ARTIFICIAL INTELLIGENCE

- THE 2021 ARTICLES -

A collection of my published articles on AI: Societal impact, Business applications, Automation, Facial recognition, Privacy & ethics and the Future of technology

JOHAN STEYN

Foreword by Dr. Jacques Ludik

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About the author

Johan Steyn is an Artificial Intelligence enthusiast and speaks globally at conferences on the Fourth Industrial Revolution and Emerging Technologies. He is the 2019 award winner: Best AI & Robotics Management Consultant by Wealth & Finance magazine (UK).

He is a published author who regularly contributes articles on thought-leadership to well-known publications such as Business Day, the Sunday Times, Finweek, News24, ITWeb, and Brainstorm Magazine.

He is the Chair of the Special Interest Group on Artificial Intelligence and Robotics with the IITPSA (Institute of Information Technology Professionals of South Africa).

He works for PwC as Lead Architect: Intelligent Automation. He writes in his personal capacity and the views expressed are his own.

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Recommendations

Johan's book is out of the box thinking on AI, could be interesting to all.
Dr Dimitri Kanevsky
Research Scientist at Google
Creator of Google's Live Transcribe

I have watched in awe as Johan became an incredibly prolific writer on this topic, as this excellent collection of articles attests to. He has also become Africa's leading AI commentator, offering a unique perspective on a subject that is usually dominated by American and European voices. Through this book you will find numerous valuable insights into the forthcoming challenges that lie ahead as we stumble and navigate our way through this turbulent period. A very worthy and timely read.
Sean Culey
Author: Transition Point: From Steam to the Singularity

Johan's articles are game-changing and have set a new benchmark of academic reference in line with B-school's accreditation requirements of referring to industry-oriented articles. Johan has initiated a mobilisation of industry-academia linkage that is here to stay. I look forward to many more articles coming up!
Dr Raul Villamarin Rodriguez
Pro Vice-Chancellor, Woxsen University

Johan writes about AI with an exceptional appreciation and sensitivity for both the technology benefits and the impact on people. He makes it easy to understand some of the more complex aspects of AI while always highlighting the positive application of this technology that can make our lives so much better. It is because of this balanced perspective that Johan brings to an otherwise complex and emotively charged subject that we, at BPESA, engage Johan regularly as a speaker, thought leader, and commentator on the subject.

Andy Searle
CEO - BPESA (Business Process Enabling South Africa)

Johan is a prolific writer and thinker and a regular source of inspiration in our industry. At MKAI - the Inclusive AI Community - we seek contributors that understand how the power of innovation can be harnessed to solve big problems, but that also have the vision to see how we must incorporate ethics, diversity and sustainability. Johan encapsulates this in his writing and his speaking and we are proud that he is a highly valued and admired member of our community.

Richard Foster-Fletcher
MKAI - The inclusive AI forum

Johan's writing on AI, especially in the African context, is relevant, often quite sobering, and always thought provoking and absolutely critical reading for anyone impacted by the Fourth Industrial Revolution, therefore, all of us.

Justus Fourie
Regional CFO at Digicall Group

Artificial Intelligence (AI) will change the way we do almost everything in our life in the coming years. We have a unique opportunity as a society to use emerging technology to shape the world we want to live in. Johan does a great job of making AI understandable while also raising the concerns we need to confront head on as a society.

Ema Roloff
Director - Enterprise Solutions at Naviant

Interesting read and great addition to the current AI era.

Dr Kathryn Malherbe
CEO Med Sol AI Solutions
Director Breast Cancer Support NPO

Johan is very passionate about AI and the positive impact smart technologies can have on society. In this book he provides great awareness of the use of AI and challenges our thinking as we prepare for the inevitable disruption.

Zenzele Ndlovu
Director at Machine Learning Africa

Johan is very knowledgeable on a wide range of important aspects and applications of Artificial Intelligence (AI). His thought provoking articles and talks help to simplify difficult concepts and broaden the general understanding of a number of complex ideas and ethical and societal considerations involving the growing adoption and deployment of AI in the era of smart technologies.

Tony Parry
CEO, IITPSA (Institute of Information Technology Professionals South Africa)

Foreword: by Dr. Jacques Ludik

Since I have met Johan Steyn a few years ago at one of the AI conferences in South Africa where we both were speakers, his enthusiasm and passion for smart technology, in particular Artificial Intelligence, was already clear.

With a background in software test automation and a strong appreciation and understanding of smart technology, he was already thinking about its implications and impact on industries, economies, and society more broadly.

We have engaged many times since then, but especially so in 2020 and 2021 on various podcasts, panel discussions, and conferences where we had many discussions on AI for Social Good and in particular on the topics discussed in my book *"Democratizing Artificial Intelligence to Benefit Everyone: Shaping a Better Future in the Smart Technology Era"*.

As it is clear from Johan's book "Artificial Intelligence - the 2021 Articles", not only was 2021 a prolific year for him in terms of writing and speaking engagements, but the AI-related topics under discussion are of great

relevance with respect to AI's societal impact on South Africa, Africa and the world at large as well as intelligent automation and the digital workforce, business applications, healthcare and longevity, and AI's likely future paths.

It also deeply resonates with my own thinking and massive transformative purpose in terms of shaping a better future in the smart technology era. We are also both very much aligned on the collective effort, visionary leadership and wisdom that will be required to steer smart technology in the right direction "to create a better world for our children" as Johan is strongly pushing for.

I highly recommend reading Johan's book and listening to his podcast!

Dr. Jacques Ludik
Founder & CEO, Cortex Logic & Cortex Group; Founder & President, Machine Intelligence Institute of Africa (MIIA); Author of Democratizing AI to Benefit Everyone; Founder of Sapiens.Network

About this book

I first encountered the term *Artificial Intelligence (AI)* a few years ago. I was working for a large bank in its technology department and we were approached by a global consulting firm to conduct a proof of concept.

They wanted to show how their AI-based platform could help us work smarter.

I was immediately intrigued by what I saw. I realised that this technology would shape the future and I decided to read as many books as possible on the topic and to speak to anyone who is considered a leader in this field (who would be open to speaking with me).

I was surprised at how many people were willing to speak with me and to freely share ideas.

I discovered - to my surprise, I must admit - that there are many leading voices working in this field in my own country, South Africa. Like many people, I assumed that only in Silicon Valley one could find the best minds in AI.

I am not a very technically-inclined person. My career in technology was shaped by experience in management consulting, working with clients to utilise technology to solve business problems.

I realised that my lack of technical expertise was serving me well: I had to uncover business solutions and value with my clients before we investigated the technology to help solve these problems.

I also realised early on that AI technology would dramatically shape the world we live in. I am passionate about South Africa and about Africa.

I am not blind to the myriad of challenges faced, but I also started seeing how smart technology could be the answer to many problems faced in the developing world.

I was invited to speak at a conference hosted in Johannesburg and in Cape Town focussing on software quality engineering. It was my first experience as a conference speaker, and although I was nervous as hell I delivered a good talk, receiving encouraging feedback afterwards.

Soon after that, I received an invite to speak at a conference in Moscow.

My trip to Moscow was a dream come true. I have always wanted to visit the Red Square and the Kremlin. More conference invites followed and I was able to visit Poland, Riga, St. Petersburg and other cities.

The Covid pandemic put a damper on conference travel, to put it mildly. However, the new world of virtual events

opened many more doors. In 2021 I was a speaker at 31 conferences.

My passion to share what I was discovering grew daily and over the last year I contributed 972 posts on LinkedIn and Twitter, and over the last six months of the year, I produced 45 articles in well-known publications, appeared on television twelve times and contributed to or participated in 65 podcasts episodes.

In this book, you will find the articles I published over the last year. It was a challenge to divide them into categories as many of my articles touch on a variety of topics.

But for the purpose of this book, I split the articles into the following parts:

1. AI in my world: an African view
2. AI in automation: an "everything automated" world
3. AI in your world: AI on the global stage
4. AI in healthcare: health & longevity
5. AI in business: practical steps
6. AI in our world: societal impact
7. AI in our future: over the horizon

Introduction

Welcome to the Smart Technology Era

We are living in the most exciting time in human history. Over the last two centuries (a drop in the ocean in historical terms), we have discovered ways to heal most diseases that have plagued humanity for millennia.

We have devised ways of feeding most people on earth and lifting many millions out of poverty.

Life has never been so good for the human race. Our life expectancy is continually increasing and our general quality of life is better than that enjoyed by only the kings and nobility of old.

We are also destroying our planet and its natural resources at a rate previously unimagined. The divide between the uber-rich and those in abject poverty is continually growing.

The Covid pandemic brought the world to its knees as a reminder that we are still vulnerable to disease and natural disasters are a growing threat to our real vulnerability. The human mastery of our own planet is a fleeting fantasy.

Climate change and the real and growing risk of nuclear war is jeopardising the long term survival of our species.

A third, and more pressing risk, is the advent of the smart technology era. It is a transformation in which the physical, digital, and biological worlds are all intertwined.

Products and services that are fast becoming more significant in today's society are being spurred on by advancements in artificial intelligence, robots, the Internet of Things, 3D printing, genetic engineering and quantum computing.

People will be divided into those who benefit and those who don't as a result of technological progress. When technology is combined with human bodies, a new humanoid species will be created. It will result in the division of humanity into two different groupings.

The wealthy can buy brain implants and other advancements in other organs and body parts. They will live longer, will be perpetually healthy, and will eventually become the dominant species - a techno-ruling class - while the overwhelming large population on earth will perish.

When John McCarthy brought a group of academics from many fields to the "Dartmouth Summer Research Project" in 1956, he coined the phrase *artificial intelligence* for the first time.

The proposal for the conference proclaimed, "The study is to proceed based on the conjecture that every aspect of learning or any other feature of intelligence can in

principle be so precisely described that a machine can be made to simulate it."

Today, we look back at the very first steps in the development of Artificial Intelligence (AI). With the rise of computing power, digital storage, Cloud computing, and other things, AI has quickly become a part of our daily lives.

"How many of you have used AI today?" I ask this question a lot when I talk about AI at conferences.

As a rule, only a few people would put their hands up. Many people think of AI as "something weird, out of reach," but I show them that almost every app on our phones has AI in it - we all benefit from AI technologies continually.

We live in an era where AI is pervasive. The new technology has the potential to revolutionise healthcare, education, and the delivery of services. We have the power to improve the lives of our children.

It's possible that new technology could be misused for evil and not assist humanity. It is already used as a weapon (think of smart drones), espionage and hacking. Facial recognition can be used to keep tabs on us like Big Brother in George Orwell's 1984.

People may fear that smart technology may replace us with robots and computers. Many people's occupations

have already been eliminated as a result of advanced automation.

We have to take this technology seriously. We have to debate, share ideas and collaborate. I often wonder what my son and his contemporaries would say about us when they look back on what we did a few decades from now.

Would they praise us for reigning in this technology, for steering it in a direction that benefits all, or would they condemn us for allowing it to destroy the lives of future generations?

Part 1: AI in my world: *an African view*

1 So, just how smart is artificial intelligence?

Despite great (human) minds presenting many clever hypotheses through the years, artificial general intelligence is still a considerable distance away from being fully realised.

Artificial intelligence (AI), in contrast to most other new technologies, has gone through several 'hype cycles' – an initial period of exuberance about the possibilities − followed by a period of realism-checking and disappointment (the so-called 'AI winter') before the next major breakthrough.

Human learning, according to psychologist Edward Thorndike, is caused by a previously unknown property of neural connections in the brain. Thorndike worked at Columbia University and published his theory in 1932.

This idea was expanded upon by another psychologist, Donald Hebb of the University of Chicago, who claimed in 1949 that learning entails increasing the probability (or weight) of induced neuron firing between linked connections in certain brain activity patterns.

A hardware model of the human brain had been constructed, researchers working on an artificial brain thought.

This hypothesis, called the Computational Theory of Mind (CTM), assumes the human mind is a computational system with thought processes similar to what we currently recognise as software running on a digital computer.

In 1936, Alan Turing came up with his Turing Machine, a mathematical model of a physical device that could do any computation. Many saw it as a path to get to AI, while Turing saw it as the foundation for natural intelligence.

The development of digital computers that could run the first 'intelligent' computer programs resulted in a lot of work on CTM in the 1950s. Ferranti Mark 1 at Manchester University performed the first AI algorithm in 1951.

If given enough time, it could compete fairly in a game of Draughts with a human opponent.

To demonstrate machine intelligence improvements to the public, researchers have traditionally used games against human opponents since Deep Blue's chess victory in 1996 and AlphaGo's victory in go in 2015.

Research on AI was supported by governments primarily focused on language processing from the 1950s through the early 1970s. For automatic language translation, perceptron networks were considered the best option.

Large sums of money were wasted trying to get a system that could handle the complexities of language in the first place. During the first AI winter, which lasted into the

1980s, interest in the connectionist approach to AI waned.

Afterwards, the excitement revolved around a technique for turning a standard computer into an expert system, capable of simulating, for example, the diagnostic powers of a human medical doctor.

An inference engine was used to draw conclusions from the patient data, which was fed into the knowledge base.

The knowledge base contains all the facts, assertions and rules related to diseases and other medical conditions, such as symptoms. It was created in a fundamentally different way from normal procedural code using the new programming languages LISP and Prolog.

Expert or knowledge-based systems continued to be developed until the 1990s, but it became evident they did not represent true AI, and commercial use dwindled due to the difficulties and time necessary in transferring human expertise to the knowledge base.

Despite their enormous size in terms of memory, the knowledge bases were restricted to a small number of specific topics.

Another issue was administration, which necessitated meticulous audits in order to eliminate false information and questionable rules that had 'learned' on their own.

As early as the 1970s, scientists recognised that a single simulated neural layer could only detect a small number

of well-specified things, each of which was evaluated to confirm the neuron output prior to each activation function was unique.

Classifications could grow even more sophisticated with the addition of a second, 'hidden', layer of neurons.

Multiple-layer neural networks provide the foundation for what is currently called deep learning. Finally, everyone thought that machines as complex as the human brain, as well as sentient robots, could be produced.

Networks are growing in size as a result of the latest generation of multi-core processors and the resurgence of connectivism.

By the 2000s, despite all the advancements in hardware technology, the traditional AI disillusionment had set in, as it became clear that deep learning was still incapable of constructing an intelligent robot. AGI (artificial general intelligence) is still a considerable distance away.

What is in store for AI as we go into the new year? Technological trends can change fast. As an example, the COVID-19 outbreak prompted many businesses to refocus their technology efforts on enabling and supporting remote work.

Nonetheless, industry observers have a basic sense of what is likely to happen in the future. Many identify cyber security and the internet of things as key trends to watch in 2022.

We can expect more mature smart automation platforms, where autonomous automation (no human in the loop)

can become a real prospect. We are likely to see an avalanche of voice technology innovation, which may lead to human-less call centres staffed by conversational AI bots.

Bias in algorithms − especially as it relates to facial recognition technology − will continue to plague us. Deep fakes will become widespread and it will pose unique challenges for the legal industry in particular.

Extended reality will reach maturity. It has the potential to profoundly alter how businesses use smart media platforms, as it enables seamless interaction between the real and virtual worlds, offering users an immersive experience.

This technology has numerous applications, ranging from healthcare to education, but most notably in the business world.

Will we head for another AI winter? It seems that the sun is shining bright enough on the AI landscape and I doubt that anything will stop its drastic and speedy advances.

2 Artificial intelligence has quickly infiltrated our everyday lives

Our human ancestors first walked the earth about 300,000 years ago. If we look at the history of our planet as a clock, then mankind has only been around for one minute and 17 seconds.

We are certainly late to the party, but we managed to make a huge impact on our planet. Unfortunately, our influence is overwhelmingly negative.

Since the dawn of the first industrial revolution in the 19th century, humans began extracting and burning fossil fuels on a massive scale.

We face the edge of a climate-change cliff with extreme weather events, rising sea levels, glacier retreat, ocean acidification, ecosystem disruptions and extinctions.

The future of our planet is not the only extensive predicament facing our species. The human race is facing the largest technological change in our history.

In the middle of the previous century, researchers began working on technology that could be smarter than humans.

This was not a new idea as in centuries past there were myths of beings created by humans that could outsmart us in intelligence and consciousness.

At a computer science conference in 1956, a researcher named John McCarthy coined the term "artificial intelligence ".

A few years later the famous code breaker Alan Turing wrote a paper on the notion that computers could simulate humans to do intelligent things.

The Turing Test was named after him, determining whether or not a computer is capable of thinking like a human being. Simply put, the test is about humans interacting with a computer, thinking they are dealing with another human.

Today we look back at the elementary starting stages in the development of artificial intelligence (AI). With the rise of computing power, digital storage capabilities, cloud computing and other advances, AI has quickly infiltrated our everyday lives. I often ask my audience when I speak on the topic, "How many of you have used AI today?"

Normally very few people would put up their hands. I think the reason is that many still see AI as "something strange, out of reach", but I then explain that almost every application on our smartphones is infused with AI technology.

Think about an application such as Apple's Siri or Amazon's Alexa. They use natural language processing

to understand what we say. Think about Google Maps or Waze that can calculate the route to your destination in seconds, utilising an astonishing amount of data on route options and geospatial data from thousands of other users.

Our lives are filled these days with "smart things". It is commonly referred to as the Internet of Things where devices such as your smart television, fridge, lights and security system can speak to each other and make decisions autonomously.

AI is everywhere we look. The technology promises great advancements in health care, education and service delivery. We could realistically create a better life for our children.

However, all technological advances could be used for sinister intent and would not necessarily benefit humanity.

AI has already been weaponised (think of smart drones), it is used for industrial espionage and hacking, and facial recognition can watch us everywhere like George Orwell's Big Brother.

Perhaps the most common and relevant fear is that smart technology will steal our jobs. Smart automation technology is already causing large-scale job displacements.

We are standing at the edge of a technological disaster cliff. This technology should be taken seriously. We should debate and agree on how to use it for good. We are all fools if we think that time is on our side.

3 AI has a place in the dusty streets of rural SA

Numerous articles, opinion pieces and books are published daily about the future of work and the world the smart technology era is creating. Many of these are written by academics and clever people who work for large technology companies.

As a technologist, I am always keen to read these pieces to stay current in my understanding of where technology is taking the human race.

On the one hand, I am filled with hope for humanity as technologies such as artificial intelligence (AI) can usher in a new era of longevity, health, the creation of new jobs and social equality.

But on the other hand, I am filled with horror considering the dark side of what this technology could bring to humanity.

Think of the weaponisation of AI, deep fakes where your identity, image and voice is recreated for cynical purposes, and the theft and harmful use of your personal data (all already a reality).

A few months ago I was part of an event at Redhill School where teenage girls from the school were joined by girls from rural areas. The event was part of a global series called "Girls in AI" and the goal was to teach the pupils about AI and offer them the opportunity to create a conceptual mobile application.

They were divided into groups and had to select one of the UN sustainable development goals as a project. The keynote address was by Emily Mbele, a senior technology leader with Rand Merchant Bank. The pupils sat star-struck as they listened to Mbele tell of her journey from a poor rural background to one of the top posts at an investment bank.

