context, shopping malls are a relatively new phenomenon. Two of the longest standing examples, Johannesburg's Eastgate and Sandton malls, were only built in the 1970s, setting in motion a new localised – though, we should not forget, racialised – 'genre' of consumer experience.

A young entrepreneur at the time, the late Richard Maponya developed the means to acquire a long lease on the land for Maponya Mall in 1979.

It was, however, only in 2007 that the mall actually opened its doors, after nearly a billion rand in investment by the prominent South African, who received the Order of the Baobab award in April the same year.

### More than just a mall

In ways similar but distinctive to metropolitan high streets, like the Champs-Élysées in Paris or 5th Avenue, New York, innovative goods and services from local and global businesses are densely concentrated in South African malls and, as such, are vital to the health of the country's retail and financial sectors.

But malls can and should also be considered innovations by mall owners, like the late Dr Maponya, who are required to strategically judge their geo-positioning, make substantial capital investments, and drive the continuous packaging and repackaging of a mall experience to align with retailer, tenant, and shopper tastes and pockets.

More esoterically perhaps, as sites and spaces that engage in invention and reinvention in relation to the preferences of their 'market(s)' or 'publics', malls can and have become part of everyday parlance, a feature of social life and cultural expression, and even sentimentality.

Scholars such as Martin Hall, Pia Bombardella and Achille Mbembe have studied South African malls like Cape Town's GrandWest, and Melrose Arch and Montecasino in Johannesburg by critically examining their adaptation of heritage symbols or in their appeals to stylised metropolitan identities, such as that of Italy's Tuscany region.

Mbembe, for example, writes playfully about the 'surfaces' of Melrose Arch in an essay entitled '[The Aesthetics of Superfluity](#)' in *Public Culture*: 'Much has been invested in the surfaces of Melrose Arch, including the streets and sidewalks. Tuscan paving stones were chosen for the road surfacing, and Port Shepstone stones were used to accentuate the design and colors (sic) of the building while maintaining an old-world handcrafted feel.'

These studies, to an extent, follow the tradition of post-structuralist scholarship like that of French sociologist Jean Baudrillard's *The Consumer Society: Myths and Structures* (1970), about the Parly 2 shopping centre located west of Paris, which opened its doors in 1969.

Speculating perhaps prophetically in 2005 about GrandWest and Montecasino, Hall and Bombardella [questioned](#) the fate of South African shopping centres. They argued:

'It is too early to tell how these heritage destinations will shake down as competition and over-trading take their toll. But an evening at Montecasino or GrandWest will show that the use of these places is diverse. The movie theatres, food courts and up-market restaurants attract visitors across a wide social spectrum: youth, families, couples on a night out, those attracted to promotions and, of course, gamblers who range from a turn on the slots to addicts. There is an undoubted social cost, with an increase in compulsive gambling by those least able to afford it. There are also social benefits, particularly in the security provided by access control, surveillance and high levels of visible policing.'

They continued:

'They are closely linked to the formation of identity, to the definition of a new middle class, and to the mechanisms of exclusion of most of the population, who can no more afford to be consumers in the new economy than they could in the old.'

### Places for innovation and inclusion

Despite marketing rhetoric boasting inclusion, it is the exclusionary practices that shopping malls – old and young – reproduce that should concern us.

This is because, at their extreme, these practices reinforce broader societal inequalities, rather than bridge vital gaps in communities already deeply fractured.

Inclusion and innovation, in this sense, should not be seen as mutually exclusive, as in the case of Workshop 17 at Cape Town's V&A Waterfront, where thoughtful place-making methods to develop opportunities for small businesses and entrepreneurs to co-grow their skills and operations alongside big brands has, to an extent, been achieved by partnerships between incubator-type organisations and shopping-mall owners.

As sites through which consumer desire is expressed in relation to disposable income and credit, shopping malls have a particular responsibility and, I would argue, opportunity: that is, to find new and creative ways for businesses to be better 'corporate citizens' in the particular societal contexts in which they find themselves. The histories and strategies of Maponya Mall and Workshop 17 could offer some lessons, to this end.

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# Mind the gap: TB prevalence higher than recorded cases suggest

In 2021, South Africa released findings of its first national tuberculosis prevalence survey, which was commissioned by the Department of Health. The data was collected from towards the end of 2017 to 2018, just over a year before COVID-19 arrived in South Africa. **Andrea Teagle** talks to **Dr Sizulu Moyo**, the co-principal investigator of the survey, about the importance of the study, the impact of COVID-19 on South Africa's treatment programme and how to close the detection, diagnosis and treatment gaps.

**Y**oung people as well as men and elderly people with tuberculosis (TB) are falling beneath the radar of TB detection in the healthcare system, according to South Africa's first national TB prevalence survey. The survey illuminated a large gap between the recorded number of cases and the actual number of cases – which had previously not been quantified.

To ensure that the sample captured a nationally representative prevalence estimate for the country, the research team, led by the HSRC's Dr Sizulu Moyo and Dr Martie van der Walt from the South African Medical Research Council, followed standardised survey methodology recommended by the World Health Organization. Overall, 110 clusters (distinct geographic areas) across the country were selected. Within each cluster, 500 people aged 15 years and older normally living there at the time of the study could choose to participate.

In total, 35 191 people over the age of 15 participated in the study, which included a symptom-screening questionnaire, a digital chest X-ray (CXR), the collection of two samples of sputum and optional testing for HIV.

The estimated prevalence in South Africa was 737 per 100 000 people, with a 95% [confidence interval](#) of 580–890. (The confidence interval, which is usually set at 90% or 95%, indicates how precise an estimate is: the wider the range, the less precise the estimate.) By comparison, the prevalence in Eswatini was 352/100 000 in 2018. The survey found an estimated 390 000 cases in 2018 – about 154 000 more than the notified cases.

Generally, detection of TB relies on people being tested and diagnosed in healthcare facilities. But not everyone with TB or TB symptoms seeks care. "The prevalence-to-notification

ratio clearly shows that not all cases are detected and shows where we are missing cases," says Moyo.

Although the highest number of TB cases occurred in the 35–60 age group, the greatest gap in detection occurred in other age groups. The study revealed a prevalence almost three times greater than that indicated by notified cases in young people aged between 15–24 years and older people over 60 years (prevalence-to-notification ratios of 2.91 and 2.88 respectively). Prevalence was much greater (1.6 times) in men than women, and the number of cases was almost double (1.89 times) the notified cases.

## Accounting for the missing cases

A key driver of missing cases is the low percentage of people with TB symptoms who seek care for them. Among the study participants who reported at least one TB symptom, almost two-thirds (66%) had not sought care; among young people in the 15-24 age group this figure was 82%. Men with symptoms are also less likely to visit healthcare facilities, the study showed, with 71% indicating they had not sought care, compared with 63% of women.

