

# THE 4TH INDUSTRIAL REVOLUTION: IMPLICATIONS FOR 21ST CENTURY LOCAL GOVERNANCE

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To many, the 4th industrial revolution is increasingly a buzz phrase or term that hints to the mystical, technologically orientated, virtual ideas of 'the future', bearing little direct relevance to their daily realities, struggles and quests for solutions. Terms such as autonomous machinery, artificial intelligence, virtual reality, the Internet of Things (IoT), 4G and soon 5G, 3D / 4D (to name a few) are intimidating to those outside of the business world, not least public officials who are often the last to wake up to any new trends and fundamental shifts in socio-economic realities.

This article grapples with some of the questions that many ask in conversations about the 4th industrial revolution. What is this 4th industrial revolution exactly and how does it, or is it likely to, affect the way we do things and most importantly, the kind of governance required in the 21st century? Is the 4th industrial revolution even relevant in our context at municipal level, or do we see it as the implementation of high-tech urban innovation exclusively modelled on developed countries and therefore bearing little relevance to our context? Can we even afford it?

## *Localising the revolution*

Before we delve into responding to these questions, let us first consider the context and environment within which local government finds itself. South Africa has undergone a

rapid transition and transformation over the last 25 years. Of course, the world has also changed dramatically in that period – the global economy is now much more interconnected, technology heavily and increasingly penetrates all spheres of life and there is a profound spatial reality to these economic shifts – the most obvious effects being rising inequality and its socio-economic impact. These changes are most obviously and immediately visible in major cities and urbanised regions in many parts of the world.

Consider that less than 30% of the labour force in South Africa occupies stable wage-earning jobs compared to 63% in vulnerable employment, while many urban dwellers live in informal settlements<sup>2</sup>. This also means that the potential tax bases of urban governments are relatively small, creating a serious financial imbalance to address service delivery and economic infrastructure needs. Declining economic growth (a permanently changing oil and commodities cycle affecting African economies in particular), climate change, increasing inequality, security risks and migration patterns, as well as IoT continues to impose new and ever more complex challenges to the management of our cities, towns and villages.

The rapid nature in which the interconnected world is changing, coupled with unprecedented disruption and innovation which challenges the old order necessitates a shift in the way we do business and governance in the 21st century. This new age, the age of

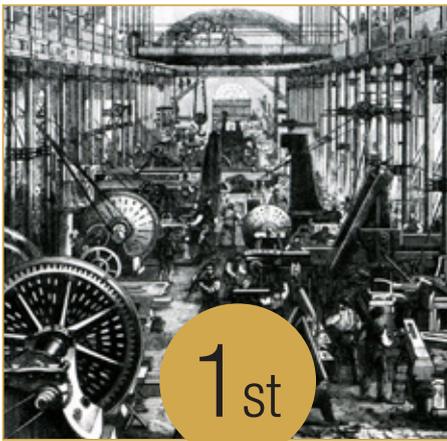
digitalisation and disruption, referred to by many as the 4th industrial revolution, seems likely to compound many of the developmental and governance challenges highlighted above, but also presents a

huge opportunity to position municipal governance at the heart of localising people-centred growth and development.

So, what is this 4th Industrial revolution?

There are four well known and confirmed stages to the revolution. The diagram below summarizes the revolution in brief:

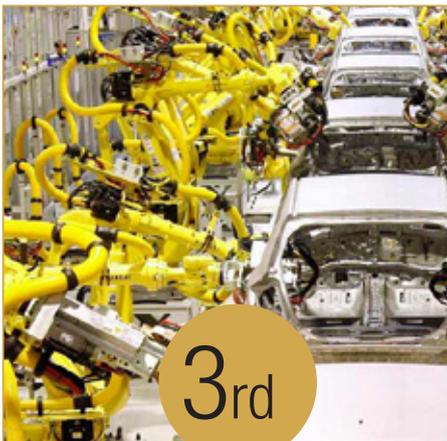
*The 4 Industrial Revolutions in brief*



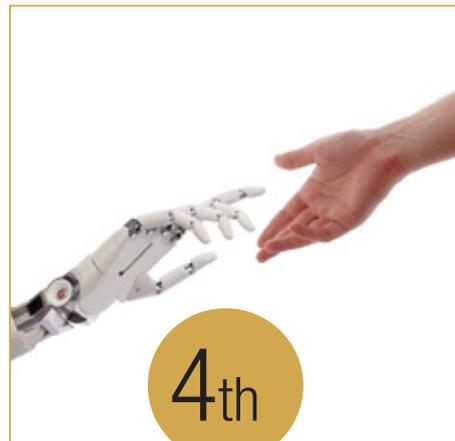
**Mechanization, water power, steam power**



**Mass production, assembly line, electricity**



**Computer and automation**



**Cyber Physical Systems**

### *The 1st Industrial Revolution (1760–1840)*

- From hand production to machine production, coincided with agricultural revolution and land enclosures
- Use of steam, cheaper textiles, chemistry on large scale, bigger role of iron and steel
- For government – pollution, urbanization because of closure of guilds and rise of factories, urban poverty and crime

### *The 2nd Industrial Revolution (1870–1914)*

- Improved on discoveries in the 1st Industrial Revolution, especially steam, iron and steel, machinery, efficient weapons of war (WW1)
- Railways, steam boats and machinery became common
- For government – the telegraph system, gas, sewage, factories, electrification, production/assembly lines
- Start of land use management and zoning

### *The 3rd Industrial Revolution (1950–2000)*

- Rise of the digital era, computers, digital record keeping
- Wide roads and freeways, industrial estates, mass electrification plants (coal, nuclear), further separation of land uses, growth of the post-WW2 New Town Movement, modernization of municipal revenue sources
- Also led to spatial dislocation - a tale of two cities with the rich increasingly opting out into gated estates and the poor being the burden of the state with declining resources

### *4th Industrial Revolution (2005 onwards, and accelerating at massive rate post 2015)*

- "This Fourth Industrial Revolution is, however, fundamentally different. It is characterized by a range of new technologies that are fusing the physical, digital and biological worlds, impacting all disciplines, economies and industries, and even challenging ideas about what it means to be human<sup>3</sup>"

### *A careful consideration of what is changing and why it matters*

Consider that in 1998 Kodak had 170 000 employees and sold 85% of all photo paper worldwide. Within just a few years, technological advances rendered Kodak's business model outdated and the business went bankrupt. Software advances will disrupt most traditional industries given the pace of technological change and innovation and what happened to Kodak will happen in a lot of industries in the next 10 years.

Uber for example is just a software tool, the company does not own any fleet of cars of its own but yet it is the biggest taxi company in the world. Airbnb is another example, with no properties of its own but just software, the company is the biggest hotel company in the world. Computers have become and

are rapidly becoming exponentially better in understanding the world. In 2016 a computer beat the best Go player in the world, 10 years earlier than expected.

It is anticipated that around the year 2020 the motor industry will experience major disruptions in that many may not want to own a car anymore. Trends indicate that most children today will never get a driver's licence and will not need to own a car. Traditional car companies have been going the evolutionary route trying to build a better car while tech-driven companies such as Tesla, Google etc. are taking the revolutionary approach and are building a computer on wheels. In time all of these changes will impact on cities because there will be less cars. It is possible at that time that parking space may be transformed into parks.

The 4th industrial revolution is bound to impact the way in which we understand the world of work. The majority of some of

the most dominant jobs will disappear in the next 10-15 years making way for a lot of new jobs (jobs of the future). The rate at which conventional jobs will disappear is likely to be much higher than the speed with which new alternative jobs and suitable skills will be built. It is not clear if there will be enough new jobs in such a short space of time to replace those that disappear nor new demand for an expanding young population. Even in education, the anticipated impact of the revolution is huge. It is estimated that by 2020, 70% of all humans will own a smartphone or roughly 5 billion cellphone users, compared to 1 billion at the turn of the century. That means everyone will have the same access to information and quality of education<sup>4</sup>.

