

# African entrepreneurs and preparation for the Fourth Industrial Revolution

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## **Abstract**

For years, the common logic that underpinned entrepreneurship was to find a niche within in a market/sector and then solidify business practice to achieve success in the market segment. The dawn of technologically-based disruptive enterprises, such as Uber and Air B&B, coupled with the nearing Fourth Industrial revolution seriously call into question the conventional business logic. In this article, the projected impact of these forces on African entrepreneurs is explored. We look at the role of government, business and education systems to prepare for the impact of the Fourth Industrial revolution. Specific focus is placed on the need for entrepreneurial skills and training to prepare for the impact of the Fourth Industrial revolution. We also explore the importance of innovation, both in terms of products and processes to mitigate against the impact of these forces.

## **A. Introduction**

From the time, our ancestors first discovered the use of fire, to the advent of steam engines in the late 1600 that revolutionised industry and transport, right up to the information communication technology (ICT) revolution, the advancement in technology has had a profound impact on the nature of human existence. According to Franssen, et. al (2018: 1):

“It is largely by technology that contemporary society hangs together. It is hugely important not only as an **economic force** but also as a **cultural force**.” [emphasis added].

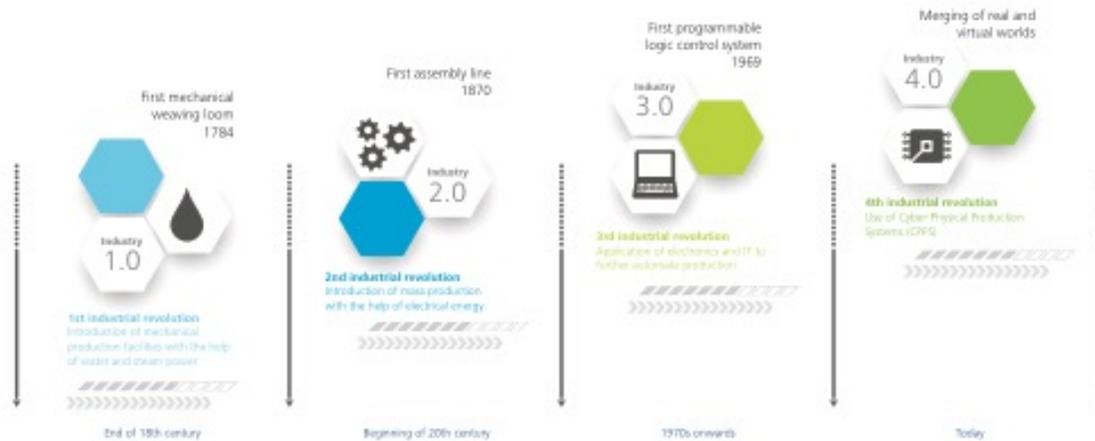
This debate on the primacy of technology in shaping modern society resulted in the emergence of a distinct branch of philosophy, “The philosophy of technology” as an intellectual pursuit to understand the societal and ethical aspects of technology. In a historical sense the quest to explain the relationship between humans and technology were first critiqued by ancient Greek philosophers such as Plato and Aristotle. Emerging from this initial exploration were two prominent themes, viz.: (1) technology as a means used by which humans to imitate nature to ensure its own survival (e.g.: house-building) and (2) the ontological distinction between natural things and artefacts (i.e.: unlike natural things that grow, change and reproduce itself, artefacts are inert, and produced to serve a human purpose) (Franssen, et. al 2018: 3-4) The latter is a theme we will return to later in this article.

According to Marr (2018: 1) unlike the preceding three industrial revolutions, catalysed by the impact of steam power, electricity and assembly lines, and computerisation, we are now on the cusp of a revolution that may challenge our ideas of what it means to be human (See figure 1 below). This epoch spearheaded by advancement in Artificial Intelligence (AI) and robotics has been the central point in global discussions on the dawn of the Fourth Industrial revolution (or Industry 4.0 or 4IR). In this paper, we explore the potential impact of the 4IR on African entrepreneurs, their business models, as well as, what steps could be taken benefit from this trend and be prepared for this new epoch.

