

Engineering Technology, the Bedrock for Driving Agricultural Programmes through Ict, A Panacea To Nigeria's Economic Development.

EMMANUEL .O. UGO

*Department Of Computer Engineering Technology
Akanu Ibiam Federal Polytechnic Unwana Afikpo North L.G.A. Ebonyi State*

IKEKPEAZU.J. IJEOMA

Department Of Elect/Elect. Engineering Technology, Akanu Ibiam Federal Polytechnic Unwana.

B.O.OSUESU

Department Of Elect/Elect. Engineering Technology, Akanu Ibiam Federal Polytechnic Unwana.

EMMANUEL OKEKENWA

Department Of Elect/Elect. Engineering Technology, Akanu Ibiam Federal Polytechnic Unwana.

ABSTRACT

Indeed, Nigeria can boast of some the brightest minds in the engineering profession across the globe and at this juncture, should reap from their wealth of experience and knowledge in this time of need bend for repositioning the Arts, Sciences and Humanities towards sustainable development in Africa. Meanwhile, the need for engineers and engineering technologists to join hands with government to build a stronger nation cannot be overemphasized. Based on my research so far, the aim of government to diversify the economy goes beyond the fall in oil price but rather targeted at building a strong economy for better Nigeria. This therefore entails that the government of this nation should give full charge to engineers and engineering technologists so as to step forward and do what they have to do to help our country Nigeria to diversity our economy, because or a developing country like Nigeria to become a developed nation she must not be consumer nation, but rather a producing nation.

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I. INTRODUCTION

WHAT IS ENGINEERING?

The word "Engineering" can be defined as the creative application of scientific principles to design, develop structures, apparatus, machines or manufacturing processes, or works utilizing them singly or in combination.

WHO IS AN ENGINEERING TECHNOLOGIST

An engineering technologist is a specialist dedicated to the development, design and implementation of engineering and technology. Engineering technology education is more of a broad specialized and applied engineering education. Engineering technologists often work under traditional engineers.

However, the engineering technologist mobility forum indicates that an engineering technologist work should have required the exercise of independent engineering judgment. For manufacturing firms, product improvement, design and construction and government agencies applying engineering principles and technical skills. Engineering technologists also may assume senior management positions in industry or become entrepreneurs.

Engineering technology deals with the same topics as engineering, but the knowledge is more applied as opposed to theoretical knowledge. The mathematics and sciences, as well as the technical courses, in technology programs are taught with more application based examples. Engineering courses may also require additional, higher-level mathematics, including multiple semesters of calculus and calculus-based theoretical science courses to prepare students for continued studies and perform research at the graduate level. Engineering technology courses generally have laboratories associated with the courses that require hands-on applications of the studied topics.

Internationally, the Sydney Accord is an agreement signed in 2001 acknowledging the academic equivalence of accredited engineering technology programs in the signatory nations. In some countries, only those individuals who have graduated from an accredited curriculum in engineering technology and have a significant amount of work experience in their field may become registered technologists. A technologist's recognition may be in the form of a certification or professional registration. For instance, Nigerian Association of Technologists in Engineering (NATE).

NATURE OF WORK

Technologists are employed in a large and wide array of industries, including manufacturing, construction, industrial, maintenance and management. They may be hired as managers of technology or engineering, depending on the technologists' educational emphasis on management. Entry-level positions (such as product design, testing, product development, systems development, field engineering, technical operations, and quality control) are all common positions for engineering technology graduates.