Also accounting for missed cases are those that are asymptomatic or sub-clinical: almost 6 in 10 (57.8%) study participants with confirmed TB reported having no symptoms and would thus have had no reason to seek care. Most of these cases (78%) occurred among participants who were not living with HIV and so were less likely to engage with the healthcare system.

"Sub-clinical or asymptomatic TB is a significant area of research, given the potential for transmission. There is ongoing research on how best to deal with this type of TB," Moyo says. However, she also cautions that the true number of asymptomatic cases was uncertain. "For example, we



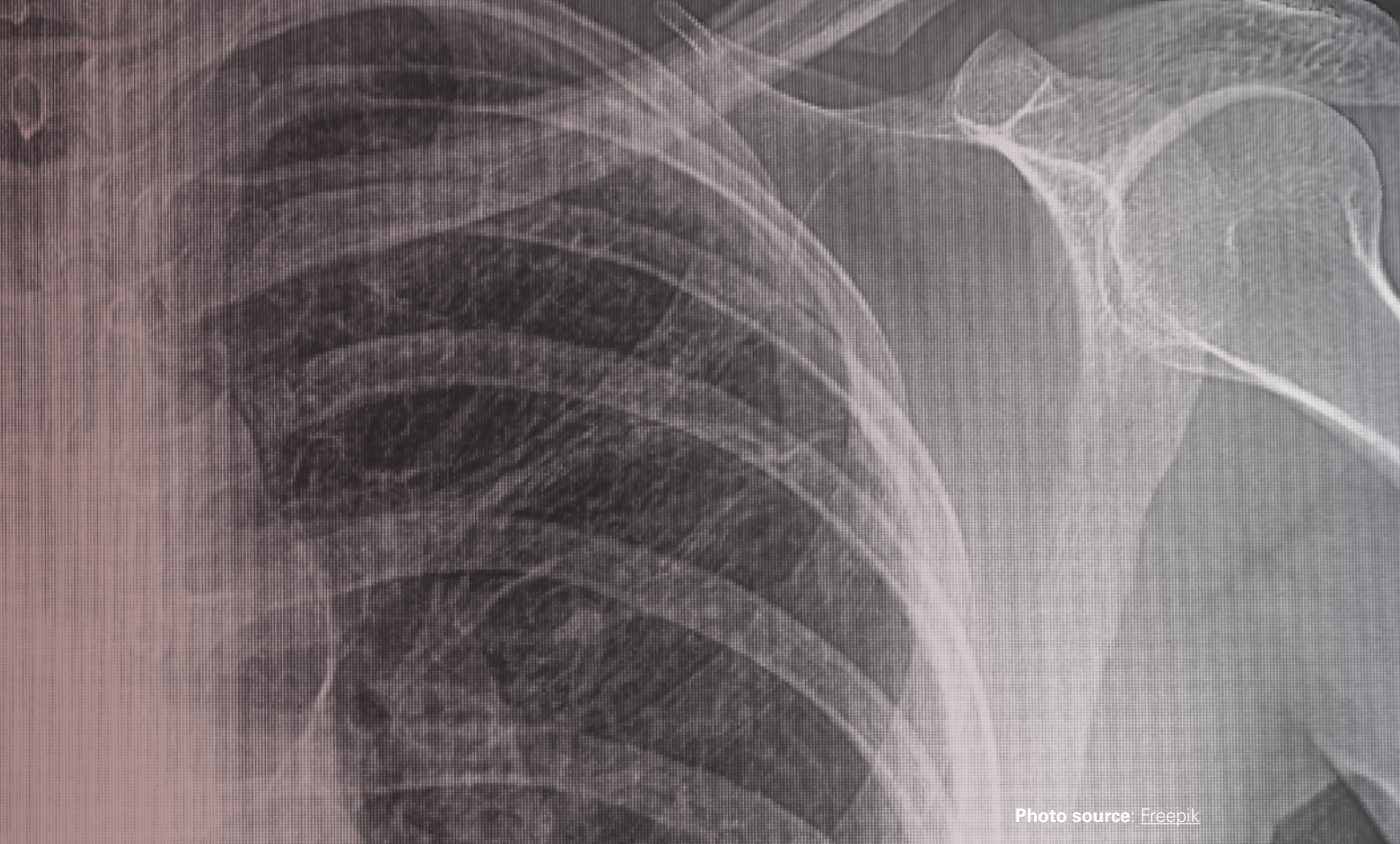


Photo source: Freepik

have to think about the proportion of people we would classify as asymptomatic who actually had symptoms, but decided or felt that it was not important or serious enough to mention.”

### **Closing the gap**

A quarter (27%) of symptomatic participants who had not sought care indicated that it was because they believed their symptoms were not serious enough, while 11% either reported having insufficient money to travel to a facility or reported that the facility was too far away. The majority (60%) of those who had not sought care reported that they still intended to do so.

The reasons for delays in seeking care are likely to be varied, Moyo says. “We need more research to better understand the healthcare-seeking behaviour for TB symptoms in South Africa.”

Some missed TB cases – particularly sub-clinical cases – can be found through [household contact tracing](#). South Africa also offers [preventative treatment](#) (prophylaxis) to people living with HIV in settings with high TB prevalence.

While HIV is a main driver of TB in South Africa, the TB prevalence among people without HIV is also high – almost half of the cases in the survey occurred in people without HIV, and people without HIV were less likely to seek care even when they reported symptoms.

Understanding when knowledge drives people to seek care is critical to increasing uptake of healthcare services for TB detection, Moyo says.

“We have learned that, going forward, we need to continue to strengthen the policies and interventions that deal with

reaching youth and men with TB testing and treatment,” Moyo continues. The TB programme could leverage and combine efforts with the HIV programme in male-focused services such as voluntary circumcision, for example. Additionally, ongoing public messaging should urge people not to be complacent about TB.

“Let us, the people in communities, be aware of TB symptoms and act on them, and our healthcare professionals remain alert for TB when attending to patients,” Moyo says.

Tackling TB in South Africa requires a multi-sectoral approach that bridges the clinical and the social sciences, Moyo believes. We also need to find innovative ways to find missed cases and close gaps in care, particularly after the decline in TB testing that followed the first COVID-19 lockdown.

