

# The Impact of the Covid 19 Pandemic on the Development of the Fourth Industrial Revolution in Southern Africa

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**Abstract:** The fourth industrial revolution (4IR) is gradually gaining momentum in a wide range, and as it gathers pace, innovations are becoming faster, more efficient, and widely accessible than before. However, due to the outbreak of Covid 19, the world had seen a shift in the traditional ways in all aspects of human activities, especially in the socio-economic sector. This paper explores the effect of Covid19 on the development of the fourth industrial revolution in the Southern African region and will review the literature on pandemic and its effect on industrial revolutions. It will also review the literature on the fourth industrial revolution, the spread of the Covid 19 pandemic, and its effect on the development of the fourth industrial revolution in Southern Africa.

**Keywords:** Covid 19, Fourth Industrial Revolution, Pandemic, Socio-Economic, Southern Africa.

## INTRODUCTION

The world from the late 18<sup>th</sup> century to the beginning of the 19<sup>th</sup> century witnessed the commencement of the first industrial revolution, which resulted in unimaginable socio-economic transformations, especially in England, where related industrial productions started [1]. The first industrial revolution resulted in global economic growth in the areas of transport communication, production, manufacturing, and service delivery. This rapid economic growth of the 18<sup>th</sup> and 19<sup>th</sup> centuries brought not only economic transformation across Europe but also resulted in diseases and death. This resulted from the rapid growth in population across England brought about by the first industrial revolution resulting in poor living and working conditions, which led to the outbreak of diseases such as cholera, typhoid, and tuberculosis, which impacted on socio-economic conditions of the people.

The second industrial revolution occurred between 1860-1914 as a result of the inventions of several technologies such as electricity, internal combustion engine, chemical industries, alloys, petroleum, and electrical communications such as the telephone, the telegraph, and the radio. The second industrial revolution transformed the world from a rural to urban society, and the transport and communication technologies transformed business and lifestyles, bringing about a reduction in the rate of infections and death from diseases and improved public health [2].

The third industrial revolution brought about information and communications technology, and this started from 1980 to 2000, and this led to the use of computers and the first wave of internet technologies [3]. According to Roberts [4], the third industrial revolution was driven mainly by technological advances in manufacturing, distribution, and energy factors supported by the following five energy pillars:

the shift to renewable energy,

- The transformation of the building stock into green micro-power plants to collect renewable energies on-site,
- Deployment of hydrogen and other storage technologies in every building and throughout the infrastructure to store intermittent energy,
- Use of internet technology to transform the power grid of every continent into energy internet that acts just like the internet and transition of the transport fleet to electric plug-in and fuel cell vehicles.

However, these industrial revolutions had experienced several pandemics that impacted the socio-economic of people and nations and the development of these industrial revolutions. The Spanish flu is a good example, and its spread started in 1918, and over 500 million people globally were infected by the Spanish flu resulting in over 100 million deaths between 1918 and 1920 [5]. The Spanish flu resulted in the disruption of socio-economic activities across the world with the shutting down of social and economic activities, and the Spanish flu has been categorised as one of the worst pandemics in the world [6].

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While the first industrial revolution led to the emergence of the steam engine that revolutionised framing, manufacturing, and transportation, the second industrial revolution resulted in rapid power mass production. While the third industrial revolution brought about electronics and information technology, the fourth industrial revolution is characterised by a fusion of technologies revolving around an exponential pace comprising of physical, digital, biological spheres and consists of advanced technology based on information and technology [7, 8]

Many countries worldwide have started laying the foundation for the fourth industrial revolution by increasing their industrial internet connectivity and automation. In Africa, however, the development of the fourth industrial revolution has mostly been limited just to policy statements and challenges such as poor physical infrastructure, low regulatory, low policy quality, the poor rule of law, high disease burden, and lack of adequate skilled workers is limiting the development of the fourth industrial revolution across the continent [9].

This study will review the development of the fourth industrial revolution in Southern Africa, the outbreak and spread of the covid 19 pandemic, and its implications for the fourth industrial revolution across the Southern African region.