II. THE NECESSITY OF INFORMATION COMMUNICATION TECHNOLOGY ENGINEERING IN REPOSITIONING THE ARTS, SCIENCES AND HUMANITIES TOWARDS SUSTAINABLE DEVELOPMENT IN AFRICA, A CASE STUDY OF NIGERIAN ECONOMIC SITUATION

Really, information communication technology (ICT) as a branch of computer engineering that is still very young in Nigeria. It has not been supported to the extent that society and businesses derive the maximum benefits from it. With a vast amount of human capital in the country, it should have been more advanced by now to the extent of generating revenue for the government and businesses. ICT is labour intensive for the most part looking around, you can't see data centres, software development centre or any meaningful business process outsourcing. This nation, Nigeria should be making trillions of dolar and not billions from ICT exports if the infrastructure is developed. At the very minimum, this country need excellent power supply, that is, uninterrupted at all times, in designated development centres that will form the nucleus of any serious ICT development for export. The banks and government should extend credits to concerns that want to do business in this area on global scale.

However, the role of ICT in a developed country cannot be over-emphasized. Take a way of illustration, in United States of America, ICT has growing beyond the imagination of the inventors/creators/developers. Productivity is at an all times height. Indeed, ICT has grew United States of America and the world a new economy that has been extended to all parts of the globe, giving rise to globalization and lift-off from poverty of many nations like India, China, Philipines to mention but a few.

2.1 ICT APPLICATION

The developed world and developing countries have been using it for quite a while now for variety of purposes, including tracking and fighting insurgencies. Drones, for example, that are used to destroy terrorist cells are ICT- operated. But this nation, Nigeria is not yet there and cannot claim to. Therefore, with resources commitment, it is conceivable that artificial intelligence with the ICT programmes can be put to use in Nigeria for a variety of use.

2.2 IBMS, THEATRE ARTS AND SO ON WILL EXPAND THEIR OPERATION IN THIS COUNTRY

In order to get rid of this economic depression, I am of the optimistic processing we need data centres, business processing outsourcing, software development centres and cyber security firms , advanced digital studios to mention but a few. Well, it appears that good news is that human capital is everywhere. Yet, at this juncture, we have to figure out how we can guarantee 24 x 7 z 365 power supply. I strongly believe that if we are able to do that, companies like Dell, IBM, Orade, and so on will expand their operations in this country.

NOTE: For us to achieve this, we have to **ADDRESS THE SECURITY ISSUES** first.

III. SOME OF THE SOCIO-ECONOMIC ASPECTS OF TECHNICAL CHANGES

Really, my recent research on growth accounting during the 1970s and 1980s estimates the average annual rate of GDP growth (for sample of ten member countries i.e OECD) at 2.9 percent for the twenty-year period, with contributions by labour increasing at a rate of 0.6 percent, those by capital at the rate of 1.1 percent and the remaining 1.2 percent deriving from TFP growth (therefore, roughly 40 percent of total growth is explained by TFP). The question is what exactly is the source of these TFP gains?

The answer is, it is technical change, yet understood in a very broad sense. However, the explanation of TFP change may be empirically related to technological development variable like RFD or to human resources

variables such as the educational level of the labour force. Reference could be made to modern management theories, in which the competitiveness of the firm basically hinges on:

- Technological capabilities
- Human capabilities
- Organizational capabilities

At macro level, we could similarly assume that TFP growth is the result of an accumulation process of intangible (technological, human and organizational) capital.

Note: (1) There is no expansion without tangible investment
(2) There is no innovation without intangible investment

IV. TECHNOLOGICAL SPILLOVERS

The interdependent aspects of the production structure induce externalities associated with innovations, usually called “knowledge spillovers” when they refer to the use of technological knowledge developed in one industry by another industry, or “rent spillovers” when they refer to a price decrease or quality improvement of inputs supplied by an innovating industry to its clients.

That knowledge spillovers indeed exist in clear from patent data and from data from innovation surveys: any economic sector relies for its development on technological developments emanating from other sectors. Several studies have also shown that the RFD efforts of supplier industries (appropriately weighted with technical input-output coefficients) partly explain the TFP growth of the client industry.

