Making Africa 4.0: Possible Impact of Implementing Industry 4.0

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Abstract

The Fourth Industrial Revolution poses significant challenges to manufacturing companies from the technological, organizational, and management points of view. Industry 4.0 has created a new production model where robots are effectively used in production, this new production model has begun to change daily life, production, and working relations. However, the potential impacts of Industry 4.0 over the labor markets, manufacturing Industries, and energy consumption in Africa remain an understudied scholarly area. It is being evaluated that Industry 4.0 will lead to technological unemployment via changing the structure of employment and bring new structural problems in terms of unemployment and labor relations. This paper aims to explore the impact of Industry 4.0 in Africa and its state of readiness. The authors applied a qualitative case study design involving semi-structured interviews with practitioners from industry and reviewed existing literature, to analyze the impact of the fourth industrial revolution in Africa. Company websites and annual reports were also examined to increase the reliability and validity of the results.

Keywords
Industry 4.0, Labor Life, Manufacturing Industries, Making Africa 4.0, GDP

1. Introduction

The Fourth Industrial Revolution, which is currently taking place, sets several challenges for manufacturing companies from the technological, organizational and management points of view. With the application of new technologies and the transformation of processes, significant changes are expected in the field of work, and future production systems demand new competencies from employees("Impact of the Fourth Industrial Revolution on Supply Chains," 2017). Work organization is expected to become more flexible in time and space, with workflows becoming more transparent, decentralized, and less hierarchical(Müller, Buliga, and Voigt, 2020). The exact risk of digitization is difficult to forecast, but nowadays it is becoming clear that workers in some countries are more defenseless than others. For example, in some regions, more than 25% of jobs are at high risk of automation(Büchi, Cugno, and Castagnoli, 2020). In the world of future production systems, some processes are expected to be simplified, and others to become much more complex and embedded. This is likely to lead to an increase in the number of higher skilled jobs and a reduction in jobs requiring lower qualifications(Conference, Woctine, Kurt, and Kurt, 2019). Industry 4.0 will therefore have a significant impact on both the labour market and society. According to Pina et al 2019(Pina, Ferrão, Fournier, Lacarrière, and Corre, 2019), the success of Industry 4.0 will be a function of both technical feasibility and the social acceptability of the whole transformation process. Some authors emphasized that if technological changes are not accompanied by significant changes in socio-economic systems, social cohesion may weaken(Bal and Erkan, 2019; Lins, Augusto, and Oliveira, 2020). Industry 4.0 is therefore both a technological and socio-economic phenomenon, the likely changes may put pressure on economic policy and regulators, and the new skills and competences required by new technologies will require changes to education systems. In the context of Industry 4.0, Alejandro et al(2014)(Germán et al., 2019) emphasized that the relocation of production activities to low-wage countries primarily affects the production of standardized mass products, but high wage countries need to resolve the contradictions between economies of scale and scope. In line with the expected changes, companies are becoming increasingly

interested in the application of new technologies to ensure long-term competitiveness and enable them to adapt to dynamically changing environmental conditions such as shortening product lifecycles, increasing diversity and changing consumer expectations(Horváth and Szabó, 2019; Karl et al., 2019). In spite of the increasing pressure, a number of factors can be identified that could hinder manufacturers in implementing Industry 4.0. Researchers have pointed out that the lack of skilled work force and financial resources, standardization problems and cybersecurity issues may be particular problems(Sharpe et al., 2019; Yadav, Luthra, Kumar, Kumar, and Rai, 2020). However, research on this topic is still in its infancy. No author known has made empirical examinations on implementation and acceptance of Industry 4.0 in Africa, by looking at the impact of the technology on Manufacturing Industries and on the Labour life.