### **The Fourth Industrial Revolution**

The fourth industrial revolution is the era of enhanced cognitive power with a broader scope than the third industrial revolution, and it is the blending of digital technologies interacting across physical, digital, and biological domains [10]. The parliament of the Republic of South Africa in 2019 defines the fourth industrial revolution as the fourth major industrial period from the 18<sup>th</sup> century from the emergence of the first industrial revolution. The fourth industrial revolution consists of a world where human beings rotate between digital domains and offline reality using connected technology to enable and manage their lives.

Ndung'u and Signe [11] defined the fourth industrial revolution as the mixture of three worlds, which are the digital, biological, and the physical world using new technologies such as artificial intelligence, cloud computing, robotics, 3D printing, the internet, and advanced wireless technology. Using the social media as a point of reference, the fourth industrial revolution

is the collective force behind many products and services, such as Apple's Siri, personalised Netflix recommendations, Facebook's ability to recognise your face and tag you in a friend's photo is indispensable in modern life. [12] listed the following technologies as drivers of the fourth industrial revolution: Artificial intelligence (AI): Where computers now think like humans and recognising complex patterns, processing information, drawing conclusions, and making recommendations. Blockchain: This allows sharing and recording data without reliance on third-party intermediaries. It consists of applications such as the bitcoin—new computational technologies such as quantum computing and the cloud. Virtual reality (VR) such as the L'oreal make-up the app and Google translates phone apps. Biotechnology harnesses cellular and biomolecular processes to develop new technologies and products for a range of uses in pharmaceuticals, materials, and manufacturing. Biotechnology harnesses cellular and biomolecular processes to develop new technologies and products for a range of uses in pharmaceuticals, materials, and manufacturing robotics, for 3D printing and innovative materials such as plastics, metals, alloys and biomaterials. These drivers of the fourth industrial are expected to transform people and businesses within years.

Apart from the above definitions of the fourth industrial revolution, there have been various arguments that the fourth industrial revolution will transform the future, impacting nations, governments, and businesses with several opportunities [13]. They are of the opinion that the fourth industrial revolution will bring about the following opportunities such as the lowering of barriers between inventors and markets, the artificial intelligence will have a more active role, different techniques and domains such as the physical, biological and technological will integrate, and there will be improved quality of lives through the use of robotics and the internet. Apart from the opportunities, the fourth industrial revolution will bring to the people, government, and business the following that will drive the fourth industrial revolution across the world; information and communication infrastructure and emerging technologies, education and training, innovation, policy innovation, responsive and context-specific strategies [14]. However, this study will define the fourth industrial revolution by working remotely through digital devices without being in the workspace. Innovations that will transform businesses, faster and more convenient means of communication, and digital

interactions that will change the way people interact with one another and work.

Apart from the opportunities brought about by the fourth industrial revolution, it will also bring the following challenges, such as significant losses of jobs due to the increased use of technology that will displace many unskilled workers, particularly with more machines robotics. There will also be mismatches and redundancy in skills due to the change in job nature and patterns because of advances in technology and manufacturing techniques. Another challenge will be in the areas of infrastructure and technology, which will affect mostly developing countries with a negative impact on industrialisation. There will also be challenges in the areas of privacy and security as a result of the integration of systems, one of the major drivers of the fourth industrial revolution, impacting data protection and privacy [14]. Zervoudi [15] also collaborated on the arguments about the challenges of the fourth industrial revolution by arguing that governments that are unable to follow the appropriate long-term policies required for the development and sustainment of the fourth industrial revolution will put the economies of their nations at risks. There will also be millions of job losses, especially those with low and middle skills, income inequality gap and increased poverty will be another challenge due to the introduction of new technologies in all sectors and job loss. Zervoudi argued that the fourth industrial revolution would bring about political challenges such as increasing conflicts due to massive unemployment, poverty coupled with rapid population growth and urbanisation. Income inequality will lead to illegal immigration that may drive serious cultural and political conflicts [15]. The fourth industrial revolution will also impact the nature and dimension of national and international conflict. War and conflicts in the age of the fourth industrial revolution will become hybrid with the possible use of chemical, biological, and nuclear weapons. Potential misuse of these new technologies of the fourth industrial revolution may negatively impact lives and ecosystems.