It is worthy of knowing that when considering “rent spillovers”, other issues come into focus. The idea behind rent spillovers is that, as a result of an innovation, a supplier may either decrease its price or increase its quality, thus helping the client to increase its own TFP. This raises the question of the appropriation of TFP gains, and directly refers to the market structure perfect competition will lead to decrease prices (or increasing quality) by the innovator, while a monopolist will be able to take full advantage of the rent generated by innovation.

Rent spillovers are an important component of growth processes in advanced industrial countries: decreases in relative prices of manufactured products resulting from TFP growth induce demand elasticity reactions that stimulate output growth and further increases of TFP. Such a virtuous circle fundamentally supported the growth processes of the 1950s and 1960s and was substantially eroded in the 1970s and 1980s (with increasing saturation of consumer durables changing elasticity reactions, and with more constraints encountered in the innovative processes of many manufacturing industries especially at the level of intermediate and basic goods).

V. MATCHING TECHNOLOGICAL, REPOSITIONING THE ARTS, SCIENCES, HUMANITIES AND SOCIO-ECONOMIC CHANGE

Actually, Neo-Schumpeterian analysis of the long waves of economic development and their relationship with changes in the technological paradigms has further elaborated the argument that depressions are the consequence of a mismatch between a new technological system and the evolution of surrounding social, economic or institutional systems.

More so, for its full development, a new technological paradigm (interpreted as a coincident cluster of basic innovations) cannot be dissociated from new productive organization, new income distributions, new employment structures, new consumption patterns, new relations between public and private activities, etc. Thus, the new technologies of the information society are the source of problems for the old socio-economic structures and then cannot develop their entire positive potential until society and social institutions are able to match perfectly with them.

Furthermore, during a transition period such as the one we witnessed at the end of twentieth (20th) century, the new socio-economic systems that will achieve the technological potential of the information and communication technology (ICT) in Nigeria, are still at an embryonic stage and many alternative scenarios remain open for the future.

VI. TECHNOLOGICAL CHANGE, ECONOMIC GROWTH AND EMPLOYMENT

The previous section highlights on the successful radiation of technology’s potential at the macro level which depend not only on concrete efforts in education, but also on the economic system structure (its capacity for inducing spillovers of knowledge and rent) and on its matching the rest of the social systems. This section examines the effect that the realization of this technology’s potential may have upon the economic and social structure.

At his juncture, an important insight into the issue is provided by Baumol’s model of unbalanced growth; if some sectors of an economy show rapidly growing TFP as a result of increased innovative activities

while others remain more or less stagnant in terms of technological change, the relative prices of the output of the stagnant sectors will progressively increase and workers will move to these stagnant sectors.

A real understanding of the frontier between sectors with progressive or stagnant TFP growth has to do with Baumol's differentiation of the role of labour. When labour is primarily an instrument ("an incidental requisite for the attainment of the final product"), it can be progressively replaced by other instruments, but that is simply impossible when "labour is itself the end-product". Really many service activities have labour as an end-product and their TFP should be relatively stagnant; however, practically all manufacturing activities and many services (in particular the network services of transportation, communication or finance) have end-products that do not necessarily require human labour. Thus, in the very long run, Baumol's model points to a social redefinition of the role of work and employment, and the speed of this change will be a function of the speed of introduction of new labour-saving technologies by the sectors with high TFP.

Despite its simple dichotomy, the unbalanced growth model provides quite a good explanation of some fundamental macroeconomic processes of change in the advanced industrial societies in recent decades. Some service sector have been growing in employment and relatively prices, while their total share of real output has remained relatively constant; this structural transformation may partly explain the overall loss of momentum by economic growth.

In our nation Nigeria, assuring that the sector where innovations occur can, though trifle decreases (or quality improvements), transmit some (or all) of the gains to the users, the final growth outcome will depend on final demand, either directly (if the innovation are at consumer level) or indirectly (if they relate to the intermediate **PRODUCTS OR TO CAPITAL GOODS**) **THIS WILL GO A LONG WAY TO SOLVE** Nigeria problem as it affects economic standard of living.