Next, we divided them into groups where we taught the girls about design thinking and the practical applications of AI. I was the moderator of one of the groups with three girls from Redhill and three from a rural area at our table. Joining us was Farieda Mayet, who was formerly a divisional chief information officer with FNB.

We were astounded by the intelligence and thinking of the girls. They developed the concept for a mobile application that can help teenage girls with sexual health, using machine learning and conversational AI.

During the course of the day, I had the chance to get to know the two girls who sat to my immediate right. They told me about their desire to study and to create a bright future for themselves and their families.

They were well-read on new technology and displayed a superior understanding of the applications of technology.

They spoke about the challenges of electricity supply and internet connectivity in their area. Most days there was no running water.

Their smiles and the shine in their eyes humbled me into appreciating their enthusiasm for a better life despite the daily hardships they suffer.

That day was a wake-up call for me; a eureka moment as I considered the future of our beloved country. In the dusty streets of our country housing the very poor there are multitudes of children with not only have hopes and dreams, but with keen intelligence and a smart sense of the future.

In their hearts and minds, they hold the solutions for problems we face now and certainly new problems we will face in the future.

The smart technology era is at our fingertips, for now. We have limited time as a society to steer this technology in a direction that will serve humanity. We can create new ways to educate our children, heal disease and empower the poor.

All of us are responsible. It is not up to the large corporations or those in Silicon Valley. We have to work together and find ways to create a better world. AI and smart technology is a gift to humanity. May we not repeat the multitude of mistakes of the past and simply monetise or gain control with this tool.

We need to democratise technology. We need to leave a gift to our children now and into the future.

4 The state of artificial intelligence in SA

Business leaders need to educate themselves on the pitfalls and advantages of smart technology.

Many business leaders are thinking about ways to use artificial intelligence (AI) technologies. Should all of them consider the benefits of the smart technology era? Absolutely.

However, in my experience, the greatest reason many AI initiatives fail or do not live up to what was expected is that executives still greatly misunderstand this technology.

To compete on the global stage businesses in SA need to embrace AI and related technologies such as machine learning and robotics or smart automation. So just what is the state of AI in SA?

SafriCloud recently released an interesting report, titled "The State of AI in SA business 2021". Of nearly a thousand local business leaders surveyed, more than half said they are not currently implementing AI in their businesses, mainly because they lack the skills.

About 60% said they plan AI initiatives over the next two years, but only 25% believe it is understood at the executive level.

The report suggests that investment in training and skills development in the local market are of the highest priority. Partnering with schools and universities to develop the needed talent is crucial.

Vukosi Marivate, chair of data science at the University of Pretoria and co-founder of the Deep Learning Indaba, writes: "In the last decade there has been a rise of initiatives and organisers in Africa that are increasing training and research in the areas of computing in general and artificial intelligence in particular."

This comes from his contribution in a recent book, *Leap 4.0: African Perspectives on the Fourth Industrial Revolution.* Marivate concludes that the indaba and Data Science Africa initiatives have contributed greatly to the understanding and practice of AI and machine learning on the African continent.

Another important contribution is the market research by the locally based AI Media Group. Its analysis, entitled "Is Johannesburg the City of 'AI' Gold*?"*, reveals that the most active top five countries in Africa when it comes to AI initiatives are SA, Tunisia, Nigeria, Kenya and Egypt.

"Johannesburg and the wider Gauteng region encompassing Pretoria appears to be the number one contender for the AI tech capital of Africa," it says.

Nick Bradshaw, founder and CEO of the AI Media Group, said: "One of our key goals was to assess and

showcase the growing emerging market opportunity for AI and related technologies in the Africa region. I am very happy to say there is a rapidly growing ecosystem and perhaps more activity than people first realise."

The state of AI in SA seems to be one of growing maturity due to a number of educational, business and societal initiatives.

Large-scale and rapid adoption is needed across the business spectrum, and for this, business leaders in particular need to educate themselves on the pitfalls and advantages of smart technology.

5 Local AI tech can help Africans breach the digital divide

I was on a Zoom call but I could hear the little voices laughing in the next room. My son was proudly demonstrating to his friends his mastery of our Google Home smart speaker.

I could hear the gasps as the artificial intelligence (AI) voice answered questions on the weather forecast and the time of the next full moon. A friend shouted, "Let's try isiZulu." "Sawubona, unjani?" I could hear the device was taking longer than normal to respond. Finally a strange sounding accent announced, "Lutho oluningi".

By now the laughter was even more pronounced. "How do you mean 'nothing much'?" One boy asked. "Ngangisiza na? Can I help you?"

Smart speakers are being used by an increasing number of people to shop, set reminders, and get answers to simple but critical questions on issues such as health care. This is due to the widespread use of voice-based interfaces such as Amazon's Alexa, Apple's Siri, and Google's Home Assistant.

According to research, by 2020, voice searches had accounted for half of all internet queries.

One manifestation of such an expectation is the widespread use of language as a means of communicating with machines.

We now communicate with virtual assistant systems, listen to their responses, and base our decisions on their suggestions or reactions.

Natural language understanding has to do with the ability of the machine to interpret human language. We are attempting to train the machine to be able to recognise and capture intelligence through the interpretation of language.

When internet connectivity in Africa is discussed, the discourse usually centres on people who have access to the internet and those who do not — the digital divide.

However, there is also a linguistic barrier, which has been growing in recent years, particularly when it comes to speech recognition technologies.

Rather than working on languages from developing countries in Africa and Asia, developers are concentrating their efforts on expanding the English language capabilities of their products.

With major platforms such as Twitter and Google AdSense not supporting many African languages, they are already at a competitive disadvantage on the internet.

Low-income groups and languages that are not widely spoken in the West are being pushed to the margins of society.

Therefore, not only will there be a gap between those who can use this form of AI for communications and those who cannot, this disparity will also make it difficult for users to take advantage of these applications for development interventions such as health care, education and finance.

My son is already using our smart speaker to help him with homework. He has all the information that has ever been created available to him.

Imagine what this technology can do for all the children in our country. Imagine what it can do in health care for people in need of health advice but who are either living too far from a doctor or who cannot afford medical care.

When his friends left, my son told me that he thinks there is a Zulu in our smart speaker. I had to smile, but it also made me wonder if we are doing enough as a collective to develop the technological application of native African languages.

To accommodate the needs of African language users, we must use a combination of locally designed machine comprehension algorithms and locally collected training data.

We should support initiatives such as Masakhane.io whose goal is for Africans to develop and own technology through a multidisciplinary approach.

Part 2: AI in my world: *an "everything automated" world*

6 The perils and promise of smart automation in South Africa

The automation of business processes has a long history and has proven to increase processing speed and reduce costs.

In an ever-more increasing global competitive environment, all business enterprises seek to deliver more work with fewer workers, while adapting faster to the demands of their clients.

The smart automation era (also called intelligent automation), underpinned by record-high processing speed, cloud computing and new technologies such as artificial intelligence and machine learning, has catapulted business process automation into a new age.

With the excitement and promise of these new technologies, society should justifiably be increasingly concerned about the impact on workers.

We have already witnessed the start of massive job displacement globally affected by smart automation.

Globally, it is the developing economies that have the most to lose. High levels of unemployment, collapsing infrastructure and education systems that have not kept up with global demand may cause these countries to experience a pandemic of job losses.

The South African economy will certainly not be spared from the smart automation onslaught.

The following, in my opinion, are the main challenges we face in the local market related to smart automation:

1. Almost all enterprises are grappling with the speed of change. They are under increasing shareholder and client pressure to deliver goods and services at a faster pace, while dramatically decreasing their operating costs.
2. Many businesses approach automation as a technology initiative while partly or mostly ignoring the impact it is having on its workforce.
3. Few organisations have efficient change management and reskilling programmes in place.
4. In many businesses, the top leadership (CxOs) have little knowledge about smart technology and its potential impact on their organisations.
5. More often than not, smart automation is not approached as a solution to the technology ecosystem (data, privacy, legacy applications, ways of working, etc).

Where should a business start in its intelligent automation journey?

It should first, and foremost, be driven by the business strategy. Too many technology initiatives are initiated and managed solely by the technology team.

It is understandable that technologists are keen to lay their hands on new technology platforms, but frequently the business case is poorly defined. Therefore many of these initiatives fail to gain cadence and continued funding.

Smart automation will introduce a significant change to how the organisation operates.

The business case for smart automation should be related directly to lowering operational costs, increasing the speed of delivering new products and features, and most importantly, better client experience.

It is important to consider the tools and platforms already in place before a decision is made to invest in new technology. The likes of robotic process automation (RPA) can deliver vast benefits to executing repetitive, back-office tasks, but RPA is not a silver bullet to solve basic process and skills challenges.

Business leaders should start with plans to mature current business processes and better utilise tools already in use.

Smart automation will introduce a significant change to how the organisation operates. This will have a direct impact on organisational culture.

Peter Drucker is credited with the saying "culture eats strategy for breakfast". With all the hype and fears around automation, workers will naturally be pessimistic, or even resistant toward automation initiatives.

We have to take our people on a journey and ensure they understand that smart automation will benefit their day-to-day work activities.

With all the changes that smart automation will bring to the ways people work, an adequate target operating model needs to be created. What is the anticipated end state for the initial part of the automation journey?

What kind of work will people be expected to do because their current work will be largely automated? And do people have the needed skills and training to perform new types of work?

It is clear that South African businesses have a lot to do in order to ensure they utilise intelligent automation to increase their competitiveness on the global stage.

There is clearly a looming gap between technological planning and the future of the workforce.

Government, business leaders and society have to work together to ensure our businesses thrive in the era of the fourth industrial revolution while maintaining our responsibility to our fellow citizens.

7 Will workplace technology automation badly affect women, in particular?

What can business do to balance the demand to lower operational costs and increase speed to market, while protecting the female workforce?

The Smart Technology era, commonly referred to as the Fourth Industrial Revolution, has catapulted platforms like robotic process automation (RPA), combined with cognitive technologies such as machine learning and smart automation, to become widely used.

These platforms provide a unique opportunity to decrease operational costs while improving the cadence of digitisation and rapidly improving customer experience.

A burning issue facing business and societal leaders is the potential displacement of jobs due to smart automation. Will we be able to retain our workforce through effective upskilling initiatives, and how do we go about doing this?

The question before us is whether smart automation will replace mostly female workers. We have made limited

progress   regarding gender equality in the job market, however, will this progress   be invalidated due to automation?

The workers who   will be most directly affected by automation are those who are involved in back-office, administrative tasks; often repetitive business functions.

A report by the World Economic Forum (WEF), Women and Work in the Fourth Industrial Revolution, concludes that the drivers of change "will heavily disrupt some of the   job families with the largest share of female employees, such as office and administrative roles".

A report in The Guardian newspaper, "Could automation make life worse for women?" states that "the highest ratio of women's employment is in clerical and administrative jobs (76% female)."

What can business leaders do to balance the demand to lower operational costs and increase speed to market, while protecting their predominantly affected female workforce?

I have reached out to several female business leaders who work in the local ICT sector for their views.

Zanele   May, who heads up the Automation Centre of Excellence at Sanlam, feels that automation technologies will continue to affect jobs. "Will the female workforce be the most impacted? The probability is very high that the answer is yes."

What can businesses do to turn the tide? "Invest in your workforce, by using training and development programmes to upskill and empower, prepare and create jobs of the future, re-engineer your businesses to be able to innovate, adapt and reinvent yourselves or your products," May says.

She stresses that technology will not be able to replace the humanness of work. "The need for socialisation and human interaction is what drives people, and this will not change.

So let us empower our workforce to embrace the change and enable them to differentiate themselves from technology by doing all the things technology cannot do."

Lenore Kerrigan, a technology thought leader who specialises in smart automation, believes that although technology will have a pronounced effect on back-office, menial jobs traditionally performed by women, there are now more opportunities than ever before.

"Working from home has become a norm, training and certifying for new skills online is an expectation and the increased focus and need for consideration of all types of bias within technologies opens up many opportunities."

Julie Regairaz is the founder of Steam & Curious, a digital and innovation youth incubator movement in France and SA.

She says there is a clear opportunity to create skills development programmes that help to close the gap in

future-ready skills for the overall youth pipeline, but particularly for women.

"We are working on   implementing low-tech and culture-specific programmes to reach out to women from communities around SA and bring awareness around Fourth Industrial Revolution opportunities and impacts on the future of jobs."

We have a long road to traverse to ensure gender equality in our workforce. Ancient maps warned travellers "here be dragons." The dragons we face on our journey to equality have the combined force of the technological explosion and the global pandemic. The task before us cannot be underestimated.

Researchers at the Stanford Center on Poverty and Inequality, writing on gender segregation in the workforce, argue that, "if the average annual rates of change since 1970 were to continue, it would take 150 years to reach full integration; if post-2000 rates continued, it would take 320 years."

8 Effective data gathering for process efficiency

It's vital to have a strong data-gathering foundation before looking to smart technology to produce executive dashboards, alerts and autonomously-generated instructions.

Businesses operate in the smart technology era and have access to powerful tools for data collection and process automation that were unimagined just a few years ago.

We have the power to use robotic process automation combined with machine learning to autonomously manage processes, resulting in greater efficiency, lower operating costs and better customer experience.

One of my long-time clients is a large bank. Every morning all its staff − and there are more than 40 000 − need to fill in an Excel form as part of a daily COVID health check, and send it to their line managers by e-mail.

This bank has invested millions of dollars in its technology platforms, utilising the latest and greatest technology platforms from the likes of Microsoft Azure and Amazon AWS, so I was astounded to learn that it requires staff members to complete the same document, on a daily basis, and send it by e-mail.

Imagine the hundreds of thousands of e-mails sent on this basis. I can bet you that most line managers do not have the time or inclination to process all these COVID health check e-mails.

It makes me wonder what was its thinking and the purpose behind this questionable decision.

There is no way the bank can smartly analyse all the e-mails, create alerts and look for patterns in the data. If it did it smarter, it would have used a web or mobile channel, making it easier for staff and requiring less time from everyone.

The data collected can immediately be analysed for patterns on a daily basis.

What patterns could smartly collected data show, in this case? You may, for instance, find that staff from the same location − like branch staff − are experiencing high temperatures and other COVID-related symptoms.

That is a clear indication that something is wrong and immediate action should be taken. In fact, if you use smart technology, you do not need a human to make that decision.

COVID symptoms from staff in the same location could trigger an automated message, instructing the affected staff members to self-isolate, while the matter is investigated.

Be clear on the strategy

- What information do you intend to gather?
- Where will you get this information, and how will it be collected?
- Why is the information needed, and what questions are the information going to answer?
- Who will use the information once collected? How will the information be analysed?
- How will any analyses be used (ie, reporting, budgeting, planning and prediction).

Use the tools you have. For basic data-gathering and reporting, there is no need for expensive or additional technology. The likes of Microsoft and Google provide tech that is either free or already part of your licensing (ie, Microsoft Office 365).

Capture the data at source. The best, fastest and most accurate way to capture data is "at source". Allow staff and customers to enter data through digital channels on their smartphones or using a chatbot on your website.

Problems come in when the source data has to be reworked (in the case of written documents that later need to be entered into a system by another person).

Make it easy and keep it simple. The people who capture the source data and those who need to use the data should be empowered. Only the most important data should be collected.

Avoid making it a laborious exercise by requiring data that is not important or that has already been submitted. (An example is asking for a client's name and address.

You should already know the address based on the CRM system info. The name can be linked to the address, or other data already in use, by connecting it to the name once submitted.)

Data privacy is key. The Protection of Personal Information Act (POPIA) is now law. A breach can result in up to 10 years imprisonment and a R10 million fine.

A breach is when the data is "lost" or hacked or used for purposes other than for why it was gathered. Key here is personally identifiable data (name, telephone number, ID number, address, etc).

In the case of Google and Microsoft, the data is safely stored in the cloud. But give consideration to how the data is used in your company. (Who has access and why? Is there data on printed paper that is not stored safely; ie, in desk drawers?)

Change management is important. Those who are required to capture the data should see how it will benefit them. If they see it as yet an additional administrative requirement, then the uptake will be slow. Ensure you keep the front-line staff and customers involved.

Ask them what would they like that would make their lives better from a reporting perspective. The roll-out of the data-gathering portal should be done with the right messaging and change management in mind.

9 Automation anxiety

And Algorithmic Unemployment

A father was serving an unfair prison sentence, thinking about his inevitable demise. Wondering if he might ever see his daughter again, he penned a moving last letter to her. "My sweet darling Alyonushka."

The father was an intellectual and a brilliant economist who fell out of favour with his government because of his views and writings. "Read good books. Be a clever and a good little girl. Listen to your mother and never disappoint her. I would also be happy if you managed not to forget about me, your papa, altogether."

It was August 1938 and soon the Stalinist government executed Nikolay Kondratyev. A pre-Keynesian economist, and sidelined by many 20th century economic thinkers, he is best known today for the 50-60 year economic supercycles he identified in capitalist economies.

To the dismay of the Soviet regime, he identified that the intermittent economic crises faced by the West did not lead to an inevitable implosion but cleared historical debris for new cycles of growth.

Kondratyev's "long wave cycle theory" was later renamed "Kondratyev waves" or "K-waves" by his contemporary

Joseph Schumpeter (known for his economic views on "creative destruction").

The first wave of innovation was water power and mechanisation, followed by steam engines and the rail industry. Electricity, later enabling the electronics era, culminated in digital networks and the Internet.

We are now in the 6th wave where our daily lives are impacted by digitisation, smart devices, hyper-automation, robotics and artificial intelligence (AI). Some call this the fourth industrial revolution but I prefer to call it *the smart technology era*.

We usually predict the future based on past events. However, with the rapid advance of smart technology, it is not easy to base our future on the past.

Danish philosopher Søren Kierkegaard famously wrote that "Life can only be understood backwards, but it must be lived forwards."

We are to "live forwards" in a world where the growing threat of nuclear war, the tangible effects of climate change and technological disruption will increasingly impact our daily lives and certainly that of our children. Perhaps the greatest impact on humanity will be that of automation.

The world is increasingly being automated around us, impacting every kind of job we can think of, giving rise to the term *automation anxiety.*

As if that is not enough, we can only imagine what impact the Covid pandemic will have on the long term job

security of millions of people. Over the last months, the majority of businesses were forced to digitise their operations.

Many realised that their employees can work from home and in most cases the drive to automate both back- and front office processes have been accelerated.

The smart technology era will give rise to *algorithmic unemployment* where smart technology and automation will result in systematic inequality created by the changing nature of work itself.

We often hear that becoming an "AI-powered" enterprise is what business leaders should aspire to. But have we considered the long term consequences?

Indications are that AI organisations will create a great algorithmic barrier between the leadership and the workers.

The organisation will be run by a small group of leaders utilising smart technology that will autonomously manage low-paid workers on the periphery.

Algorithmic work allocation, initiated by the elite few, will allocate tasks to the herd in an Orwellian nightmare where only some animals are more equal than others.

Digitally mediated work - the bread-and-butter of the gig economy - will create a coded ceiling where workers are doomed to perform their menial tasks forever.

Career advancement will be a thing of the past. The result will be a hollowed-out middle class and the long term societal impact will be reversible.