*The national TB survey was a collaboration between the South African Department of Health TB Programme; the South African Medical Research Council; the Human Sciences Research Council; the National Institute for Communicable Diseases; the World Health Organization (South Africa and Geneva); the United States Agency for International Development; The Global Fund to Fight AIDS, Tuberculosis and Malaria; and the Bill and Melinda Gates Foundation.*

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Seed pods of *Moringa olifera*

Photo: Forest & Kim Starr, Wikimedia Commons

# Harnessing the nutritional benefits of the mighty moringa tree

A relatively new food crop in South Africa, the moringa tree is known for its health benefits: a moringa leaf is almost a third protein and contains many vitamins and minerals. Medicinal properties of the plant, native to the Indian sub-continent, include anti-inflammatory, antioxidant and anti-diabetic properties. Better still, the tree is fast-growing and drought-tolerant, and so is well adapted to the South African climate. As the popularity of the plant grows, so too does the need to understand how growing conditions affect the bioactive compounds that make it so attractive as a means for alleviating poverty and food insecurity.

By **Andrea Teagle**

The cultivation potential of the moringa tree (*Moringa oleifera*), which is native to the Indian subcontinent, has already been demonstrated in many countries. However, variation in quality remains a challenge. In South Africa, where the moringa industry is in its infancy, the Department of Science and Innovation [supports the cultivation](#) of the high-protein crop to alleviate food insecurity.

How does the moringa tree produce its abundance of vitamins, minerals and anti-inflammatory compounds? The concentration of beneficial bioactive compounds in healing plants differs depending on growing conditions. In South Africa, traditional healers have in the past claimed that cultivated indigenous plants [lack the potency](#) of their wild-grown counterparts. This might have a scientific basis: for example, some bioactive compounds are the plant's defence against insects or other pests that farmers kill with pesticides. In other instances, wild-grown medicinal plants might have greater concentrations of certain compounds simply because they are older than faster-growing cultivated varieties.

On the other hand, cultivating plants offers the opportunity to carefully control the growing process, from nutrient availability to temperature. Hydroponic systems, for example, which use fertiliser solution in place of soil, can produce consistently high-quality yields in certain medicinal plants elsewhere in the world.

How cultivation conditions affect the quality of moringa products in South Africa, in particular the concentrations of medicinal compounds, remained an open question. Led by the HSRC's Lavhelesani Managa, a team of researchers set out to answer it.

## Nature and nurture

In 2018, Manga and his team set up their study in the humid city of Pretoria, Gauteng – one of six provinces where [the tree is grown in South Africa](#). The others are Mpumalanga, KwaZulu-Natal, Free State, North West and, most commonly, Limpopo, where it is mostly grown at the household level. They planted two cultivars of interest: the PKM-1 variety and the so-called Malawi hybrid. Half the seeds were sown in a field and the other half in hydroponic systems in shade-cloth covered greenhouses.

Hydroponic farming is increasingly popular in South Africa, as it uses less water, expanding growing possibilities in dry areas. While shade cloth does not allow for full control of the environment, it is an affordable option for South Africa's small-scale farmers.

In the summer of 2018, the team harvested leaves from both types of moringa in the field and the hydroponically cultivated trees. They did the same in autumn (May) and then tested the leaves for concentrations of the compounds of interest. The post-harvesting processes were standardised across the groups: the leaves were airdried in a dark room at room temperature, ground into a powder and stored in a -80-degree freezer until processing.

Then they analysed the samples. The team was particularly interested in moringa's medicinal properties. They measured and compared the concentrations of seven bioactive compounds that might account for its anti-fungal, anti-inflammatory, anti-diabetic and antidepressant properties. These included chlorogenic acid (also found in coffee beans); ferulic acid, esculetin and niazirin (all antioxidants); vanillic acid (also found in vanilla plants); wagonin compounds; and GABA (a natural brain relaxant).

## Hydroponic healers

The analysis revealed that in both types of moringa, the medicinal compounds in the leaves are most concentrated in summer; and that trees grown hydroponically have, on balance, higher concentrations of bioactive compounds. Hydroponic conditions appeared particularly beneficial for PKM-1, which showed statistically significantly greater concentrations of chlorogenic acid, ferulic acid and vanillic acid, compared with its field-grown counterparts.

The differences in concentrations of compounds between field- and hydroponically-grown plants were also more pronounced in the summer harvest.

Only one of the compounds, GABA, favoured field cultivation, according to the analysis.

The team notes that isolating individual factors that contributed to these differences is not possible, particularly as they likely interact with one another and with the genetics of the plant. However, carefully controlling environmental factors, including fertiliser mix, water salinity, temperature, humidity and light, appeared to promote better-quality moringa in terms of its bioactive compounds.

They write, 'continuous supply of fertiliser solution may provide ideal conditions ... particularly when plants are placed under osmotic or salt stress, which boost the natural bioactive compounds of plants.'

Higher concentrations of compounds in the hydroponically-grown plants may have an effect on the antioxidant, anti-diabetic, anti-microbial and anti-inflammatory bioactivity of the leaf products, the authors write.

### Sun lovers

Another notable finding is that the moringa trees produced higher concentrations of bioactive compounds in the summer versus the autumn harvests. The tree's preference for warmer temperatures is good news for South African farmers, particularly in hot areas like Limpopo.

For the Malawi hybrid, chlorogenic acid was significantly higher in summer, while in the PKM-1 variety the summer-harvested leaves had higher qualities of all seven of the targeted bioactive compounds. The difference was significant for both hydroponically-grown plants and field-grown plants.

Which type of moringa tree has greater medicinal properties? The cultivars came out about even, with the Malawi variety having boasted greater concentrations of esculetin, niazirin, wogonin and GABA, while PKM1-1 had higher levels of chlorogenic acid, ferulic acid and vanillic acid.

Although in the case of moringa, desirable properties on balance increased with temperature, irrigation and consistent fertiliser, this will not be the case with all plants. According to Managa, the method could be adapted and used to investigate the cultivation potential and optimal growing conditions of other medicinal plants and herbs, including traditional medicinal plants that are indigenous to South Africa.

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All parts of the moringa tree are edible: the leaves are eaten fresh in salads, the immature pods are often added to soups, and the dried leaf powder can be drunk as tea, as shown above, or added to soups or other dishes.

**Photo:** Hamed Elhaei, Pexels



# Universal **test** and **treat** not enough to end HIV epidemic

Early models of HIV epidemics calculated that near-universal antiretroviral treatment coverage and medical circumcision could almost eliminate new infections. However, as countries like Eswatini reach their 90-90-90 targets, it's becoming clear that this is not the case. Randomised trials in sub-Saharan Africa confirm the feasibility of universal test-and-treat, but localised data and additional preventative measures are needed to reduce new infections enough to eliminate the HIV epidemic.

By **Andrea Teagle**

**S**outh Africa introduced the universal test-and-treat (UTT) approach in September 2016 to manage the HIV epidemic, extending treatment to every person who tested positive, regardless of their CD4 count (a measure of how well the immune system is working).

