



CYBERSECURITY:

A Big Data career path with many opportunities

Big data is more than just a buzzword. It's shaping the way we live, work and innovate. But as its influence grows, so too do the risks to privacy and security. That's where leaders like Dr Jabu Mtsweni of the CSIR come in. Recently honoured with the 2025 NSTF-South32 Management Award, Mtsweni is pioneering solutions that safeguard information while creating career pathways in cybersecurity and other 4IR fields. His story shows how curiosity, resilience and unexpected turns can lead to a future at the cutting edge of science and technology.

Not everyone may fully understand it, but many have heard the term 'big data'. The question is, what does it have to do with our daily lives? Big data is transforming the way the world understands trends, decisions and opportunities – and South Africa (SA) stands to gain immensely. From smarter healthcare and efficient service delivery to boosting business innovation, big data can unlock solutions to some of the country's toughest challenges. However, like all digital data, big data is vulnerable to security risks.

Dr Jabu Mtsweni of the CSIR (Council for Scientific and Industrial Research) is a trailblazer in cybersecurity, and his expertise and leadership in the field have earned him the prestigious 2025 Management Award at the NSTF-South32 Awards, known as the 'Science Oscars' of SA.

Dr Mtsweni holds a PhD degree in Computer Science from the University of South Africa (UNISA). He is currently the Head of the Information and Cyber Security Research Centre and Technical Lead of the National Policy Data Observatory at the CSIR. Mtsweni plays a technical and

strategic role in building and implementing information and cybersecurity solutions across the public and private sectors. He also has a strong focus on other fourth industrial revolution (4IR) technologies, such as data science, Internet of Things (IoT), artificial intelligence (AI) and machine learning.

Mtsweni is passionate about addressing privacy and security challenges in big data. "Our innovative efforts are designed to directly support a capable state by providing robust security solutions and enhancing national security, while simultaneously building critical skills and essential research and development (R&D) infrastructure necessary for the country's digital resilience."

According to the ResearchSpace website, big data refers to information characterised by huge volumes, varying speeds and diverse structures. While big data has a positive impact on our lives, the publication highlights several challenges in its use: "Even though the rise of big data can yield benefits, its nature poses challenges as



Dr Jabu Mtsweni, 2025 Management Award at the NSTF-South32 Awards.

capturing, processing and storing it becomes difficult. One of the key issues relates to privacy and security, which are among the most prominent challenges, as they directly affect individuals.

In accepting the award, Mtsweni said: "Through big data, people often lose control over how their information is used and are unable to protect it. An invasion of privacy." An invasion of privacy occurs when data is used to infer aspects of one's life without consent. The prospect of data breaches in big data is also a significant risk and can result in millions of personal records being exposed."

He says his entry into the field of cybersecurity was not something he aspired to as a young boy, but he has since fallen in love with it. "My entry into the field, and ultimately my chosen career in cybersecurity, was quite unexpected. When I finished matric, my strongest subjects were in accounting, and that was my initial chosen path for university. However, like many students, I submitted my university application late, only after receiving my results. Because of this, the only space available for acceptance was in Computer Engineering, a field I knew very little about at the time. I'll admit, I decided to take a chance, despite not even knowing how to operate a computer or a mouse back then! Yet, as my first year unfolded, I became completely immersed. I found myself enjoying almost every subject, as the qualification offered a

diverse blend of engineering principles, programming, networks and digital systems. This breadth of knowledge captivated me, and I went on to complete all my qualifications in the field."

His advice to future leaders? "Consistency, persistence and action. It's not enough to talk about leadership – you must demonstrate it through your deeds. Never forget that true leadership development is accelerated and enriched by the guidance, insight and wisdom of those who've gone before you." Being honoured with the NSTF-South32 Management Award, he says, is both humbling and motivating. "While awards are never the goal, they remind us that impact matters. STEM (science, technology, engineering and mathematics) is not just about bright minds in labs – it's also about those who lead, mentor and drive innovation from vision to impact."

For more information on careers in STEM, refer to the [STEMulator.org](https://www.stemulator.org) and the [STEMulator Career Booklet](#). If you are interested in big data, 4IR, cybersecurity and AI, have a look at: Computer engineer and computer programmer (p14); Computer security specialist and computer systems engineer (p15); Database administrator and data science (p16).

