

## **INDUSTRIAL REVOLUTION: POLICIES, STRUCTURES AND INDUSTRIAL DESIGN IN NIGERIA**

**By**

Emmanuel UchennaKanu  
Department of Industrial Design  
ModibboAdama University of Technology, Yola  
emmauchekanu@gmail.com

### **Abstract**

*Changes in our modern world have continued to be revolutionary across various aspects of human endeavours, with huge economic benefits. Developed countries champion the course of these transformational changes, while newly industrialized countries strive to make meaningful contribution to the trends as underdeveloped countries battle with issues of development especially industrial. This paper explored industrial revolution on the global scale and considered the policies, structures and industrial design outcomes that have stalled the roadmap to industrialization in Nigeria despite the many development plans, beginning with the First Development Plan of 1962 to Nigeria Industrial Revolution Plan, 2014, and establishes that industrial design is a strategic tool for economic growth that has taken root in developed countries as both a professional area of practice and study and should be incorporated into Nigeria's economic development plans.*

**Keywords:** Industrial Revolution, Industrial Design, Economic Development, Nigeria, Industrialization.

### **Introduction**

Industrial changes that brought historical economic transformations over the Centuries are described as disruptive. Resulting from huge technological developments in manufacturing which has influence across complementary industrial sectors such as agriculture, mining, communication, trade and investment; these changes have impacted positively on the economies of nations and lives of their citizens. Some scholars have described these transformational changes, which began in the late 18<sup>th</sup> Century Europe, as revolutionary changes that made significant social, economic and political gains for some nations of the world. The economic well-being of a nation is directly linked to her level of

industrialization and material resourcefulness, on the basis of which countries are classified into developed, developing and under developed (Kayode&Kanu 2016).

Developed nations are characterized by adequate industrial development, research and development (R&D) activities, and structural changes that have significant economic growth effects reflected in capital accumulation, low income inequality, reduced poverty level and advanced infrastructure. Developing nations, underdeveloped countries, less developed countries and peripheral countries, otherwise known as the Third World countries, on the other hand, have limited industrial development, R&D, and slow rate of international technology diffusion resulting in higher poverty level with greater income inequality, poor infrastructural facilities and limited human and capital resources (Kniivila 2007). However, some peripheral countries, in the last five decades with manufacturing contributing 20 to 25% of Gross Domestic Product (GDP), have moved up the development ladder to be recognized as 'Newly Industrialized Countries (NICs)' from Latin America and Asia, they include: Argentina, Brazil, Mexico, South Korea, Taiwan, Hong Kong, Singapore and Malaysia. India and Turkey with similar developmental strides have also risen to NICs status.

Nigeria is on the process of transforming into a developed nation through industrialization and diversification of her economy; however, enormous challenges have continued to stall this process as conditions such as environmental depletion, deforestation, subsistent agriculture, declining efficiencies in many sectors of national life, are still very much prevalent. This paper looks at the global revolutionary industrialization trends, vis-à-vis the policies, structures and industrial design outcomes that have stalled the roadmap to industrialization in Nigeria.

## **Industrial Revolution**

Industrial Revolution was not just a derivative of technological innovations for speeding up of the production process; it had extensive effects on transformation of various aspects of societies in different parts of the world, earlier in Europe and American and later in East Asia by assimilation and adaptation of techniques and equipment. Societies before industrial revolution were basically agrarian and characterized by human and animal labour exploitation and servitude. The industrialization of late 18<sup>th</sup> Century Western Europe by transformation of home manual factories to mechanized industries had effects

beyond mere technological advancement; changes in social systems and ideologies were notable, based on the need for the social evolution of man.

Scholars generally acknowledge that Industrial Revolution has taken three phases with the fourth revolution imminent, as evident in the transformational changes and innovations taking place in digital domains. The first industrial revolution was centered on hydropower technology and evolution of machine tools. The second came in the widespread use of electricity and assembly line for mass production. While the third, in the form of green revolution, is focused on cleaner energy technology, electronics and information technology (Kayode&Kanu 2016).