If it is further assured that, in the OECD member countries, many manufactured goods are close to saturation levels (and are thus increasingly less elastic in response to income or price changes), the key question concerns the possibility for the new technologies either to develop entirely new manufactured products corresponding to new consumption functions (eg the PC), or to lower the prices of some services and find adequate elastic demands in those cases. While there may be intrinsic limitations to the continuous development of new manufactured products, the case for services seems rather clear since, for many of them, saturation is difficult to anticipate (eg. Education, health, leisure, transportation, communication or information services).

Under these assumptions, the future growth model of the OECD countries greatly depends on the introduction of new technologies into service sections that are still using instrumental labour. These are the only ones in which technological innovation is possible since, by definition, sectors where labour is the product cannot be technological changed-although and/or their qualitative content

VII. SCENARIOS

When facing the problem of the introduction of new technologies, the advanced industrial countries of the OECD have to consider a number of challenging issues; the following require special attention:

- i. Will it be possible to maintain a high level of welfare and employment?
- ii. Will it be possible to sustain a high ecological balances?
- iii. How will the new technological developments affect relations with the rest of the world?

These challenges really question the growth model associated with the new technologies-the growth model of the information society. The characteristics of these model can be exported by examining alternative scenarios-and these in turn can offer insights into the most likely future alternative paths.

The first scenario ("conversational wisdom") reflects the present set of opinions about the future (which normally reflect the recent past as well as some clearly identified, long-term trends).

To further deepen the analysis, two alternative scenarios centered on opposite views about the role of government in pointing innovation policies will be considered.

These alternatives are simple transformations of the conventional wisdom scenario; the first reinforces the transfer of responsibilities to market mechanisms (the "market" scenario), and the second reinforces the institutional and the second reinforce the institutional processes (the "New society" scenario).

The analysis is thus constructed around a central path, which is greatly dependent on supposedly realistic present situations, surrounded by a band which is limited by "pure radical concepts with low probability of occurrence (as real systems tend to be complex and more "Mixed"). If the conventional wisdom scenario us correctly oriented, the band should encompass cyclical fluctuations around this central path, if. Fluctuations between socio-political contexts that are characteristics of modern advanced industrial societies.

7.1 THE CONVENTIONAL WISDOM SCENARIO

Efforts or elaborate coherent long-term pictures of large economic and social number of partial long-term studies on specific issues is increasing some of the more relevant features of the conventional wisdom scenario:

- i. The world, and especially the OECD are, is expected to strengthen economic integration processes, with the EU successfully developing the EMU, and with the creation of large free-trade areas (in the Pacific basin, in the American zone), within a general in the Atlantic zone), within a general trade towards the elimination of all trade and non-trade barriers (WTO).
- ii. Services sectors, which traditionally operated in overregulated and over-protected national markets, will be open to competition; this trend, already evident in key service sectors such as finance, transportation and communication, is expected to reduce the “sheltered” areas of national economies only to the permanently shrinking public service activities; social services traditionally delivered in monopolistic conditions by public agents are increasingly expected to be open to competitive supply by private agents contestable markets).
- iii. The expected greater international competition in all markets for products and services should stimulate globalist ion processes with regard to economic production agents (Large multinational firms or networks of firms based on agreement about technology production facilities, marketing, etc); these processes of globalization are already evident in the financial services sector, but they are also develop rapidly in manufacturing (e.g automobiles and other services (e.g telecommunications).
- iv. In our country Nigeria, access to technology and to finance are considered necessary factors for competitiveness at all levels.

Features of conventional wisdom scenario for the first decades of 21st century, it can be said that this period is expected to be characterized by the emergence of a “global economic system” increasingly oriented by both a technological and an economic system logic of competitiveness and efficiency.

The new system has clear agents (the final), but the role of the state needs some redefinition. This conventional wisdom scenario refers to offer implicit views about the future that are considered to be most likely by long-term analysis.