Like a wildfire racing across a veld, IoT is expanding rapidly and relentlessly. Vehicles, machine tools, street lights, wearables, wind turbines, and a seemingly infinite number of other devices are being

embedded with software, sensors, and connectivity at a breakneck pace. In 2016, 5.5 million new things were connected to network infrastructure each day<sup>5</sup>. Gartner Inc. forecasted that 8.4 billion connected things would be in use worldwide in 2017, up 31 percent from 2016, and will reach 20.4 billion by 2020. Total spending on endpoints and services will reach almost \$2 trillion in 2017<sup>6</sup>.

As IoT grows, so does the volume of data generated. Globally the data created by IoT devices in 2019 will be 250 times greater than the data being transmitted to data centres from end-user devices and 50 times higher than total data traffic. Even as businesses, government agencies and other pioneering organisations take initial steps to implement IoT's component parts - sensors, devices, software, connectivity - they run the risk of being overwhelmed by the sheer magnitude of the digital data generated by connected devices<sup>7</sup>.

Essentially any idea designed for success in the 20th century is doomed to fail in the 21st century. If it does not work with your phone, forget the idea. Data and its usage is likely to change who and how we govern and will influence the manner in which we make decisions about energy production, sewage management, communication, urbanization, employment and governance. IoT brings with it immense opportunities, but to fully explore its potential requires that we first have a clear strategy for tackling current economic, social, cultural and ecological challenges, and then to use the technologies available to think big, start small and scale fast<sup>8</sup>.



***Connecting city governance and 4th industrial revolution***

It is undeniable that technology presents great possibilities to address the present developmental challenges facing us. However modernisation and smart solutions are not just about implementing technology for its own sake, but rather using it as an



enabling tool to help us tackle our most pressing challenges such as sprawling populations and integrated urban living, reach and efficiencies of basic service provision and infrastructure demands, mobility costs, affordable and quality healthcare, improved citizen and community safety, social inclusion and others.

By their very nature cities<sup>9</sup> concentrate on economic activity, governance and transportation. They are hubs that intersect the urban/rural, city/city, and city/country perimeters. Cities offer opportunities to expand access to services such as healthcare, education, public transportation, housing, electricity, water, and sanitation in an economically efficient manner. Urban dwellers also have access to larger and more diversified labour markets, and enjoy healthier lives overall. At the same time careless and unplanned urban growth threatens to undermine sustainable development and almost ensures that the potential benefits of city living are distributed unevenly. This fuels - rather than eradicates - inequality.

South Africa, like many African countries, experiences high levels of urbanisation. This puts pressure on cities to improve

service delivery to residents, to provide economic diversification and to ensure greater operational efficiency. Given that almost a third of the country's population are millennials, the country's demographic makeup (including those younger than 18 who grow up with technology) points to an inevitable rise of smarter cities, as this generation and the one to come is filled with savvy users of advanced technologies including mobility, cloud, social, and big data analytics. The rise of jobless technologies and new technologies in services generation and reticulation should be our key focus.

Structural unemployment, extreme dependence on social grants, high levels of urban poverty and violence, declining state and municipal income as well as growing levels of dissatisfaction and civil unrest are increasingly forcing government entities (whether national or local) to consider more efficient ways to deal with the rapidly rising demands.

The big question city administrators should ask is: how does one govern all of this and what does it mean for municipalities and local governance as a whole over the coming decade?

Data overload and digital disruption is what this generation understands as normal, so what are the implications and opportunities this presents for locally connected governance? In effect we as a country ought to be asking ourselves how we could possibly harness the potential provided by technology of the 4th Industrial Revolution to:

- Govern internally - using technology to improve efficiency whilst reducing labour and management costs;
- Govern externally - to engage with our citizens in ways that make sense to them;
- Provide services through new ways of planning, providing and managing social and economic infrastructure; and
- Manage escalating debt and discover new forms of local revenue generation.