### *First Industrial Revolution*

Industrialization initiated by Britain in late 18<sup>th</sup> Century, first transformed the economies of Western Europe, polarized social classes and put greater political agitation from ordinary people and workers. This movement is regarded by historians as the first industrial revolution. The dominant technology and raw materials include steam engine, power loom and iron and steel processing; while energy source was mainly coal; transport and communication systems relied mainly on railway and telegraphy respectively. United Kingdom, Belgium, Germany and France were the core countries in the first wave of industrialization, they were liberal states that encouraged freedom of trade and recognized property rights with a degree of reward for technological inventions. (Adams 1999, Green European Foundation 2010).

The first industrialization regime faced opposition from the Arts and Crafts Movement of 1880s, which was born out of concern for the disastrous effects of industrial manufacture and unregulated trade on design, traditional skills and on the lives of ordinary people. Industrial mass production was considered a dishonest approach to use of materials and modes of construction which had dehumanizing effects on factory workers. The movement sought to establish new set of principles for living and working, advocated the reform of art and turned the home into a work of art. However, the impact of the critique of industrialization process by major proponents of the Arts and Crafts Movement was very limited, as the drive towards mass-production of consumer goods increased by the end of the century and setting the economic agenda for the early 1900s (Victoria and Albert Museum 2015; Woodham 1997).

### *The Second Industrial Revolution*

The second Industrial Revolution was precipitated by electricity, combustion engine, assembly line and chemistry. Oil and coal were the major sources of energy and plastic the new raw material. Car and airplane emerged as the means of transport, in addition to the existing train system, while radio and television became available for mass communication. The United States of America, Japan and Germany were noted to be core countries where the effect of the second revolution was most felt, nonetheless, they were characterized as welfare, mass society and parliamentary democratic states with mass production capability. Many manufacturers, contented with old technologies and being conscious of the cost of new technology, were reluctant to adopt the innovations of the second industrial revolution. However, historians hypothesize that slow diffusion of new technology, coupled with learning-in-plant after the adoption of new technology, caused several decades to slip by without considerable increase in measured productivity growth (Green European Foundation 2010).

### *The Third Industrial Revolution*

*“It is becoming clear that the second Industrial revolution is dying. What we need now is a bold new economic narrative that can take us into a sustainable post carbon future”*  
Rifkin 2012

Environmental consciousness and the need to save the ecosystem from further degradation are driving the third industrial revolution termed “green revolution”. Renewable energies, low-carbon and eco-efficient technologies are replacing oil and coal based domestic and industrial energy sources that have caused significant climate change and depletion of natural resources reserves across the globe. Green European Foundation (2010) wrote,

*The shifts in the fuel base of industry have always affected economic sectors and all levels of society. On the one hand, there is potential for crisis and social conflicts, on the other hand, such shifts present an opportunity for technical, social and political innovation.....reevaluation of capital and of professional skills, and necessitate a redistribution of wealth within and between sectors and regions. These changes are already taking place, with the strong growth in renewable energy production and eco-efficient technologies being their most recent and visible manifestation.*

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The green revolution is geared toward bringing sustainable development that is linked to a low-carbon, knowledge-based and resource-efficient economy. This will be driven mainly by ICT, microelectronics, and cleaner technology applied in renewable raw materials, biotechnology and recycling. The emerging transport systems of the era are high-speed rail systems, electricity powered and low-carbon emission fuel automobiles. Telecommunications are shifting to mobile devices with high-speed Internet connection and mega data capacity. The core countries at the centre of the green revolution are EU member states, United States of America, Japan and China.