## **B. What is the Fourth Industrial Revolution?**

Although Klaus Schwab, the founder and executive chairman of the World Economic Forum (WEF), is widely credited with coining the concept fourth industrial revolution, Garbee (2016: 2) points out that the phrase first came into popular use as far back as the 1940’s. According to Schwab, the 4IR is different from previous industrial revolutions in terms of scale, complexity and scope. It is characterised by a range of new technologies that are fusing the physical, digital and biological worlds. The disruptive influence of such technologies is said to be felt across disciplines, economies, industries and governments.

Figure 1: The evolution of industrial revolutions



Source: Deloitte (2017)

But if the notion of a 4IR merely conjures up the images robots replacing humans in production lines or 3D printers and nano technology being used to produce complex machinery, think again. Humanoid robotics have evolved way beyond the point of its so called “DDD application”, thus its use for those human endeavours that might be deemed Dull, Dangerous or Dirty (Mitchell, 2016).<sup>1</sup> Even once revered professions such as that of being a surgeon, a chartered accountant, or a pilot is not spared from the technological onslaught.

Johnson and Johnson’s Ethicon and Alphabet’s Verily Life Sciences (a subsidiary of Google) has announced that great strides are being made in developing a digitally-enabled robotic surgery platform – Verb Surgical (Enriquez, 2017). Some estimations suggest that within the next decade much of the complex surgery (especially keyhole surgery) currently performed by human surgeons will be left to robots (Devlin, 2018: 2-3).

In the field of accounting, much of the technological advances, especially the use of cloud technology has been seen as enhancing the role accountants (Skoulding, 2018). However there has also been the realization that, as Slyozko and Zahorodnyea (2016: 5) point out “the complete computerization of accounting will lead to the abandonment of the use of modern accounting staff, which will be replaced by various algorithms.”

As far as aviation, especially military aviation, is concerned we have witnessed an intense debate on the future role of unmanned aerial vehicles (UAVs) or drones. This debate has become convoluted with topics ranging from issues such as privacy, safety, legality and more recently ethics (Hopkins, 2017:4-6). Despite promises from former American President, Barack Obama that the use of drones will be kept on a “tight lease”, evidence suggests that thousands of civilians have died in US drone attacks, much of which have been branded “extrajudicial killings” (Matthews, 2013).

<sup>1</sup> The use of technology to compensate for a lack of emotional engagement – here we just have to think of the “Tamagotchi” craze in the late nineties where a technological artefact was created to substitute human emotions and characteristics such as care, loyalty and some may even say love (HBR, 2003:3). Psychological dynamics might redefine what it means to be human and influence how we interact not only with machines but one another.

Whilst the common refrain has been that “behind every drone is a human controller”, the increased use of Artificial Intelligence (AI) or smart technology to enhance drones is bound to complicate the debate. And although many commercial airline executives have bemoaned the global shortage of commercial pilots, a 2017 study showed that, currently, Airbus and Boeing pilots manually flew their planes for only three to six minutes per flight – thus less than three percent of the time! (Ellis, 2017).

## **C. The impact of the Fourth Industrial Revolution on...**

### **C.1 The labour market**

The renowned economist, John Maynard Keynes (1933: 3) predicted the occurrence of widespread technological unemployment due to humanity’s “discovery of means of economising the use of labour outrunning the pace at which we find new uses for labour.” According to Frey and Osborne (2013: 2) the phenomenon of jobless growth has been spurred on by use of computers as substitute for jobs that have become obsolete. In the United States of America (USA) global consultancy group, McKinsey Global Institute, found that after the 2008 financial crisis 44% of companies reduced their headcount by means of automation (MGI, 2011). In a comprehensive study across 702 occupations in the USA, Frey and Osborne (2013) found approximately 47% of total US jobs may be at risk due to computerisation by 2030. Nordhaus (2007) found that since the 1980s computing costs declined on average by 64%, while computational power increased dramatically. Advances in the fields of Machine Learning (ML) and Artificial Intelligence (AI) has also led to a wide range of non-routine cognitive tasks (with the availability of big data) becoming computerisable (Frey and Osborne, 2013, 15:17).