It is no longer news that governance as a process is about to get far more complex. We cannot as a country (and as a people) be caught unaware when this happens. We need to rethink now how we want to address the increasing complexity of governance, in particular:

- How to structure and modernise governance approaches to be more inclusive and people-centered, as well as linking up people with their activities, ecosystems and institutions; and
- How our cities and towns can pioneer and provide development modes and transformation models that are more sustainable and just.

The biggest challenge to this new agenda will be the local elites and the power they exert over local governments. These are the rich and poor who wield the greatest influence over local government decision-making and whose priorities often become the priorities of local government, despite the best intentions of government to work for the common good.

### *The possibility of using data and technology to advance the Constitutional objectives for local government*

As aptly articulated by Renzo Piano<sup>10</sup>, “the City is a place where exchange is physical and intense, rather than virtual. There is much talk about virtual culture, of newspapers being replaced by video, but the city remains the space in which we live together. When I imagine a city, I imagine it compact and dense, capable of generating intense relationships.” Indeed, liveable, integrated and connected spaces and places remains our objective, not digital cities. But while technology cannot fix complex social, political, ecological and cultural problems<sup>11</sup>, it can be a strategic enabler and tool in enhancing reach and connectivity, efficiency and economies of scale. To holistically and accurately use technology to address such problems, municipalities need to transform their planning, governance and regulatory roles<sup>12</sup>.

The mandate of local government as articulated in the Constitution and the White Paper is as follows:

1. Provide democratic and accountable local governance to communities
2. Ensure sustainable service provision
3. Promote social and economic development (spatial transformation)
4. Promote a safe and healthy environment
5. Encourage the involvement of communities (and organisations) in municipal affairs
6. Sound financial management and financial sustainability
7. Leading and learning (social learning for innovation)

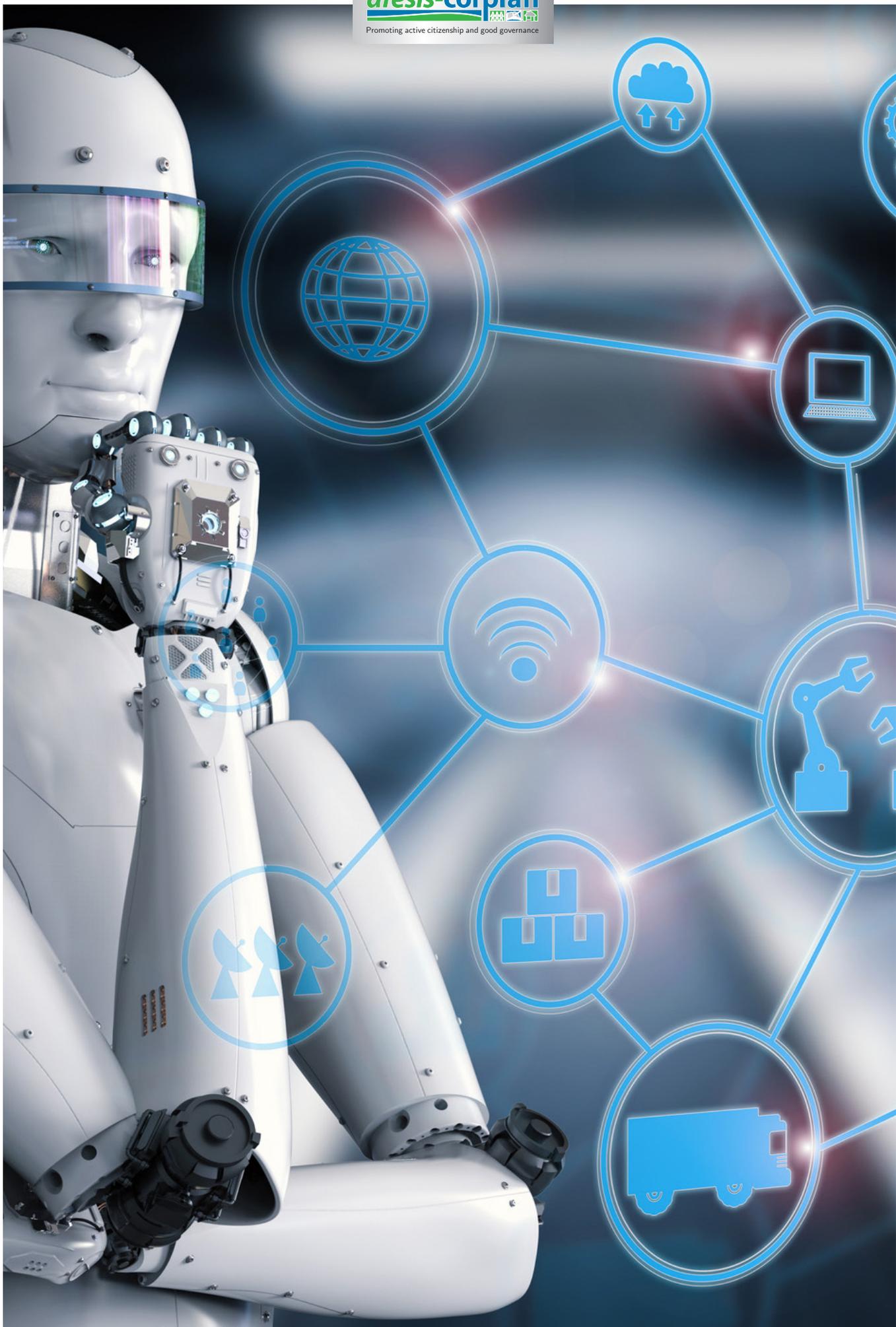
Many cities around the world, whose mandates are similar to those of South Africa’s local government, have already begun adopting new business models and technology to transform themselves and continuously improve, with a few innovative