What is in store for us over the next few years? Global audit and consulting firm PwC reckons that there will be three waves between now and the next decade: *algorithmic, augmentation* and *autonomy*. "During the first wave, we expect relatively low displacement of existing jobs, perhaps only around 3% by the early 2020s. By the mid-2030s, up to 30% of jobs could be automatable."

One is left to wonder if Kondratyev's theory will prove relevant in the future. Will the world economy and even democracy itself be able to survive in a world where everything is automated?

A world where almost everyone could be without a job (the "useless class" according to Yuval Noah Harari), and our future may be that of dragnet surveillance, big data policing and technological police states?

10 Tsunami Warning:

Intelligent Automation and the Digital Workforce

It happens without warning out of sight deep under the ocean. It happens without our permission – whether we want it to happen or not – and it has the potential to destroy life at an unimaginable scale.

Many of us remember the horrifying television coverage of the 2004 Indian Ocean tsunami caused by an undersea megathrust earthquake.

We remember the 2011 tsunami that hit the Fukushima Daiichi Nuclear Power Plant complex, causing level 7 meltdowns at three reactors. We collectively held our breath, fearing another Chernobyl disaster.

You may wonder why I start an article on Intelligent Automation and the Digital Workforce with reference to tsunamis. Will I be painting a bleak picture of the future, an indication that humanity's fate is sealed due to advances in technology and automation?

Will this wave of autonomous technology sweep over us like that caused by a colossal earthquake under the oceans? My answer is yes, and no.

Technological advance is in a sense like a tsunami: it is happening whether we want it to or not, it is happening faster than we can imagine, and it is often happening out of sight and without our awareness, only to announce itself by rapidly and forcefully changing the world we work and live in.

On the other hand, these advances are like water tamed by humans to produce power. We use water to serve us and to make our lives better.

Will current and future technology destroy or serve us? We still have time to make the right business, societal and investment decisions to steer the rising wave in a direction that will benefit our species.

The concept of automation is certainly not a new one. The term automation was first coined in the automobile industry around 1946 to describe the increased use of automatic devices and controls in mechanised production lines.

These days automation is infused in our daily lives: from the appliances we use at home, the applications on our mobile phones, the way we produce goods and services, the aeroplanes we fly and the things that entertain us.

Up to now, we have automated the "things", but we are entering a world where the "things" will automate themselves. We hear terms like digital automation, autonomous automation, and hyper-automation.

We read about potential job losses and employment implications. We think about our children's education, and we wonder if current secondary and tertiary

educational institutions are providing adequate learning and skills for a very uncertain future.

This topic is very relevant to society in South Africa. To become increasingly relevant in a globalised world and compete with other nations, we have no choice but to follow the path to intelligent automation in all aspects of economic life.

But in a world where economies have been severely affected by the global pandemic and in a country where unemployment is a growing clear and present danger to our future, we have a tough balancing act to follow.

We need better guidance and legislation from our government. We need a mature approach from large and small businesses alike.

I think we can work together to achieve efficiencies and operational cost reduction through intelligent automation and, at the same time, upskills our labour force.

I admit that this is perhaps a bit naïve and most likely not achievable. But we have to think about this, and we have to work together.

Part 3: AI in your world: *AI on the global stage*

11 Welcome to the Zettabyte Era

We were waiting for the arrival with great anticipation. Once the courier handed over the package we rushed back to the warehouse, eager to lay our hands on it.

I started my career building personal computers and managing the logistics for a computer distributor.

Back then, the standard-size hard drives we installed in computers was 20MB (megabytes). But that day, based on a unique client order (and at great expense) we opened a box to the future.

In my hands was a 1GB (gigabyte) hard drive. It was big and heavy and the crowd around us almost bowed in reverence.

That evening I had to send a picture of this alien technology to a friend. I connected my digital camera to my computer, uploaded the picture, and waited patiently for my dial-up modem to connect.

The file size was 2MB and I waited several minutes for the data to upload before the email was sent.

Young people today may imagine that my story was from the time when Thomas Edison worked on electricity generation, but it was a mere 20 years ago.

Back then large amounts of data were produced by large businesses such as banks and telcos, but these days we all produce vast amounts of data.

Just think of all your social media interactions, the pictures you upload to various platforms, your geospatial data (exactly when and where you have been).

A few years ago Cisco announced we have entered the Zettabyte Era, based on the amount of internet traffic we generate on an annual basis. Remember the 1GB hard drive?

Put a trillion of those next to each other and you will get a zettabyte, which is 2 to the 70th power bytes, or 1 sextillion bytes.

What are the factors that contribute to this incredible amount of data we are generating? Technology is always on the road to becoming smaller, cheaper and more powerful.

The computing power in the average smartphone was almost beyond imagination just a few years ago. We live in a world of increasing wireless and mobile traffic, broadband speeds, and video streaming.

We often hear the term "big data" which refers to data that is so large, fast, or complicated that processing it using traditional methods is difficult or impossible.

Imagine a company with a million customers who interact with it daily to procure products or services.

Imagine the amount of data generated by those transactions.

A good example is mobile network providers with millions of customers. Your bank may have fairly up-to-date data on you, such as your purchase history over the past week.

But your mobile provider knows exactly where you are at any time (given that your phone is on and accessing their network), how much data you use and which applications you access.

Not all organisations have such large transaction volumes from a vast amount of clients. However, in the smart technology era, it is possible for all organisations to use technology such as AI or the so-called internet of things to gain real-time data on their clients.

In the past, companies would use client data retrospectively. They would use executive dashboards on recent historical transactions to plan for the future.

These days it is possible to use machine learning models to predict the needs of clients instantly. We can use computational social science to solve human behavioural prediction challenges.

Smart technology is good news, it can take your company's performance to new heights. But your clients are getting smarter and they are getting used to better service levels from your competitors.

Your clients lack patience and want to interact with your business instantly, in a manner of their choosing.

As much as smart technology can empower businesses, it is empowering your clients even more. They are expecting you to use all the data which you have been harvesting to offer them better products, services and better instantaneous experiences.

12 Embrace AI to speak to your customers

Voice computing opens opportunities in the way we interact with and serve customers in real time

It was perhaps the one Zoom call that left me more emotional and inspired than any virtual conversation I had before. The man on my screen has been deaf since early childhood and he spoke with a beautiful humility and profound articulation.

I could barely understand what he was saying and he could not hear me. So how did we communicate? Our intermediary was a smart technology called natural language understanding.

In August 2020 I conducted an interview for my YouTube channel with Dimitri Kanevsky. Before joining Google, he was a research staff member in the speech algorithm department at IBM.

He is the creator of Live Transcribe, an app with the potential to give people who are deaf or hard of hearing greater independence.

More than any day before I realised how smart technology can be used to make life better. The fields of education and health care are already showing great

potential when infused with artificial intelligence (AI) algorithms.

Our ability to speak and to communicate with each other is what makes us human. Speaking to another person, gaining understanding, agreement and friendship are at the core of our lives.

Sherry Turkle, a professor at the Massachusetts Institute of Technology, in her book *Reclaiming Conversation: The Power of Talk in a Digital Age*, writes: "Afraid of being alone, we rely on other people to give us a sense of ourselves, and our capacity for empathy and relationship suffers.

We see the costs of the flight from conversation everywhere: conversation is the cornerstone for democracy, and in business it is good for the bottom line. In the private sphere, it builds empathy, friendship, love, learning and productivity."

Clifford Nass in *Wired for Speech: How Voice Activates and Advances the Human-Computer Relationship*, writes: "Even before birth, a foetus in the womb can distinguish its mother's voice from all other voices. Within a few days after birth, a newborn prefers his or her mother's voice over that of a stranger's and can distinguish one unfamiliar voice from another.

"By eight months, infants can tune in to a particular voice even when another voice is speaking."

Speaking, listening, understanding and responding with meaning makes us human. It is also what makes the new wave of technology smart. In the days of mainframe

computers, IBM was the ruling firm; the desktop era was dominated by Microsoft.

In the internet age Google reigned supreme. Facebook and Apple proliferated with mobile computing. We have now entered the era of voice computing.

What happens when our computers become as articulate, compassionate and creative as we are? "The advent of voice computing is a watershed moment in human history because using words is the defining trait of our species."

So writes James Vlahos in *Talk to Me: How Voice Computing Will Transform the Way We Live, Work, and Think.* "Voice is becoming the universal remote to reality, a means to control any and every piece of technology.

Voice allows us to command an army of digital helpers — administrative assistants, concierges, housekeepers, butlers, advisers, babysitters, librarians and entertainers."

Voice computing offers many benefits to businesses. It opens new opportunities in the way we interact with and serve our customers in real time.

We are able to harvest valuable behavioural data from client interactions, enabling us to predict and reduce churn.

13 Internet of things

The "Things" are getting smarter

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Greatly increased computing power, cloud technology, machine learning and autonomous decision-making are revolutionising the role devices play in our lives.

The walls in the large room were filled with mainframe computers, screens and flashing lights. I was mesmerised as it felt like I entered the cockpit of Star Trek Enterprise.

As a six-year-old boy, my dad took me along to Sentrarand, a centralised traffic system and railway marshalling yard for Transnet's cargo and freight traffic in Johannesburg.

He explained how there were sensors on the rail tracks that determined the location and speed of the trains as they crisscrossed through the yard.

The data was fed to the large computers for monitoring and control. If a train was found to be on the wrong track or above the acceptable speed limit, the sensors on the tracks would engage to stop the train.

Sensors that send us data are not something new. The technology to read or sense data has been utilised in the likes of electricity distribution, agriculture, infrastructure management and security for many decades.

In the past, these devices were focused on specific industrial uses; they were somewhat "dumb" in that it did not understand the data collected and it did not interact with other devices.

Sensor data had to be interpreted by human operators for decision-making.

So what has changed over the last few years? The advent of the smart technology era, with greatly increased computing power, cloud technology, machine learning and autonomous decision-making, has been revolutionising the role devices play in our lives.

No longer limited to industrial use, we all carry smart devices in our pockets in the form of smartphones, smartwatches or other smart wearables.

Internet of things (IoT) is everywhere
The business application of smart devices, driven by pattern recognition and prediction algorithms, are already found in all industries. Let's review a few examples:

- **Consumer IoT:** Our houses have progressed from dumb, to automated, to smart, combining security, energy management and convenience. Inside, they are outfitted with linked items, ranging from toothbrushes, to refrigerators, to beds. We wear a new category of IoT gadgets on our bodies, measuring ourselves and our surroundings.

- **Commercial IoT:** Telematics is helping commercial industries such as transportation improve fleet management. In healthcare, IoT is augmenting our doctors' knowledge and abilities while also providing their patients with the information they need to treat or prevent sickness. Everywhere you look, equipment is being outfitted with sensors to send data to its owners in order to enhance their company and consumer connections.
- **Infrastructure IoT:** Infrastructure is getting smarter, beginning with smart cities that connect their assets with their people and the vehicles that carry them. Utilities are delivering electricity more effectively and reliably by emulating smart power stations connected to smart grids connected to smart meters in our smart houses that contain our smart gadgets.
- **Industrial IoT:** Manufacturers can produce better products and generate more vehicles, machinery and chemicals at a reduced cost. The oil and gas sectors use sensor data to extract, process and distribute their products more effectively. Mining is boosting production and safety by using self-driving equipment that operates 24 hours a day. In agriculture, yield modelling supplemented by machine learning is being used to boost production by utilising data from crop sensors.

IoT into the future

Smart technology brings to life intuitive human to machine interactivity, which will allow us to interact with other humans over great distances, sharing the same sensory experience.

The potential is vast in areas such as education, entertainment and medical care. Cyber-physical platforms will deliver 3D audio and haptic sensations.

Smart technology brings to life intuitive human to machine interactivity, which will allow us to interact with other humans over great distances, sharing the same sensory experience.

Let's consider some IoT future predictions:

Expect an explosion of devices infiltrating our world. There were more than 4.7 billion objects linked to the internet in 2016. The market for IoT devices will grow to over 11.6 billion units in 2021. It is expected that by 2025, there will be more than 21 billion IoT devices.

More cities will become more "smart". Consumers will not be the only ones to make use of IoT gadgets. Smart technology will be increasingly used by cities and businesses in order to save time and money.

Cities will be able to automate, remotely control, and gather data through visitor kiosks, video camera surveillance systems, bike rental stations and taxis, among other things.

As artificial intelligence technologies mature, so will IoT capabilities. Smart home hubs, thermostats, lighting systems and even coffee machines collect information on your preferences and use trends data.

When you set up voice-controlled devices, you give them permission to record what you say to them and save the recordings in the cloud. In most situations, the data is collected to aid in what is known as machine learning.

The sensors will become smarter and more secure. Most consumer IoT devices are vulnerable to security flaws since they are located in the house and cannot be protected by security software.

Many manufacturers work hard to get their IoT devices to market as soon as possible, so security may be an afterthought. Securing devices, especially in healthcare, will become a greater priority.

5G networks will provide better speed and will fuel IoT growth. Major cellular providers will keep deploying 5G networks. 5G cellular wireless, or fifth-generation cellular wireless, offers faster speeds and the capacity to connect more smart devices at the same time.

Faster networks imply that the data collected by your smart devices will be captured, analysed and managed to a greater velocity. This will drive innovation among IoT device manufacturers and increase customer demand for new goods.

Concerns about security and privacy will fuel legislation and regulatory activities. The proliferation of IoT devices is only one of the reasons for increased security and privacy issues. GDPR has sparked similar security and privacy efforts in a number of countries across the world.

In South Africa, we need to consider personal data collected by smart devices in compliance with the POPI Act.

The internet of things provides opportunities for businesses previously unimagined. On the one hand, consideration is to be given to the types of devices to be used and to the data that needs to be collected.

The processing of sensor data with prediction modelling is most important: it is one thing to collect all the data, but how can we use it to better serve our customers?

14 AI is only starting out and yet to reach puberty

"What kind of work does your dad do?" My son had a few friends over and I was listening with interest to them with one ear while trying to focus on a Zoom call with the other. "He fixes computers."

I had to smile. How do you explain artificial intelligence (AI) and intelligent automation to a seven-year-old?

The next morning my son asked: "Daddy, are computers smarter than us?" We were getting ready for school and he tried to make "butterfly wings" while tying his shoelaces. What a question.

Well, I thought, while tying his laces hundreds of millions of impulses were streaming in and out of his brain, from tendon bodies and muscle spindles in his extremities to his retina, otolithic organs, and semicircular channels in his head.

Can AI tie its shoes? Is AI smarter than my son, or all humans for that matter? "It is comparatively easy to make computers exhibit adult-level performance on intelligence tests or playing checkers, and difficult or impossible to give them the skills of a one-year-old when it comes to perception and mobility."

In 1988, Hans Moravec penned those words. As an adjunct faculty member at the Robotics Institute of Carnegie Mellon University in Pittsburgh, he teamed up with Rodney Brooks and Marvin Minsky to produce what became known as "Moravec's Paradox".

It's easy to see the fundamental differences between human and artificial intelligence since carbon-based biological brains and digital silicon-based computers have been tuned for quite different types of work.

Because of these distinctions, using our own minds as a model, analogy, or basis for reasoning about AI could be extremely misleading. Consequently, it's possible that erroneous assumptions will be made regarding the difference between human and AI abilities to do difficult jobs.

By nine months, babies are learning to relate pictures to real items. An image of a toy can teach a baby about it before their first birthday.

The time and effort necessary to teach a youngster what a cat is versus the recognition process for a computer illustrates the learning gap.

A toddler can identify a cat by looking at it, whereas a machine needs to analyse huge volumes of data to get the same conclusion (estimated at 10-million images).

In 2016, a great deal of excitement about AI was widely published when AlphaGo, developed by Google's DeepMind Technologies, became the first computer program to beat Lee Sedol at the Chinese board game

Weichi (or Go). Training an AI to play Go cost an estimated $25m.

The number of permissible board places in Go has been estimated to be about 2.1 x 10,170, which is significantly more than the estimated number of atoms in the known, observable universe, which is about 1 x 1,080.

Human-like intelligence is the gold standard for AI, and discussions on such topics as trustworthiness, explainability and ethics are marked by implicit anthropocentric and anthropomorphic concepts.

No matter how advanced AI agents get in terms of intelligence and autonomy, they are likely to remain unconscious robots or specialised devices that assist humans in specific, complex jobs for the foreseeable future.

AlphaGo reached a significant milestone in computer engineering. But did it know it had won? Did it realise the importance of its accomplishment?

Did it revel and celebrate in its victory? The answer is simply no. AI, for now, does not share consciousness with humans.

AI is like a young person who is yet to reach puberty. We speak about artificial narrow intelligence. But in time, AI will grow to be a teenager.

Artificial general intelligence will be capable of thinking, comprehending, learning, and using intelligence in the same way that humans do.

15 Goliaths can turn the tables

Big companies need to revamp and innovate not only from the top down, but encourage innovation from the bottom up.

When the company was started it was fuelled by an entrepreneurial spirit, a keen appreciation of digital technology, and it soon became internationally recognised as a market leader in its domain.

This firm attracted the best talent available; they were the talk of the town and other business leaders viewed them with a jealous appreciation.

Now, almost two decades later, the company is a behemoth of corporate structure, political undercurrents, and the once can-do attitude has morphed into competing status quo alliances.

Many of the exceptionally talented and ambitious engineers who joined them in the early days are still there.

They steadily climbed the corporate ladder and the many years of success bred a smug sense of entitlement.

Once an exciting technology-led start-up, blinded by triumph, the company stagnated. Producing ever-strong annual results, but unaware of the sea change in the technology landscape, the executive slumber at the steering wheel continued.

Dear business leader, do you identify with this story? I am writing about a particular client I consulted with over the years, but this story most likely applies to many organisations in our market.

The rate of change brought on by the smart technology era, where start-ups use artificial intelligence (AI) to streamline their back-office operations and front-office client interactions, poses a dire threat to many traditional corporations.

Imagine working for a company that had smart technology at its very foundation. Just think if you could lead a firm with a lean workforce, few disabling structures, with AI at its centre.

Envision how you could disrupt your well-established competitors, quickly eating away at their once-secure market share.

You may shrug in despair, believing that the large and slow-moving firm you are now leading may never compete in the long term with the new kids on the block.

In *Goliath's Revenge: How Established Companies Turn the Tables on Digital Disruptors*, authors Todd Hewlin and Scott A. Snyder provide an insider's view on how large global firms such as General Motors, Hitachi, Mastercard, and others accelerated into the digital era.

"They have seen some of their traditional competitors succumb to the digital attackers that are setting the rules for their   industries. Instead of waiting for their businesses to be disrupted by some Silicon Valley whizz kid, they are saying, Why can't we use those same strategies, tactics, and tools for ourselves? Some are setting their sights even higher."

The authors offer a step-by-step map for executives of established businesses to follow the Silicon Valley model and profit from digital disruption.

AI, robotics, the internet of things, blockchain, and immersive experiences are all transforming the competitive landscape.

"They are simultaneously protecting their core businesses from digital disruption while also running the disrupters' playbook to expand into high-growth adjacent markets."

Leaders of "Goliath" corporations are encouraged to revamp their client outcomes and to innovate not only from the top down, but to encourage innovation from the bottom up.