The UTT approach had twin goals: to enable people living with HIV (PLHIV) to live healthy, long lives and, by getting people onto treatment early, to reduce new infections at a population level.

By 2020, South Africa and other countries aimed to achieve the UNAIDS 90-90-90 target: 90% of PLHIV would know their status, 90% of those diagnosed would be on antiretroviral treatment (ART) and 90% of those on ART would be virally suppressed (meaning that the amount of the virus in the bloodstream is too low for that person to transmit HIV to anyone else). It was expected that achieving these goals, which equates to 72.9% of PLHIV achieving viral suppression, would reduce new infections enough to eliminate HIV epidemics by 2030.

## **Real-world evidence**

According to the fifth national HIV survey, conducted by the HSRC and the Centers for Disease Control and Prevention, South Africa has a way to go to meet the 90-90-90 targets, although we have made significant progress towards the first 90, with 84.8% of PLHIV aware of their status in 2017.

However, as countries now look to reach new, 95-95-95 targets by 2030, there is growing evidence of the effectiveness of UTT and what is needed going forward to eliminate the HIV epidemic.

Five randomised population-level trials in sub-Saharan Africa (Botswana, Zambia, Uganda, Kenya and South Africa) have assessed UTT interventions.

The trials showed that UTT is cost-effective, rapidly and significantly increases the number of people in care, and reduces the number of people who die from HIV-related illness. 'When coupled with robust linkage to HIV care, rapid ART start and patient-centred care, UTT achieved among the highest reported population levels of viral suppression in SSA,' write Professor Diane Havlir from the University of California, San Francisco, and colleagues in the *Journal of the International AIDS Society*. The impact of UTT in these settings must not be understated. However, the reductions in new infections fell far short of what was required to achieve epidemic control, even allowing that the impact on infection might increase over time.

The take-home message is two-fold. Firstly, evidence supports the implementation of UTT as standard policy, particularly in countries with generalised epidemics where most people with HIV are not known. Secondly, measures additional to UTT should be implemented for countries to control their HIV epidemics.

## **Eswatini and South Africa models**

Why has the UTT not reduced new infections as much as early models predicted? Evidence from Eswatini suggests that it is because real-world ART coverage is not equal across different demographic groups that are more or less at risk for transmission, and newly infected individuals are especially infectious. So, if a country's ART programme misses groups that are disproportionate transmitters (young



Ending the HIV epidemic will require expanding preventative measures, such as youth-friendly reproductive and health services.

Photo: [Freepik](#)

men, for example), its effectiveness is compromised. In the sub-Saharan Africa trials, although an impressive 87% of participants on treatment were virally suppressed by the end of the studies, this figure was lower among young people.

Eswatini is one of the countries closest to achieving the 90-90-90 goals. However, despite significant health gains, new infections remain too high to eliminate the epidemic, write Adam Akullian and colleagues. Extrapolating from current statistics, their model, which was published in [The Lancet HIV](#) in 2020, found that even with 100% ART coverage (and annual universal HIV testing) and medical circumcision, HIV incidence in Eswatini would remain above the threshold needed for epidemic control.

Specifically, it would reduce HIV incidence to 7.3 per 1 000 person-years by 2030 and 4.6 per 1 000 person-years by 2050 – still far off the epidemic control target, which is 1 infection per 1 000 person-years. ([Person years](#) is a way to measure rates of new infection and is calculated as number of people multiplied by time. For example, if 500 people are followed for two years over a study, then there are  $500 \times 2 = 1\,000$  patient years of follow-up. If 2 of those participants acquire HIV, then the incidence rate would be 2 per 1 000 person-years.)

In South Africa, another [model](#), taking account of different coverage across risk groups, found the same outcome. It found that reductions in new infections were sensitive to differences in risks between demographic groups, and whether ART coverage (and viral suppression) extended to high-risk PLHIV. Co-author Dr Dimitrov Dobromir and colleagues conclude, 'Reaching UNAIDS treatment cascade

targets does not equate to the end of the HIV epidemic in South Africa.'

### Extending universal test-and-treat gains

In a recent [editorial in The Lancet](#), Professor Ruanne Barnabas from the University of Washington and the HSRC's Professor Heidi van Rooyen note that the Bukoba Combination Prevention Evaluation (BCPE) in Tanzania, in response to the mixed results of the other sub-Saharan UTT trials, successfully employed several strategies to extend access to HIV testing and to initiate and keep more people on treatment.

They offered community-based HIV testing to reach men and young people who might not seek care at clinics and offered same-day ART initiation to everyone who tested positive. Peer counsellors helped to link and keep people in care, following up with individuals who did not return to the clinic within 90 days. When these patients did return, they were welcomed with expedited services and extra assistance.

Van Rooyen and Barnabas note that the study more than halved undiagnosed HIV cases and doubled the number of people on ART. 'Critically, their data-driven approach identified gaps for future interventions to reach men, people who use alcohol, and those living in poverty, thus closing the gaps in HIV care,' they write.

Another gap in care that Havlir and colleagues identified in the sub-Saharan trials, and another reason for lower-than-expected reductions in new infections, is the challenge of reaching mobile populations. Implementing UTT over broader geographic regions would increase the reduction in new infections at the population level.