business models disrupting the way services are delivered. The manner in which urban infrastructure and services are being managed has attracted increased private-sector and entrepreneurial interest, with co-creation and collaboration being its foundations. However as much as technological tools and solutions are a useful aid, in and of itself, technology is not a silver bullet to addressing our cities’ governance challenges but is merely a tool that can aid solutions being more efficient and effective. Technology has little value if we don’t understand and/or resolve the underlying problems.

For municipalities the opportunities for technological use would appear to be centred chiefly on:

- Building smart, connected and resilient cities - harnessing the value chain, efficiency and interdependence of the urban system and built environment (including small towns and the rural economy);
- Stimulating local action in building clean and green, healthy and sustainable communities;
- Modernising governance and staying in touch - technological innovation and connecting people to their ecosystems, institutions and services;
- Revenue generation and financial management in a changing economic environment - rethinking Public Private Partnerships, infrastructure investment and innovative financing; and
- Building communities of purpose - enhancing resource efficiency and transparency through solution based and open (e-) procurement.

Municipalities are also being confronted by growing complexity within IT and operational systems and by the (dis-) connection between digital and physical environments. There is a need to determine capabilities required and undertake the non-technical and technical investments and actions to effectively advance towards data and event-driven decision making. We have two options in the face of this reality – do nothing and suffer the consequences, or embrace ever improving cutting-edge data and technology solutions as a strategic enabler to tackling some of our most difficult spatial and development challenges.



## Conclusion

The 4th industrial revolution is a reality and brings with it change which our cities have to adapt to. Undoubtedly there is a need to invest in a greater understanding and awareness around the opportunities that the emergence of the IoT and the 3rd platform technologies (big data/analytics, social, mobile and cloud) offer. African countries, businesses, and consumers are increasingly embracing the future of technology, anticipating that the wave of innovation will lead to increased prosperity. As a result many of our municipalities are already engaged in smart city transformation activities in order to improve the quality of life of their citizens, enhance the experience of businesses and provide an environment that is conducive to economic development.