In Developing countries in general, and Africa in particular, the adverse impact automation on employment may be similarly dire. In a study conducted by Karabarbounis and Neiman (2013) they found that the labour share of GDP had declined in 42 out of 59 countries. This they argue are most notably due to the fact that advances in ICT caused the price of machinery and equipment to drop, resulting in companies shifting investment away from labour towards capital. The World Bank (2013: 56) estimates that for global employment rates to merely remain stable as populations grow between now and 2030, the world economy will need to create some 600 million new jobs. In Africa alone 11 million young Africans are expected to join the labour market within the next decade. And as Raja and Amphah (2016: 2) rightly point out, “If they cannot find work, their frustrations could undermine national and regional stability and undo decades of progress.” Naude (2017: 4) points out that in even relatively poor African countries such as Angola and Ethiopia, there is a risk of having around 50 and 44 per cent of current jobs being susceptible to automation respectively.

To complicate matters further, African and other developing countries may be losing their comparative cost advantage as robots allow developed countries to “re-shore” manufacturing (Naude, 2017:5). The UNCTAD (2016: 2) sounded the warning that this phenomenon “could turn global value chains on their head, and lead to their decline as a potential industrialization strategy for developing countries.”

## C.2 Businesses

Over the past decade we have witnessed a slew of disruptive business models that evolved out of advances that can be associated with the 4IR. Advance in computing power and greater interconnectivity has led to what is today commonly referred to as the “Internet of Things” (IOT) – see figure 2 below. Such interconnectivity holds major advances for businesses, especially Small Medium and Micro Enterprises (SMMEs) to integrate their products and services into the much larger global value chains. The use of new production technology such as 3D printing (additive manufacturing) has revolutionised the manufacturing sector. According to Naude (2017: 6) this gave rise to ‘new forms of manufacturing’ referring to small scale manufacturing that is now made more competitive and efficient through tools that enables additive manufacturing, mass customisation, cheaper automation and reduced input costs. Brynjolfsson and McAfee (2012) refers to affordable “robots-in-a-box” which allows small businesses to set up their own automated factory, dramatically reducing the costs and increasing the flexibility of manufacturing’.

Figure 2: Interconnectivity of the 4IR



Source: Deloitte (2017)

In addition to the impact on manufacturing and the potential for greater connectivity, the 4IR allows for new business models that directly challenges the way business is conducted. In this regard, we turn to three examples, namely the rise of transport network companies (TNCs), online retailing and mobile money.