1.1 Objectives

This study is designed to contribute to the overall picture of the concept of Industry 4.0, by analyzing the degree of readiness in Africa as presented in Figure 1. The authors carried out a qualitative exploratory study among practitioners in industry, also by reviewing the existing publish literature and lastly, by examining the annual reports from companies' websites to validate the results of this research. The remainder of this paper is structured to present a theoretical background of Industry 4.0, followed by the methodological approach used in getting data, followed by presenting the reports from the interviewee and a summary from existing literature, and lastly, conclusions and recommendations were made.

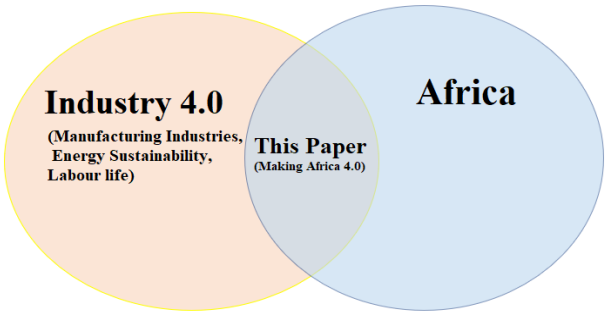

Figure 1. The Position of this Paper Regarding Industry 4.0 and the State of Readiness of Africa

2. Literature Review

This section gives an overview of the existing literature on Industry 4.0, following which the advantages and challenges of implementing Industry 4.0 technologies are discussed. In the last part of this section the analytical approach is outlined

2.1 Advantages of Industry 4.0

As well as understanding the concept of Industry 4.0, it is important to discuss factors that may encourage African companies to move towards this approach. Ongoing changes on a global level have led to a networked society, affecting both business and private life. Santos et al. (2018) claimed that we are moving towards a ubiquitous knowledge society, in which smart and autonomous machines are inevitable (Santos, Brittes, Fabián, and Germán, 2018). Growing levels of competition have made it essential for companies to increase their innovation capacity and productivity and reduce their time-to-market(Jorge, Peças, Amaral, Jorge, and Peças, 2020). Investments in new digital technologies allow companies to improve their comparative advantage and create a decisive advantage over their competitors. Change is also forced by decreasing product life cycles, changing consumer expectations and needs, and markets becoming more heterogeneous over time(Manufacturing, Manufacturing, and Dossou, 2020). Dotsinis et al. (2019) noted that previous production systems are outdated, and no longer meet today's expectations, often causing environmental damage(Doltsinis, Ferreira, Mabkhot, and Lohse, 2020).

By improving productivity, the quality of manufacturing can be significantly increased, and waste reduced, also, significant improvements can also be achieved in energy efficiency. Qin et al. (2017) were the first to note that Industry 4.0 can positively affect environmentally-sustainable manufacturing, with the development of green products, manufacturing processes, and supply chain management(Qin, Liu, and Grosvenor, 2017). Companies can therefore

draw on Industry 4.0 to increase sales volumes and achieve significant cost savings. Industry 4.0 can therefore be defined as a basic pillar in the future competitiveness of manufacturing companies. The advantage of Industry 4.0 identified from literature are shown in Table 1.

Table 1. Advantages of Industry 4.0 Identified from the literature.

Driving Force	**Sources**
Growing Competition	Sharpe et al. (2019); Adetunla et al. (2016); Namasudra et al. (2020)
Increased Innovation capacity and Productivity	Benesova and Hirman (2020); Henao-hernandez et al. (2019);
Efforts to Save energy and Improve Sustainability	Imran et al. (2019); Stief et al. (2019); Santos et al. (2018)
Financial and Performance Factors	Kamble et al. (2019); Raj et al. (2019); Ahmed et al. (2019)
Support for Management Factors	Jorge et al. (2020); Lui et al. (2020); Lopik et al. (2020)
Opportunity for business model innovation	Singh et al. (2019); Castelo-branco et al. (2019)

