Exploring Africa's Readiness for The Fourth Industrial Revolution (FIR)

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Abstract

The Fourth industrial revolution was coined by Klaus Swab the director of world Economic forum who envisioned operations and activities to revolve around domains, online interconnectivity or integration of technologies to manage lives termed the digital revolution[1]. The COVID 19 pandemic activated a new regime where dormant terms like fumigation, masks, isolation, contact tracing, quarantine and working from home became the order of the day. Infected persons were isolated to minimize interactions and reduce infection rates. Health restrictions triggered innovations to bridge the gaps generated by the health restrictions in order to save humanity. These included automatic washing machines, sanitizing booths using sensor technology, food distribution to isolation words using robots. Statistic became the order of the day where infection rates, deaths and recoveries were monitored real time to try and predict the trends across continents, states and regions.

Industrial revolutions are triggered by events similar to the Covid 19 Pandemic. The aim was to realize increased productivity and change of how things were being done. This paper explores the opportunities available in the Fourth industrial revolution. The opportunities include harnessing the benefits of artificial intelligence, integration of different techniques and domains, Robotics, 3D printing, online marketing and distribution of products. Manufacturing outfits and SME are expected to remodel their processes and align to the new environment. This will be possible by growing partnerships for faster transfer of first world technologies and knowledge. GIS will come in handy for data and information management. Academic institutions are also expected to repackage knowledge content to the new emerging world demands.

Keyword's

Forth Industrial Revolution (FIR), Artificial Intelligence (AI), Geographic Information Systems (GIS), Robotics, Small and Medium Enterprises (SME), Partnerships

Introduction

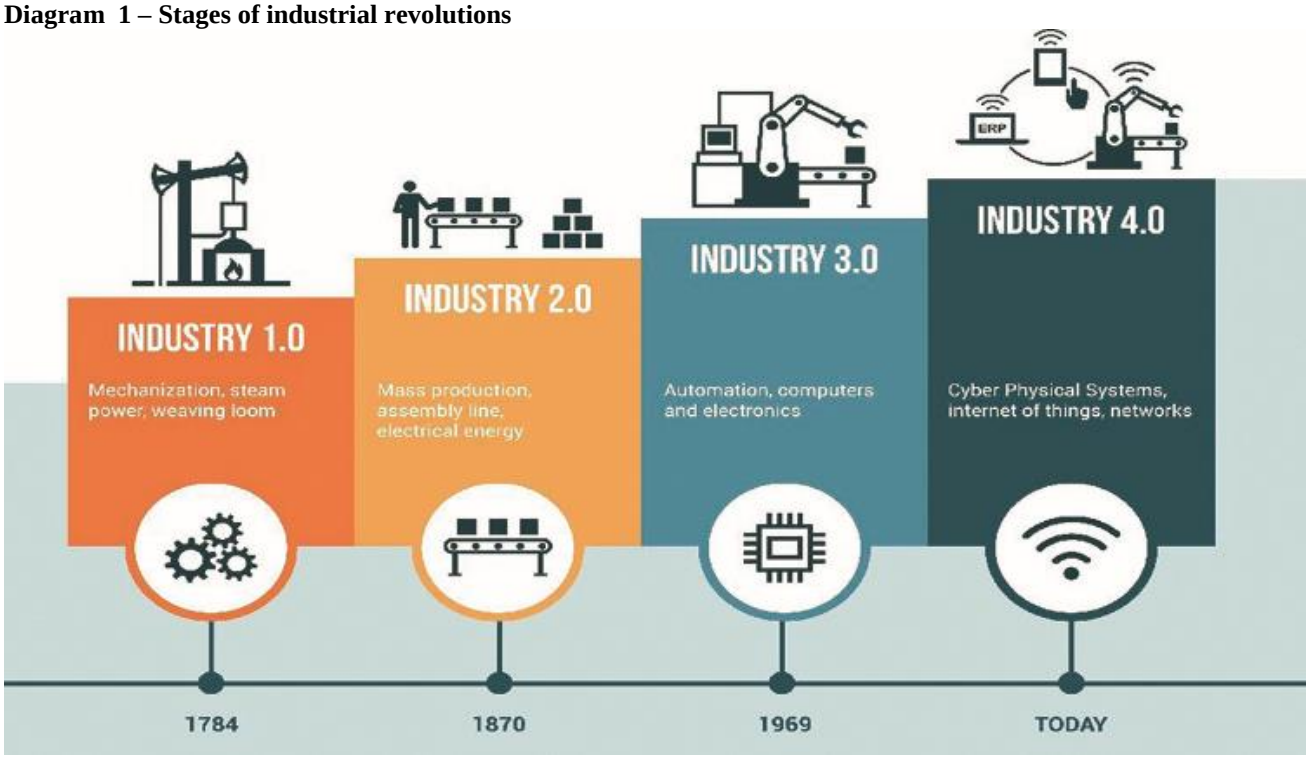
World industrial revolutions have been triggered by different causes namely emergence of capitalism, imperialism, efforts to mine coal and effects of agricultural revolution. The 1st industrial revolution was realized in the 18th century in 1765 where steam engine was invented for coal extraction. Water and steam was used to mechanize production. Rural to urban migration meant less workers for agriculture. During this period animal power was used hence the term horsepower. In the 19th Century starting around the year 1890, the second industrial revolution was characterised emergence of cities, need for improved transport systems, government involvement to grow industries, the birth of the steel industry, mechanization of agriculture and textile manufacturing. New sources of energy came on board namely electricity, oil and gas. During this period:-