### **C.2.1 Transport network companies (TNCs)**

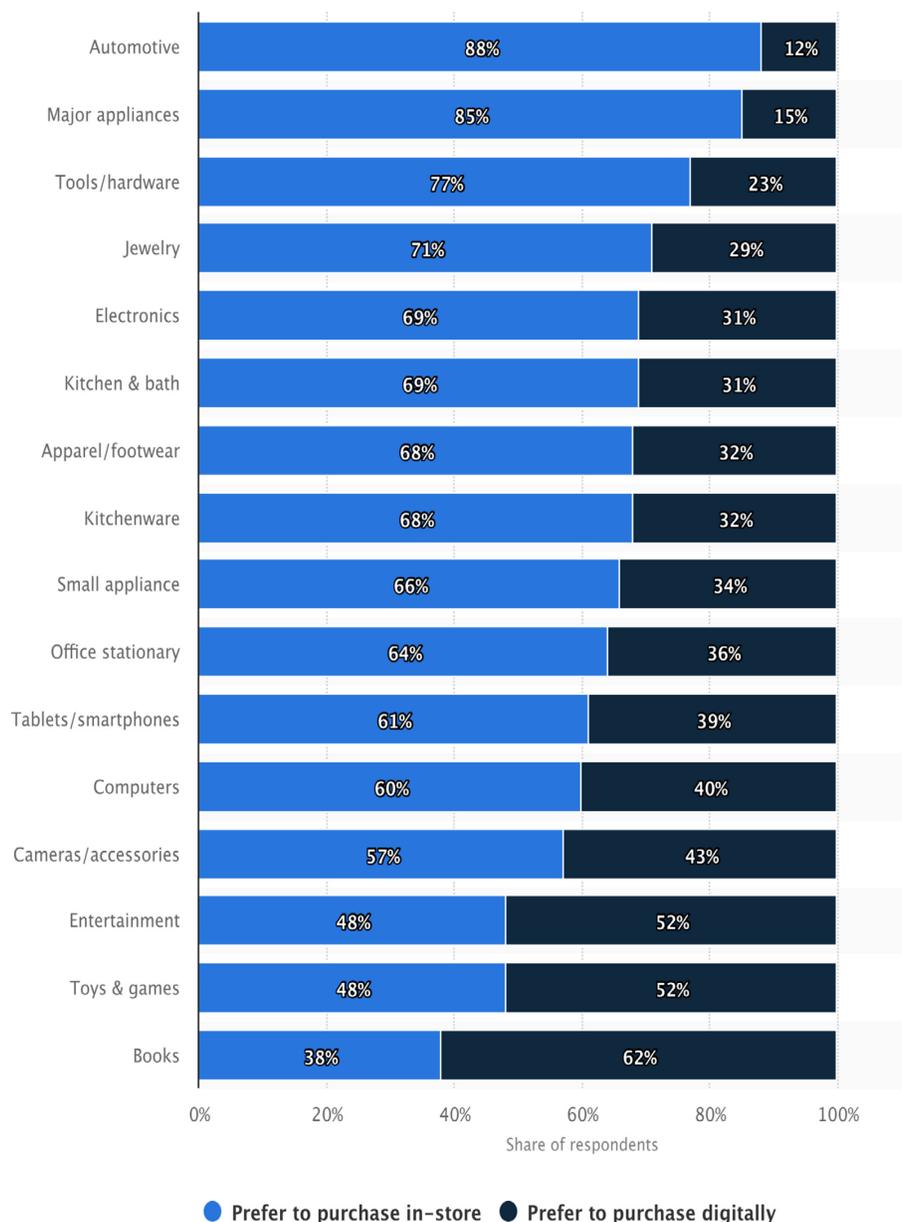
The introduction of TNCs such as Uber and Taxifi, has heralded the end of the traditional meter taxi sector. In San Francisco, the birthplace of Uber, the number of traditional taxi rides declined by an average of 65% between 2012 and 2014 (SFMTA, 2016). A study conducted by Berger (et. al 2017) found that although the earnings of traditional meter taxi drivers has fallen by 10% in the US market since the introduction of Uber, hourly rates of self-employed Uber drivers grew by the same margin. The introduction of these services has however in many cases been met with sharp resistance ranging from legal court battles (e.g.: Canada and Australia) and violent (even deadly) clashes between TNC drivers and traditional meter cab drivers in country's such as South Africa, Greece. In countries such as Bulgaria, Denmark and Hungary TNCs are banned, with limited bans of certain services in Italy, France, the Netherlands and Finland.

The introduction of TNCs caught many regulators off guard. Legal action against these companies were brought against these companies from both those in existing taxi industry and also TNC drivers themselves. Given the fact that TNCs view their drivers as "independent contractors" rather than employees, they have managed to skirt around issues such as taxation and working hours, which the traditional taxi companies are bound to. On the other hand, drivers found that many of the legal protections and benefits (such as overtime) have been denied them through this business model. The irony of TNC as examples of business models of the 4IR, is that it too may become as another advance in technology, that of autonomous vehicles, come online.

### **C 2.2 Online retailing**

In the retail sector, much strain has been experienced by "brick and mortar" shops and malls due to the impact of e-commerce, specifically online shopping. For those in the retail sector it is of critical importance to take note of the trends discernible regarding consumer preferences regarding online versus in-store purchases (see figure 3). As distribution services becomes more reliable and global competition, especially from Chinese companies such as Alibaba Group Holdings and JD.com, drive prices down a spurt in online-shopping can be expected.

Figure 3: Online versus in-store purchase in the USA



Worstell (2015) points out that by 2015 12% of retail spending in the US was online. He further mentions that although only 2% of malls have closed down, with 4% in grave danger of following suite and 3,4% of malls are more than 40% vacant (representing 30 million square feet). Fantoni (et.al. 2014) states that the e-commerce revolution and the rise of digital technologies are fundamentally reshaping consumer expectations and shifting the function of stores towards useful and entertaining customer experiences.