2.2 Challenges of Industry 4.0

Many authors agreed that one of the major challenges to the implementation of Industry 4.0 is the lack of skilled workforce, and the requirement to retrain staff to fit changed circumstances(Environment, 2017; Kadir, Broberg, and Souza, 2019; Liu et al., 2020). In the future, new ways of working are needed, which may have positive and negative effects on employees. Changed working conditions may lead to conflicts in business organizations. A number of sources have suggested that shortage of financial resources is a significant obstacle to implementation, also, low degrees of standardization, poor understanding of integration and concerns about data security could hinder Industry 4.0 adoption(Castelo-branco, Cruz-jesus, and Oliveira, 2019; Singh et al., 2019). Raj et al. (2019) also discussed the legal issues affecting cybersecurity, they noted that the spread of new technologies meant that fears about the safe handling of private information and data were expected to intensify in the future(Raj, Dwivedi, Sharma, Beatriz, and Sousa, 2019). The development of manufacturing systems also significantly affects the risk of fragility, creating further uncertainties in the general adoption of the system. Successful integration of components, tools and methods requires the development of a flexible interface, because the synchronization of different languages, technologies, and methods can lead to significant challenges. The reliability and stability of the systems must also be ensured, and this is a critical factor in machine-to-machine communication(Kamble, Gunasekaran, and Sharma, 2018). A study by Castelo-blanco et al (2019) found that many companies have not yet developed business cases and feasibility studies that clearly support the need to invest in the data and systems architecture required for the introduction of Industry4.0 applications(Castelo-branco et al., 2019).

This creates a further challenge to Industry 4.0 adoption. Similar conclusions were drawn by Aheleroff (2020), who noted that many companies are not clear on the benefits of using Industry 4.0 technologies(Aheleroff et al., 2020). It is also essential to emphasize the role of organizational culture in transformation. This is usually not identified even though the management of organizational resistance and achieving cultural acceptance of innovations is generally a priority task during Industry 4.0 projects. The challenges identified from the literature are shown in Table 2.

Table 2. Challenges to Industry 4.0 Identified from the literature

Challenges	**Sources**
Human resources and work circumstances	S. Lass and N. Gronau (2020); Chae et al (2018)
Standardization Problems	Wang et al (2018); Lopik et al (2020); Doltsinis et al (2020)
Concerns about cybersecurity and data ownership issues	Stief et al (2019); Santos et al (2018); Jorge et al (2020); Lui et al (2020)
Risk of fragility	Kawahara et al (2018); Chirumalla et al (2017)
Technological integration	Adetunla et al (2016); Benesova and Hirman (2020); Henao-hernandez et al (2019)
Lack of planning skills and activities	Raj et al (2019); Ahmed et al (2019); Santos et al (2018)

Organizational resistance (Potential loss of Job of human)	Dewa et al (2018); Henao-hernandez et al (2019); Imran et al (2019)

2.3 Research Gaps

To determine the impact of Industry 4.0 implementation in Africa and also to determine the degree of readiness, it is necessary to evaluate to what extent this concept is implemented in Africa. For that reason, this work reviewed the existing literature to have full knowledge of the implementation of Industry 4.0 in the top 5 countries with the largest economies in Africa in terms of Gross Domestic Product (GDP)(Sign, 2018), namely, Nigeria, South Africa, Egypt, Algeria and Angola as shown in Table 3. Nigeria is Africa's largest crude oil supplier. Not to mention the rich agricultural sector responsible for 18 per cent of the country's GDP and almost a third of employment, with population of over 200 million based. South Africa has a GDP of $349.3 billion, the country's growths are based on agriculture, mining and manufacturing Industries. Egypt has the third largest GDP in Africa, the country's main exports include petroleum, insulated wire, textile production, food processing, and gold. Petroleum and natural gases are Algeria's most important mineral resources, with the biggest exports being either mined or manufactured, while agriculture plays a comparatively minor role. Some of Algeria's principal farm crops that are exported are wheat, oats, citrus fruit, and olives. Angola being the fifth largest GDP in Africa, is today considered one of the fastest-growing in the world, despite recent struggles with the global oil market, which is their major export(Ahmed, Talukder, Ahmed, and Tayeenul, 2019).