Article written by Barnard Manne, Media Liaison and Communications Manager at the National Science and Technology Forum (NSTF).

CAREERS FOCUS:



BEYOND THE NUMBERS

HOW DATA SCIENCE IS BUILDING A BETTER SOUTH AFRICA

Have you ever wondered how we could solve our country's biggest challenges such as water shortages, electricity issues, or even increasing crime (physical and online)? It might sound like a job for a superhero, but the real heroes are working with something even more powerful: data. In a world that's becoming more digital every day, we are creating more information than ever before. This is the "Big Data World," and it's giving us the tools to build a smarter, stronger South Africa.

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Demystifying Big Data

So, what exactly is Big Data? Imagine every email you send, every photo you upload, every weather report, and every census form ever filled out. Now, multiply that by a million. Big Data is the name we give to these massive, complex sets of information that are too big for traditional tools to handle. It is not just about the volume (how much there is), but also the velocity (how fast it is being created) and variety (all the different types of data, from text to photos to sensor readings). In this big data world, data is not just a bunch of numbers; it is a digital fingerprint of our world. By analysing these digital traces, we can discover patterns and solve real-world problems.

This is where a groundbreaking project in South Africa comes in. The energy crisis in South Africa is a typical example where loadshedding has been with us since 2008 (this is improving). The need for the National Policy Data Observatory (NPDO) also became apparent in 2020, and since then and across all different socio-economic government interventions in South Africa, research and data analytics is never left behind in the conversations.

The National Policy Data Observatory (NPDO)

What if we had a central brain that could collect and analyse all this information to help our government make better decisions? That's the idea behind the National Policy Data Observatory (NPDO). This powerful initiative is a government-led project under the Department of Science, Technology and Innovation

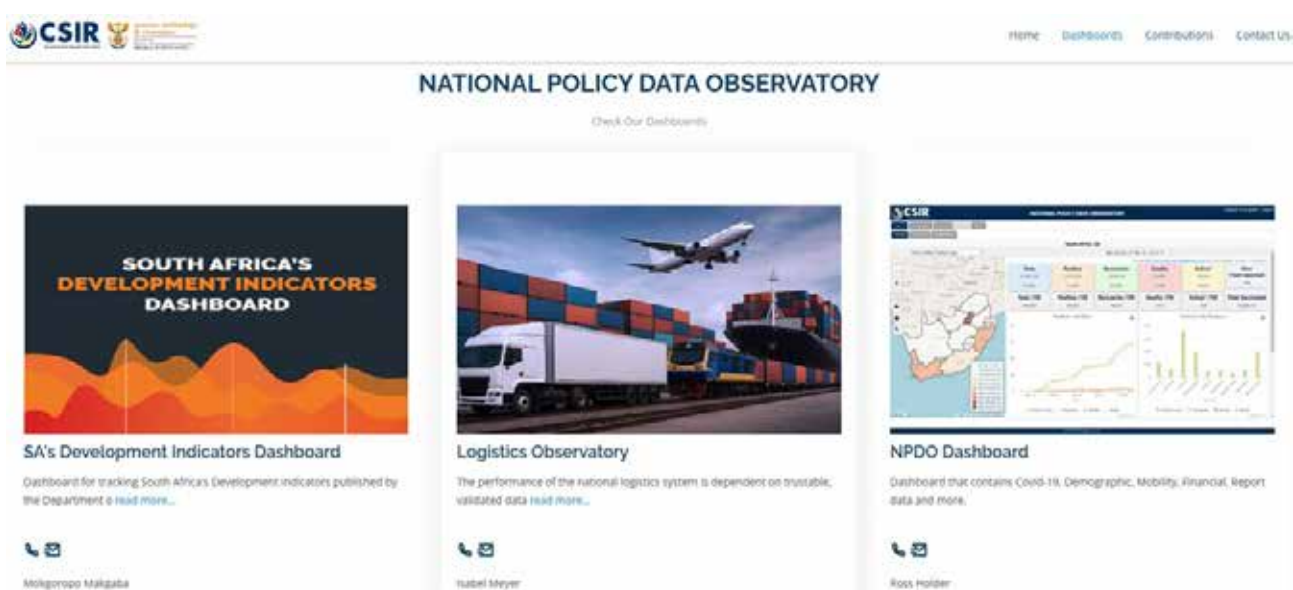
(DSTI) and is hosted by the Council for Scientific and Industrial Research (CSIR). The NPDO acts as a super-powered research lab for our country, bringing together data from countless sources, from government departments and universities to public sensors. You can see some of our work and dashboards for yourself at dataobservatory.csir.co.za.