We need to build on the foundations of the last two decades of democratic local governance and take the opportunity in the context of the 4th industrial age to:

- Transform our spaces through building inclusive and sustainable local economies based on local solutions, particularly through ensuring that the current and next generation of Integrated

Development Plans (IDPs) facilitate real transformation, inspire entrepreneurial innovation and partnerships and grow our pockets of excellence through encouraging more practical solutions in building inclusive local economies.

- Make sustainable choices / difficult trade-offs in expanding our infrastructure network and services to support our short, medium and long term housing, energy, transport, water and sanitation needs.
- Strengthen social accountability and people's involvement in the modernisation and governance of municipalities.
- Learn from successful initiatives and share experiences among municipalities (for example, the smartest municipalities challenge – could be a benchmarking or knowledge sharing tool)

A central question to be answered in responding to this challenge is what should the next (fourth) generation of IDPs (2021 -2026) entail to be a truly integrated, transforming and economic catalyst? This would mean looking at efficient land use and transport systems, alternative ways to provide essential services (water, electricity, sewage etc.), as well as governance models that need fewer resources but harness greater synergies and integration.

If we are to make significant inroads in our transformation and development agenda then this 4th Industrial Revolution and Sustainable Development Goals era provides a real opportunity to fashion a realistic and sustainable development path (which may be different in each locality) aimed at achieving spatial justice while creating inclusive economies based on sustainable resource use and ecological regeneration. We need a holistic approach to space development that ensures the execution of a smarter approach to integrating strategy, finance, processes and connecting people. We need to use technology and big data in ways that help us build cohesive and inclusive spaces and places.

We should think big, start small and scale fast. It is always lots of little steps, not a singular big one, that makes the giant leap forward.

As for the cost argument I only have this to say: can we afford not to take advantage of this technological age to modernise our governance approaches and connect, scale and leverage the opportunities it presents? To ignore exploring and tailoring its potential benefits to our needs may in time prove to be very costly indeed!

## References

- <sup>1</sup> Managing Partner at Nexo Consulting, see [www.nexo-sa.co.za](http://www.nexo-sa.co.za), contact [reuben@nexo-sa.co.za](mailto:reuben@nexo-sa.co.za)
- <sup>2</sup> McKinsey Global Institute report, Africa at work: Job creation and Inclusive Growth, August 2012
- <sup>3</sup> Klaus Schwab, World Economic Forum, 2016
- <sup>4</sup> <https://www.statista.com/statistics/274774/forecast-of-mobile-phone-users-worldwide/>
- <sup>5</sup> Andy Daecher & Robert Schmid, The Internet of Things: Think Big, Start Small, Scale Fast, February, 2016

- <sup>6</sup> <https://www.gartner.com/en/newsroom/press-releases/2017-02-07-gartner-says-8-billion-connected-things-will-be-in-use-in-2017-up-31-percent-from-2016>
- <sup>7</sup> Andy Daecher & Robert Schmid, The Internet of Things: Think Big, Start Small, Scale Fast -, February, 2016
- <sup>8</sup> Andy Daecher & Robert Schmid, The Internet of Things: Think Big, Start Small, Scale Fast -, February, 2016
- <sup>9</sup> In the global context, cities mean municipalities and it is important to note that many 'cities' in the world are far smaller than our smallest municipalities. Cities as used here therefore does not mean metros or secondary cities as

we've come to know it in South Africa. The South African view of 'cities' is quite uncommon and not shared in many countries in the world.

- <sup>10</sup> Pritzker Prize laureate, Italian Architect, [www.rpbw.com](http://www.rpbw.com)
- <sup>11</sup> Edgar Pieterse, THE GLOBAL SOUTH & THE URBAN OPPORTUNITY, African Centre for Cities - University of Cape Town, February 2014, pg 13
- <sup>12</sup> World Economic Forum, Industry Agenda, Inspiring Future Cities & Urban Services Shaping the Future of Urban Development & Services Initiative, April 2016, pg6