#### *The Fourth Industrial Revolution*

The 21<sup>st</sup> Century has been characterized by changes associated with innovations in nanoscience, engineering and technology expected to lead to the next industrial revolution. The United States of America Government (2000), acknowledge that “the emerging field of nanoscience and nanaoengineering – the ability to precisely move matter- are leading to unprecedented understanding and control over the fundamental building blocks of all physical things. These developments are likely to change the way almost everything - from vaccines to computers to automobile tires to objects not yet imagined - is designed and made. *Industry 4.0* - the fourth industrial revolution is on its way. Roland Berger Strategy Consultants (2014) state that revolutions are fast, disruptive and destructive as will be experienced in some places; while others will be more evolutionary – slowly but steadily, and for Industry 4.0 there is no going back as it will be the answer to the challenges lying ahead. They opine that Internet will fuse with physical objects seamlessly to form a sophisticated network described as the Internet of Things (IoT).

IoT will rival past technological marvels, producing profound economic resurgence across the developing and developed nations of the world at an unimaginable speed. A decade ago, about 500 million devices were connected to the Internet; today 10-20 billion objects are connected, and in five years ahead, 40-50 billion may be connected to the Internet giving rise to a new age of data. This looming data driven revolution, could do away with many inefficiencies, hassles, dangers and unsafe practices of modern life, offering unprecedented myriad of opportunities to economies, cities, businesses and people to succeed irrespective of if they belong to the developed or developing world. (DuBravac&Ratti in the forewords of American International Group, 2015).

Deloitte (2015) explains that exponentially growing technologies such as intelligent robots, autonomous drones, sensors and 3D printing, will accelerate digital transformation of traditional manufacturing industry to surpass the production capacity of the automation process propelled by developments in electronics and information technology of the third industrial revolution. They expatiate that “commentators use the term Industry 4.0 to refer to the fourth industrial revolution with four main characteristics:

1. *The **vertical networking** of smart production systems, such as smart factories and smart products, and the networking of smart logistics, production and marketing and smart services, with a strong needs-oriented, individualized and customer-specific production operation.*
2. ***Horizontal integration** by means of new generation of global value-creation networks, including integration of business partners and customers, and new business and cooperation models across countries and continents*
3. ***Through-engineering** throughout the entire value chain, taking in not only the production process but also the end product- that is, the entire product life cycle*
4. ***Acceleration through exponential technologies** that, while not really new in terms of their development history, are only now capable of mass-market application as their cost and size have come down (e.g sensor technology) and their computing power has risen massively.*

## **Industrialization of Nigeria**

Shortly after independence, Nigeria began the pursuit of economic development for self-reliance through several national development plans. Between 1962 and 2014 eleven national economic development plans were rolled out. The numerous development plans failed to reach full implementation on account of poor planning and monitoring of programmes, inadequate funding, corruption and poor accountability, and consequently, have negative impact on the industrial sectors of the economy (Onwuma, 2015; kayode and Kanu, 2016).

In February, 2014, the Federal Government of Nigeria unveiled the Nigeria Industrial Revolution Plan (NIRP) aimed at accelerating the long desired industrialization, with focus on agriculture, oil and gas, construction, light manufacturing and services as sectors perceived to be comparatively advantageous. The NIRP, which is the most current policy document on national

economic development, was developed by the Federal Ministry of Industry, Trade and Investment and described as the first strategic, comprehensive and integrated unique roadmap to industrialization. It aims at job creation, economic diversification, import substitution, export diversification, improvement of government tax base, and building of stronger institutions (Federal Government of Nigeria, 2014).

The NIRP is an export-led industrialization plan developed uniquely based on the peculiarities within Nigeria while taking lessons from China and Brazil in global contexts. The document identified seven supporting structures or enablers that would remove structural impediments to Nigeria's industrialization. They include: Infrastructure, Skills, innovation, investment climate, standards, local patronage and financing.

NIRP acknowledge that despite the role played by key actors in infrastructural development, there is still major infrastructure gap in Nigeria, namely: insufficient power; high cost of inland transport; poor equipment of industrial zones; poor ports infrastructure and cross-border services; inadequate funding for vital infrastructure development; growing population pressure on urban facilities; and institutional weakness. The plan seeks to remedy the situation by creating industrial cities, parks, clusters; to provide the required infrastructure; give incentives and streamlined regulations available in world-class manufacturing hubs anywhere in the world.