The African continent has also witnessed the heralding of the fourth industrial revolution, with researchers arguing on the fourth industrial revolution's impact on citizens, governments, and businesses across the African continent. Naude [16] argued that the benefits of the fourth industrial revolution, such as economic growth, especially in the manufacturing sectors, will impact negatively on African countries because of Africa's low industrial growth. The

innovations brought about by the fourth industrial revolution will result in increasing unemployment, especially in routine employments and middle-skilled jobs that will be taken over by artificial intelligence through the use of software or physical robots. It will increase the opportunities in creative, innovative, and social skills jobs.

Despite the loss of routine and semi-skilled jobs such as in factories, offices, and farms across Africa, new models of business brought about by the fourth industrial revolution will result in a closer alignment of consumer needs with production, and there will be more accessibility to goods and services resulting in better utilisation of the natural resources across Africa and preventing waste [16].

### **The Fourth Industrial Revolution and Southern African Region**

Like in other regions across the African continent, the Southern African region consisting of countries such as South Africa, Zimbabwe, Malawi, Mozambique, Botswana, Lesotho, Angola, Namibia, and Eswatini is experiencing the heralding of the fourth industrial revolution. South Africa is the most industrial and technologically advanced country within the Southern Africa region, with a well developed and advance communication and financial systems is setting the pace. The government of South Africa had made it a point of view that the strengths of the fourth industrial revolution lie in technological innovations and digitalisation.

These had led to series of policies such as the national integrated ICT policy formed in 2016 and aim to provide and improve on ICT infrastructures to achieve universal access and ensure that ICT services are accessible to every resident and accessible innovations and science technology with the establishment of a future industrial production and technological unit to deal with the impacts and challenges of the fourth industrial revolution [17].

The major objective of South Africa's national integrated ICT policy is to position South Africa's emergent technologies in the era of the fourth industrial revolution (4IR). Also, President Cyril Ramaphosa, the president of the Republic of South Africa, in his state of the nation address in 2018 transformed the digital revolution commission to the presidential commission on the fourth industrial revolution with some of the following mandates;

Coordinate the development of South Africa's national response action plan to deal with the 4IR, develop an integrated national strategy and plan to respond to the 4IR, mobilise resources to support the fourth industrial revolution interventions, advise on the skills development and future of work and advise on strategies to enhance South Africa's global competitiveness.

Despite South Africa having more developed communications and financial services among countries within the Southern African region coupled with the formation of policies geared towards the fourth industrial revolution, there has been some criticism of these policies. Sutherland argued that although the national economic strategy of the government of South Africa consists of the fourth industrial revolution, the country is still ill-equipped for the transformations resulting from the fourth industrial revolution due to the factors such as lack of adequate skills, poor quality infrastructure, lack of adequate markets and a strong Chinese presence in several sectors of the Southern African economy [18].

Apart from South Africa, other countries within the Southern African region do not have any significant policy on the fourth industrial revolution. In Botswana for instance, only 9% of the population has access to the internet, and such access is limited to the urban areas, Lesotho 30%, Tanzania 20% and Madagascar 4-2% access to the internet [19]. The above argument shows that despite the inevitability of the fourth industrial revolution in the Southern African region, countries within the region with the exemption of South Africa still lack the basic necessities needed to meet up with the benefits, challenges and components of the fourth industrial revolution.

Despite the challenges faced by countries in Africa, such as those of the Southern African region, the fourth industrial revolution will result in the potentials for these countries because it will lead to competitive small-scale manufacturing, customisation of products, cheaper raw materials, the emergence of new business and infrastructural development [20].