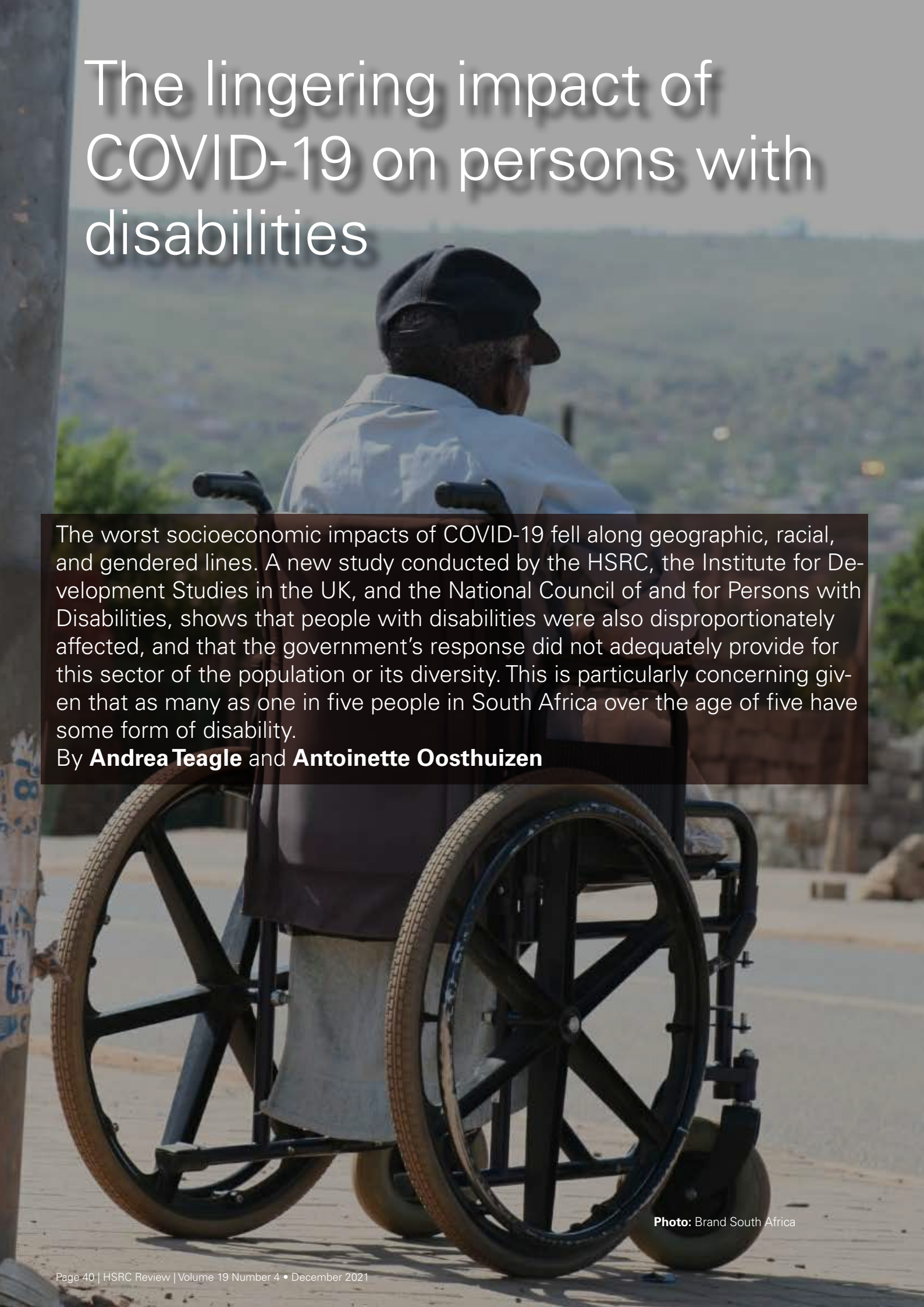
The results of the BCPE trial suggest that bridging demographic gaps in testing and treatment through data-driven targeted interventions valuably extends the benefits of UTT. 'Taking what we have learnt from clinical trials and programme evaluations, incorporating innovations and data-driven adaptations with ongoing monitoring and evaluation, we can maximise health benefits from HIV prevention and treatment programmes ...', Barnabas and van Rooyen write.

Additional preventative strategies that, alongside UTT, could help to reduce new infections to the epidemic control threshold include pre-exposure prophylaxis, youth-friendly sexual and reproductive health services, condom use and [syringe service programmes](#). Dobromir and colleagues argue that more-dynamic models are needed to understand how different high-risk groups contribute to new infections and to identify the most effective combinations of treatment and prevention.

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# The lingering impact of COVID-19 on persons with disabilities

A photograph of a person in a wheelchair, seen from the back, looking out over a cityscape. The person is wearing a light-colored shirt and a dark cap. The wheelchair is black with large, spoked wheels. The background shows a hazy cityscape with buildings and trees under a bright sky.

The worst socioeconomic impacts of COVID-19 fell along geographic, racial, and gendered lines. A new study conducted by the HSRC, the Institute for Development Studies in the UK, and the National Council of and for Persons with Disabilities, shows that people with disabilities were also disproportionately affected, and that the government's response did not adequately provide for this sector of the population or its diversity. This is particularly concerning given that as many as one in five people in South Africa over the age of five have some form of disability.

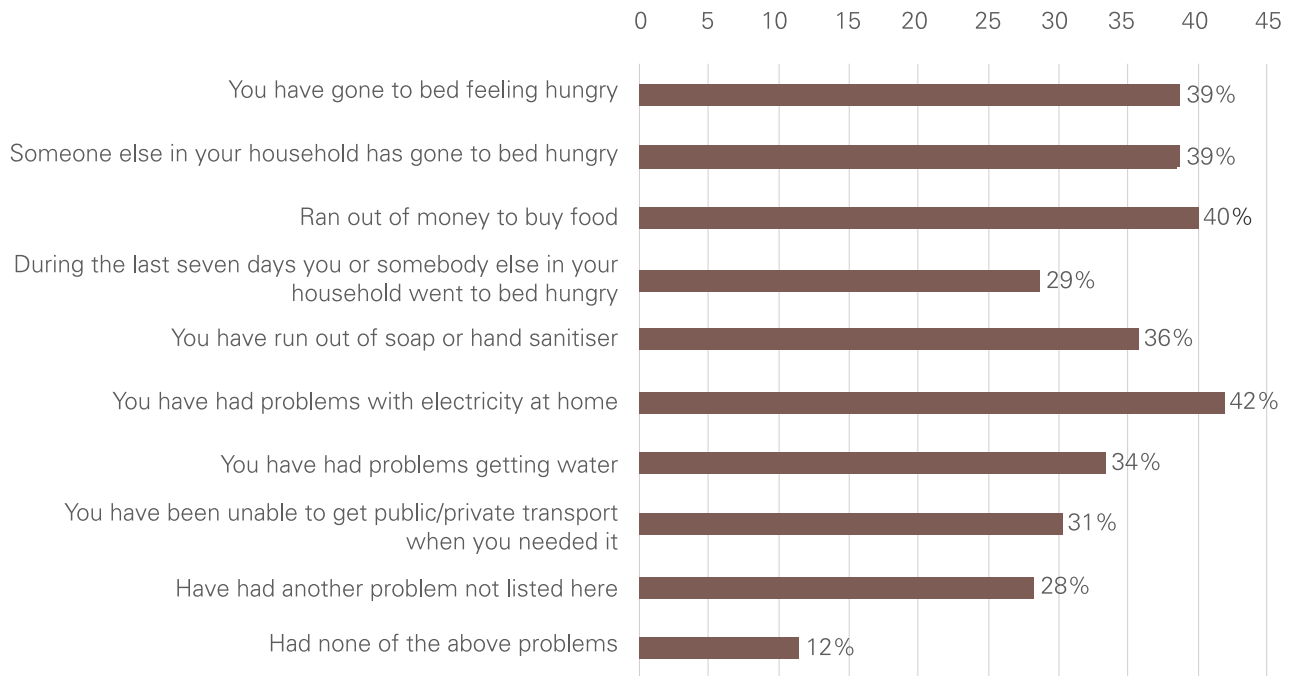
By **Andrea Teagle** and **Antoinette Oosthuizen**