1. Internal combustion engine was invented.
2. Communication systems improved
3. Automobiles and planes were made

The third industrial revolution began in the 20th Century in the year 1969. This revolution was characterized by nuclear energy, Electronics telecommunication and computing. Computerization was the driver of this era coupled with lean production in industry, internet and biotechnology. Factory automation for industries was undertaken including introduction of robots for specific manufacturing processes e.g car production. The advent of ICT innovations saw factory interdependencies on board, manufacturing material planning improved and just intime systems were introduced. ICT has reduced the need for large warehouses for manufacturing environments[4]..

The 4th industrial revolution is therefore the current and developing environment in which disruptive technologies and trends such as the Internet of Things (IoT), robotics, virtual reality (VR) and artificial intelligence (AI) are changing the way we live and work. This is a new era of innovation in technology that will enhance human-machine relationships, unlock new market opportunities, and fuel growth across the global economy. This 4th industrial revolution is changing how we live, work, and communicate. It's reshaping government, education, healthcare, commerce and almost every aspect of life. In the future, it can also change the things we value and the way we value them. The diagram 1 below is a diagrammatic representation of world industrial revolutions.

Diagram 1 – Stages of industrial revolutions



Internet of Things (IOT) and Internet of Systems. (IOS)

Internet of things is basically a network of an interconnected smart devices that allow each separate smart devices to interact, send and receive data from other devices on the network. When smart devices have access to more data, they become independent. Finally, they will have sufficient information to make them autonomously, make independent decisions and control key business processes like supply chains without human input.

For business-owned systems, collection of data from IoT networks will enable these systems to make independent decisions about business strategies, marketing campaigns, sales, and forecasting etc

Drivers of the 4th Industrial Revolution

Previous industrial revolutions were fuelled by new energy sources. The fourth industrial revolution is fueled by four drivers

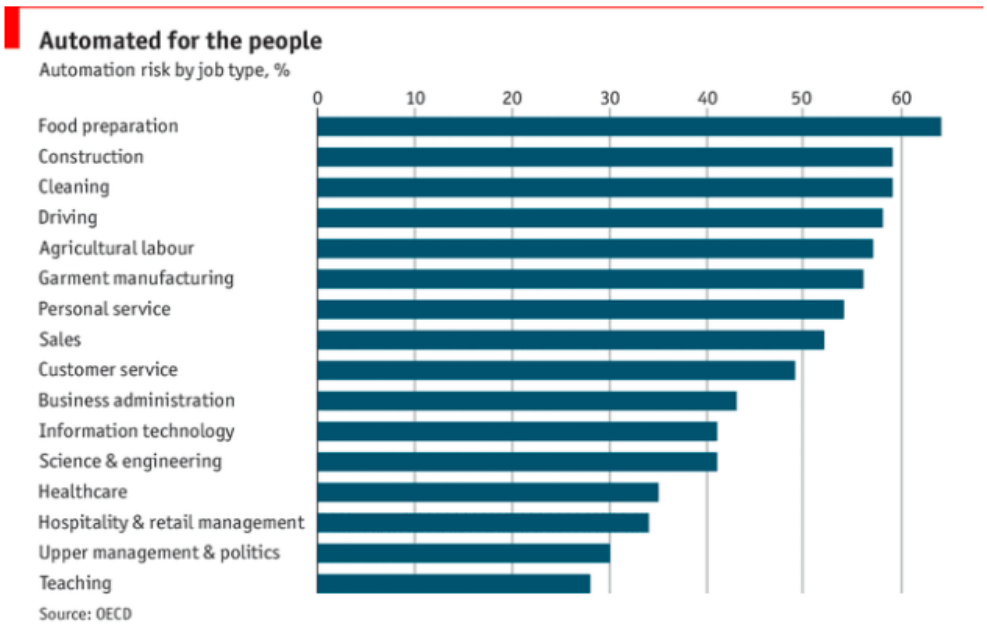
1. High speed internet
2. AI and automation,
3. Use of big data analytics
4. cloud technology.

