



It's the end of the world as we know it

You can run but you cannot hide from the Fourth Industrial Revolution, says Professor Sunil Maharaj in an interview with PRIMARASHNI GOWER

PRIMARASHNI Gower: Should we be nervous about the Fourth Industrial Revolution (4IR)?

Sunil Maharaj: Yes and no. Yes, because we need to be more vigorous about providing the right technical education and training, ranging from artisan through to engineer level, or we could very easily plunge deeper into the digital divide, poverty and inequality. No, because I see this as an opportunity, through focused and decisive leadership, for South Africa to "leapfrog" our digital transformation agenda and improve our health, food security and economic growth.

PG: How is the 4IR different from previous revolutions?

SM: The 4IR is a game-changer for the future as it is marked by breakthroughs in fields including robotics, artificial intelligence, nanotechnology, Internet of things (IoT), quantum computing and biotechnology, to address future challenges such as food security, health, education, water and energy. The other revolutions focused on steam power, which led to industrialisation, while the age of science led to urbanisation and powered mass production in factories. The digital revolution led to automated production, a switch from analogue to digital technologies.

PG: Do you have empirical evidence that several jobs will be lost in South Africa?

SM: No study that I am aware of has been exhaustively conducted in South Africa. However, based on 2018 reports from Canada, more than 25% of Canadian jobs will be disrupted by technology in the coming decade, while 50% of occupations will undergo a major skills overhaul. Lakefield University's report on Empowering Canadian Youth for the jobs of tomorrow indicates that 2.4 million jobs are expected to open up in the next few years and they require a new mix of skills which include critical thinking, social perceptiveness and complex problem-solving.

People will reskill and change jobs several times, while digital fluency will be necessary. Traditional jobs (mechanists, sheet metal workers, electricians and carpenters) could shift to 21st-century jobs (drone assemblers and robotics engineer technicians).

In South Africa, there is potential for job losses but people will need to reskill for different types of work. It is important that we train now for jobs that could exist in 10 years time. There will be new jobs in augmented reality, coding, big and massive data science, for surgeons that have an engineering background, unmanned flight control, robotic deep mining, for traffic controllers and engineers. The traditional role of many jobs will be radically dis-



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rupted and jobs such as a receptionist, cleaner, farmer, the traditional accountant or auditor, will, in my view, be redundant.

A traditionally trained mining engineer and doctor will need different skills sets, which include artificial intelligence. Companies need to help employees with continuous professional development and universities could be involved in retraining. It is essential that industries, the government and people embark on lifelong learning, reskilling all the time.

PG: Author Elbert Hubbard said: "One machine can do the work of 50 ordinary men. No machine can do the work of one extraordinary man." Can artificial intelligence replace workers entirely?

SM: The human touch will still be needed for leadership and debate, conflict resolution and ethical and moral considerations for decision-making. The skills of writing, speaking and making videos are important, but the fundamental skills of critical thinking, problem-solving, effective communication, community building and team work, will be powerful.

Despite great advances in technology, today's most powerful 20-megawatt computer cannot come close to matching the human brain.

PG: Is South Africa doing enough to plan for the 4IR?

SM: The Department of Science and Technology is tackling issues around the 4IR. However, South Africa needs to invest more in research, particularly in the discipline of engineering. There needs to be investment in areas such as smart transportation, cybersecurity, artificial intelligence and machine learning. We need to create a partnership between the government, industry and academia. To be globally competitive, we need to develop high-level technical skills and perhaps even overhaul our size, shape and priorities within the education landscape.

PG: Are schools preparing pupils for IR4?

SM: The school system in general is falling society in terms of producing the right types of skills. There is a high failure rate among first-year engineering students country-wide, as they lack sufficient problem-solving, communi-

cation and mathematical skills. There are relatively few schools in South Africa that do exceptionally well. This is evidenced by the quality of the Grade 12 mathematics and science results over the years.

PG: How different could South Africa look, 30 years down the line?

SM: South Africa has some of the deepest mines in the world and safety is a major issue. We can minimise the safety risk by having remote-controlled mining and inspections by robots, which would save lives and also make some of these mines profitable. Using robots will be cost-effective. Mine workers would have to be reskilled to do other jobs, such as mine robotic controllers and supervisors, IoT safety officers and planners.

In Germany, which has a strong manufacturing economy, smart manufacturing by remote control occurs, as well as additive manufacturing using 3D printing technology.

You can operate a factory through hologram technology. There is much research progressing in haptic technology, where robots and devices are not just things or devices, but have some

level of sensation of feeling or touch.

We will have driverless cars that need to speak to each other. They will also need to sense a congested route and speak to bridges. Cars need artificial intelligence to do this, while your smartphone could diagnose medical problems.

Our homes will be automated. You could talk to your robotic housekeeper to start the cooking or maybe monitor the children doing their homework.

PG: How can artificial intelligence help bring about social justice in South Africa?

SM: We can use AI to bring about equanimity between rural and urban areas. We can build sustainable services in rural areas but it requires vision and investment.

In rural areas there is a scarcity of good maths and science teachers but a teacher in for example, Johannesburg, could hologram himself or herself using future telecommunications technology, such as fifth-generation technology termed 5G, into a classroom in real time and pupils could interact with the hologram.

A highly specialised physician, for

example, in the United States could hologram herself into a rural hospital in Uthuli and instruct a robot to perform complicated, life-saving surgery on a patient in the not-too-distant future. South Africa needs a paradigm shift in its planning and implementation, and this is what is meant by digital transformation.

PG: What about the ethics and the pitfalls of artificial intelligence?

SM: There could be an invasion of privacy in our homes with cameras and sensors in our kitchens and other spaces. Our rights as individuals could be compromised. If a driverless car crashed into another driverless car, who pays for the damage?

We would need to relook at insurance policies and the profession of law. These are exciting new areas for further research, transdisciplinary work and new policies, where South Africa can become an innovator and leader both locally and globally.

PG: What is the University of Pretoria doing to prepare its graduates for the 4IR?

SM: At the faculty of engineering, built environment and information technology, we educate our graduates with the fundamental and foundational skills in mathematics, stochastics, programming, electronics, problem solving, critical thinking and design, which can be applied in a new work environment. We include aspects pertaining to professional practice, communication skills, ethics, human values and environmental and social responsibility into our curriculum.

We recently launched TuksNova, a non-profit company owned by UP which is a hi-tech business incubator, in collaboration with the Department of Small Business Development, Trade and Industry and the Small Enterprise Development Agency.

The aim is to promote hi-tech job creation among students by providing support for the incubation, development and opportunities for the commercialisation of technology with industry partners, venture capitalists and other funding agencies.

We also have the Multichoice-funded Chair in Machine Learning, which will help grow the country's pool of talent in AI, machine learning and cybersecurity for the digital future. These initiatives will position our graduates to be 4IR ready and to become global thought leaders.

Professor Sunil Maharaj is the dean of the faculty of engineering, built environment and information technology at the University of Pretoria. Maharaj and his faculty experts will be speaking to pupils and school communities across KwaZulu-Natal at the University of Pretoria's #ChooseUP Career Expo on October 2 at Durban High School. Pupils, parents and teachers are welcome to attend.