You can use the vast amounts of client data at your disposal in smarter ways while reframing your company's purpose. Always value talent over technology and upskill your workforce for the future.

Part 4: AI in healthcare: *health & longevity*

16 The future of medicine

The Robot will see you now

From drones to smartphones, artificial intelligence is helping to deliver medical technology to those who need it the most.

I live near a large hospital and drive past it almost every day. I do not like hospitals. They are places of health care and healing, but also of death. A hospital is the last line of defence where we mortals try in desperation to end suffering and prevent death.

But our science almost always leaves us behind in the dust.

The quest for immortality has obsessed humans for as long as we have walked the earth. Alchemists over many eras and civilisations tried to create the elixir of eternal life. The ancients in India, China and Mesopotamia pursued ways to avoid death.

Some call it the philosopher's stone, a potion believed to bring perpetual youth.

While modern medicine may sometimes perform miracles, it also frequently provides care that is dangerous, unreliable and prohibitively costly.

Technology, meanwhile, has been hailed for years as the panacea for all of health care's woes.

And after years of resisting computerisation health care has finally gone digital. It is among the industries that have benefited the most from the smart technology era.

An example is radiology, the branch of modern medicine where imaging technology is used to diagnose and treat disease. Machine learning algorithms are very good at image recognition.

Medical technologists feed the artificial intelligence (AI) millions of brain, lung or breast scans and the technology helps doctors to compare them with a multitude of categorised images in split seconds, providing an instant and accurate diagnosis.

Not only does the smart technology era vastly increase the effectiveness of medical treatment, it also promises to greatly lower the cost of medicine. This is good news for the large majority of people on Earth who do not have access to medical care.

Technological advancements result in smaller and more affordable devices — just think of your mobile phone — and these devices are becoming more powerful by the day.

Complex and expensive medical equipment and medicine are becoming easier to transport to outlying areas where they are most needed.

According to the World Economic Forum, about 2-billion individuals do not have access to essential medication, mostly because they reside in deep rural areas.

Drones have been used to deliver personal protective equipment and medicine to out-of-reach areas affected by the Covid-19 pandemic.

They have also been used by the SA National Blood Service to deliver urgently needed blood supplies to rural clinics.

The University of Pretoria's Kathryn Malherbe and her team at Med Sol AI Solutions are deploying cost-effective wireless ultrasound probes from Clarius in rural areas.

The scans are instantly uploaded to the cloud where complex algorithms compare them with numerous other scans to assist in early and accurate detection of breast cancer.

While Malherbe believes AI will never replace doctors, those not using AI will be replaced by doctors who do.

17 Computerising the brain: the next frontier in human evolution

The working of the brain has been studied for a long time. Technology such as magnetic resonance imaging (MRI scans) and computerised tomography (CAT scans) have been used to produce detailed images of the brain.

They can assist doctors in detecting and diagnosing diseases such as cancer, stroke causes, and vascular dementia.

If technology can see the brain functioning, can it also read our minds? The mind is not an organ, but the brain is. It is the physical location of the mind, a container for the electrical impulses that give rise to thinking.

Your movements, your organism, your activities, and the transmission of impulses are all coordinated by the brain. However, you think with your mind. You can think about what happened, what is coming up, and what might happen.

The latest technology in brain reading is the brain-computer interface. The brain may be controlled by a variety of elements, all of which can be manipulated by devices implanted in the neural network.

In the realm of neurotechnology, it represents a new form of technological integration.

Neuralink, founded in 2016 by Elon Musk and others, aims to create a brain-computer connection by implanting electrodes in the brain.

In the near term, Neuralink plans to develop devices to cure major brain disorders, but the long-term objective is human improvement, known as transhumanism.

The goal of neurotechnology is not only to read our brains, or to send electronic instructions, but also to receive instructions from the brain.

For decades we have used our hands to send commands to computers via a keyboard or mouse.

Lately, we have been able to use our voices and speak commands to our electronic counterparts.

But what if we can simply think and the computer will understand and execute? Or, and this is where the ethical challenges come in, what if computers can influence how we think, what we think, and control us?

Imagine the repercussions on privacy and on the very foundations of democracy itself.

The "Recommendation on Responsible Neurotechnology Innovation", published by the Organisation for Economic Co-operation and Development, addresses a range of unique ethical, legal, and societal questions.

"These questions include issues of (brain) data privacy, the prospects of human enhancement, the regulation and marketing of direct-to-consumer devices, the vulnerability of cognitive patterns for commercial or political manipulation, and further inequalities in use and access."

It seems that the development of brain-computer interface technology is the gold rush of our era. Large organisations and governments are investing billions into this new age of technological colonisation.

Musk says that he wants to create a "superintelligence layer" in the human brain to help safeguard humanity against artificial intelligence, while Facebook CEO Mark Zuckerberg has stated that he wants people to be able to post their ideas and emotions on the internet without having to type.

Our thoughts are perhaps the most private part of our existence. If I am able to upload my thoughts, others will be able to download them.

British writer George Orwell warned us a long time ago against the "thought police" who discover and punish thought crime: personal and political thoughts unapproved by the regime.

18 **There is a robot in my bloodstream working its magic**

"Daddy, how big is the coronavirus?" During the first lockdown, my son was asking many questions about the pandemic. "Can we see it?"

To answer this question, I used examples from around the home. I thought it best to start with millimetres (mm): an ant is on average 5mm long and the head of a pin is about 1-2mm wide.

To go smaller, I tried to explain the nanoscale: the prefix "nano" means one-billionth of a metre or 10 to the power of 9.

This made me wonder: how big is a virus? It seems the answer is about 100 nanometres (nm).

A sheet of paper is about 100,000nm thick and a human hair is about 80,000nm wide. Then the geek in me started wondering about how small computing technology could become.

Could a computer chip be so small that we cannot see it? What if we inhaled it, or what if it was injected into our bloodstream?

In 1965, Gordon Moore, Intel's then-chair, projected that the number of transistors on a computer chip would quadruple every year.

Many people nowadays are anticipating the collapse of Moore's Law in the near future due to the constraints of silicon semiconductors and the laws of physics.

Scientists have been experimenting with novel materials and techniques to cram more transistors onto circuits, and they have discovered a means to reduce transistor connections without sacrificing performance in carbon nanotube devices.

Nanorobotics encompasses several fields, including nanofabrication techniques for nanomotors, nanoactuators, and nanosensors, as well as physical modelling at nanoscales.

Approval hurdles
Nanomedicine is the latest and most practical use of this technology, which employs nanotechnology to enhance illness research, diagnosis, and therapy at the single-molecule level.

Self-propelled nanomotors and other biodegradable nanodevices composed of bio-nano components can transport medicines to sick cells in our bodies.

Nanomedicine technology is in its infancy and there are many technological, ethical and governmental approval hurdles to overcome.

Predictions are that the nanotech market will exceed $125bn by 2024 and that the smart pill market will reach $650m by 2025.

The following technology is already in medical use:

- The ingestible camera PillCam was the first FDA-approved smart pill in 2001. PillCams have already been used in millions of operations.
- Constipation is efficiently treated using vibrating Vibrant capsules that induce muscular contractions to restart digestion without the need for laxatives or any severe adverse effects.
- Dose-tracking pills contain a sensor that relays data through a patch worn by the patient, tracking dosage adherence.

Medical nanotech under development includes:

- Atmo gas capsules, in which gases pass via a permeable membrane into the capsule, where sensors monitor amounts of oxygen, hydrogen and CO_2. Researchers may use oxygen levels to determine the capsule's position, while hydrogen provides important information about the microbiota of the stomach.
- Smart sensor capsules, which unfold into a Y-shape, lodging in the stomach where it tracks vital signs for diagnosis and

treatment monitoring. Preloaded compartments can be customised to release medications and are controlled by Bluetooth technology. These capsules are under development at MIT.

I am glad to be able to tell my son that despite the coronavirus being very small, we will have effective treatment in future of hitherto incurable diseases due to nanotechnology.

19 **The brain wired for healthcare**

The answer to some of mankind's biggest medical problems is likely in the future to be found at the confluence of science and technology.

A Peruvian physician used a crude instrument and began scraping a hole in her patient's skull. The doctor did not use anaesthetic or sterile procedures and most of her patient's shattered upper skull was removed before the surgery was finished.

The head wound was a result of a battle between warring tribes. Surprisingly, the operation was a success and the victim survived.

One can only imagine that the hospital's medical review board would be aghast when learning about this unorthodox procedure. Interestingly, this did not happen in a hospital but in a cave.

And there were no review boards at the time, as we are talking about trepanation: operations performed in ancient times to treat head wounds, or for mystical reasons.

For millennia, humans have been peering into the skulls of others, interested in the workings of the brain and

curious about why our cranium is smaller than those of other mammals.

Thankfully, brain surgery is very advanced these days and we do not have to bite on a plank as the local witch doctor opens our skull.

The most recent breakthrough in brain-reading technology is the brain-computer interface. The brain may be regulated by a variety of variables, all of which can be controlled by devices implanted in the neural network.

In the realm of neurotechnology, it represents a new form of technological integration. Smart devices might lead to a cure for serious brain disorders as part of the long-term aim of human improvement known as transhumanism.

Nervous system injuries − often irreversible − are difficult to treat. However, the answer to some of the problems that people with paralysis or other disabilities confront is likely to be found at the confluence of science and technology.

Nerve-stimulating devices have been created by technologists to aid amputees suffering from phantom limb discomfort.

The technique works by stimulating particular neurons and blocking chronic pain with a generator the size of a pacemaker and an electrode.

Neurotechnology-based treatments, which were previously considered science fiction, are rapidly becoming a reality.

The gadget might also be used to treat pain in other chronic diseases, such as post-surgical pain and migraine headaches.

Neurotechnology-based treatments, which were previously considered science fiction, are rapidly becoming a reality.

The field blurs the borders between technology and biology, utilising neurostimulation techniques and brain-machine interfaces.

In order to do this, they either record brain impulses and "translate" them into technical control orders, or deliver electrical or visual stimulation to the brain in order to influence it.

Hybrid brain-machine systems are likely to become increasingly common in the future. Numerous neurotech firms, in various phases of development, are trying to do anything from forecasting an athlete's potential, to treating depression.

Scientists predict a big advance in neurotechnology, thanks to the development of ultra-flexible brain-machine interfaces that might reduce the immunological response of the patient.

It has the potential to be a game-changer for many patients, as well as having far-reaching societal consequences.

Brain-interface technology is still in its early stages, but it's vital to investigate ethical issues as devices are created, to ensure they're not harmful. We would not want scientists to create a new gadget and then discover that it has significant ethical implications.

When it comes to neurotechnology, ethical concerns are entrenched not just in the technology or research, but also in society.

Questions like these aren't only for scientists, engineers, or even professional ethicists; they're part of a wider discussion in society over technology's proper applications, the use of personal data, and when patients should be free to decline treatment.

Part 5: AI in business: *practical steps*

20 My personal banker is a robot

The smart technology era is changing how clients interact with their banks. A new generation of banking clients, growing up in a digital world, regard banking relationships differently. Will relationship bankers be able to adapt fast enough?

"Alexa, how should I invest my money?" The 20-year-old recently started her first job. Tracy, fresh from graduating from university, is looking for financial advice. And not just the typical one size fits all kind of advice.

She is looking for information tailored to her personal life and financial profile. She is looking for instant feedback in the digital channel of her choice.

Her father urged her to visit the local bank branch. His relationship banker has been a friend for many years.

This is what relationship management conjures up: one-on-one meetings between a relationship banker and a client, offering advice on financial matters such as cash management or other requirements.

When it comes to relationship management, the high-touch strategy has long been regarded as relying

heavily on the abilities and relationship skills of the individual banker.

However, as clients become more demanding and self-reliant, and banks seek higher levels of productivity, these kinds of relationships are fading. This is why our story starts with the young lady speaking with her smart speaker.

She and her friends are used to interacting with smart technology. Their idea of personal relationships is different from that of their parents.

Comfortable living in the virtual world of social media, learning from a young age to use technology, they do not always seek human interaction.

Digitally connected banking
Client relationships, which relationship bankers have spent decades cultivating, are what they live and die by. The trend toward more digitally connected banking is unavoidable when it comes to loans, deposits, or other services in the banking industry.

Retail and business behaviours are driving this change, and banks are being compelled to move at a rate they are not used to.

In the digital age, relationships will not disappear; rather, they will undergo changes due to technology. As future generations become more tech-savvy, financial institutions must analyse what makes a leading digital relationship.

At too many banks the service culture has been replaced by a compliance culture, one in which the customer comes second.

Virtual assistants are more than just a new way to gain access to various services. The creation of new social standards concerning privacy and security, work and leisure, as well as the intimacy and empathy of human-technology relationships, are necessary to meet these challenges.

What is it like to be a part of such systems? What kind of behaviour do they expect them to have?

Insightful digital banking
Customers prefer it when banks fix problems for them instead of creating new ones. By utilising data analytics, bankers can gain insights into customer account activity and future demands that are superior to what can be provided by a single banker alone.

Both large and small business consumers should benefit from improved bank insights.

Customers want omnichannel access as they now expect internal systems to communicate with one another. Many banks continue to rely on antiquated systems that necessitate manual data entry or have poor internal communication.

Traditional banks must adapt their analogue procedures to the new global order, which is a difficult task. Because of outdated systems, many banks are unable to go digital. Numerous financial institutions have been

hindered from embracing digital transformation due to obsolete systems.

Behavioural banking

Because of the high stakes and uncertainty associated with financial decision-making, technology-enabled, self-service channels are particularly challenging to optimise for financial services.

Money causes anxiety and people who are apprehensive want reassurance from other human beings. This can result in reduced levels of satisfaction as well as decreased trust.

A bank's ability to upsell or cross-sell to a customer in the future will be based on actionable data and customer behaviour intelligence.

The ability to predict when and where a customer will need your bank to solve a problem or meet a need will be the catalyst for a real-time, or near-real-time, highly relevant cross-sell or upsell engagement.

Differentiation will be determined by your data pools, partners, and insights that lead to the right trigger at the right time, as well as your ability to deliver that contextually with the least amount of friction.

Although some will look at this as a continuation of database marketing, behavioural models will prove more important than segmentation and targeting.

It is a dramatic change since marketing departments lack these skills. It is a matter of modelling data, not targeting and market research is not the same as data science.

Voice-user interfaces and augmented reality displays for information and feedback are both technologies that can move banking away from day-to-day interaction and sales.

The bigger difficulty is that in this new era, the capacity to acquire, cross-sell, and upsell depends on fundamentally different skills than before.

No one left behind
Banks should not limit their attention to digitally savvy, internet-connected customers. Consider developing compelling "low tech" solutions for pay-as-you-go phone users or consumers living in areas with poor broadband connectivity.

Look for ways to improve member communication via email, text messaging, or social media direct messages.

Human interaction will not disappear
Identify technology-enabled strategies to better utilise and enhance your customer-facing workforce. Instead of replacing human service encounters with automation, how can you give customers a map to help them navigate your website and digital systems?

To maximise limited time, how can technology prioritise customers who require face-to-face contact with bank employees? What dashboards or back-office solutions

can you offer your employees to help them better serve your customers?

Minimise branch visits
Do you support digital signatures for loan applications, or do members still need to visit your branch to complete a transaction?

Accelerate the development of technological solutions to reduce visits. Facilitate remote conversations ahead of required visits to reduce contact time while maximising relationship-building opportunities to impress and even delight customers.

With the pre-work done online, the branch visit can be more personal and caring, rather than clinical.

Financial well-being is a priority
Place a premium on financial well-being in your service value proposition. People require tools to assist them in planning and preparation during times of uncertainty and flux, and the finest solutions offer both customisation and contextualisation.

As a result, demand for personal financial management services will continue to increase in the future. It offers consumers a financial well-being toolkit that includes budgeting and cost tracking technology, income smoothing and savings apps, bill negotiation, loan repayment and credit management and repair, as well as investment and portfolio optimisation.

Human bankers in the loop

Remote channels have the advantage of allowing customers to choose how much engagement they want to have with their bank. They may choose to avoid involving a human if they so desire.

Mobile banking's seclusion and perceived anonymity can be a welcome alternative for customers who don't want to have awkward encounters with customer support employees.

The most essential step in your service value chain is the shift from automated to human interactions. Getting it right will increase loyalty while getting it wrong will result in lower engagement and higher turnover.

Maybe not a robot, but a robot-supported banker

Who knows how the future of technology will unfold in banking? One thing that seems sure is that technology will drastically change the way clients choose to interact with their banks, and therefore the way banks interact with clients will have to change too.

Perhaps Tracy, featured at the start of this article, will learn the value of human interaction in managing her financial affairs. We are hard-wired for human interaction. I wonder if a robot will ever be able to be a trusted financial advisor.

Humans need to accept that smart technology is here to stay, that it advances drastically and that it can support us in ways previously unimagined.

21 The future of accounting with bots

The new breed of techno-colleague is here to stay. We can avoid them at our peril, or we can form a mutually beneficial working relationship.

"Humans need not apply." Imagine reading those words on a job-seeker website portal. The smart technology era introduced us to computer systems that can be programmed to do the tasks that most human workers do on a daily basis.

Computers can see (computer vision), they can speak and hear (natural language processing), they can execute tasks (robotic process automation) and they can think and learn (machine learning).

One might wonder what is left for human workers to do in an age where robots can do what we do faster, more accurately, who are not involved with unions and industrial action, and who never sleep nor need sick leave.

In his book, *Humans Need Not Apply: A Guide to Wealth & Work in the Age of Artificial Intelligence*, futurist and technology entrepreneur Jerry Kaplan caution readers that the warning signs of techno-unemployment are

before us. "The two great scourges of the modern developed world - persistent unemployment and increasing income inequality - plague our society even as our economy continues to grow.

If these are left unchecked, we may witness the spectacle of widespread poverty against a backdrop of escalating comfort and wealth."

White-collar bots are here
For decades white-collar jobs were mostly spared from the onslaught of automation. While robots may be taking over less-educated individuals' blue-collar employment, artificial intelligence (AI) is set to disrupt higher-paying occupations for university-educated professionals, ensuring that no one is immune to the influence of technology on the global workforce.

In order to compete in the global market, organisations are utilising smart automation technology to decrease their operating costs, increase the development and delivery of new products and services, and offering clients a better experience.

Many businesses are attempting to leave their infant shoes of basic process automation. Others are only now learning to walk without assistance by implementing platforms like Robotic Process Automation while others have learned to run the course by embracing smart technology like AI.

The race is swift and lengthy, and the finishing line is continually moving out of sight.

On the horizon glimmers a new day of Intelligent Automation. Those businesses who are in their infant shoes or only now learning to walk are very, very far behind in the race. Will they ever be able to catch up?

In a recent global survey, covering all business domains, nearly 90% of business leaders indicated that they plan to deploy Intelligent Automation to stay ahead of their competitors.

42% of CEOs indicate that their organisations are already on a digital transformation journey, with 56% indicating they have experienced gains with the implementation of Intelligent Automation.

Finance functions on techno-steroids
All the functional areas in business are candidates for smarter automation. Perhaps the best of them all is the finance function.

Supplier onboarding, accounts payable, audits, procurement, cost management, closure processing, and customer enquiries are among the accounting activities and procedures that computing technology can streamline.

