GLOBALISATION: CAN NIGERIA PLAY THE GAME AND WIN?

The Nigerian Educational System and Economy

in the Globalisation Era

Delivered by

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Abstract

Nigeria faces severe constraints to economic development, growth and poverty reduction. These challenges could be attributed to several reasons including the fact that the economy has not been based on production or value addition. While there are several reasons to explain why the Nigerian economy has not been based on production or value addition, perhaps the most important is a gap in technology that developed between Nigeria and the rest of the world in the last century. While other countries such as Taiwan and Korea have successfully narrowed or bridged the technological gap in the last forty years, the gap continues to widen in the case of Nigeria.

Nigeria, on the other hand had revenue from oil; however, this only widened the gap through massive importation and lack of local production or innovation. The economic challenges are projected to grow in the next few decades if steps are not taken to bridge the technological gap. If we consider mastery of production as an effective way of adding value and achieving economic development that is robust and sustainable, then bridging the technological gap is key to development.

However, production and technological gaps have to be bridged in the context of production activities elsewhere in the world. It is thus very important to understand how production is organised and the changes that have occurred recently.

Globalisation of production has in the last few years led to great uncertainty and, at the same time tremendous opportunities all over world. In the 70s, the most successful corporations were vertically integrated.

They succeeded by meshing research and development, design, manufacturing and marketing allowing people to work together often in the same location, in close proximity to suppliers and customers.

The 90s saw crises in these corporations leading to massive restructuring, fragmentation and splitting of huge fractions if not all of the production systems.

This led to the transformation of production systems from one in which all production functions were within a single corporation to one which appears to be a network of supply chains with each firm concentrating on a few core functions. This had the ultimate effect of improving efficiency and productivity, reducing risk, and lowering capital cost because resources and capabilities were shared across multiple corporations and sometimes industries.

The reorganisation of production activities has created opportunities for relocating these production activities around the world principally to lower costs, fund new workforce and new markets. The reorganisation of production has interacted with new influences, such as the rise of new sources of human capital, and old ones, such as the lure of low-cost locations and jumping trade barriers, to cause a relocation of m*any* production activities.

To contrast the organisation of production today with the 80s, a comparison between IBM in the eighties and Dell today, illustrates a lot of the important changes and characteristics. IBM in the 80s was a company that performed all functions in the value chain: research and development, design, manufacturing, marketing, sales and service.

However, today, Dell, a company that sells computers does no manufacturing or research and development and it out-sources all its production and even distribution to Taiwanese firms that did not exist in the 80s. Dell focuses exclusively on product definition, design and marketing. It out sources manufacturing to Quanta, a Taiwanese original manufacturer (ODM) that has very little role in product definition, brand name or relationship with consumers. In the past, vertically integrated firms were the only ones capable to move tacit knowledge across multiple production functions resulting in significant advantages in productivity and efficiency. However, today, digitisation has wiped out these past advantages since transactions across functions are now codified lowering the cost of these transactions.

These massive changes in the organisation and location of production reflect the globalisation of the international economy. In 2000, a team of MIT researchers started a project to investigate how globalisation works from the ground level up rather than pursue macroeconomic studies of globalisation. The team consisted of engineers and social scientists, who believed that to develop better insights on the prevailing questions of globalization, we needed to move from the plane of generalisations and theories about globalisation, to the field. We settled on six sectors ranging from high to low technology as our focus - electronics, textiles and apparel, autos and auto parts, software, telecommunications and finance - and we set off to visit plants and interview managers in these industries. We also interviewed decision makers in government and government laboratories. This typical interview team consisted of two engineers and two social scientists allowing us to bring together different skills and insights.

Electronics is a high technology sector with rapidly changing technologies, short product cycles, and massive capital investment; textiles and garments are mostly low technology, or at least, steady state technology industries, with heavy labour costs and relatively low costs of entry. Despite all the differences between electronics and textiles and apparel, our interviews show many of the same patterns emerging in both, as firms figure out which capabilities to keep in-house and which to outsource; and which activities to keep at home and which to relocate abroad.