By combining information on everything from traffic flow and electricity usage to healthcare trends and population demographics, the observatory can create a detailed, real-time picture of our country's challenges.

NPDO's Current Projects

The National Policy Data Observatory has made great strides since its establishment in 2020 and has expanded its capabilities to include the development and operationalization of data-driven national platforms. The NPDO has several ongoing projects aimed at using data to address key national challenges. These include:

- **Crime detection, prevention and prediction:** This project uses a three-phase approach that includes descriptive, predictive, and diagnostic analysis, along with social media data analysis.
- **South African Development Indicators Dashboard:** This project has created a dashboard to track South Africa's development indicators as published by the Department of Planning, Monitoring & Evaluation. The team has implemented "robot-coloured" indicators and has begun data forecasting for a sample of data.



- **Census In The Digital Age:** The goal of this project is to explore data- and technology-driven methods for estimating the population on a regular basis, as traditional census counts are expensive and difficult to conduct.
- **Improving service delivery using data science:** This project seeks to identify key factors contributing to service delivery challenges and to develop predictive models to prevent future conflicts.
- **Water Security:** South Africa is a water-scarce country, and this project aims to produce projections on water availability and scarcity, as well as contribute to early warning systems.

For instance, how could Data Science help solve a water crisis?

- **Collecting the Clues:** The observatory is able to combine data on dam levels, rainfall patterns, water consumption from different locations or areas, and even social media chatter about water problems.
- **Finding the Patterns:** Using powerful analysis, the NPDO is able to identify which areas are using the most water, predict when dam levels might become critical, and even pinpoint faulty infrastructure.
- **Informing the Decisions:** This analysis can give policymakers the evidence they need to make smart, targeted decisions. Instead of making guesses, they could implement policies that are backed by solid facts, like sending water-saving information to specific districts or repairing pipes in high-leakage zones.

The People Behind the Data

The NPDO would not be possible without two key things: powerful computers and brilliant minds. To analyse all this information, researchers use a type of

technology called Artificial Intelligence (AI). These AI models are fed huge amounts of data and trained to find patterns that a human eye would miss. This requires massive computing power, often housed in what we call data centres; large, energy-intensive buildings that store and process digital information. In the CSIR, the NPDO is hosted with the Centre for High Performance Computing which is a national infrastructure called NICIS (National Integrated Cyber Infrastructure System).

Over and above the technical infrastructure, data is only as useful as the people behind it. The people who make sense of all this are called **data scientists**.

Data Science: Your Future Career

So, how can you be a part of this exciting world? Data science is a fantastic career path that is growing rapidly in South Africa and around the globe. It is not just about being good at maths, though that helps! A great data scientist is also:

- **A Storyteller:** They can turn complex data into simple, powerful insights that anyone can understand.
- **A Problem-Solver:** They are curious and love figuring out the "why" behind the numbers.
- **A Communicator:** They can work with different teams, from government leaders to community members, to make sure their findings are used effectively.

In this career, you get to be at the forefront of innovation, tackling some of our nation's most important issues and helping to create a better future for everyone.

Article written by Dr Jabu Mtsweni, Head of Information and Cybersecurity at the National Policy Data Observatory (NPDO).

Na u kile ua ipotsa hore na re ka rarolla mathata a maholo a naha ea rona joang, a kang khaello ea metsi, mathata a motlakase, kapa esita le keketseho ea botlokotsebe (ka 'mele le inthaneteng)? E ka utloahala joalo ka mosebetsi oa mohale oa metlae, empa bahale ba sebele ba sebetsa ka ntho e matla le ho feta: lintlha (data). Lefatšeng le ntseng le e-ba la dijithale letsatsi le letsatsi, re hlahisa tlhahisoleseling e ngata ho feta neng kapa neng. Lena ke "Big Data World," 'me le re fa lisebelisoa tsa ho aha Afrika Borwa e bohlale le e matla haholoanyane.

Translated into Sesotho by ChatGPT-5