The mall as the ultimate symbol of consumerism is steadily losing its shine and websites such as **deadmall.com** has sprung up to record failing malls across the US and other countries – a sort of online obituary for failed malls. The website even featured a section on the continued failing of South China Mall in China, which at 5 million square feet shopping space made it the biggest mall in the world – twice the size of Mall of America (Bloomington, Minnesota); the biggest mall in the USA. In an interesting phenomenon witnessed recently has been that many e-commerce companies are also venturing into investing traditional “brick-and-mortar” stores to consolidate their market positions. In the USA, it started with Amazon acquiring Whole Foods, but the trend has even been more pronounced in China with Alibaba and JD.com spending billions of dollars in acquiring retail space (Feng, 2018).

### **C 2.3 Mobile money**

The networked society has created tremendous opportunities for new models of banking. In Africa, a remarkable success story in this regard, is that of global leader in mobile money, M-Pesa. “Pesa” which translate to “money” in Swahili was launched by Vodafone’s Kenyan subsidiary Safaricom in 2007. From its humble beginnings as a means for mobile phone users to transfer small amounts of money between them, it today has 30 million users spread over 10 countries. Its service offering ranges from international cash transfers to small loans and even health provisions. In 2017 an estimated share of Kenya’s GDP processed over M-PESA. (McGath, 2018).

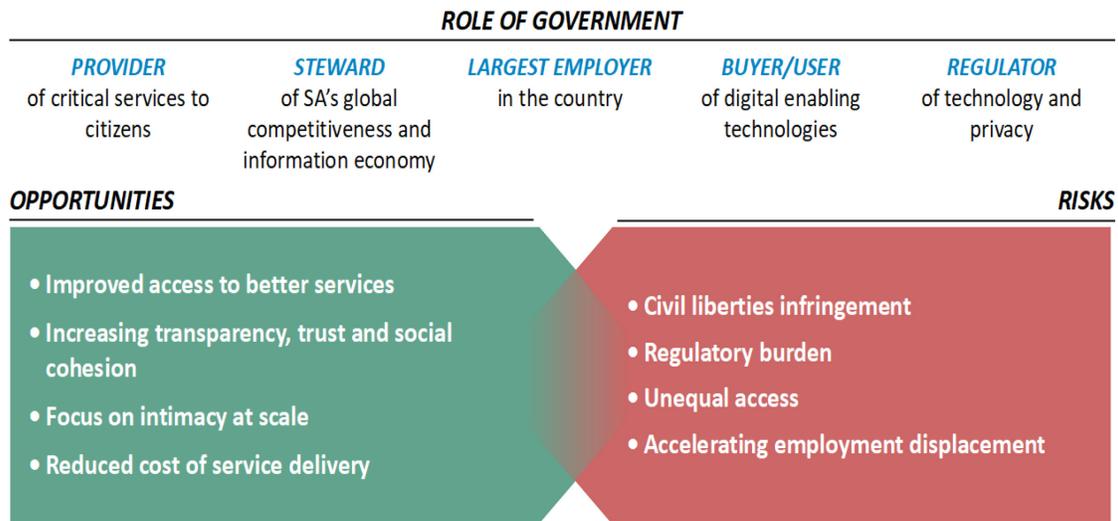
## **D. Lessons to be learned and action to be taken**

### **D.1 Prepare for the storm**

The anticipated impact of the 4IR on the labour market, as discussed in this paper, may have a dire impact on African economies, increasing unemployment and deepening inequality. With this in mind collaborative action is required from governments, the business community and educational institutions. A recent study by Deloitte (2018) found that Africa has an advantage over developed markets because it is not weighed down by infrastructure legacy issues and may have little difficulty in embracing change. They further suggest that great leapfrog potential to directly adopt or develop specific industry 4.0 or IOT applications exists. The chaos associated with the introduction of TNCs in South Africa and elsewhere on the continent however draws one’s attention to the importance for governments to put in place the appropriate regulatory environment for such ventures.

In a recent assessment by telecommunication giant, Telkom the role of government in preparing for the 4IR was summaries as follows:

Figure 4



*Source: Rabana (2017)*

Smart technologies will create new opportunities for prosperity. Rather than being wary of automation or robot or being complacent the strategic choices need to be made today. If policy does not prepare now, the risks to sustained and shared prosperity will only increase. As Raja and Ampah (2016: 2) state:

“Sustainable development will require investments in technology, in line with the UN Sustainable Development Goals, especially 8 and 9c. Not doing so would perpetuate existing digital divides and be a miss opportunity to address inequality.”