Over the past decade, the digitalisation of information needed to produce electronic industry goods has driven a profound re-organisation of the value chain of electronics. Digitisation has enabled the modularisation of electronics value chain. The basic idea of modularity is that value chains can be broken down into parts (modules) with clearly defined (a) functions and (b) interfaces between the different functions. These clearly defined interfaces simply hand over processes from one function to the next. This modularisation has in turn led to segmentation of the value chain because modularity allowed for clearly defined functions and the accompanying codification of the necessary information needed to establish an information interface between functions in the value chain.

Modularisation, for example, has allowed for new firm entry as firms occupy new niches created by modularisation, such as the pure play IC fourier entrants, or take advantage of the lower cost of entry in narrowly defined niches, such as IC design. Design firms arose well before the modularization was complete, but they faced difficult barriers to coordinating production and technological barriers. IC design houses can access an array of services that have arisen with reorganisation.

Reorganisation may even cause a virtuous cycle of new firm creation as firms think of new ways to focus on a segment or functions of the value chain, and look for partners to help them to facilitate this strategy. For example, the rise of the pure play foundries helped to drive the rise of the ASIC vendors, firms that offer design services for the backend chip design, as foundries looked to partner ASIC vendors to enhance the services offered to their design house customers.

Critically, the facilitation of entry of new firms goes hand in hand with re-location as many new firms filling new niches appeared in parts of the world with previous little experience in those activities, such as the rise of foundry fabrication in Taiwan and Singapore.

Modularity combined with better communication at lower costs opens up opportunities for vertically specialised, spatially dispersed activities. Relocation under modularity has several distinct features: no necessity to co-locate the production chain and human capital has become more significant as a driver of relocation due to the freedom from the previous necessity of co-location. In the past, only large vertically integrated enterprises h˜d the ability to spatially disperse their activities because hierarchy was needed to overcome the coordination and communication problems (Saxenian: 2000; 259). Small firms at very least needed to be in the vicinity of firms to make use of the economies of scope, the industrial district model; because it did not have the capabilities to do everything in-house and they could not control outsourced activities at a distance. Today, fables design houses around world make use of the foundries of Taiwan and Singapore.

Likewise, the branded electronics firms from the advanced economies make use of CEMs (contract electronics manufacturers), brandless firms which offer manufacturing services, and ODMs (original design manufacturers), brand-less firms which offer both manufacturing and product design services, but the production facilities do not need to be near the contract manufacturer's headquarters nor near the branded firm.

What is different about the new relocation of production is the role of small and new technology enterprises. New entrants seizing the opportunities afforded by the reorganisation of production particularly in the electronics industry have pushed the geographic boundaries of the global electronics industry to encompass more and more of the world. Generally, these new entrants are occupying relatively high value-added segments along the production chain and they have placed their home location on the global electronics map rather than wait for multi-national corporations to take advantage of the opportunities of reorganiation to promote new locations in the developing world.

The modular model developed for a high technology industry such as electronics has been extended to the textile and apparel industry and the general conclusion seems to hold. This brings us to the question, what relevance does this have for Nigeria?

In my talk I will lay out the arguments for why Taiwan, Korea, Hong Kong, Singapore, and other newly industrialised countries have succeeded in leapfrogging to the forefront of technology, production and income. I will argue that in addition to good macro-economi, policies, a central factor in their successes has been excellent educational systems that at almost comparable to the West.

I will go on to argue that for Nigeria and the rest of Africa) to attain such success in adding value and income growth, she has to have a well-educated workforce that is flexible: agile, and able to adapt to new situations and innovate.

I will then go on to recommend some approaches to attain this goal starting with elementary education, continuing with secondary education and undergraduate education and ending with graduate education. I will end my talk with approaches in which Nigeria could encourage achievement and adding value addition.