Table 3. Largest economies in Africa in terms of GDP

2019 Rank	Country	Nominal GDP ($ billions)
1	Nigeria	376.28
2	South Africa	349.3
3	Egypt	237.04
4	Algeria	178.29
5	Angola	124.21

Based on the literature review and to the best of the authors' knowledge, there are, as yet no studies on the impact of Industry 4.0 in Africa, the impact of this new technology on energy consumption, Labour life and manufacturing industries. And in general, the state of readiness of these countries and Africa as a whole, to Industry 4.0 implementation

3. Methods

Our interview guide was developed from the literature and served as a navigation tool during the research. The interview guide allowed us to explore completely new, unexpected areas and therefore discover new aspects of Industry 4.0. The interview consisted of two main parts. In the first part, we discussed general issues such as the company's activities and history, the interviewee's position and experience and the company's movement towards Industry4.0. In the second part, we examined the interpretation of Industry 4.0, its impact on workers, challenges, and other organizational and management aspects of Industry4.0. Based on guidelines Golafshani (2003)(Golafshani, 2003), we triangulated the research data by checking 10 other companies' websites in similar industrial sector in Africa to validate our study. Interviewees were assured of anonymity and confidentiality, to reduce bias and increase the reliability of the result. The data were analysed using grounded theory. The state of readiness of Africa was determined by conclusions made from the interviews and the annual reports from the company websites. Three main factors were used to determine the implementation of Industry 4.0 in Africa and it's state of readiness;

- The impact on manufacturing Industry, and
- The impact on Labour life(workers)

4. Data Collection

This study explores the interpretation of Industry 4.0, and it's impact on manufacturing industries and labour life in the top five (5) African countries with the highest GDP. The impact and acceptance of this technology were used to evaluate the state of readiness of Africa to Industry 4.0. We used a grounded theory approach and interviews. Grounded theory aims to develop comprehensive explanations about a given phenomenon, the method is generally used for building theories based on data that are systematically collected and analysed(Ma, 2015). According to Chen

(2018), "the objective in grounded theory studies is to explain phenomena in light of the theoretical framework that evolves during the research itself"(Chen, 2018). Grounded theory uses a systematic set of techniques to identify concepts and build theory based on qualitative data collection. In line with the principles of grounded theory, we collected and analysed our data iteratively to reach a point of theoretical saturation. The aim of qualitative research is to gather data through the perception of local actors, paying considerable attention and drawing on empathic understanding. After weighing up the advantages and disadvantages of in-depth interviews and focus groups, we decided to conduct semi-structured interviews rather than focus groups. The disadvantages of focus groups include that responses are unstructured, so it's difficult to analyse. Also, respondents may also feel that they are under social pressure and want to meet the expectations of the group, affecting their responses. We conducted semi-structured interviews with practitioners of Industry 4.0 across the five (5) African countries, companies' annual reports were studied to increase the reliability of our results (Table 4).

We defined three roles in Industry 4.0;

1 Providers, or Industry 4.0 technology manufacturers,
2 Users of Industry 4.0 technologies, and
3 Providers and Users (companies that both manufacture and use Industry 4.0 technologies)

Table 4. Details of companies involved in interview

Interviewee ID	**Role in Industry4.0**	**Domestic or Multi-national company**	**Country**	**Industry Sector**
1	Provider	Multi-National	Egypt	Industrial automation and Drive technology
2	Provider	Domestic	South Africa	Machine engineering and Industrial automation
3	Provider	Domestic	Algeria	Tool manufacturing and Agriculture
4	User	Domestic	Nigeria	Logistics and freighting
5	User	Domestic	Angola	Building technology and Energy
6	User	Multi-national	Egypt	Food and beverages and Textile
7	Provider and User	Multi-national	South Africa	Mining and Technical software development
8	Provider and User	Multi-national	Nigeria	Industrial gas production and Energy

We reviewed 10 companies' annual reports from their websites and conducted a semi-structured interview with 8 other companies, which their details are shown in Table 4. The recorded interviews lasted between 10- 30 mins. Published articles from key players of Industry 4.0 were also reviewed.