Technology like machine learning may help firms boost their value by improving loan underwriting and lowering financial risk.

As corporate accountants, analysts, treasurers, and investors strive toward long-term prosperity, AI may help reduce financial crime through enhanced fraud detection and can pick up on unusual transactional behaviour.

Smart technology is influencing the sorts of employment roles that will be accessible in the future of accounting.

Humans will undertake more of the analysis as improved technologies handle monotonous tasks, making them the essential link between data and clients. In the future, technology will continue to have an influence on the function of the accountant and the need for accountants.

Accounting is reaching new heights thanks to technological advancements. Whether you're an experienced accounting professional wanting to keep on the cutting edge of the business or an ambitious novice, you'll want to be aware of how the accounting profession is changing due to smarter technological platforms.

Are they coming for our jobs?
When people hear that robots will be introduced to the workforce, it is normally met with suspicion if not outright fear and resistance. A few years ago I worked in the technology division of a large bank.

The bank was the first local one to introduce a humanoid robot called Pepper. Standing just under a meter and a half tall, weighing nearly 30 kilograms, and with large child-like eyes, Pepper was destined to welcome customers as they entered a bank branch.

Despite all the excitement generated around our little electronic co-worker, many of my colleagues expressed a sense of unease. What made matters worse was that in the same week the bank's financial results were announced.

The CEO's remarks were taken out of context and the media reported that the bank would be getting rid of thousands of workers. Imagine that: the first of a potential cohort of robot workers are introduced and it seems that many would be left without a job.

The bank's leader actually said that they plan to employ fewer people over the next financial year due to smarter ways of working and better automation.

But whichever way you look at it, smart automation and robotics pose a threat to many workers. We can either fear the advances of technology or we can embrace it, ensuring we make ourselves robot-proof.

Educate for the future
What are finance professionals to do? Almost all the mundane, repetitive tasks in the finance function are candidates for automation.

They need to ensure that they have a good understanding of the business applications of smart technology.

They do not need to become technical experts who can write the algorithms that enable a machine learning platform to operate.

They need to understand how their profession is moving from mainly historical reporting and analysis to anticipating and advising on future trends utilising prediction models.

With automation expected to become a big part of accounting in the near future, it's critical to have the abilities needed to perform the managerial and analytical jobs that technology can't.

Many accountants may also take on a consulting position with customers, which means they'll need to be adept at analysing large amounts of data to detect patterns and trends. Knowledge of data mining and other data science techniques is essential.

The education of future finance professionals must be built on a solid understanding of technology applications to the craft. Tertiary educational institutions across the board need to review their curricula in light of the rapidly changing demand for skilled, techno-savvy workers.

Technologies impacting finance
Audits, tax preparation, banking, and payroll are just a few of the labour-intensive aspects of accounting that are fast becoming entirely automated.

As AI is used to develop self-learning systems, technology will take over the repetitive and time-consuming activities, allowing finance professionals to handle the analytical and advisory responsibilities.

Cloud computing enables access to resources like data and processing power. The constant updating of information is a significant benefit of a cloud-based system, allowing accountants and clients to analyse data and make decisions based on the most up-to-date information.

Blockchain technology will influence the demand for accountants in the future. The appeal of blockchain for accounting stems from the prospect of a new form of accounting ledger — one that can be updated and validated in real-time without the risk of being tampered with or damaged.

Welcoming the future

A new neighbour has moved in next door in the financial fraternity. Do we fear and avoid it, or do we welcome it and learn to live together in harmony? The new breed of techno-colleagues is here to stay.

We can avoid them at our peril, or we can form a mutually beneficial co-habitation ecosystem.

22 The future of GBS: threat or opportunity?

Global business services (GBS), which often includes both shared services and outsourcing, are increasingly being used by leading companies to create alignment among their business units, serving as a single enterprise organisation or network that can drive collaboration and efficiency to improve service delivery.

Large corporations continue to embrace shared services models to suit their global reach as they extend their operations throughout the world.

Human capital management, finance, accounting, supply chain and back-office support services are delivered through a global network of regional service centres.

Greater cost savings compared to typical country-specific shared services models, as well as increased employee engagement, faster working capital cycles, and enhanced vendor relationships, are some of the significant benefits that are realised.

Business process automation has a long history of increasing processing speed while also lowering costs. In an ever-increasingly competitive global economy, all businesses strive to produce more work with fewer employees while reacting faster to their clients' needs.

The era of Smart Automation (also known as Intelligent Automation) has pushed business process automation into a new era, powered by record-high processing speeds, Cloud computing, and new technologies like Artificial Intelligence and Machine Learning.

The future of GBS is under threat
GBS's future resides in its capacity to help organisations accomplish even more with less by combining data and expertise from different businesses, departments, and regions to change customer and employee experiences with predictive insights at unprecedented speed.

As many businesses across the world implement smart technology platforms they realise benefits on their own which may cause them to reconsider their GBS partnering model.

The technological platforms currently implemented by the vast majority of global enterprises fall into three main categories:

Robotic Process Automation (RPA) RPA involves the use of a virtual worker (or software "robot") to complete tasks using a software application user interface, replacing the need for human intervention.

RPA is logic-based software that automates repetitive digital tasks or rule- and logic-driven steps.

Virtual agents Virtual agents (VAs) are customer relationship management software platforms that pose to be online customer agents that, in terms of language and communication, behave like humans.

Customers can use them to do regular transactions like making reservations, ordering catalogue goods, answering common inquiries, and updating their customer profiles.

Natural language processing may also be used by VA software to comprehend the customer's purpose and direct them to their desired conclusion.

Artificial Intelligence (AI) AI is the use of computer software to do activities typically associated with human intellect, such as decision making, pattern identification, speech recognition, and language translation.

This technology can learn and think and go beyond what RPA and virtual assistants can do, which are restricted to organised and repetitive duties.

Both structured and unstructured data may be used by AI software to sense, reason, and execute tasks.

GBS service offerings in the future

Whatever your point of view, you can't deny that these new technologies will have a significant impact on how GBS businesses offer services in the future. Whether they are a problem or an opportunity, it is preferable to deal with them now rather than later.

Let's have a look at a couple of examples:

Decisions on Business Process Outsourcing (BPO) Companies have relied on BPO solution providers for years to reduce the costs of conventional, rule-based, repetitive operations. As a result, BPO solution providers relocated their service centres to emerging nations with cheaper labour prices.

But what if RPA bots could automate the processes involved? Insofar as many organisations are trying to adapt new intelligent automation technologies to their solution offerings, this would either decrease the requirement to outsource chosen operations or have an influence on the selection of which BPO service provider to choose.

RPA's capacity to automate repeated process transactions GBS executives are debating whether to switch to a single-instance ERP system or cope with the hassles of numerous ERP solutions throughout their global presence.

RPA solutions can help them avoid this dilemma by acting as a simple integration platform. If their customer service personnel are presently logging into one system and then utilizing that data to input into another, RPA may be a more cost-effective option than switching to a single ERP system.

Decisions concerning the location of CEOs The same may be stated for centres of excellence. These have traditionally been placed near the company's headquarters, where service professionals may be found. Some or all of these activities can be performed anywhere in the globe where AI systems are capable of doing complicated analytical tasks.

Imagine the potential of our people
South Africa is uniquely situated as a prefered destination for outsourcing business services. I close my eyes and imagine the world-class outsource centres we could build in rural areas, staffed with young people who are ambitious, excited and well trained in the craft of digital technology.

We can work together to make the dream a reality by utilising the potential of smart technology and create world-class service centres.

We have the power to combine our influence and expertise in training young people to work alongside digital assistants and become the workforce of business service teams admired across the world.

It is time to turn our dreams into action. The time is now.

23 **Robots in the finance team**

Experts at Gartner, a leading provider of information technology research and consulting services, estimate that the Chief Financial Officer (CFO) of the future will spend the majority of their budget on artificial intelligence (AI).

Smart technology can help them to optimise their departments by removing inefficiencies such as disconnected data and time-consuming processes.

Finance departments frequently disagree on how to collaborate with business leaders outside their ranks. Unconnected data is a major problem, and cost management and reduction are constant concerns.

The month-end close process takes an average of up to 20 days for most firms. Automation and efficiency-improving initiatives may be able to help reduce this processing time.

Currently, up to 70% of company data is deemed useless. Due to inefficiencies in the collection, processing and classification of data, it is practically impossible to make effective use of all of it.

Using AI and machine learning, every part of the process can be optimised, from data collection through to analytics. With machine learning, a program can learn

from past errors and get better at making decisions. Though it necessitates human interaction, it uses a fraction of the resources and can handle more difficult problems.

There is nothing new about digital transformation; most companies have been through it since the 1990s. Digital has an effect on all aspects of a company's operations, and any business must make a considerable investment to meet this new challenge.

This digital development, which includes analytics, automation, and AI will be driven by the CFO within the next two years, if not sooner. The importance of financial leadership is rising as a key strategic driver in the digital transformation effort.

The best place to begin is by aligning your road map with the priorities, resources, and timelines of your organisation. Instead of only focusing on supporting the next wave of growth, CFOs should look to the rest of the organisation's leaders to set the route for the workplace and digital business transformation.

The CFO will be faced with making potentially game-changing investments in people and technology, which will come at a considerable cost and with a high degree of uncertainty.

To shape the success of these projects, CFOs must make strategic changes to their working style early on; otherwise, they risk becoming an obstacle to progress on these mission-critical challenges.

Digital technology is only as impactful as a human's ability to leverage it. A major challenge for many organisations is training for or acquiring talent that can operate in a digitised world. These initiatives can never be technology-first; they should always be a people-first approach.

Technology platforms will not always improve ways of working — the smarter the technology, the greater its effect on organisational culture.

The technological metamorphosis of the finance function is key to the future of any business. Cloud technology is a key enabler delivering new functionality and lowering barriers to innovation.

Augmenting finance workers with smart automation will add scale and efficiencies, and will enable knowledge sharing across the enterprise.

Insight adoption through visualisation will replace predefined dashboards, resulting in quick and accurate financial decision-making.

CFOs, and the whole C-suite, must focus on improving their knowledge of the potential of smart technology platforms. Their lack of understanding is often, in my experience, the main reason technology initiatives fail.

24 Apply here for future jobs

SA is on technological back foot and has much to do to leapfrog into what future will require.

"Apply here to be trained for jobs that do not yet exist." Imagine reading that in your local high school brochure. The facilities are world class and the classrooms are staffed by top-rated teachers, skilled in science and technology.

Imagine further that SA can produce some of the best future-skills training facilities, resulting in scientists, doctors and computer engineers who are the admiration of the developing world.

Is this too utopian? I fear that it is, but I will not be told that it cannot be possible. In the 2021 Africa Global Business Services (GBS) benchmarking and market report by research firm Knowledge Executive, it was highlighted that SA is a prime destination for the business outsourcing sector.

A month ago we read the news that 900 new call centre and support jobs will be created in Durban. Metro, a US firm, partnered with CareerBox and CCI SA in an initial business process outsourcing (BPO) deal.

The local BPO sector is aiming to create 500,000 jobs over the next two years. Andy Searle, CEO of Business

Process Enabling SA (BPESA), was earlier quoted saying that about 70,000 locals are now working for international BPO clients.

On the one hand, there is a huge demand for BPO services, and SA — because of our cultural and language diversity — is a sought-after destination.

On the other hand, there is a huge skills gap, the so-called digital divide, and a lack of internet connectivity. Therein lies the conundrum facing us.

Last week saw the publication of the 2021 ICT skills survey by Wits University's Joburg Centre for Software Engineering in partnership with the Institute of Information Technology Professionals SA.

It highlights the dilapidated state of education locally, especially in science, technology, engineering, and mathematics (STEM) subjects.

It reports that there are several initiatives by business and societal organisations to address these issues, but these are often not coordinated and are a drop in the ocean compared to the large challenge around the underlying issues of appropriate curricula and skilled teachers.

Despite the initial hype from last year's report about the presidential commission on the fourth industrial revolution, the government, and in particular the department of communications & digital technologies, faces a huge task ahead.

Our country is on the technological back foot and we have much to do together to leapfrog into what the immediate future will require of us. We should focus not only on current skills demand and appropriate training and education, but concurrently focus on future skills demand.

The smart technology era, underpinned by artificial intelligence and machine cognition, has the potential to displace many current jobs. It also will create a vast amount of new jobs. Technological advancements can be the silver lining to our dark cloud of unemployment.

We need to create curricula and skilled teachers who can — at scale — train our young people so that they will be able to apply for jobs that we are yet to imagine.

25 Interviewing with bots

Imagine that your next job interview is with an Artificial Intelligence (AI) recruiting platform. It is a virtual meeting and the computer-generated person on your screen looks as life-like as you could imagine.

It displays all the emotions and facial expressions that you would expect from a real person. You feel comfortable as it expresses empathy and even laughs at your jokes. If it only knew that you crack jokes when you are very nervous. For all you know it already does.

During the interview, a vast number of data points are being analysed. Facial recognition technology scrutinises your micro-expressions to determine potential signs of deceit.

The algorithms in the background determine a baseline on your behaviour - like with a polygraph - to figure out how much anxiety and tension is influencing your behaviour.

Even your voice is being examined for signs of stress or insincerity. Meanwhile, machine learning models are comparing your suitability, mapping your responses to the role definition and the personas of the potential clients you will be working with.

A few weeks later you join the organisation. Your onboarding experience is mostly virtual but very

effective. Even your learning and development path is successfully mapped to your personality and individual training needs.

This is the best job you have ever had. You are so satisfied with your experience that you could never imagine working for another firm.

Already a reality
Many businesses are utilising massive volumes of data to have a better understanding of the client lifecycle for marketing and sales purposes. Consumers leave a substantial digital footprint, which marketers can leverage to deliver more personalised experiences and increase engagement.

As with customers, there is an employee lifecycle that includes recruitment, onboarding, training, performance management, and remuneration. These generate significant volumes of data.

Mapping this data across the employment lifecycle enables businesses to significantly improve employee engagement and experience.

Recruiting smarter with algorithms
In the near future, recruiting is going to be dependent on a recruiter's capacity to automate their workflow and utilising the intelligent technology tools at their disposal.

Even if it's challenging to do so impartially and efficiently, conducting a resume screening remains the primary problem in recruitment.

While talent acquisition managers feel recruiting is extremely challenging, they acknowledge that the most difficult aspect is figuring out which applicants are suitable.

With the technological advancement in the field and the increasing difficulty of the task, new techniques are fast becoming available. The humdrum task of reviewing resumes all day and hiring people based on subjectivity, impressions and emotions rather than reasoning is over.

There are multiple case studies already of human capital management (HCM) departments utilising AI and data analytics for talent acquisition.

AI systems can use text analytics to locate profiles on LinkedIn or to determine the best resume match based on job prerequisites.

Rather than manually sifting through hundreds of resumes, they may quickly restrict the pool of prospects and interview only the most qualified candidates.

This is a critical benefit of AI across the board: it enables HCM workers to work more effectively and concentrate on higher-level activities.

AI can automate the entire recruitment process. Candidates can be assessed more thoroughly with the help of recruiters who can collect data on each of them.

Special algorithms are used to determine candidate talents and experience, utilising numerous AI models.

The recruiter can pick candidates based on their talents and identify a suitable position for applicants where their skills are most needed. A new breed of computational cognitive tools would not only help businesses but also empower potential employees to enhance their abilities.

Because of our personal prejudices, we cannot be truly objective. No matter what type of company, people making biased decisions is a prevalent problem, and AI can help decrease this.

Businesses have the chance to hire only the top prospects, as all decisions are made based on data predictions and behavioural analytics.

The potential for this new breed of technological platforms becomes more apparent once the individual joins the organisation.

Enhancing the experience for employees
The digital footprint created by employees can help organisations set themselves apart and see where they are in their career trajectories, resulting in lower employee turnover and increasing staff engagement, contentment, and productivity.

Companies can individualise the work environment for each employee by using AI. It extends their career span by decreasing challenges faced, delivering positive employment experiences. Organisations could use data to individualise employee benefits and remuneration.

Predicting attrition and absenteeism

AI can be used to discover the objective elements that impact worker turnover, to identify the key causes of employee departure from an organization, and to predict the likelihood of a worker quitting.

By mapping and analysing massive volumes of employee data and behaviour, HCM professionals can detect and forecast the employees who are at risk of attrition, empowering managers to address the issue proactively.

A huge red flag, absenteeism is a leading indicator of attrition. Businesses can identify which employees will leave by utilizing predictive analytics to recognize patterns of absenteeism, which may allow them to take planned measures to avoid turnover and lengthen the employee lifecycle.

To improve the health and wellness of employees, employers should identify employees who are likely to take time off due to illness and offer them treatment options to reduce or eliminate absenteeism.

Learning and development (L&D)

L&D departments throughout the world are shifting to agile learning models that support individual learning rather than delivering broad-based solutions for the entire enterprise. No one needs to be trained on the same material any longer.

Learners can be served with material that matches their learning requirements and strengths. Training curricula can be recommended based on prior behaviour, and

predictive models and algorithms can be used to generate fresh content.

Employees must be equipped for new jobs through adaptive learning that will involve different skill sets, such as analytical-, strategic- and critical thinking. Cultural awareness and emotional intelligence are considered to be increasingly important.

Breaking down silos
Many companies are increasingly discovering the potential and scope of AI applications that enhance the employee experience from the moment of recruitment to the moment of exit.

A company's value offer can be enhanced through integrating AI into HCM by including a layer of computer cognition, making it easier for firms to meet the needs of and retain valuable employees.

Corporations should digitise personnel data to provide effective analysis. For many firms, the current data situation is complicated by a wealth of siloed information that must be connected with external information systems to form a comprehensive organisational understanding.

Businesses can improve worker efficiency and responsiveness by implementing a data-driven and analytics-based strategy to human capital management.

Imagine the future

Business owners need to realise that the smart technology era is at our fingertips. Through cloud technology and consumption-based platforms, the ability for firms large and small to bring computer intelligence into the employee lifecycle is not only within reach, but more cost-effective than imagined.

Of importance are your workforce strategy and business planning. These platform decisions should always be a people-led decision and not an isolated technology strategy.

We can imagine the future and the art of the possible. We should take our people on the journey with us and realise the technological benefits already within our reach.

26 Executive education in the AI era

The smart technology era is a revolution characterised by the blending of the physical, digital and biological worlds. Artificial intelligence, robotics, the Internet of Things, 3D printing, genetic engineering, and quantum computing is spurring on the creation of products and services that are rapidly becoming more important in today's world.

All businesses, regardless of their size or sector, are affected by this revolution. Technology and the disruption it delivers will create external forces that leaders will have little or no control over, presenting a unique challenge for them.

In his recent book, "*Democratizing Artificial Intelligence to Benefit Everyone,*" local AI entrepreneur and academic Jacques Ludik writes: "Given the accelerating pace of smart technology-driven automation and its impact on people's required skills and knowledge in the dynamic job market, there is a growing need for an always accessible type of continuous learning that covers life-wide and lifelong learning."

Executive education providers are adapting to the realities of a new world. A shift in perspective is required from focusing on the growth of individual participants or a

single company to focusing on industry wide development in collaboration with multiple stakeholders.