Photo: Brand South Africa



In a recent (July–August 2021) survey of the experiences of people with disabilities during COVID-19, 13% of participants (35% of those employed) reported having lost their jobs because of the pandemic. Although the survey relied on voluntary participation and was therefore not a random sample, the results do suggest that people with disabilities were more likely to be made redundant than other workers. The survey also revealed that 3 in 4 respondents (76%) had difficulty paying for their living expenses due to their financial situation because of the lockdown. And one in four (29%) indicated that they or a member of their household had gone to bed hungry in the week before answering the survey – more than a year after the

**Figure 1:** Experience of events during the pandemic that were not normally experienced



**Source:** HSRC

According to the HSRC’s Dr Tim Hart, the measures implemented during lockdown were not disability inclusive and did not consider the diversity of persons with disabilities. Where government assistance was offered – for example a temporary increase in the disability grant, food parcel delivery at community centres, or sign language accompanying televised COVID-19 messaging – information did not always reach the intended beneficiaries. Food parcels were often unobtainable by those who had some degree of immobility and could not get to the collection points. About half of the survey participants were not aware of any focused government effort to support persons with disabilities. The third who were aware of such efforts mainly noted the temporary increase in the grants and the emergency social relief of distress grant.

Six out of 10 participants said they had some difficulty with accessing information about the pandemic. In many cases, this was related to not being able to read print material or hear radio broadcasts, but it was also due to television broadcasts not having captions and the sign language interpreters not being visible enough.

About half of participants indicated that they believed the general government (51%), the government’s social and health sectors (49%) and non-governmental institutions (48%) did a ‘bad job’ in accommodating the needs and rights of persons with disabilities in their responses to the pandemic.

The diverse needs of persons with disabilities need to feature in pandemic interventions, and also in the disaster-mitigation planning for the recovery phase.

**Photo:** [Freepik](#)

## Financial struggles

The study, supported by the UK Research and Innovation's Newton Fund, specifically aimed to reach persons with disabilities and not the organisations that represent them. Participants could be aided by family, friends, parents, guardians and carers, but the purpose was to hear their voices. The majority of the 1 857 participants were black South Africans (83%), and disabilities included challenges with vision, hearing, mobility, communication, self-care, concentration and memory.

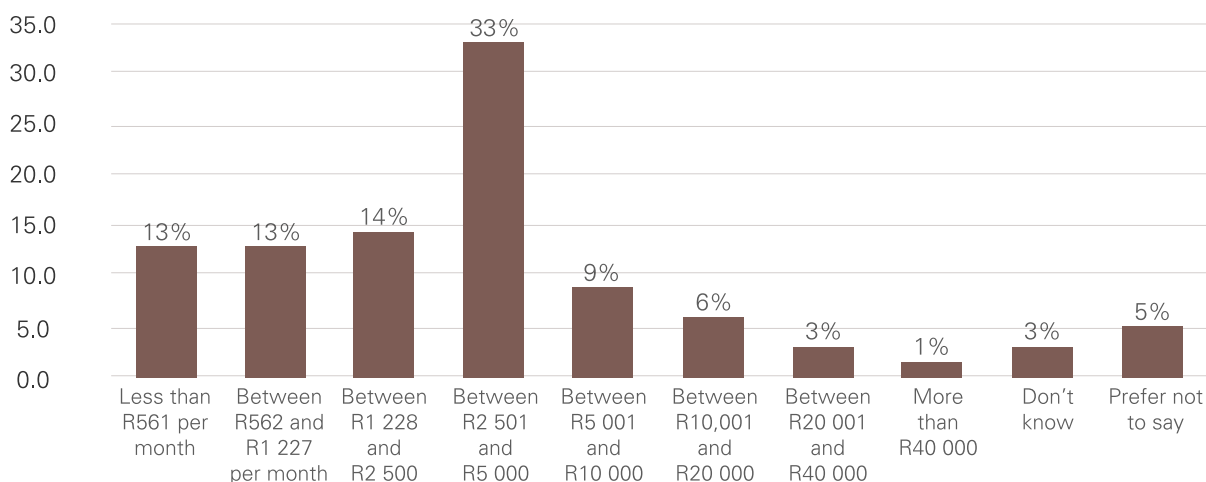
Respondents also reported upper-body immobility, lack of use of hands, and experiences of anxiety or fear, stress and depression (psychosocial challenges).

Although 79% received a social grant from the government, just 31% received a disability grant and 33% received the temporary COVID-19 social relief of distress grant of R350 per month. The remainder received old-age pensions (10%) and child support, care or foster grants (5%). One in five (21%) had been denied a disability grant by the state because of the income means test (19%) or because the state did not recognise their disability (2%). See Figure 2.

Some participants relied on state facilities (37%) to access disability-related services, 25% on organisations such as NGOs and 20% on family and friends. Many had these services disrupted during the pandemic. Over half (51%) said they were currently reliant on support from disability service organisations. With 60% relying on the services of a caregiver or support for daily activities, many experienced disruptions of this care during lockdown. In most cases, the services were unavailable for only a day (29%), but in some cases for weeks and months or it was still ongoing.

Before the pandemic, most participants were already struggling financially: 13% lived on an income below R561 per month