5. Results and Discussion

5.1 Impact on Labor Life

After conducting interviews with 8 practitioners of Industry 4.0 technologies from Industry and reviewed 10 other company's websites. Many interviewees argued with the combining the four most important elements of Industry 4.0, which are; Sensors, Data, Information and Operations, many unskilled labour forces will be eliminated.

"*With the acquisition of robots and machines which will replace the unqualified workforce, character and qualifications of labour force as well as the number of the workers in a given industry set to change dramatically. The mechanization of production processes will inevitably draw the working class from the labour market, and consequently an increase in the army of the unemployed".* (Interviewee 1)

"There are many problems on the human resources side, which mean that the work force is going to be replaced by robots and digital technologies. However, we will do everything we can to compensate for labour shortages by increasing efficiency." (Interviewee 2)

"By expanding the use of Industry 4.0 technologies, many companies aimed to be able to allocate employees to tasks that generate higher added value. With the use of digital technologies, we aim to take daily, weekly routine jobs from the workers' hands. This way they can work on tasks that generate much higher added value" (Interviewee 3)

"One major challenge in implementing Industry 4.0 technologies is that companies do not currently have skilled workers with the competences required in future. It may also be challenging to retrain employees, because this takes a long time, increasing costs. The next group of factors is financial resources and profitability. Increasing digitization of production processes provides a number of financial benefits, including significant reduction in cost of human resources, inventory management and operations. However, the introduction of Industry 4.0 technologies also requires a significant amount of financial resources, which may hinder companies" (Interviewee 5)

"Many companies are not yet ready for Industry4.0, organizational resistance and inadequate management of it can also be a major obstacle. In our case, contradictory interests among organizational units, lack of understanding of the new technology, and fear of the unknown were experienced. Organizational resistance were observed with both lower level employees and middle managers. Employees are frightened of losing their jobs with increasing digitization, and afraid of not having the appropriate skills to handle new technologies. Overtime, the scope of activities of middle managers will also be completely transformed and their role will change to include some new tasks that may need more expertise" (Interviewee 7)

"Despite the fact that new technologies are a positive change, workers still feel that as a burden and therefore resistance is inevitable. We have to invest a lot of extra energy to handle this. During the digitization projects, we saw people clinging to the accustomed, and changes were cumbersome and uncertain. There must be a cultural change, which is time-consuming, and no immediate results should be expected" (Interviewee 8).