A new design, complete with cutting-edge technology and more lucrative revenue models, will allow them to reinvent how business education and training will be provided in the future.

Business leadership students may benefit from a platform with a recommendation engine that delivers relevant content for them, much like the entertainment model of streaming service Netflix.

For participants to embark on their own personalised learning experiences in the future, a subscription-based service, uniquely customised to individual needs, will characterise the future of business education.

In an article by Mohan Sawhney in a Harvard Business publication, "Reimagining Executive Education: What Program Delivery Should Look Like Post-Pandemic." it is proposed that several trends will transform business education.

Firstly, a channel-agnostic or omnichannel approach is needed, where students can access relevant content in-person or online on the platforms of their choice.

Providers of executive education will increasingly partner with global technology and consulting firms in creating customised learning programmes relevant to current market demands and technology trends.

High-volume commercial educational platforms such as Coursera, Udemy, and LinkedIn Learning, will increase

their share in the low-cost mass market, while business schools need to offer unique content for executives willing to attend in-person training based on a community-centric experience.

Harvard Business School has pioneered a hybrid classroom experience where holographic projectors provide an immersive experience as if instructors were in the same room as students, utilising speaker-tracking cameras and directional microphones.

They also created "geographic pods" where a limited number of students gather in-person at a location close to their homes. Content is live-streamed to their location while they can enjoy the benefit of breakout sessions and face-to-face collaborative learning and networking.

The new technology provides a unique opportunity for business schools. The ability to create and deliver relevant content has entered a hybrid world, where instructional design, learning facilities and teaching equipment must be adapted to future needs.

A new breed of instructors is needed with relevant domain experience, technological know-how and who has a great screen presence.

The future model and approach of business schools need more thinking and one is left to wonder if the current breed of instructors and training delivery models is not already outdated.

Part 6: AI in our world: *societal impact*

27 In the digital age, your face is yours no more

In a busy coffee shop, a woman sits alone, headphones in her ears, her eyes focusing on her laptop screen. A stranger walks up to her and greets her by name. He seems charismatic and talkative.

She's really not in the mood to be disturbed, much less to be flirted with, but this guy seems to know so much about her. The stranger's familiarity makes her feel both intrigued and a bit terrified. "How does he know so much about me?"

What she does not know is that the stranger used technology to instantly find out much about her life. He noticed her sitting two tables from him, took out his smartphone and captured a picture of her face.

Next, he opened an application called FindFace and uploaded the picture. In a second he viewed a multitude of pictures matching her face and it enabled him to view her LinkedIn, Facebook and Twitter profiles.

He also read her blog and gained insight into her dreams, fears, hobbies and friends.

The human brain is a facial recognition machine. Neurons in the brain's temporal lobe respond to the

distinct features of faces. Babies can recognise faces when they are very young, even when the rest of their visual capabilities are still developing.

We have all experienced the embarrassment of recognising a stranger's face — we know we have seen them somewhere before, but we cannot remember the context.

Did you know we are barely able to recognise faces when the pictures are upside down? Some people are not able to recognise faces at all. It is thought that about 2% of the population struggles to recognise faces. It is referred to as prosopagnosia, also called face blindness.

The development of artificial intelligence (AI) technology is largely based on the working of the human brain. Information processing in biological intelligence inspired what we call artificial neural networks.

In the human brain, signals are communicated between millions of neurons in various layers. The way we recognise images and human faces would have been impossible without the light speed of signals travelling the superhighways in our brains.

We can teach computer algorithms, functioning much like this superhighway, to recognise images. The "computer brain" needs a multitude of images fed to it to learn. Think of a self-driving car that can recognise the road, pedestrians and traffic signs.

It is based on the millions of similar images it learns from that the algorithms can achieve high levels of accuracy. There are applications for our smartphones that can

recognise music, transcribe our voice, identify animals or flowers. The application of this technology is infinite.

How do facial recognition systems work? We need to provide millions of face pictures for it to "learn". The algorithms look for unique facial features such as the shape of the chin or the distance between the eyes.

But here is the problem: the learning data we feed the system is usually filled with bias. We have already seen many cases where the technology struggles to recognise the faces of women or of people with dark skin.

We have seen cases of misidentification and false arrests. We run the danger of automating inequality. Many of the large technology firms decided to hold back on this technology. We read about algorithmic obedience training in China based on surveillance and scoring systems.

We need to be serious about the threat posed by this technology. Our biometric future may be that of dragnet surveillance, big data policing and technological police states.

28 Beauty is in the AI of the beholder

What makes something beautiful? It seems that the answer to that question has been observed by the curious and the learnt for centuries.

Great minds such as Pythagoras, Euclid and artistic geniuses such as Leonardo da Vinci and Salvador Dalí knew about it. We know it as the golden ratio, represented by the Greek letter phi. In numbers, it is 1.61803398875 (the decimals go on forever).

Another way to look at the golden ratio is to use the Fibonacci sequence in which each number is the sum of the two preceding numbers.

The beauty of this ratio has been observed in nature, earning it the name of the divine proportion. We notice the design in almost everything we can see such as seashells, ocean waves, pine cones, aloe plants, fern fiddleheads and chameleon tails.

On a grander scale, this design is visible in hurricanes or an expansive spiral galaxy.

What makes a face beautiful? We see a face and we may think that person is beautiful, but we do not always

understand why. We may argue that beauty is in the eye of the beholder. We see a face and in milliseconds decide if they are beautiful or not. Science shows that a beautiful face has all to do with symmetry and proportion.

Again, the golden ratio can help us. The ratio of what we see as a beautiful face is about 1.6, which means a person's face is about 1½ times longer than it is wide.

Now look at yourself in the mirror. Do you see the divine proportion? I bet you that you can't and that you are likely to notice only flaws.

Because of this we humans have for millennia tried to make ourselves look more beautiful. Just think of makeup and cosmetic surgery.

We can now also look to the smart technology era to change our appearance. We know that facial recognition, based on artificial intelligence (AI) and machine cognition, is widely used for security and policing purposes.

But did you know that there are facial recognition applications that can instantly make you look better? I bet you did, and that you use the face filters in your favourite social media platform or dating app to make yourself look better.

There are even AI platforms that can tell you if you are beautiful. Imagine that! These platforms can recommend treatment or surgery to take your face from an as-is to a to-be perfect appearance.

As if our facial features are not enough, you can also find mobile applications that can alter your body shape in pictures or videos.

The Video Body Editor app claims: "Only with a few steps, you could easily edit your selfie videos like slimmer waist, longer legs and smooth your skin."

PrettyUp promises: "Retouch your video and get more likes on your favourite social media accounts, such as Facebook, Instagram, Twitter, Snapchat and TikTok."

Formative years
The time we spend online and on mobile applications is dramatically increasing. Of concern to parents should be the amount of "screen time" their children are exposed to.

Psychologist and economist Herbert A Simon was the first to theorise about the attention economy.

As we apply an ever greater amount of attention to applications such as social media, we have more time than before to compare ourselves with others who look better than us.

We can only imagine what all these near-perfect looking bodies and faces can do to our self-image. No longer the exclusive domain of magazines and movies, the opportunity to make everyone look better online is at our fingertips.

Imagine what this can do to teenagers who are in the most important formative years of their lives.

The Mental Health Foundation reports that poor body self-image can cause anxiety and self-disgust. It may even lead to thoughts of suicide.

Technology should serve us, but if we are not careful it can lead to self-hatred, discrimination and violence. It can destroy the brittle body image of young people. We need to make sure our children understand the dangers. We also need to make sure they know how to use the incredible potential for doing good.

29 Objects of scrutiny: Facial recognition and our biometric future

Smart technology will greatly impact our future privacy, as our faces, the way we walk, our mannerisms and body language will be catalogued as identificational data.

Since the 1960s, a major effort has been made to train computers to "see" the human face − to build automated systems for recognising and differentiating faces − commonly referred to as facial recognition technology (FRT).

While computer engineers are working on FRT in order to create more intelligent and interactive machines, businesses and government agencies see the technology as particularly well-suited to "smart" surveillance − systems that automate the labour of monitoring in order to improve their efficacy and reach.

Corporations, law enforcement and state security agencies, all confident of the technology's usefulness and unconcerned about its intricate and potentially disastrous societal repercussions, are driving FRT.

Over the last months, we have witnessed the backlash against FRT policing, especially in the United States, leading to large-scale upheaval and protests. If there is

one kind of smart technology which revealed the danger and proclivity of bias, it has been facial recognition.

It is a proven fact that these algorithms struggle to accurately identify the faces of females and of people with darker skin tones.

Following protests, IBM stopped selling facial recognition products, and Amazon imposed a one-year moratorium on police use of its facial recognition technology.

Amazon hoped its moratorium would provide the government with enough time to implement appropriate rules governing the technology.

One might wonder if Amazon's optimism is misguided. IBM also urged for a national conversation on whether and how face recognition technology should be used by domestic law enforcement agencies.

New kinds of human-machine integration promise to improve the effectiveness of surveillance systems and expand their reach across time and place.

However, whether these experimental technologies can or should be used to achieve these aims is a point of contention, one that frequently manifests itself in the news and policy debates as a trade-off between "security" and "privacy".

Automated face recognition and automated facial expression analysis are two separate technological endeavours.

Face recognition technology, strictly speaking, considers the face as an index of identification, ignoring its expressive ability and communicative significance in social interaction.

This is never more evident than in laws forbidding drivers from smiling in their driver's licence photographs in order to increase computer matching accuracy.

The goal is to leverage the iconicity of face pictures to demonstrate their indexicality, or definite links to actual, embodied people.

Automated facial expression analysis, on the other hand, focuses on precisely what facial recognition technology tries to control for − the various meanings that a single face can convey − and this promises to accomplish what facial recognition technology fails to do: see inside the person by using the surface of the face.

Technologies such as face recognition, automatic licence plate scanners, drones, prediction algorithms and encryption influence us directly.

How should we approach concerns of privacy, civil liberties and public safety? How do these technologies affect the way police officers function in our society? How should antiquated privacy rules established for a bygone era be updated?

If one were to compare biometric technology to other security methods now available, it would rank extremely high in terms of interest, comprehension and societal implications.

It might be an image of our fingerprint, vein pattern, face, eyes, hand form, or even our voice that is collected by physiologically-based biometric technology.

From the perspective of behaviourally-based biometric technology, mannerisms in the way we sign our names or even write on a computer might be recorded.

The problem of biometric technology's societal consequences for the world's citizens is that when it comes to installing and implementing a biometrics-based infrastructure for their country, whether it's for e-passports, e-voting, border security, or a national ID card system, many nations and their various governments are actually very receptive, if not ecstatic.

Many businesses do not reveal how biometric templates are kept, or what security measures they have in place to ensure they are not the target of a cyber attack or threat.

Biometric suppliers must make significant efforts to make the different biometric modalities available today and have a strong level of simplicity of use for the end-user in order to counter these worries and anxieties among the public.

Another aspect contributing to the negative impression of biometric technology is that each biometric vendor's procedures for developing biometric devices are proprietary, particularly in terms of the mathematical formulas utilised.

In the biometrics business, however, this lack of openness has resulted in a lack of standards and best practices. Perhaps biometric technology would not be

seen as a sinister technology in the end if there was a list that could be freely accessible by the public.

We have to accept that our biometric future, our freedom − and perhaps democracy itself − will be greatly influenced by smart technology. Not only our faces, but the way we walk, our mannerisms, the way we express with our hands, and body language will be catalogued as identificational data.

We have to debate and think, we have to influence public policy. We have to protect the future privacy of our children.

30 **Are we outsourcing parenting to technology?**

"Hey Google, play some children's music!" I had to smile. My seven-year-old son was sitting in the bath howling commands to the Google Home device in the next room.

"Hey Google, set the volume to seven." Music was now blaring throughout the house and it is here where dad had to take over control of our artificial intelligence (AI) house guest.

These days many children are exposed to smart devices almost from birth. Parents can place a smart device in their little one's room that could monitor the temperature, humidity, sounds and movements.

Technology can be a wonderful companion to children and parents alike. The smart technology era has opened a marvellous world of techno-childcare and techno-education.

Our children are growing up amid technological opportunities that we can hardly imagine. But we should not allow the silver lining to hide that the dark cloud it surrounds is very dark indeed.

The dangers facing our children were highlighted by Unicef and the World Economic Forum in a report titled

"Children and AI: Where are the opportunities and risks?" The first, and perhaps most important concern is around identity protection.

Smart devices allow children to interact with them, to ask for songs or stories and to have conversations. Data analytics and machine learning algorithms "learn" about the child, their identity and location detection.

A child may innocently provide a host of personally identifiable information as she interacts with the device. She may talk about her school by name, the names of her friends and parents and the area she lives in.

The report also identifies potential emotional and psychological ramifications. We need to pay close attention to the development of our children's socio-emotional skills as they grow up with technology.

Children could easily develop emotional attachments with animated characters that look like people. They are drawn into a counterfeit virtual world that can easily distance them from the real one.

Another concern is the potential cognitive implications. We are still not sure what AI can do to the human brain, let alone those of small children.

The report asks: "What happens when we hand over cognitive tasks to AI, what are the implications of the attention economy? What are the psychological implications — depression, anxiety, social skills?"

Most concerning is the topic of cognitive manipulation. "What does it mean to use AI to direct or control

children's behaviour?" The global lockdown forced children to stay at home. Bored and curious, many children started spending long hours with their computers, tablets and smart devices.

In a report titled "Children at increased risk of harm online during global Covid-19 pandemic", Unicef highlights the risks of increased sexual exploitation to the estimated 1.5-billion children who have been forced to stay at home during the pandemic.

Focusing on our own country, the report warns that "In SA, the current lockdown may put children's privacy in danger as they spend more time online. They may be more likely to encounter online risks, including being exposed to child sexual abuse material, or child sexual abuse and exploitation.

And while sharing images and stories of lockdown and its challenges through social media is a way to stay connected, children's rights to privacy and protection should not be compromised."

Parents should be vigilant about children's exposure to smart technologies. We should ensure that our children are "street smart" and informed, but they should not fear this technology.

We can never just hope for the best as we outsource parenting to technology. We should be informed and involved in our children's technological future.

31 Digital-age democracy

It was a great idea. At a recent cabinet meeting, the president approved an ingenious plan to influence the outcome of the upcoming election of an adversarial state. We agreed that a number of factors had to fall in place for our plan to work.

First, we had to find a populist leader with great wealth and influence. It would be a bonus if he was a celebrity and a household brand.

On our shortlist were a number of people we had a great deal of dirt on. During their visits to our country, we easily engineered opportunities with the oldest trick in the book: sexual temptation. All these little adventures were filmed and stored for a rainy day.

The second part of our plan was to gain access to our adversary's electoral technology. They largely used electronic voting machines and it was easier than we anticipated to gain access to their secure networks.

Third — and this was the keystone of our whole endeavour — we plan to employ a number of algorithmic weapons to spread misinformation and manipulate public opinion.

The proliferation of smartphone technology and social media platforms enable the opportunity to deliver

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customised news stories direct to households, underpinned by behavioural psychology and mass indoctrination.

Thankfully this is just a little story I chose to write. Imagine this was possible? Or is it — did we not see something somewhat similar in recent years?

Many have opinions about the previous US president and alleged foreign government influence on his election and administration.

In 1947 Edward Bernays published an essay *The Engineering of Consent*. He argued that the US constitution guaranteed freedom for constituent groups to influence public opinion.

Political groups use modern communications and mass media to increase the public's familiarity with leaders and can therefore mould perception.

Of importance here is the idea that governments use these ideas to remain in power. If the public's opinions are to control the government, the government must not control the public's opinions.

In *The Consent of the Governed,* John C Livingston & Robert G Thompson wrote: "Consent that is thus engineered is difficult to distinguish in any fundamental way from the consent that supports modern totalitarian governments."

The smart technology era is revolutionising the way voters receive information and make their will known. Some believe that digital democracy will result in better

transparency and accountability from politicians to the public.

Because of this, it is more likely that public policies will more closely represent the desires of the majority of the population. Citizens can now present petitions to their government, start projects online, vote electronically, and even replace their legislature, thanks to the internet.

Some pessimists say that unlike the traditional process of representatives meeting in person to get to know one another and to discuss and settle issues, cheaper and faster communication can lead to more unpredictable and poorly considered policy choices.

\voters mark their cross on a sheet of paper behind a curtain at a polling station during elections. Electronic voting, it is feared, may not safeguard the privacy of each individual's choice.

Voters have no way of knowing how computerised voting machines work because they are shielded from public view. Election observers who empty ballot boxes in the presence of election monitors are absent in electronic voting.

Propaganda has entered the age of social media, making it easier to engineer consent on a huge scale. One is left to wonder if the foundations of democracy will remain standing.

32 AI whistle-blowers must be protected as tech giants loom over society

A shy orphan boy, living with his uncle, receives supernatural powers. Thinking his newfound abilities are for his own benefit, Peter Parker refrains from stopping a robber, only to find that his beloved uncle was murdered by the criminal.

Inspired by his uncle's life to do good and adapting the motto "with great power comes great responsibility", Peter becomes Spider-Man.

Long before the web-slinger entered our collective consciousness the idea of doing good with great power appeared in sacred writ: "From everyone who has been given much, much will be demanded."

After the French Revolution, at the National Convention, it was stressed that representatives "must contemplate that a great responsibility is the inseparable result of a great power".

The book that perhaps had the greatest effects on me as a young man was Jonathan Glover's *Humanity: A Moral History of the Twentieth Century*. Investigating human nature and the psychology that leads to atrocities,

Glover uncovers how ideology and tribalism led to the horrors in Auschwitz, Stalingrad, Hiroshima, and Rwanda.

Given the right set of circumstances, humans — that is you and me — are capable of evils we would never have imagined.

Swinging between buildings, Peter Parker may have said it differently: "Don't be evil." Those words were Google's unofficial motto morphed into its official code of conduct since 2000.

Early on, the bright-eyed youngsters realised they were tapping into unthinkable power. Later, in 2018, the phrase was removed from the code's preface and moved to the obscurity of the last sentence.

As their power and influence over humanity grew, I wonder if the Googlers realised that doing good is difficult to maintain. I also wonder if the large tech firms have become techno-dictatorships.

History teaches us that those who stand up against dictators will soon face their end. What will happen to those, who in this "more civilised century", stand up to the masters of technology?

Ethiopian-born Timnit Gebru rose through the ranks at Google to co-lead a team focusing on the ethics of artificial intelligence (AI).

She realised there were a vast number of biases in the algorithms used at Google, especially related to facial recognition. This technology does not accurately identify

the faces of females or people with darker skin tones. The implications are vast, especially as it relates to policing.

Gebru famously wrote a paper to highlight these problems and was forced by her employer to withdraw it. She refused and was fired (though Google claims she resigned).

She has since become a champion of AI ethical issues and appeared in the celebrated Netflix documentary *Coded Bias*.

Recently we witnessed the US Senate hearing where Frances Haugen testified about the flaws in Facebook's algorithms and gave evidence that the firm wilfully refuses to make the needed changes.

"I'm here today because I believe Facebook's products harm children, stoke division, and weaken our democracy," Haugen said at the start of her testimony.