About The Lecturer

Akintunde Ibitayo Akinwande is a Professor in the Electrical Engineering and Computer Science Department of the Massachusetts Institute of Technology, Cambridge MA, USA. Professor Akinwande bagged a B.Sc. (1978) in Electrical and Electronic Engineering from the .Jniversity of Ife (now Obafemi Awolowo University), Nigeria; a MSC 1981) and PhD. (1986) in Electrical Engineering from Stanford University, Stanford, California.

At Stanford, his dissertation was on semi-conductor fabrication processes with focus on physics, technology and modeling of the semiconductor - insulator interface. He was part of the team that developed models for the semiconductor fabrication process simulation program - Stanford University Process Engineering Models (SUPREM), an industry standard for semi-conductor virtual manufacturing and prototyping.

He joined Honeywell Inc. in August, 1986, where he initially conducted research on GaAs heterostructure FET technology for very high speed signal processing and GaPAs Complementary heterostructure FET technology for very low power circuits. His work resulted in several world record demonstrations of GaAs technology including the fastest digital signal processor ever built as of 1988, a record that lasted till the late.

He demonstrate a power delay product of 1.5 fJ at a gate length 1 um, which is still one of the lowest power delay products ever demonstrated for any semi-conductor technology - a record that still stands.

Honeywell and Motorola (under license from Honeywell) had (and may still have) plans to commercialise the CHFET technology (designated CGaAs™ by Motorola) for radiation hard and space applications. For his contributions to GaAs device and circuit technology, he won the 1989 Sweatt Award, Honeywell's highest technical achievement award. He later joined the Si Microstructures group where he conducted research on pressure sensors accelerometers, thin-film field emission and display devices.

Professor Akinwande joined MIT's Microsystems Technology Laboratories (MTL) in January 1995, where his research focuses on device and micro-fabrication technologies with particular emphasis on smart displays, large area electronics, field emission & field ionisation devices and electric propulsion. His earlier work at MIT focused on high resolution and high luminous efficiency field emitter displays.

His current work on displays focuses on Electronic Textiles which seeks to build electronics using a textile weaving paradigm allowing the fabrication of flexible and very large area/wall-sized displays and wearable electronic garments.

Professor Akinwande is a recipient of the 1996 National Science Foundation (NSF) Career Award. He has served a number of technical program committees (committee member, committee chair and conference chair) for various conferences, including the Device Research Conference, the International Electron Devices Meeting, the International Solid-state Circuits Conference, the International Display Research Conference and the International Vacuum Microelectronics Conference.

ProfessorAkinwande also conducts research on the organisation of the electronics industry as part of the Globalisation Project in MITs Industrial Performance Centre.

He co-led the study of the electronics sector. As part of this study, he visited most of the electronics corporations that are involved with the production of semi-conductor devices and consumer electronics in Germany, France, United Kingdom, Italy, Norway, China, Taiwan, Singapore, Hong Kong, Korea, Japan and the United States of America. He also participated in studies commissioned by governments. The results of his research on globalisation of the electronics industry have been .published in numerous journal papers, a book entitled: *Global Taiwan: Building Competitive Strengths in a New International Economy* and another book on globalisation in writing.

Background in Nigeria: Tayo Akinwande was born in Offa, Kwara State, and attended St. Marks Primary School, Offa, until the second grade of elementary school after which he transferred to St James's Primary School I, Oke Bola, Ibadan, when his family moved to Ibadan. He attended Government College, lbadan, from 1968 to 1974. He is a very proud member of the very illustrious class of 1968/72/74. While at GCI, he participated in track events and was a sprinter specialising in 400 meters. He was also the first head of the newly formed GCI buttery in 1973. He attended the University of Ife (now Obafemi Awolowo University) from 1974 to 1978 and was a University of Ife Scholar from 1975 to 1978. At Ife, he studied Electrical and Electronics Engineering.