Youths' inability to find jobs and companies claim of job availability is a paradox that must be solved by closing the gap in skills development and industry needs through technical and vocational education. The NIRP identifies the following skills related challenges: skills development not aligned to market needs; lack of nationwide access to skills development facilities; insufficient real work experience; rigid skills development programmes; and insufficient tutors. The skills acquisition programme is expected to stir innovation in the manufacturing sector. According to the plan, low critical mass in scientific field; inadequate equipment; inadequate information sharing, weak or no interaction between Academia, Industry and Government; and unclear commercialization path are some of innovation issues hampering industrial development of Nigeria. NIRP stipulates the adoption and implementation of "Triple Helix Model" to facilitate the bringing together of Academia, Industry and Government.

Investment climate is one of the vital enablers of the National Industrial revolution Plan, 2014. The document articulated measures for improving investment climate of Nigeria, believing that “all international benchmarks on investment climate and competitiveness, can only serve as broad outlines to organize our investment climate reforms. Strategic channeling of funds to industrialization has been deficient as “over the years, Nigeria has been unable to channel capital and investors towards strategic sectors which will diversify the economy away from upstream Oil and Gas. Investors have overwhelmingly focused on low-value added activities and product trading. Nigeria will need to intensify mobilization of funds and investors into industry to diversify exports, reduce the import burden, create jobs and broaden the government’s taxable base.”

The articulation of the Nigeria Industrial Revolution Plan, Release 1.0, 2014, is very commendable. It reveals a proper understanding of the industrialization challenges of Nigeria, no wonder the Economic Commission on Africa (2014) described it as “the most ambitious industrialization programme”. But like other plans in the past, it feared that the implementation of this elaborate plan will be stalled by political and other influencing factors. An inclusive institutional and implementation framework, with a structure involving the Federal Ministry of Industry, Trade and Investment, Federal Government Ministerial Departments and Agencies, Private Sector Industrialists and Associations, Development Agencies and State Ministries of Commerce and Industry are listed as implementation stakeholders, to be guided by outlined principles from an implementation model. Steering Committee, Project Office, Sectorial Teams, Support Structure Teams and other relevant councils and boards are to ensure proper implementation of the plan. It is not in the scope of this paper to measure the level of implementation of the NIRP, however, a probe of the performance of the noble initiative is worthwhile, especially in the face of a new political dispensation and the economic hardship Nigeria is experiencing.

### **The Relevance Industrial Design in Economic Transformation Programmes**

Economic growth through industrialization entails growing manufacturing activities of a nation alongside electricity generation, transportation facilities and communication networks which would reflect as increase in the portion of manufacturing in Gross Domestic Product (GDP) and in the occupations of

economically active population (Kirk-Greene in Iwuagwu, 2011). Industrial Revolution initiated mechanized system of production of consumer goods for the satisfaction of growing population. Products are conceptualized, planned, embodied, manufactured and delivered for consumption. Industrial design responds to the task of conceptualizing and delivering consumer products. Tezel (2011) posits that Industrial Design has much to do with mass production and use processes of objects and simply defines it as “an approach to design consumer products.” Er (1997) views Industrial Design as a strategic process and reports that:

Little is known about the development of this strategic industrial activity outside the core countries of the global economic system. Since industrial design has been usually associated with the product innovation activity of the industrialized market economies, the lack of literature regarding the design issues of the Third World may not be surprising to many. Nevertheless, growing members of peripheral countries have begun to play an increasingly active role in the international economy over the last two decades. Yet despite the academic attention given to the development of those countries in the economic literature, the development of industrial/product design capabilities in the Third World has long remained under-researched.