In a recent study by Mcinsley Global institute, adoption of artificial intelligence and automation, the 4th industrial revolution will impact 20% of the global work force. Organizations will need to define new roles for their workforce, companies will employ specialist contractors and remote workers. Employees will have the freedom to work away from workplaces, organization will recruit from a global workforce, there will be increased production due to employee loyalty and commitment due to work life balance and greater flexibility leading to overall employee satisfaction [5].

According to the Organization of Economic cooperation and development, (OECD) 50 % of the jobs will become irrelevant as a result of this industrial revolution. Physical and mental work will be done by artificial intelligence i.e robots. The responsibilities of Doctors, lawyers, accountants, drivers, production line people, warehouse personnel and surgeons will be taken over by artificial intelligence. The new economy will be driven by an explosion of science by linking science to produce thousands of new solutions.

It is therefore necessary to remodel our education from remembering facts to championing creativity. Education systems should focus knowledge transfer on sciences, innovation and creativity. This therefore means starting to downscale certain courses in our academic institutions and upscaling others namely arts, drama and practical sciences to spur creativity for the new revolution.

Diagram 2 below is an analysis of the professions at risk as a result of the 4th industrial revolution.



Africa Opportunities in the 4th industrial revolution

There exit similarities between previous industrial revolutions and ages of civilization. Hunter and gatherer age, agriculture age, the industrial age, the information age and the emerging age of wisdom. [3]. In the first three ages of civilization, workers produced goods and services with their body whereas in the last two ages with their minds. For each age, productivity increased by over fifty times whereas the opportunities created were destroyed and new opportunities emerged. Opportunities created by the industrial age were destroyed by the information age. Knowledge workers provide focus creativity and leverage to achieve organization objective more efficiently. Challenge is how companies can motivate workers to release their human potential. The opportunities that come with the 4th industrial revolution include: -

1. lower boundaries between inventors and marketer- 3D printing for prototyping. Entrepreneurs with new ideas will establish small companies with lower start-up cost and bring product reality with 3 D printing
2. More active role for artificial intelligence- e,g driverless car may replace uber and taxi, whereas autonomous shipping may transform shipping industry far fewer jobs for truck drivers
3. Fusion of different techniques and domains- Fusion of technology between physical digital and biological spheres (Schwab 2015)
4. Improved quality of our lives- robots will drive cars, cook food, play music record our shows. During the COVID 19 pandemic we have seen videos of deliveries of food to isolation wards to patients. These innovations will increase and become a new norm in the near future. As a result of this, there will be improved quality of existing jobs and avail more time to focus on other engagements. We have alternative accommodations through platforms like booking.com or airbnb
5. Clean energy
6. Data collections, analysis and deployment for decision making

Internet of things and internet of systems will provide connectivity of systems, devise and services that will go beyond machine to machine communication. This will bring on board – smart grids- smart electricity systems, smart cities, Robotic petroleum tank inspection, intelligent pipeline integrity inspections and intrusion systems where engineers will access installed infrastructure vide smart devices, receive intelligent information on the condition of the infrastructure and plan for corrective or remedial action without necessarily being on sites. This will result in improved downtimes and better management of resources.

As for the energy perspective a lot of work will go in policies that accelerate harnessing of clean energy and reduction of greenhouse gas emissions. Consumers will directly be involved in energy generation or production, storage, purchase and sell energy through smart platforms and virtual markets in a profitable and efficient manner [6]. This will include harnessing energy from the solar system, hydrogen energy and solar powered cars,

Geospatial information systems for data collection organized around Cloud computing and virtualization will become handy in providing data for driverless cars, smart city initiatives considering that accurate location data is vital for decision making. [8].

Conclusion

The Fourth industrial revolution is a dispensation characterized by scale, speed of occurrence and propagation of scientific discoveries [6], complexity and transformative power. Digitization which is a new type of energy has brought into focus a completely new virtual world that is steering the physical world. The fourth industrial revolution has brought forth investment opportunities for African countries just like the other industrial revolutions. These opportunities as discussed in this paper has focused on investment in research, education systems, investment in workers, internet, communication infrastructure, smart technologies, GIS systems, data analytics and internet of things. These opportunities however do not come without challenges including cybersecurity, ethical dilemmas and a need to re-engineer the education systems and align the same to the digital revolution. Digital platforms will connect the wold for marketing, sales distribution thereby improving quality and prices of goods and services. There will therefore be a need to develop collaborative environments for the purpose of accelerating innovations.

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