**Figure 2:** Monthly income of persons with disabilities during the pandemic (N=1 857)

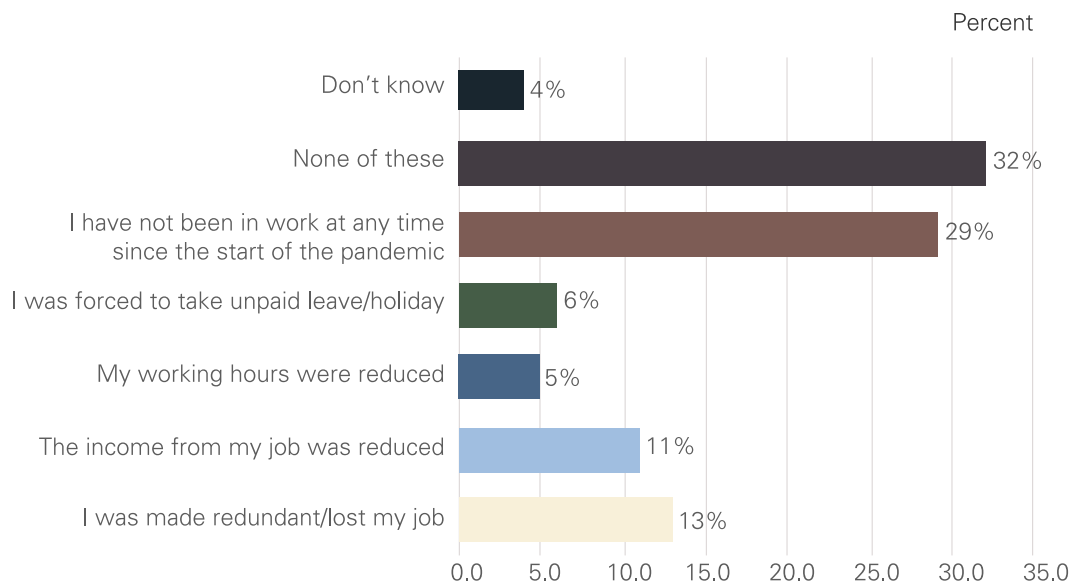


Source: HSRC

and 13% on R562 to R1 227. Another 14% lived on R1 228 to R2 500, and 33% on R2 501 to R5 000. Half (49%) the participants struggled to cover their disability-related expenses.

Only 37% of the participants reported being in full-time, part-time, casual or self-employment during the pandemic, while 35% were unemployed. The remainder were unable to work, doing unpaid care work, or were students or pensioners when lockdown started. A follow-up question revealed that one in three (35%) experienced some change in employment conditions at some point during the pandemic: 13% lost their jobs and the remainder had income or working hours reduced or were forced to take unpaid leave. See Figure 3.

**Figure 3:** Changes in employment status (N=1 857)



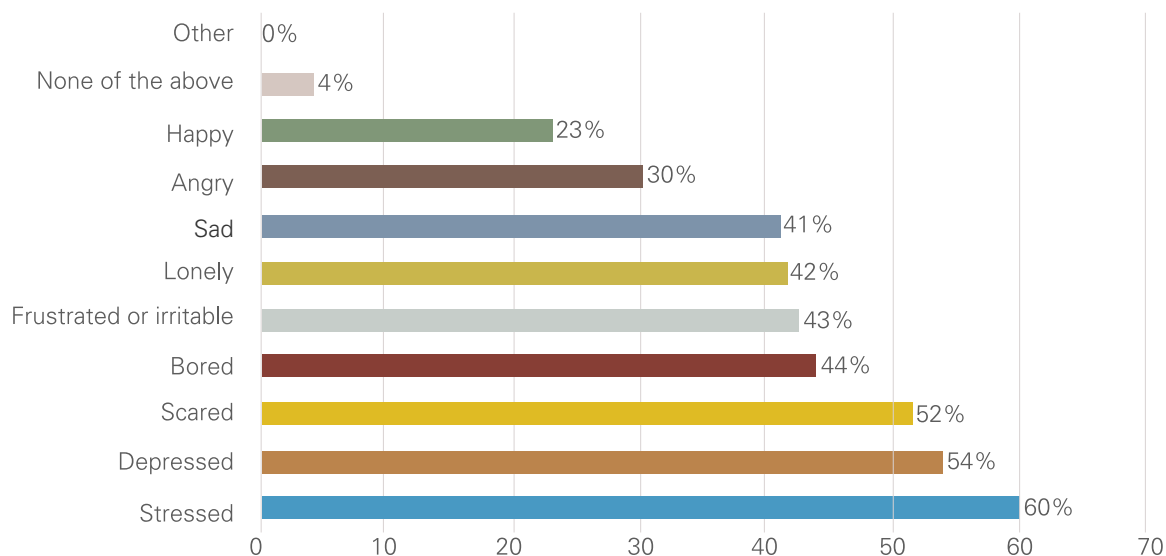
**Source:** HSRC



**Photo:** [Freepik](#)

About half of the participants expected their financial situation to worsen in the following months because of the pandemic's economic consequences. Six in 10 participants reported feeling stressed, and half reported experiencing depression (54%) and fear (52%). See Figure 4.

**Figure 4:** Psychosocial perceptions of the pandemic and lockdown



**Source:** HSRC

### Prioritising people with disabilities

Although 8 in 10 (78%) of participants indicated wanting to get the COVID-19 vaccine at the time of the survey (July–August 2021), only 5% had been vaccinated. Persons with disabilities were not regarded as a priority group for the vaccine programme, despite some of them being particularly vulnerable to respiratory illness due to their disabilities.

According to Hart, the diverse needs of persons with disabilities need to feature in pandemic interventions, and also in the disaster mitigation planning for the recovery phase. Many people with disabilities also face other challenges, such as living far from places of work in informal settlements or townships, facing gendered wage gaps or contending with low educational or job opportunities.

“The results of the study provide clear evidence that it is crucial for government to take an intersectional approach in mitigating the impact of disasters and to be aware of the impacts of their mitigation regulation on vulnerable members of society,” Hart said. “The evidence indicates that mitigation measures were about controlling the spread of the virus, and no thought was given as to whether these regulations would benefit or have unintended negative impacts on persons with disabilities.

“We must remember that this is a diverse group, and an intervention is not going to accommodate all persons with disabilities equally or at all.”

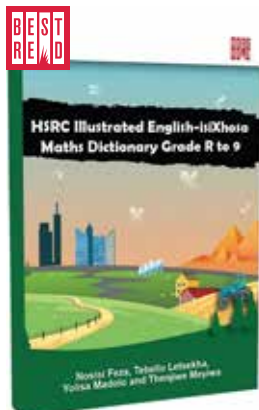
*Listen to the following interviews conducted with HSRC researchers: Tim Hart on NewzRoom Afrika, 14 October, at 7:30 a.m. The interview is available [here](#). Gary Pienaar was on SAFM The Talking Point at 10:40 a.m. His interview is accessible [here](#). An in-depth analysis of the survey data will be released in the following months.*

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## HSRC Illustrated English-isiXhosa Maths Dictionary Grade R to 9



Price **R195**

Author:	Nosisi Feza, Tebello Letsekha, Yolisa Madolo and Thenjiwe Meyiwa
Publication date:	March 2021
ISBN (soft cover):	978-1-928246-31-2
Format:	210 x 148 mm
Extent:	96 pp

### ABOUT THE BOOK

Helping learners understand and retain mathematics lessons is a challenge faced by teachers, parents and the government. One reason is that most learners learn mathematics in English, which is not their home language, and so they must spend time translating each concept taught by the teacher into isiXhosa. Also, parents find it difficult to explain English mathematical concepts, especially if they have never studied mathematics themselves.

The *Maths Dictionary* is a response to this problem. It is accessible to parents helping their children in their studies and learners. Each term is not only defined in both English and isiXhosa, but also accompanied by a picture that reflects the life of isiXhosa-speaking people. This is one of the features that will make the learners enjoy using this dictionary, as it talks about things they know, even though these things are not strictly mathematical concepts but rather show how mathematical concepts work. The terms were selected by mathematics experts and teachers – people who work with learners and understand their challenges.