Tezel (2011) agrees that the scope of industrial design has surpassed mere activity to satisfy users in product function to being a strategic tool for developing countries to favourably participate in the globalized transnational trades, and further acknowledges that developed countries have used it as an infrastructure of sustainable economy, providing link between politics, industry and education sector's research and development efforts. It is both an academic discipline and area of professional practice that uses innovative design as a development tool of a political economy, complemented by other industrialization development entities such as good public policy and adequate infrastructure, to deliver product innovation, economic growth results and global market competitiveness as evident in development efforts of South Asian countries and some newly industrialized Latin American countries. Er (1997) examines the role of government in industrialization drive of NICs with focus on development strategy and industrial design and asserts that:

The emergence and development patterns of industrial design in NICs are influenced by the development policies of governments, which determine

not only trade regimes-the direction of market orientation-but also the mode of technology transfer through foreign investment policy, and industrial structure through sectorial policies. The link between development strategy and industrial design indicates the nature of government involvement in the development of design capabilities. NICs have been characterized by State involvement in their industrialization process, and this extends to the development process of industrial design.....The development prospects of industrial design in NICs are related to the extent to which governments are prepared to absorb design as an integral part of their long-term development strategies rather than to the extent to which they give direct support to design institutions and promotion. Consequently, the main effect of government involvement in the development of design capabilities appears to be to stimulate manufacturing firms to use industrial design as a competitive tool in domestic and international markets. The absence of this kind of government involvement, in many cases, manifests itself as an underdevelopment of industrial design in the Third World. Therefore, any meaningful attempt to link design to the economic development requires an evaluation of the role of design in the wider context of government development strategies.

Industrial design in the 4th Industrial Revolution will assume new roles as industries begin to return to pre-industrial forms, where it all started, due to digital fabrication technologies such 3D printing, smart devices and the Internet revolution. Hermans and Valtonen(2014) state that in this period of 'Post-Industrial Design', professional designers will be making toolkits and incomplete designs for consumers to adapt according to their desires and needs with minimal involvement or by active participation, all embedded in the concepts of mass customization and co-design approach. This shift from designer centric approach to limited consumer involvement and active consumer participation has implications for future design practice and education. Competence will have to be built around new digital industrial technologies.

Industrial Design in Nigeria is yet to emerge as an area of professional practice and a distinct field of study in the nation's academic institutions;Minimum standards for design education in Nigerian Universities has departmental nomenclature of industrial design with curricular content sectionalized into graphic design, ceramics and textile design of applied arts. Industrial Design -

hybrid of arts, engineering and science of materials - which is very much attuned to developing products for manufacturing, is not yet an academic study area in Nigerian Universities. The absence of design offices, professional organization for designers and their presence in manufacturing companies in Nigeria is an indication of its non-existence as a profession in the nation. Consequently, there is a dearth of design discourse and research needed to build an epistemological base that reflects Nigeria design activities; therefore indigenous efforts in product design are very often not recognized and documented.

Nigerian Government development policy statements, especially in the NIRP, do not recognize industrial design as a strategic economic development tool. NICs have leveraged favourable national government policies, recognizing industrial design as an economic development tool, to achieve industrial growth. Nigeria's desire to rise to the status of industrialized nation must be accompanied with proper implementation of viable economic development programmes, recognizing the capacity of design, as a strategic development tool within her unique socio-economic and political systems, to transform craft industries, meet basic needs, reduce dependency, improve conditions of living for masses, and to create cultural identity.

## **Conclusion**

One of the cardinal objectives of the economic programmes of the Federal Government of Nigeria, over the years, is to transform the country into a global hub for economic activities through industrialization. This objective is far from being achieved as the country's economic development indices reflect unfavourable global rating as a result of multiple systemic impairments. Newly Industrialized Countries (NICs) from Latin America and South Asia have leveraged the opportunities provided by industrial revolution through technology transfer for eventual development of indigenous techno-cultural capabilities. Industrial design as a strategic tool for economic growth in industrialized countries of the World is incorporated into national development plans in which governments vigorously pursue economic development for the benefit of citizens and national pride. It is therefore, imperative for scholars and industrialists from arts, design and engineering backgrounds interested in the industrialization of Nigeria, to begin to engage relevant levels government to recognize the value of Industrial Design as a strategic tool for economic transformation and incorporate it into policy statements and structures that must

be implemented to the fullest to enable Nigeria ascend to the status of industrialized country.

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