The Southern African development community (SADC) the sub-regional organising comprising of countries within the Southern African region had taken a strategic policy known as SADC's industrialisation strategy geared towards the fourth industrial revolution. SADC's fourth industrial revolution strategy consists of

the following initiatives: Digital SADC 2027, which is geared towards the digitalisation of the Southern African region. The digital SADC 2027 is expected to bring about the following benefits:

- A well informed rapid decision making, efficient, transparent governance, globally competitive industries and knowledgeable public.
- Lifelong learning leading to instant access to knowledge and better jobs.
- Social and cultural inclusion leading to the end of isolation and discrimination.
- Create more wealth and livelihood options and employment opportunities.
- Lead to efficient cross-border travel and the seamless market for goods and services.
- Increased agricultural production and more efficient produce markets.
- Accessible government, commercial and financial services, cultural heritage and indigenous.
- A healthier and happier population.

The pillars of the digital SADC 2027 are infrastructure, E-service and applications, research, innovation, industry development, capacity building and content [21]. Another initiative of SADC geared towards the fourth industrial revolution is SADC's declaration on the fourth industrial revolution. This declaration focuses on the creation of enabling environment for the development of ICT, which is viewed as a major determinant to the socio-economic development of the Southern African region which will create the ground for the technologies of the fourth industrial revolution and focuses on six pillars which are infrastructure and connectivity, affordability, skills and awareness, entrepreneurial development and local content [22]. Markowitz [22] argued that only South Africa within the Southern African region had shown initiative to overcome some of the barriers encountered in the implementation of the fourth industrial revolution. Other countries within the region need a more encompassing fourth industrial revolution digitalisation strategy and which some of this policy geared towards the fourth industrial revolution can be nationally driven with the need for regional collaboration. Therefore, despite the

challenges encountered by countries within the Southern African region in the implantation of the drivers of the fourth industrial revolution, the region is witnessing its emergence.

### **The Corona Virus (Covid19) Pandemic**

Pandemic has been used vaguely to describe the outbreak of a very large spread of an epidemic [23]. In defining pandemic used the following key features to define a pandemic which are:

- Wide geography extension: These are diseases that spread over large geographical areas such as cholera, influenza and human immunodeficiency virus (HIV).
- Diseases movement: These are spread through transmissions such as influenza and SARS.
- High explosiveness and attack rates: This is highly contagious diseases with a short period of incubation such as cholera and influenza
- Other features include minimal population immunity, a novelty which are diseases that are new, infectious, diseases such as obesity which are geographically extensive but are not transmissible, contagious diseases such as influenza that can be transmitted in multiple ways.

Defining pandemic as an epidemic that spread over a wide area, spreading across international borders and affecting large population of people [24]. Heath defined pandemic as an epidemic that spread over a wide area, spreading across international borders and affecting a large population of people. The Illinois department of public health in the United States while defining a pandemic as a global disease outbreak identified the following characteristics of a pandemic border closures and travel restrictions to delay the arrival of the virus, overloading of the health care system, which results in inadequate medical supplies followed by economic and social disruption.

From the above definitions of a pandemic, a pandemic can be defined as a disease that is transmitted from human to human and spread across large geographical areas with negative impacts on society.

The world had experienced several pandemics with humanitarian and socio-economic impact on nations

across the globe. Throughout the course of history, diseases such as cholera, smallpox, tuberculosis, influenza and AIDS have ravaged humanity. The world had also had its share of pandemics, such as the following:

- Prehistorical epidemic (Circa 3000BC): This occurred in China, and the disease wiped out an entire village.
- Plague of Athens (450 BC): According to historical sources. An epidemic ravaged the people of Athens after the war between Athens and Sparta and killed over 100000 people.
- Antonine Plague (AD 165-180): The disease during this pandemic was suspected to be smallpox, and it killed over 5million people in the then Roman empire.
- Plague of Cyprian (AD 250-271): Named after St. Cyprian a bishop in the Tunisia city of Carthage, this epidemic killed over 5000 people a day in Rome.
- Plague of Justinian (AD 541-542): This is a plague named after Emperor Justinian of the Byzantine Empire, and over 10% of the world population were said to have been killed by this epidemic.
- The black death (1346-1353), Cocoliztli epidemic (1545-1548), American plagues (16<sup>th</sup> century), Great plague of London (1665-1666), Great plague of Marseille (1720-1723), Russian plague (1770-1772), Philadelphia yellow fever (1793), Flu pandemic (1889-1890), American polio epidemic (1916).
- Spanish flu (1918-1920): The Spanish flu is said to be one of the epidemics that had one of the highest rates of infections in the history of pandemics. From the South Seas to the North Pole, over 500 million people were infected, and millions die from the epidemic.
- Asian flu (1957-1958), AIDS from 1981, H1N1 Swine flu (2009-2010) and the Zika virus: These epidemics have impacted negatively on the lives of millions of people across the world.
- Ebola (2014-2016): The Ebola epidemic ravaged the West African region and spread across national borders from its first reported case in Guinea in December 2013 to Liberia, Sierra

Leone, Nigeria, Mali, Senegal to the United States and Europe. Over 28600 were infected with Ebola, and it resulted in over 11325 deaths.

The Spanish flu caused over 40 million deaths, Asian flu over 2 million deaths, Influenza H1N1 over 18000 and Ebola over 11325 deaths [24]. These were pandemics with a huge humanitarian crisis and impacted negatively on the socio-economy of nations. Moren, Folkers and Fauci (2009) in their definition of the term pandemic used certain features to describe what a pandemic is and one of such features is novelty diseases that are new, and the coronavirus (covid19) falls under a novelty. The coronavirus (covid19) is a severe acute respiratory syndrome virus that was first identified in the city of Wuhan, Hubei province of China and its mode of transmission has been identified as host to human and human to human [25].

As of 30 July 2020, the coronavirus disease (covid19) an infectious disease has infected over 17million people globally with over 660266 deaths. In Africa, there are over 789266 cases with South Africa having the highest cases which continue to increase as a result of the lifting of some of the restrictions imposed to limit the spread of the virus. According to [26], the coronavirus pandemic has resulted into stifled economic activities, and the spread of the virus has led to social distancing which resulted into the shutdown of financial markets, corporate offices, business and events across the globe.

Also, the crisis caused by the coronavirus pandemic is dropping the economy of the world to depths unknown since the outbreak of the Second World War. It has not only impacted on human health but also disrupting global economy through global chains, fall in commodity prices, fiscal revenues, foreign exchange receipts, foreign financial flows, travel restrictions, declining of tourism and hotels and a frozen labour market [27]. On the African continent, the spread of the coronavirus is impacting negatively on socio-economic activities, and major sectors of the African economy such as tourism, aviation and hospitality are virtually collapsing. Unemployment rates are increasing especially jobs within the formal and informal sectors with over 20 million jobs on the line. Health care facilities across Africa is already in crisis, and its inadequate facilities are already over stretched resulting into inadequate and dilapidating health facilities across the African continent and affecting patients with high burden diseases such as AIDs, tuberculosis and malaria resulting into lack of access to

medications and increasing mortality rates [27]. The coronavirus pandemic has also resulted in lockdowns across the globe. The lockdown of industries led to a decrease in the emission of industrial; waste due to lack of operational vehicles, there is almost zero emission of greenhouse gases and toxic tiny suspended particles to the environment. Ecosystems are recovering, and the ozone layer is being revived to some extent due to the reduction in pollution levels and decrease of power in industries [28]. Therefore, the coronavirus pandemic since its first case in Wuhan, China in December 2019 has spread beyond national borders to virtually every nation on earth. Millions have been infected by the virus, and hundreds of thousands have died, to curtail the spread of the virus, the government of various nations have imposed restrictions leading to lockdowns of virtually every sector of the global economy leading to job losses that may trigger civil or social unrest across the continent. The African continent is also being impacted by the spread of the virus resulting in economic hardships and increasing mortality rates. Furthermore, social distancing has been adopted, and patterns of work, interaction and communication have changed.