Naude (2017: 15) however rightly points out that no government are in the position to fully protect its citizens against job losses due to 4IR, but care should be taken to prepare current and future workers for its impact. Governments need to act now, in partnership with the private sector, to invest more in skills, in improving business environments, and in strengthening the social safety net to protect the vulnerable.

## **D.2 Ride the wave**

African entrepreneur should place themselves in a position to exploit the global dynamics of declining cost in computing and robotics, and the availability of new manufacturing technology, such as additive manufacturing. In this regard, it is heartening to notice that across the African continent a number of projects have been launched to do just that. In robotics, the Ugandan Fundi Bots initiative is teaching Ugandan schoolchildren about robotics, and in Egypt EG Robotics was launched in 2015 as an entrepreneurial initiative to promote robotic development in Egypt. Liberia also piloted the first Ebola-fighting robot. This robot disinfects rooms and kills the Ebola virus, thus protecting health workers against exposure to the virus (Naude, 2017: 18).

The use of additive manufacturing is also on the rise across the continent – mostly in collaboration with European partners. In Togo, a local entrepreneur (Afate Gnikou) won an international prize for manufacturing a prototype 3D-printer from recycled electronic for less than US\$ 100. The Vanderbilt-Zambia Network for Innovation in Global Health Technologies 3D-prints fully functioning molecular biology and chemistry labs in rural Zambia for use in malaria testing. And in Uganda 3D-printers have been introduced to print prosthetic limbs for amputees (Scot, 2015).

As far as indigenous TNCs are concerned, network-linked motorcycle taxis, called Boda Bodas, are used with great success in Kampala, Uganda and has spread to other parts of Eastern Africa (Siegel, 2017).

FarmDrive in Kenya has created financial solutions that links often unbanked and underserved smallholder farmers to credit, while also helping financial institutions to increase their agricultural loan portfolio (Ekekwe, 2018).

### **D.3 Build it and they will come**

To prepare for the exponential speed and change of the 4IR manufacturers need to adjust their infrastructures and develop new ones, upskill their workforce and reorganise their businesses. Having an integrated IT system in place that can handle the increased speed of change, higher flow of data and new networking and communication needs, while leveraging new applications such as cloud computing for example, will become indispensable in the 4IR (Deloitte, 2017). Overall, this redesign should facilitate continuous experimentation and innovation of new, scalable business models, not just the traditional area of product innovation. (Deloitte, 2017:21-22)

Innovation has traditionally focused predominantly on product offerings, but its major potential lies in the areas of company structures, processes, networks and profit models, together with customer-facing functions, such as new services and distribution channels. Rather than thus only focussing on product innovation, the need exists to ensure process innovation.

Collaboration between business and the higher education sector will also become ever more critical to ensure greater fit between the offering of tertiary institutions and skills required by companies. Universities can also play a meaningful role in setting up incubators to assist SMMEs in preparing for the 4IR. An interesting example in this regard is Stanford University's Design School's "Real-World projects". Through this programme firms are invited to partner with the design school to develop projects for students that address real-world challenges (Stanford.com).

Recently South African telecommunications company, Telkom, in partnership with the Universities of Witswatersrand, Johannesburg and Fort Hare launched SA4IR (Arnoldi, 2018). The stated objective of this partnership is to build an "inclusive developmental future for South Africans by stimulating a national dialogue and developing a national agenda in response to the impact of the Fourth Industrial Revolution". SA4IR is said to strive for "tangible solutions" to the challenges of the 4IR and set its aim to bring together various stakeholders to develop comprehensive strategies for mining, healthcare, manufacturing and the services sector.

## **E. Conclusion**

The market and policy conditions created by the 4IR requires vigilance and not complacency. A “business as usual” attitude is not an option. Investing now in the necessary infrastructure and skills development can put African countries (and its businesses) in a position to optimally take advantage from the opportunities it presents. Collaboration between business, government and educational institutions reaching beyond borders is of paramount importance. For the entrepreneur an awareness of trends and technology requires a forward-looking attitude that does not wait till their sector or business becomes obsolete but fixing the adapting their businesses continuously. Thus, than following the dictum that says “If ain’t broke, don’t fix it!”, perhaps fixing it before it breaks might be the more appropriate action required.

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