From the ten companies' website annual report and the review of existing literature, this study observed that Industry 4.0 is based on information and communication technology. Training the young population on these foundations and providing the necessary qualified workforce beginning from primary education, vocational high schools and universities, and giving education on coding, software, robotic technology will ensure the evolution of the workplace(Hirman and Benesova, 2020). In this sense, with the new industrial revolution, some professions will come to an end, and new and high professions that require high knowledge and technology will emerge. On one hand, while unemployment is expected to increase, on the other hand, employment will be increased in the new jobs and occupations that will arise. In this new era, the first African country that can be able to implement Industry 4.0 fully in all sectors are expected to experience decrease rather than the increase in unemployment, whereas on the other hand, it is estimated that the countries that cannot be able to adopt themselves to the technology and who are latecomers in this field may experience unemployment problems(Manda and Dhaou, 2019). Since the first industrial revolution, the need for more qualified labour force has always been raised in different periods. In the fourth industrial revolution, it is inevitable that some professions will end and some professions will change(Grassi, Guizzi, Santillo, and Vespoli, 2020). The professions that will shine the star can be enlisted as technical professions, professionals in the field of information technologies, internal audit expertise, digital human resources expertise, digital marketing expertise, interface design, data analyst, big data management etc(Aghimien, Matabane, Aigbavboa, and Oke, 2019). When we look at the historical process, it is seen that every innovation and change leads to the emergence of new professions while causing some professions to be lost or lost. For example, the professions such as Copperworking, Blacksmith, Saddle-producing, Stone Carving, Wooden Spooning, Straw Grinding, Basket Weaving, Willow-producing, Pottery and Gramophone Repair stand out as lost professions (Meredith and Pilkington, 2018). Similarly, within a period of time less than two decades, we will witness that the most popular professions of today such as Edge Computing Expert, 3-D Printer Engineering, Data Security Engineer, Machine Learning Engineer, IT/IoT Solution Architecture, Cloud Computing Specialist, Wearable Technology Design and Data Security Expert-ship will be absent or unknown("The Impacts of the Fourth Industrial Revolution on Jobs and the Future of the Third Sector," n.d.).

The Fourth Industrial Revolution has many opportunities and threats, the idea that the revolution will only affect the production process is not correct. As in the other three revolutions, the transformation in the production stage in the Industry 4.0 process will seriously affect the labour relations and hence the social, economic and legal structure(Kawahara, Tadaka, and Okochi, 2018). However, rather than saying the producing robots will result with unemployment, the labour force needs to align itself as to fit the need of the new era and to canalize its potential into

areas such as robotics and automation. New professions, new products, new processes, new production methods and new technologies are to be produced by the humans(Mukwawaya and Emwanu, 2018). The transformation of a production process into a digitalization process does not mean that all employment will be adversely affected. On the contrary, people should respond to this process with more than one transformation strategy and with innovative changes(Chirumalla, Oghazi, and Parida, 2017). As Africa is in a threat zone in terms of the high possibility of faster-than-expected unemployment rise, evaluating the threats and opportunities of the new era consists a more imminent responsibility of most African countries to fully implement Industry 4.0.

5.2 Impact on Manufacturing Industry

Many practitioners of Industry 4.0 gave positive review of the concept in their companies; however, the issue of data security has been documented as a major concern.

"We use only one millionth of production information, so we need to determine the necessary data. During production processes, a large amount of data is generated. By processing these data, our company has gained a lot of benefits including support in decision making. However, it is important to extract and process only data that are really useful" (Interviewee 1)

"Overall, by using Industry 4.0 technologies, more predictable production has been achieved. By integrating individual systems, using sensors, special cameras and wireless technologies, machine-to-machine communication (M2M) becomes possible. The integration of systems has allowed communication between systems in different companies across the whole supply chain". (Interviewee 2)

"Our company implements industrial sensors, they are suitable for measuring temperature and vibration, or detecting difficult-to-see objects. I/O-Link is an input/ output technology that enables communication with sensors and actuators, allowing monitoring of the production process. The use of special cameras enables continuous feedback and reduces errors and therefore the scrap ratio. Besides quality control and tracking the state of the machines, the industrial cameras have allowed production to be documented, hence facilitating traceability" (Interviewee 3)

"The application of intelligent warehouse solutions which is a result of Industry 4.0 technology, allowed product flow to be optimized in real-time. Our warehouse systems use radio frequency identification (RFID), tags, readers and antennae to track products. Intelligent logistics systems deliver material to fit the loading order of the trucks and optimize shipment routes". (Interviewee 4)

"There is a strong focus on improving efficiency, especially reducing lead times, as this is a crucial success factor for us to adapt flexibly to customer needs. By increasing flexibility, our company has been able to respond to individual customer needs more quickly. If our customers see that we deliver the products exactly, always on time and in the right quality, they will not choose another supplier ahead of us" (Interviewee 5)