Global tech giants have grown to have unprecedented influence over humankind. The very foundations of democracy and human freedom are at stake if these firms are allowed to operate unregulated.

Whistleblowers are needed and should be protected at all costs.

33 Artificial intelligence:
made in our image

When I speak on artificial intelligence (AI) at conferences, I usually start by showing the audience three pictures.

The first is of computer code, the second is the evil robot from the movie *Terminator*, and lastly, a picture of a cute-looking, friendly robot.

I ask the audience to vote on the picture that best resonates with their idea of AI. The overwhelming response every time is the evil robot. It is then my task to explain to the delegates that, in fact, the image of computer code should be the correct answer.

Most people tend to fear new forms of technology because of the hype they read in the media and how it is portrayed in films.

We tend to fear things we do not understand and we think threaten our existence. The most common fear around AI is that robots will take our jobs away.

Human evolutionary history shows how we tend to make sense of things we do not understand by attributing human traits to them. Ancient humans looked at the stars and named them after the gods.

They feared approaching thunderstorms or earthquakes and named them after their deities too.

Archaeological discoveries show that, for thousands of years, humans made small objects from clay or other material of human-like objects depicting fertility or war gods.

We tend to make things we do not understand in our image. The attribution of human characteristics, emotions, or intentions to nonhuman entities is a natural tendency of human psychology.

This is known as anthropomorphism. The term is derived from two Greek words: *anthropos*, which means human, and *morphe*, which means form or shape.

Well-known is the tendency to anthropomorphize AI's capabilities and inventions. A lot has been written about the anthropomorphic attitudes of the public, including some of the ethical implications (particularly in the context of social robots and their interaction with humans).

Though anthropomorphism permeates AI research (that is the terminology used by computer scientists, designers, and programmers), the consequences for epistemology and ethics have received less attention.

In recent studies, it has been found that anthropomorphism can be activated by paying attention to social cues that are situational and that psychiatric problems or brain injury can influence whether or not someone displays it.

While their ability to anthropomorphize remain intact in the absence of explicit social cues, a recent study with amygdala-damaged subjects showed that their inability to notice and process socially salient information impaired their spontaneous anthropomorphism of non-human stimuli (inanimate objects such as technology).

Amygdala activity has been linked to people's predisposition to anthropomorphize nonsocial phenomena, such as objects and animals.

It is important to note that while we tend to humanize technology, especially AI, and though it was invented by people, its inner workings are fundamentally opaque to the public.

Even while there is a common inclination to attach human-like features and motivations to technology devices, there are numerous flavors of AI-anthropomorphism.

As a society, and especially as leaders in business, our task is to ensure that people understand that AI technology is to our benefit. Job displacements are a real and present danger but with the right approach and planning, we can take people on the journey with us.

AI can serve humanity, it can benefit workers. We need to manage the narrative.

34 Humanity's survival paradox

A few days before he died from cancer, cultural anthropologist Ernest Becker was disappointed that his last and most important book didn't find a publisher.

Perhaps it was because he was writing about death and publishers were reluctant to offer such work to readers who were looking for quick-fix, self-help and entertaining books to read.

The manuscript landed on the desk of an ambitious young editor, Sam Keen, at Psychology Today. He read it in one sitting and decided to make it his mission to publish and promote Becker's work.

Keen went to visit the author a few days before he died, and worked tirelessly to get it published. In 1974, four months after the author's demise, The Denial of Death was awarded the Pulitzer Prize for non-fiction.

All biological organisms die. Of the mammalian species, humans are the only ones aware of our impending expiry.

Becker argued that 'the basic motivation for human behaviour is our biological need to control our basic anxiety, to deny the terror of death'. All life forms share a

biological proclivity for self-preservation in the service of reproduction.

Humans, however, are unique in our capacity for symbolic cognition, which develops self-awareness and the ability to reflect on the past and contemplate the future. This leads to the understanding that death is unavoidable and can come at any time.

The smart technology era has given us the ability to process enormous amounts of data. We've already seen how businesses are using data from sensors or from client interactions to autonomise decision-making, optimising processes, leading to better customer outcomes.

The fields of healthcare and medicine are perhaps where we see smart innovation more than in any other domain. The ability for doctors to look into patient bodies through scans has seen a seismic shift.

Image recognition platforms enable medical teams to quickly analyse scans, leading to more accurate prognosis.

What if doctors could view the body from the inside out? What if sickness or death was predictable and controllable? I wonder how death avoidance would change the face of humanity and how it would impact our most basic anxieties.

The next step in our drive to avoid death is technology on the nano-scale. The prefix 'nano' refers to 10 to the power of nine, so a nanometre is one billionth of a metre. Medicines can be delivered to sick cells in our

bodies using self-propelled nanomotors and other biodegradable nanodevices made of bio-nano components.

These small devices may be programmed to deliver molecular payloads while restricting tumour blood supply, resulting in tissue death and tumour reduction.

If we are able to successfully develop these medical nanobots, and get them approved and regulated, it will change the trajectory of humanity.

We should care about technology that can end suffering, but we also need to make sure that these advances benefit not just the wealthy minority, but that all humans have access.

We're already strip-mining our planet of resources at an unimaginable scale. Humans have proven to be a cancer on the face of the Earth.

Not only should we be concerned about the impact of technology on our biology or our privacy, we should be aghast at our impact on the environment.

Do we really want more people on the planet? Do we want to create technology that could end suffering and death? This is a difficult balancing act. Our fragile ecosystem will struggle to handle billions more people, who live much longer than at present.

However, if a loved one developed cancer and the doctors could use nano-medicine and smart pills to heal them, I would be the first to say we should speed up our research and development in this field.

35 AI war machines

In the past 10 years, digital and artificial intelligence (AI) technologies have made significant progress. It has an effect on a variety of industries, including healthcare, finance, travel and employment.

Military and law enforcement organisations are increasing their efforts in AI research & development.

Once activated and deployed, fully autonomous weapons systems are capable of detecting and attacking human targets.

Gunpowder and nuclear weapons were the first two revolutionary forces in combat; lethal autonomous weapons systems (LAWS) are often considered the third.

LAWS have yet to be defined in a way that everyone agrees on. In 2017, at the UN "Convention on the Prohibition or Restrictions on the Use of Certain Conventional Weapons that may be Excessively Injurious or Have Indiscriminate Effects", the first governmental expert group on LAWS was established.

The rush to develop military weapons has infused technological innovation. As a significant factor in the battlefield of the near future, AI is quickly establishing itself as a worldwide arsenal of choice and self-driving

weapons systems have grown in popularity in recent years.

Semi-autonomous weapons are already extensively used, which rely on automation for some components of their system to communicate with a human to approve strike decisions.

However, a fully autonomous weapons system can be placed anywhere and respond to changes in the environment and execute attacks without military personnel involvement.

An intelligent machine that is capable of performing any projected warfare task without the involvement or intervention of humans — using only the interaction of embedded sensors, computer programming, and algorithms with the surrounding environment — is fast becoming a reality that cannot be ignored.

What happens if malware or data manipulation is introduced into the system as a result of its reliance on machine learning?

When it comes to security, it's difficult to overlook the reality that connected devices increase the likelihood of cyberattacks executed by foreign governments or terrorist groups.

If AI goes to war with itself, cybersecurity implications will pose significant threats to humanity's long-term survival.

The militarisation of AI is unavoidable as governments bolster their efforts to gain a competitive advantage in

science and technology. Building autonomous weapons systems is one thing, but using them in algorithmic combat against other nations or individual targets is quite another.

It is important to think about what the future of war would look like.

There is little doubt that autonomous weapons systems will be around for a long time to come. The question is whether AI will be the driving force and determine our strategy for human survival and security in the future.

It creates challenging security considerations for decision makers in every country, as well as for the rest of humanity. The ethical, political and legal debate will be centred on the decision to use force and take a human life autonomously.

Some may argue that human soldiers make mistakes due to fatigue, confusion or unclear instructions. We do not always hit what we aim for. AI weapons will almost always hit their targets but are vulnerable to bias and software quality issues.

Robots will undoubtedly form part of the future armed forces with increasing involvement in deciding who to kill or who to spare. We cannot assume that algorithms will execute their decisions with altruism in mind.

36 *Government in the smart technology era*

Artificial intelligence (AI) has advanced significantly in recent years, mainly due to advancements in processor power, data availability and the introduction of novel algorithmic approaches.

As a result of these breakthroughs, AI now has the potential to have a significant impact on our society and economic systems, making it a critical technology of the 21st century for individuals, businesses and governments alike.

Only in 2017 and 2018 did the vast majority of the world's major economies begin to properly contemplate their respective AI prospects.

In the future, domination will be confined to a small number of countries with substantial financial resources, top-tier AI competence, and large governmental resources dedicated solely to achieving technological supremacy.

The countries with the highest levels of development can function as de facto custodians of AI by allocating large resources to the long-term enhancement of the technology. The world's best-known corporations, on the other hand, are expected to continue to develop and gain

significance, providing them with a significant competitive advantage.

Global competition for more powerful autonomous weaponry, as well as an acceleration of the world's transition to potentially lethal new types of combat, will be fuelled by future AI advancements that benefit them most.

In the short term, the majority of people are concerned about a shift in the economic paradigm away from antiquated industrial processes and fossil fuels toward technological advancements previously only seen in science fiction films, which is the most serious issue facing the world right now.

It will be difficult to make the transition from a culture dominated by tangible objects to one dominated by intangibles. The cyber world has already arrived, and virtual reality is not only a possibility, but is also something that many of us would like to directly experience in the near future.

We are intrigued by this brilliant new world because of the countless possibilities it offers us to explore.

Highly-skilled workers such as surgeons, architects and computer programmers may soon be replaced by AI-powered robots. Individuals with high levels of adaptability, ingenuity and problem-solving abilities will stand to benefit the most from this development.

In light of technological advancements, these and other major global phenomena, as well as the relationship between global patterns such as ageing, migration and

climate change, must be thoroughly researched and investigated.

If you were asked to describe the current status of AI in a single word, "practical" could be a good place to start.

Despite the public's fascination with, or apprehension about computers that can see, hear and speak, governments have grown increasingly optimistic about its real-world applications.

It can help improve the environment, make public spaces safer, and eliminate the mundane, manual work that bogs down and slows the operations of government agencies and departments.

Because residents in many countries are already familiar with the use of AI in the business sector and have come to expect to be able to converse with a digital assistant, bot, or other intelligent services, governments must not fall behind in its adoption.

The Chinese government is unquestionably setting the bar extremely high when it comes to innovative forms of government.

Big Data's new economic philosophy, on the other hand, differs from Soviet-style central planning in that it may allow planned economies to transform markets and, in some cases, leapfrog democratic institutions.

When combined with Big Data, sensor technology and AI, a Chinese techno-utilitarianism could swiftly transcend participatory decision-making.

What would happen if other countries followed China's model? How would democracy fare in such an environment?

Many people in the West are concerned that China will develop into a totalitarian digital autocracy in the same vein as Russia.

We must consider what kinds of political frameworks are required to manage an AI-driven society, especially in light of the large amount of AI utilised in China.

Many are concerned about the long-term survivability of democracy as a result of humanity's transition towards an artificially intelligent age.

Because of the increasing popularity of this developing technology, decision-making procedures in every business, particularly in the public sector, should consider it. Some government functions will be removed as a result of the digital revolution.

By enabling more individuals to participate in democracy through the development of new instruments for open governance and intelligent citizens, AI will support democracy.

Top-down decision-making and centralised systems seem to be entering the final phase of existence.

Citizens' participation has typically been limited to voting and lobbying on behalf of specific interest groups. However, this is changing.

The creation of closed decision-making systems was motivated by this same rationale. In today's internet-dominated economy, tools that bridge algorithmic decision-making with new types of collaborative decision-making are critical to achieving success.

Even if the impacts of AI on world order are still being researched, it is possible to see a future in which money, wealth and power are considerably more concentrated than they are today.

It is possible that resource-related conflicts may not only be waged in the future but that they will also have long-term ramifications for humanity's history.

With AI in the driver's seat, the world's wealth and power may become more concentrated than they have ever been.

Governments and corporations cannot afford to put off crucial issues such as AI governance, legislation and the rule of law until it becomes financially viable to do so. In the same way, the world cannot afford to let nature run its course.

After it is put in place, a successful multilateral system has the potential to have a considerable impact on the trajectory of global economic growth going forward.

International organisations must engage in more debate, resource allocation and action to construct and control our global AI future to be successful.

37 AI & the climate change

Nuclear war, climate change and technological advancements such as artificial intelligence (AI) are among the most serious threats to humanity.

According to the UN Environment Programme, climate change affects 80% of the planet's land surface and 85% of its population.

In the spirit of keeping your enemies close, I'm wondering if humanity can use one threat to combat another? Storms, wildfires and droughts caused by climate change can be predicted and mitigated using AI and digital tools.

The European Commission's Destination Earth project aims to create a digital twin of Earth that can be used to track climate change and investigate potential solutions for slowing or reversing the trend.

The programme seeks to determine whether global climate initiatives can be evaluated, tallied and additional steps to slow or reverse climate change can be decided.

To avoid a global disaster, the scientific, industrial, public and governmental sectors must work together. These difficulties were highlighted at the COP26 Climate Change Conference in Glasgow.

According to a Business Day report from last week, a historic climate finance agreement for SA worth about R130bn contributed to the gathering's promising start.

Fortunately, Eskom was proactive in finishing the work ahead of time, and SA stood out from the crowd by presenting a concrete plan for discussion.

Human life and natural ecosystems must be protected from future climate change — according to the UN — by achieving net-zero emissions by 2050. The 2021 summit focused on both infrastructure and agricultural development.

We will be able to get a greater understanding of the natural world, climate, ecosystems, and human social and economic activities thanks to AI and data science.

Net-zero emissions will result in a 46% reduction in greenhouse gas, according to the International Energy Agency.

Governments should place a greater emphasis on the positive environmental repercussions of emerging technology when investing in research.

AI applications could help with the design of more energy-efficient buildings, the expansion of energy storage, and grid placement optimisation by incorporating solar and wind energy.

Electric automation technology can be employed in smaller-scale applications, such as automatically turning off lights when not in use, to send electricity back into the grid and assist in meeting anticipated demand.

Scientists studying climate change rely largely on AI in this era of big data. Using an innovative machine learning approach, scientists were able to locate over 100,000 academic publications on the effects of climate change.

The researchers used satellite images to create a global map of climate change effects, which they linked to human-caused temperature and precipitation fluctuations.

We will be able to better understand how various climate-saving efforts from around the world may combine to form a more effective total by applying AI.

The world's first satellite of its kind, GHGSat was launched in 2016 as a high-resolution satellite capable of assessing air quality and computing greenhouse gas emissions at all industrial sites.

Satellites provide data to Earth regularly, which can help us understand how and why the climate is changing. By 2025, the worldwide datasphere will have transmitted over 175 zettabytes of data.

]It is positive news to read that Eskom presented a good plan at the recent climate change conference. SA has the talent and technology firms to launch an inclusive plan by using smart technology to predict and avoid regional climate disasters.

38 Transhumanism and techno-human evolution

He waited 23 years to publish his findings, but after *On the Origin of Species* was released it caused a firestorm. It was what Charles Darwin feared. He struggled all those years to reconcile his scientific findings with the accepted worldview of his day.

Charles was a reclusive man. He required someone to be his champion and public defender. He needed what became known as *Darwin's bulldog* and found it in Thomas Henry Huxley.

Seven months after the publication, on 30 June 1860, Huxley famously debated Bishop Samuel Wilberforce in the Oxford University Museum. What became known as the *Oxford evolution debate* is a story of legend. Huxley's grandchildren spread the word even further. The celebrated dystopian science fiction novel *Brave New World* was authored by Aldous Huxley.

His brother Julian Huxley was the first Director-General of UNESCO. Julian first used the term *transhumanism* in his 1957 book *New Bottles for New Wine.* A total cosmic self-consciousness is needed to give fullness to the universal and unique substance of which it is a part, Huxley proposed.

A philosophical view, with hope in the unknown future of invention, his views were religious rather than based on

techno-innovation. However, since Huxley, the definition of transhumanism has shifted. It quickly became the renaissance of humanism in the modern day.

It embraces and eventually strengthens basic tenets of secular and Enlightenment humanist ideology, such as faith in reason, individuality, science, progress, and self-perfection or growth.

These days, transhumanism is a loosely coupled collection of techno-optimist concepts. The futurist Fereidoun M. Esfandiary, who later changed his name to *FM-2030*, is widely credited with coining the term *transhuman*.

Building on Huxley's ideas, but moving it to the realm of technological advancement, he went on to write about the democratisation of knowledge, renewable resources, and the impending arrival of immortality and the supercharging of the human brain through genetic and bio-engineering.

FM-2030 is widely regarded as a forerunner of modern transhumanism. He had a particular impact on the American wing of contemporary transhumanism, including Natasha Vita-More, who wrote the *Transhuman Manifesto* in 1983.

Her husband, Max More, founder of the Extropy Institute, is known for his essay *A Letter to Mother Nature* in which he proposes several amendments to the human condition.

What is this "human condition?" I imagine he was building on the work of cultural anthropologist Ernest

Becker, who argued that man is in denial of his mortality, that he embodies a decaying carcass of flesh.

But for More that was not a satisfactory conclusion as technology would rescue us from our evolutionary curse. There will no longer be the "tyranny of death." Humanity will expand through "biotechnological and computational means." We will expand our intelligence and "supplement the neocortex with a *metabrain."*

Humans will no longer be slaves to its genetic predisposition while recreating our emotional and bodily vulnerability. People will expand their biological limitations by integrating technological features into their bodies.

The smart technology era, known for artificial intelligence, machine cognition and smart devices (the Internet of Things) will transform the way humans evolve. We may develop into what Neitzche called the *Übermensch*.

Human perfection, underscored by digitisation and gene enhancement technologies will create human-technology creatures known as cyborgs.

As a collective, we have to care deeply about the changes technology is introducing to the very nature of human-ness.

Darwin could never have imagined that technology could catapult our evolutionary progress. What would it mean to be human in the years to come, as carbon and silicon blend and immortality is within our reach?

39 Artificial Intelligence: our creation has become creators

His father paraded the young boy all over the courts of Europe. And he had every reason to do so: the young boy was a prodigy, a uniquely gifted musical genius. One day he accompanied his father to the Sistine Chapel to hear a performance from the work of Gregorio Allegri.

The piece, *Miserere mei, Deus,* composed during the 1630s, was for exclusive use in the Vatican during Holy Week. Rumours about this incredible piece of liturgical music abounded, but it was to be used only (one might call it an early form of copyright) at the ecclesiastical empire in Rome.

The 14-year-old Wolfgang Amadeus Mozart was deeply moved by the high C, the movement of the piece and the sacred emotions it evoked. Returning to their lodgings, the young man could not sleep.

He decided that this most beautiful sacramental choral music should be heard by the whole world.

The young man, who would define what many people would centuries later still think about as the creator of the most beautiful music invented, reproduced the *Miserere* from memory.

Urban legend, some may think. But remember that this boy composed his first composition at five years of age: the charming *Minuet and Trio* in G major.