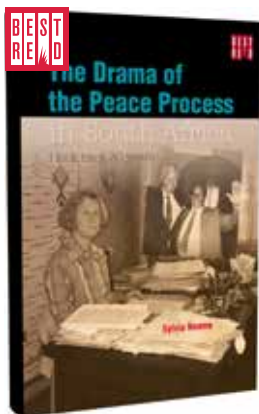
This dictionary is mathematics support material that learner, teacher and parent alike can use.

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## Drama of the Peace Process in South Africa

I look back 30 years



Price **R490**

Author:	Sylvia Neame
Publication date:	October 2021
ISBN (soft cover):	978-1-928246-42-8
Format:	235 x 168 mm
Extent:	528 pp

### ABOUT THE BOOK

The *Drama of the Peace Process in South Africa: I look back 30 years* is a rare portrayal of the unfolding of the peace process in South Africa in the second half of the 1980s into the 1990s as it links general historical accounts with personal experience. Its author, historian Sylvia Neame, one of South Africa's 'magisterial historians' as Tom Lodge has described her in his recent book *Red Road to Freedom*, was a member of the African National Congress and the South African Communist Party and combines the view of what she calls an outsider (the historian) with that of an insider.

The chief historical figures in Neame's narrative are the ANC leaders Nelson Mandela, who was serving a life sentence, and Oliver Tambo, who led the organisation from exile, but she also includes her own contribution to the peace process in the form of 'internal papers' addressed to the leadership of the liberation organisations from 1985 to 1990. She makes the point that her efforts were geared specifically to reaching a political solution, and not simply a negotiated one, that could take place at the end of an extended armed struggle.

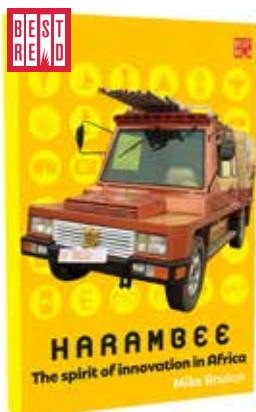
What adds to the interest of the book is that Neame was at the time based in communist East Germany and the theme of German reunification finds its way into the book, including in the diary extracts in Part II. She was indeed able to experience at close hand two important historical events of the late 20th century and to observe from a strategic location in Central Europe what she believes was the unfolding of a new epoch of world history in which global human problems would come to the fore. Her work finds strong resonance for developments in present-day South Africa.

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## Harambee

The spirit of innovation in Africa



Price **R495**

Author:	Mike Bruton
Publication date:	November 2021
ISBN (soft cover):	978-1-928246-41-1
Format:	235 x 168 mm
Extent:	383 pp

### ABOUT THE BOOK

Is this Africa's century? How many inventions have been made in Africa? Is the nature of innovation in Africa different from elsewhere? Do you know the difference between 'tef' and 'TEF', or a SolarTurtle, a Turtle car from Ghana and a satellite-tagged loggerhead turtle? How many African countries have produced their own cars? Why is the M-Pesa mobile money system so important?

*Harambee: The spirit of innovation in Africa* answers these and many other questions by showcasing the resourcefulness and resilience of people in Africa as they search for solutions to the pressing problems they face daily. This remarkable book is the first of its kind – over 800 inventions and innovations by more than 600 innovators from 50 African countries are discussed, and a variety of issues related to innovation are debated. From mumpreneurs to moguls, waste pickers to fintech wizards, locust whisperers to rocket scientists, robocops to internet-enabled balloons, surfing therapy to gin flavoured with elephant dung, seshweshwe cloth to microsatellites, you will be astounded by the creativity of the continent's techpreneurs. This book is a must-read for anyone interested in the future of Africa.

### Endorsements

*Mike's vast experience across multiple disciplines has equipped him to write with authority and boundless enthusiasm about African innovation, to explain how it has shaped the continent and how it continues to change the lives of billions. In this book, he pulls together disparate threads from many different perspectives to produce a fascinating compendium that the reader will consume in the best possible way.*

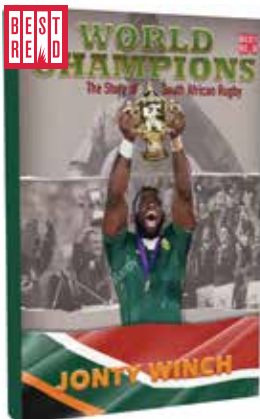
– Alan Duggan, founding editor of the sci-tech magazine *Popular Mechanics* (South Africa)

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## World Champions

The Story of South African Rugby



Price **R495**

Author:	Jonty Winch
Publication date:	November 2021
ISBN (soft cover):	978-1-928246-43-5
Format:	235 x 168 mm
Extent:	464 pp

### ABOUT THE BOOK

Rugby was established at the Cape in 1879 in support of a political desire to promote Englishness, Afrikaners developed a special affinity for the game and it became a significant part of their culture. It also spread rapidly amongst ethnically mixed communities, the Muslim descendants of slaves, and a black middle class emerging from mission stations.

The Cape's rugby establishment enforced racial separation some years before the government implemented a system of segregation. The story of South African rugby subsequently evolved through two pillars that controlled the game for the greater part of the 20th century: the white SA Rugby Football Board and the non-racial SA Coloured Rugby Football Board, later known as SARU.

Each chapter tells its own story, exploring key events and questioning entrenched narratives. Meticulous research has led to a fascinating window on society, examining the way one side of the racial divide enjoyed periods of success as unofficial world rugby champions, while the other struggled in the face of relentless challenges up to – and beyond – unity in 1992.

This story could not have been written earlier. It needed the 2019 Rugby World Cup, when Makazole Mapimpi and Cheslin Kolbe scored South Africa's first-ever tries in a final. Duane Vermeulen was man of the match, and Siya Kolis held aloft the Webb Ellis Cup. This memorable success inspired a genuine appreciation of the skills that have always existed across the racial spectrum.

### Endorsements

*Jonty Winch has written the definitive book on the history of rugby in South Africa. From the very first match to the World Cup triumph in Tokyo, Winch explores the story of the game using deep research and passionate narrative. He uncovers the lost history of black and coloured rugby, reassesses the controversies of the past, and examines why rugby is so important to South Africans of all backgrounds. For anyone interested in rugby and its place in South African life, this is essential reading.*

– Tony Collins, an emeritus professor of history at De Montfort University, research fellow at the Institute of Sports Humanities and author of *A Social History of English Rugby Union* and *The Oval World: A Global History of Rugby*

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