#### **Covid19 Pandemic and the Fourth Industrial Revolution in Southern Africa**

The Southern African region first case of the outbreak of the coronavirus was in the first week of March 2020 and as of 30 July 2020, the covid19 virus has spread across the Southern African region impacting on countries within the region such as South Africa, Botswana, Namibia, Mozambique, Zambia, Zimbabwe, Tanzania and Eswatini. South Africa, as of July 2020, has the highest numbers of positive cases with over 450,000 positive cases and over 7300 deaths [21]. The spread of the covid19 virus across the Southern African region has resulted in significant effects on the socio-economic and on the development of the fourth industrial revolution in the region. With the increasing spread of the covid19 virus, the governments of countries within the region imposed several restrictions such as lockdowns, to curb the spread of the virus. This lockdown has resulted in the increasing use and reliance on the internet in various sectors of the economy, such as in businesses, health, governance and education. According to [29] components of the fourth industrial revolution such as the internet has seen an increasing usage, through the use of telecommuting, Flexi-taxis and e-commerce and resulting to an unprecedented revolution or transformation in shipping, businesses, trading and in

distributions. Conference calls are fast replacing face to face meetings and also the increasing use of drone delivery. The restrictions imposed as a result of the spread of covid19 is also impacting on the way we access to finance. This has resulted to the increasing use of smartphones, blockchains and the social media in trading and accessing of finance, resulting to most traditional financial institutions such as the banking institutions closing and reducing the number of branches in operation.

Using South Africa as a case study to examine the effect of covid19 on the digital transformation of education, the digital transformation of education is one of the signification assumptions of the fourth industrial revolution. Mhlanga and Moloji [30] argued that the spread of covid19 and restrictions imposed such as lockdown led to the increasing use of several tools of the fourth industrial revolution in various segments of education in South Africa and other countries across the Southern African region.

Such tools of the fourth industrial revolution implemented in education as a result of the lockdown imposed to curb the spread of the covid19 virus include the use of virtual classes conducted by television and radio stations such as the SABC and pay stations like the DSTV. Apart from virtual learning, zero-rated applications and educational websites were also utilised, provided by network providers like the MTN, Vodacom and Cell C. Also the STEM lockdown digital school was launched and the wide uses of the social media like the Facebook and Twitter to facilitate online learning [30].

## CONCLUSION

Although the outbreak and spread of the covid 19 pandemics have resulted in a disruption of the socio-economic of the Southern African region, leading to the collapse of businesses, loss of income and increasing unemployment. It has, however, resulted in the development of the fourth industrial revolution across the region. The covid19 virus and the restrictions imposed to curb the spread of the virus has resulted to the acceleration of the use of digital technologies and the digitisation of the society leading to a huge leap in the advancement of the fourth industrial revolution in Southern Africa.

Across the Southern African region, online grocery shopping, deliveries of foods and beverages have seen an upsurge while social distancing and lockdown has

led to the increasing use of e-commerce. However, the outbreak of covid19 caused a loss of jobs, especially in traditional occupations in offices and factories, and in hospitality sectors such as in tourism, hotels and restaurants. It has resulted in employees working remotely from their homes with the aid of digital technologies. This has led to the workplace across the region been redefined and emphasis on skills such as artificial intelligence, internet of skills, robotics and biotechnology the drivers of the fourth industrial revolution. Digital platforms such as webinars, Google classroom and zoom are now used to facilitate training, hold workshop and seminars. Social distancing and lockdown had seen social events and meetings conducted through digital means like video meetings and learning conducted through virtual means and other digital platforms.

Therefore, every sector of the Southern African society needs to re-skill while basic human skills such as emotional intelligence, critical thinking, leadership, innovation and empathy need a different process of learning. The spread of covid19 has accelerated the development of the fourth industrial revolution in Southern Africa and has changed and transformed production systems across the region, remodelling management and governance. And to save the economies of the countries across the Southern African region, adequate funding by the government of these countries is vital to be able to adapt to the increasing technological changes and transformation resulting from the outbreak and spread of the covid19 virus and its resulting effect which is the acceleration of the fourth industrial revolution.

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