Humans are distinct from other species — godlike if you would — in that we have the ability to create something out of nothing. Imagine Van Gogh staring at a blank canvas, Hemingway peering over a new page in his typewriter, Michelangelo assessing a block of marble.

We all create every day: we make plans, we write e-mails, we formulate arguments and we create the most mundane or marvellous works of art. We scribble, we write Post-it notes, we create shopping lists.

However, humans have never been able to create something that could also create by itself. We may be creators, deities in our own right, but unlike the gods, our creations have not grown to be creators themselves. Until now.

Marcus Du Sautoy, a mathematician and professor at Oxford University, and author of *The Creativity Code: Art and Innovation in the Age of AI*, argues that the ability of a computer to perform more calculations than the human brain could ever hope to accomplish makes exploratory creativity an obvious fit for a computer.

A fascinating aspect of combinatorial creativity is that artificial intelligence (AI) could pick up on patterns and apply them to new contexts.

AI has already shown that it can create music, produce writing and create designs that are difficult to distinguish

from those produced by humans. In academic research, there is a major push to use platforms that can identify plagiarism due to AI-generated articles produced by students supported by their silicon classmates.

Christie's, the famous auction house, in 2018 became the first to sell a work of art produced by an algorithm. *Portrait of Edmond Belamy* sold for an unimaginable $432,500, signalling the arrival of AI art on the world stage of artistic creation and auctioneering.

In the smart technology era, we are producing things that can surpass us in their ability to create. Will we steer it to fashion a better world or will the tribalism that has plagued our species since time immemorial result in algorithmic creations that will divide or even destroy us?

Part 7: AI in our future: *over the horizon*

40 Into the future: AI in 2022

We are living in an unprecedented era. On the one hand, there are the uncertain times brought about by the global pandemic, while on the other hand, there are the changes brought about by the era of smart technology. And in some ways, these two concepts are inextricably linked.

Many workers around the world have been forced to adapt to working from home. The demand for improved digital services and faster internet access, combined with the rise of virtual meetings, transformed the workplace. Numerous organisations that had been putting off digitisation were compelled to do so.

Many realised that it is possible and much easier than anticipated.

The following are some of the major technological trends that will emerge in 2022:

Hybrid work and Extended reality
Numerous organisations are already encouraging employees to return to their offices on a rotational basis. While virtual meetings are convenient, they also present a challenge in terms of team collaboration.

As humans, we are hardwired to connect and to read body language, and the virtual world as it currently exists is incapable of meeting that requirement.

Extended reality (XR) has the potential to fundamentally alter how businesses use smart media platforms, as it enables seamless interaction between the physical and virtual worlds, providing an immersive experience for users.

This technology is applicable in a variety of fields, from healthcare to education, but most notably in the business world.

I wonder if the new year will introduce more immersive virtual experiences where it feels like we are really in the same room with other people.

Automation and Unemployment
Technological automation of tasks currently performed by a large number of workers is a legitimate societal concern.

We have already witnessed the beginning of a global wave of job displacement brought about by intelligent automation.

Globally, developing economies will bear the brunt of the loss. High unemployment, collapsing infrastructure, and education systems that have not kept up with global demand may result in a job loss pandemic in these countries.

South Africa's economy will undoubtedly be harmed by intelligent automation's onslaught.

In the next year, we will witness a rapid increase in automation platform use. We will also see an increase in job displacements.

We need to work together and think smartly about the fine balancing act of operational efficiency and the upskilling and continued employment of our workers.

Facial recognition and Biometric data

While facial recognition technology is widely used, it is also contentious. The evidence of algorithmic bias is evident in the technology's struggle to correctly identify individuals, particularly women and those with darker skin tones.

New forms of human-machine integration have the potential to increase the effectiveness and reach of surveillance systems across time and space.

However, whether these experimental technologies can or should be used to accomplish these goals is debatable, frequently manifesting itself in the news and policy debates as a trade-off between "security" and "privacy."

Locally the news media has been reporting that the government is considering widely using this technology. Let's hope it is done correctly and that it will not be used in ways that international deployments have shown to be ineffective and disconcerting.

Artificial Intelligence and Business application
To compete on a global scale, businesses in South Africa must embrace artificial AI and related technologies such as machine learning, robotics, and intelligent automation.

The state of AI in South Africa appears to be maturing, owing to a variety of educational, business, and societal initiatives.

Widespread and rapid adoption across the business spectrum is required, and business leaders, in particular, must educate themselves about the risks and benefits of smart technology.

Skills Shortage
Wits University's Joburg Centre for Software Engineering, in collaboration with the Institute of Information Technology Professionals SA, released the most recent ICT skills survey in October 2021.

It demonstrates the region's deteriorating educational system, particularly in the sciences, technology, engineering, and mathematics (STEM).

While several initiatives by business and social organizations have been launched to address these issues, they are frequently fragmented and represent a drop in the bucket in comparison to the larger challenge of developing appropriate curricula and skilled teachers.

41 **After 50 years the future is still shocking**

Predicting the future is akin to a blind man in a dark room looking for a black cat that is not there. The "black cat" analogy has been in use for more than two centuries and a variety of quotes have been attributed to Charles Darwin, Georg Wilhelm Friedrich Hegel, Oscar Wilde and others.

There are some trends predicting what the effect of automation and machine cognition are likely to be, but for a large part we really don't have a clue.

The rate of technological change and innovation has made the role of futurists a tricky one. I think they are there to help us imagine possibilities more than act as predictors of anticipated realities.

Alvin Toffler wrote in 1970 about the "rental revolution" and the "demonopolisation of media", predicting that the major media outlets will no longer be the custodians of opinion formation.

Future Shock sold millions of copies and was translated into dozens of languages.

The self-trained social science scholar achieved international fame and his book is still in print. Many of

Toffler's predictions became a reality. Companies such as Uber and Airbnb created a world where the ownership of cars or even homes may be in decline, in what is referred to as "the sharing economy".

His book anticipated that customer experience would become a major focus for organisations of all types. He foresaw a world where social media platforms such as Facebook and others would become more powerful in dispensing news and engineering public opinion than traditional print and television media outlets.

Last year, in celebrating the 50th anniversary of this important book, a hundred of today's foremost futurists contributed essays reflecting Toffler's predictions and offering a compelling view of what our future may look like.

In *After Shock: The World's Foremost Futurists Reflect on 50 Years of Future Shock — and Look Ahead to the Next 50*, the contributors focus on, among other things, the concept of "adaptivity".

It's difficult for many people to keep up with today's fast pace of change. Even in the face of rapid technological transformation, *Future Shock* anticipated that people are far more adaptable than we previously thought.

Since publication of his book, the pace of change has dramatically accelerated, but we are more adaptive than we think we are.

According to Toffler, "cyborgs among us" will be the most significant transformation in the next few decades. Humans and machines were already intertwined when

Future Shock was published. Brain-computer interface technology is still in its infancy and has yet to fulfil its potential, despite recent breakthroughs.

As a result of technological advancements, people will be separated into those who benefit and those who don't. Between what will become two distinct human populations, biases and prejudices are inevitable.

If you wait long enough, the words "future shock" will be redefined. As the pace of change in the future continues to accelerate, both individuals and groups will have to continually adapt and cope.

42 Pinocchio is a real boy: extended reality will transform our world

I was glued to the television screen. We rented a VHS movie (remember those?) long before we could rent a DVD (remember those?)

It was 1989 — gosh, in the previous millennium — and we were watching the second installment of the movie *Back to the Future.* "Just imagine," I thought, "one day we would have tablet computers, 3D movies, voice recognition and video conferencing."

Ok, I did not know what to call it back then, I bet no one did. But the movie was surprisingly accurate in its future tech predictions. We are, however, still waiting for flying cars and time machines.

In one of the scenes, Marty McFly sits at a dinner table, wearing smart glasses. Wearable technology was mostly still beyond imagination and even more so was virtual reality.

The latest in the smart technology era is called extended reality. It is a catch-all phrase for all virtual and actual settings created by computer technology. This covers

virtual reality, mixed reality and augmented reality components.

Extended reality (XR) is poised to fundamentally transform the way companies use smart media platforms, with the ability to allow seamless interaction between the real and virtual worlds, providing users with a fully immersive experience.

The application of this technology is immense, from healthcare to education, but especially in the business world. Employees can be trained and educated in low-risk, virtual environments. When dealing with real-life circumstances, the experience they gain will be priceless.

As a replacement for traditional training manuals, it will allow personnel to focus on the work at hand without having to flick through pages in a handbook. It can even remotely link an expert to a real-time situation to provide professional guidance.

New hires can be made with the help of extended reality platforms, training them to operate in complex corporate environments.

Simulating real-life situations will transform diversity and inclusion training. Difficult conversations with subordinates can be replicated in a controlled environment, providing valuable skills to corporate leaders.

XR is a combination of a number of reality-led innovations. Through a simulated digital experience, virtual reality transports its users to a new location. It

employs a head-mounted display to provide an immersive experience by mimicking as many different sensations as possible.

Augmented reality takes the existing reality and overlays it with various types of information, enhancing the digital experience. It could be categorised as marker-based, marker-less, and location-based.

Mixed reality, the latest breakthrough in these types of technology, is experienced through mixed reality glasses or headsets that allow you to interact with physical and digital things in real-time.

Because XR is a fairly new invention, it will have significant development and implementation expenses in the beginning. There might also be health concerns and unanticipated side effects such as nausea, headaches and eye strain.

Regulators and policymakers are left playing catch-up, as is the case with any technology that evolves faster than legal frameworks can keep up. This is no exception in the case of XR platforms.

There are thus no clear rules governing what is permissible and what is prohibited in virtual environments.

Novelist Carlo Collodi gave us the ageless story of Pinocchio, the wooden puppet who wanted to become a real boy. Technology is fast allowing all our creations to come to life. The question is whether smart technology will reveal its growing nose so we can determine if it is leading us to deception.

43 Uploading inequality: how technology could create new caste systems

"We are probably one of the last generations of homo sapiens. Within a century or two earth will be dominated by entities that are more different from us than we are different from Neanderthals or from chimpanzees. Because in the coming generations we will learn how to engineer bodies and brains and minds."

This startling statement was made by Yuval Noah Harari during his address at the World Economic Forum meeting in 2020 at Davos. An Oxford-educated historian and professor at the Hebrew University in Jerusalem, Harari reached prominence with his 2014 book *Sapiens: A Brief History of Humankind*.

It was followed by two other best-sellers: *Homo Deus: A Brief History of Tomorrow* (2016) and *21 Lessons for the 21st Century* (2018).

His books and public lectures are a rallying call for humanity to wake up and understand that new technologies such as artificial intelligence (AI) will change the trajectory of our species dramatically.

Many public figures have been influenced by his work, and even Bill Gates wrote about Harari, calling him "such a stimulating writer that even when I disagreed, I wanted to keep reading and thinking".

During a recent interview with Anderson Cooper for CBS's *60 Minutes*, Harari said that "one of the dangers is that we will see in the coming decades a process of greater inequality than in any previous time in history because, for the first time, it will be real biological inequality".

Technology, blended with human bodies, will create a new humanoid species. It will split humanity into two distinct groups (or castes, as Harari calls it).

The wealthy will be able to afford brain implants and other advances to various organs and body parts. They will live longer, be always healthy and will become the dominant species — a techno-ruling class — and the rest will be left behind.

Perhaps for the first time in the debate on evolution through natural selection, we will be able to agree on intelligent design. But this time the intelligence will be attributed not to a deity but to algorithms and computer cognition.

The survival of the fittest will be enhanced through data, brain-computer interface technology and 3D-printed organic material.

Harari explains how the concentration of land ownership in ancient times gave rise to a split between aristocrats and commoners. More recently the rise of machinery and

limited technological ownership again created a split between humans, this time between capitalists and wage earners.

Data is the most important asset on earth nowadays. Those who control the data will control the world. Data ownership and control — already concentrated in a minority of organisations — will again create a split between two types of human species.

The new type of human will be able to upgrade his or her brains and nervous systems by connecting it to the power of the internet.

Harari's message is not all gloom and he does not claim that humanity's destiny is a dystopian future set in stone. But his warnings — and those of others like him — should be taken seriously. AI and other smart-technology inventions are, for now, still under our control.

We need to think deeply about the ethics and philosophy of new technology. We need to consider whether we are like Prometheus of ancient mythology unleashing powers that humankind cannot control.

44 Hey Dad, you were right about technology helping to create utopia by 2050 (Part 1)

Author's note: *In part one of a two-part series, I imagine a letter my son would write to me in 2050. The smart technology era brings with it tremendous promise for a better life on Earth, but there are also dire warnings that it could affect humanity with tragedy unimagined.*

In this part, I imagine that technological change would have resulted in a more utopian world. Next week's article will be based on the converse conclusion.

Hey Dad, I wish you were still here. I celebrated my 36th birthday this week. You were always going on about the future of technology and how society should take it seriously.

I am so glad that you and countless others worked hard to sound a clarion call, and that our society woke up to the fact that the advances in smart technology could make life better on Earth.

Back in 2020, the final report of the presidential commission on the fourth industrial revolution was officially gazetted. While the commission's recommendations were at first largely ignored by

government agencies and large businesses, they eventually woke up to the stark reality facing SA.

The world was changing fast and we were already left behind in the dust of international innovation. But finally, in 2022 an Artificial Intelligence Institute was created in Johannesburg.

Many relevant government departments aligned with the private sector to create sustainable solutions for a future workforce, taking into account the unique challenges facing the African continent.

What was perhaps most surprising was that there was real action. SA went from conferences, opinion pieces and too much talking, to measurable initiatives that made a difference in the lives of millions of people.

SA became a destination of choice for many of the world's largest technology companies, which established regional head offices and research & development centres locally.

Thousands upskilled
Some of our top universities became academic destinations of choice. They were offering world-class and cutting-edge training, enabling business leaders globally to understand and embrace new technological capabilities.

We were able to create a number of offshore service centres, situated near some of our poorest rural communities. Thousands of young people were upskilled

and worked in buildings that reminded us of Silicon Valley.

There was so much enthusiasm as some of these youngsters became world-leading entrepreneurs, creating start-up technology firms that employed thousands more.

We are now leaders in agriculture on the continent and are well on our way to create what some call a post-scarcity world. Collaboration and innovation largely turned the tide on climate change and we discovered ways to grow crops producing staggering yields.

We were able to use machine-learning algorithms to predict and treat illness. Even cancer is a thing of the past. My friends say we are now living in a transhumanist world. Whatever we call it, life is better for people who live healthier and longer lives.

My partner and I now have two children. Our doctor used artificial intelligence to compare our hereditary proclivity for illness to ensure that genetic flaws were removed from the genomes in the embryos.

The doctor even asked us how we want our babies to look. Some scoff at our "designer babies" but we are happy and they are healthy.

Holographic feast
Oh, and you would have loved this: everything in my home is automated through voice- and face-recognition technology. The fridge even orders food when we are

running low, the heating and moisture are always at optimal levels and our carbon footprint is almost zero.

I need to get going. We have friends coming over for dinner. We call it a holographic feast as none of them are really here. But our brain implants provide an incredibly realistic experience as if they were here with us in the room.

I am grateful to you and others for your foresight back in the day, in reining in this technology so we can live the amazing lives we are living now.

45 Hey dad, 2050 isn't the paradise you imagined (part 2: Dystopia)

Author's note: *In this two-part series, I imagine a letter my son would write to me in the year 2050. The smart technology era brings with it tremendous promise for a better life on earth, but there are also dire warnings that it could affect humanity with tragedy unimagined.*

In last week's article, I imagined that technological change would have resulted in a utopian world. This week's article is based on the converse conclusion.

Hey dad, it saddens me to say that I am glad you are not with us anymore. I celebrated my 36th birthday this week. You were always going on about the future of technology and how society should take it seriously.

Despite the fact that you and countless others worked hard to sound a clarion call, warning us about the dangers of technological advancements, I am sad to say that we now live in a terrible and unimaginable world.

The warning signs have been there for many decades. Back in 2020, the final report of the Presidential Commission on the Fourth Industrial Revolution was officially gazetted. The commission's recommendations

were largely ignored by government agencies and large businesses. SA lost the technological race because we did not even enter the arena.

The smart technology era had the promise of making life better for most people. Our dusty township streets were always filled with children with ideas and dreams, many with great potential and intellectual curiosity.

We now live in a country of technological dictatorship. We all have computer chips implanted in our bodies. Originally the government promised us that these implants would protect us from human trafficking and that our parents and the police would be able to find us wherever the criminals would hide us.

We were also made to believe that the implants would monitor our health and that they would track early signs of cancer or dementia, resulting in preventative treatment. The possibilities were vast.

With great power comes great responsibility. Our government found ways to track us and to control us. The implants can read our brain functions and therefore even our thoughts are monitored.

A friend reminded me of a book that you always told me about (Orwell, was it?) where the thought police and big brother were always watching.

Everywhere I go my face is recorded and tracked. I am not able to find work or even buy food if my rating on the government's algorithmic obedience training system is not sufficiently adequate.

Most people are without work. Almost every industry has been automated. Only a small part of our population is digitally literate and able to function in an economy of digital exclusion.

For the small number of jobs that remained after the technological devastation, our government decided to fill it largely with outsiders. The Chinese are now our technological masters. They subjected our beautiful country to one of its many technological exclusion zones across the world.

Their efforts at technological colonisation burned our potential on a grand scale in a policy of scorched earth robotic dehumanisation.

Many of us wonder why the government of the day allowed this to happen. The smart technology era promised the employment and social upliftment of all people in our country.

It was only a few years ago that leaked documents revealed the scale of the government's perpetual fear of losing power.

Even in your day, dad, the ruling party lost support among the economically emancipated. Their power base was guaranteed by social grants to the very poor — the majority of our people.

No wonder they were not really interested in upskilling and employment initiatives. Our leaders decided to ignore the advancing storm, they kept most of our people poor, and they allowed a foreign people to become our masters.

Conclusion

It is the end of 2021, and what a year it has been. As I write, Christmas is around the corner, it is time for rest, time for family and loved ones, and time to reflect on the year that has been.

I started a new job in July at one of the big four global audit firms. It has been difficult and challenging to start a new role in a time of lockdown restrictions and virtual meetings.

I have been to the office only a few times and I am yet to meet in person most of the colleagues I interact with on a daily basis.

It has also been a most productive year. I was a speaker at 31 conferences this year, I produced or participated in 65 podcast episodes, appeared on television 12 times, and posted on Twitter and LinkedIn more than 900 times.

Over the last 6 months, I published the articles you read in this book.

A constant theme in many of my articles is my seven-year-old son. I think about his future, how technology will impact his life and permanently change the world he lives in.

I am permanently aware of the fact that we, collectively, can steer smart technology in the right direction.

We can create a better world for our children. But this will not happen without a great deal of debate, effort and cooperation. We can not simply rely on our governments or even on business: as a society we all need to play a role.

The future is already happening - the future is now. Let's embrace it enthusiastically and carefully and work endlessly for the sake of our children.

ARTIFICIAL INTELLIGENCE
- THE 2021 ARTICLES -

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Johan Steyn is an Artificial Intelligence enthusiast, thought leader, author and conference speaker. He is the 2019 winner Best AI & Robotics Management Consultant by Wealth & Finance magazine (UK).

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