From the existing literature and companies' annual report, it was noted that the implementation of Industry 4.0 to the manufacturing sector is a very demanding process consisting of many activities, these activities have to be well planned and managed(Sciences and Sciences, 2019). The quality of manufacturing increases with the implementation of Industry 4.0, which will lead to an increase in sales and reduction of loss. By producing information using data analysis software, faultless, higher quality products are manufactured. Since loss will be mostly eliminated in manufacturing with the implementation of Industry 4.0, there will be a decrease in costs (Dewa, Adams, Tendayi, and Nyanga, 2018). Time and costs for maintenance and repair will also reduce. Thus, as both the quality and quantity of manufacturing increase in a short time, there will be more exportation and less importation. Along with innovation and other changes, industry 4.0 will increase the share of high value-added products from global trade (Systems, n.d.). Integrated strategies for innovation, training for the needed skills in workforce and industry 4.0 applications need to be developed and turned into government policy.

The manufacturing industry that assimilate, transform, and exploit external knowledge are better prepared to engage not only in exploitative innovation strategies, but also in exploratory innovation strategies and the resulting search for new business models("Is Africa ready for digital transformation ? Contents," n.d.). In turn, this preparation enables such companies to redesign their business models toward efficiency and novelty. Some authors suggested that in order to derive tangible benefits from technological innovation, companies need to learn to exchange knowledge across the entire organization and its value creation network not only with direct customers and suppliers(Gastrow, Sciences,

and Africa, 2018). The implementation of Industry 4.0 will also allow companies to gain new partners globally, and companies should not only regard them in terms of business transactions, but also in terms of the possible knowledge acquisition(Africa, 2016). Industry 4.0 brings a whole new perspective to the industry on how manufacturing can be collaborated with the latest technologies to get maximum output with minimum resource utilization

6. Conclusion

This article presented a literature review, companies' annual report and interviews from 8 companies implementing Industry 4.0 technology in Africa. This was done with the aim to investigate the state of readiness of Africa to fourth industrial revolution, by studying the impact of this new technology on labour life and manufacturing industries in Africa. Through our examination of 18 cases of Industry 4.0 technology implementation across Africa and from the existing literature, several key insights emerge.

Our findings suggest that Industry 4.0 open a new range of opportunities to explore and develop further monitoring and control systems for supporting sustainable decision-making. Our insights also suggest that the perspectives of technology providers and users tend to be very different concerning opportunities and risk factors.

As less labour will be employed, unit costs are getting cheaper in countries that have manufacturing that is compatible with industry 4.0. This change gives them a competitive advantage in the exportation of their products, leading to an increase in exports and a decrease in imports. Industry 4.0 investments will reduce the employment of low-level labour force while increasing the employment of qualified labour force in areas such as design and information technology. The increase in personalised product manufacturing will lead to an increase in sales and manufacturing. The quality of manufacturing increases with the implementation of Industry 4.0, which will lead to an increase in sales and reduction of loss. These developments in manufacturing will lead to an increase in economic growth, which is needed in most African countries. However, data security and organizational resistance has been documented as a major challenge of many industrialists.

Furthermore, the study noticed organizational resistance to Industry 4.0 technologies in Africa, due to high risk of losing their jobs. The research suggests that training the young population on these foundations and providing the necessary qualified workforce beginning from primary education, vocational high schools and universities, and giving education on coding, software, robotic technology will ensure the evolution of the workplace. This approach is not implemented in the educational system in Africa which may delay the readiness of Africa to fully implement the fourth industrial revolution technologies.

Lastly, Africa needs to urgently upgrade the global competitiveness index. The existing training system implemented by most African countries are no longer suitable for this Industrial Revolution and does not serve any functional purpose. Consequently, in order to educate the present generation, the National Education System needs a well-planned educational structure as soon as possible. Most African governments need to promote Industry 4.0 to increase exports and decrease imports, and thus make Africa stronger economically.

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