Among these views the following address the challenging issues mentioned above with special reference to the OECD area

(a) GROWTH AND EMPLOYMENT

It is generally felt that, despite the innovation activity associate with the new technologies (IT, biotechnologies, new materials) and the productivity gains to be expected from increased trade specialization (resulting from elimination of international trade barriers) and from efficiency of financial globalization (lowering overall transaction costs for the world economy), the growth rate of the OECD countries will remain relatively low, in terms of both population and economic activity

Population and GDP growth rates (PPP)
(Annual rates in percentages)

Population			GDP (PPP)	
	1995/1960	2030/1995	1995/1960	2030/1995
World	1.8	1.1	3.7	3.8
OECD	0.9	0.3	3.3	2.1
Source:	CEP11,1996 ¹⁶			

As result of this process, the OECD economics, which accounted for 59 percent of world output in 1960 and 52 percent in 1995, are expected to account for less than 30 per cent of world output in 2030. There is however, little doubt that the OECD area, as the most technologically advanced region of the world will continue to be the main source of new technological developments, and innovation.

The new technologies are expected to change practically all products, processes and life styles and the organization of production distribution and consumption as well as the functioning of the financial system conventional wisdom directly associates new technologies in forms, regions and nations, thus justifying active public policies in this area. Increasing world security, implying a relative decrease of defence-related technological research, is expected to re-orient R & D efforts towards economic and social goals.

(b) QUALITY OF LIFE AND THE ENVIRONMENT

The conventional view about long-term future of environmental quality considers the growing importance of problems of a global regional or urban nature, and the need for active policies (taxes and regulations, or public expenditure).

In generally, great expectations are placed on the successful introduction of new technologies (for improving quality of life fir clean production processes, for re-establishing, ecological balancing processes, etc) that, again require active public related policies.

(c) RELATIONS WITH THE REST OF THE WORLD

The conventional wisdom scenario assumes that the rest of the world will continuously move towards economic and social system lingual with those adopted traditionally by OECD countries, thus that they will rely large on markets and on democratically controlled governments enacting policies compatible with market functioning. This aspect of the conventional wisdom scenario is currently supported in the IMF policy recommendations in the WTO actions, and in the trend towards globalization within the financial system (enhanced by the telecommunications).

7.2 THE MARKET SCENARIO

The market scenario is expected as a sideline if the conventional wisdom scenario that strongly emphasis the more extreme extant proposals for the application of perfect market economics” it is there based on the same general ideas concerning the future of free trade in goods and services and the globalization of economic market and agents.

The main difference with respect to the conventional wisdom scenario lies in the definition of the frontier between market and non-market activities.

In the market scenario, the activities of public entities are reduced to those of a “minimal state (justice, defence and administration; regulation by the democratically elected government of the state/replaces direct public intervention. The state ceases entirely to be producer of services of direct economic relevant (transport, communications) and transfers the production of social services (education, health, insurance, etc) to re-orient R & D efforts towards economic and social goals.

7.21 GROWTH AND EMPLOYMENT

Should the nation Nigeria be able to follow the path of a market scenario, there are reasons to believe that the growth rate of production could be higher than in the conventional wisdom scenario:

- i. The transfer of social services to market forces should, in principle stimulate their rate of innovation under competitive pressure, the new information Technology (IT) applied in higher levels of diffusion.
- ii. Facing price-and income-elastic demands, fully privatized social services could contribute to a “virtuous” circle of demand-further production-relative price declines further demand.
- iii. The minimal state should be able to reduce the tax burden and to eliminate budget deficits thus allowing for lower capital costs for private investments.

Because of the new technological wave is centered in information technology (IT) and because these technologies are particularly relevant in the services particularly relevant in the services area, it would seem that the positive expected impacts of their introduction will depend greatly upon the innovative dynamism of services.

VIII. CONCLUSION

Conclusion, Technology and Future the cluster of new technologies in the information society (i.e. computers, telecommunications and bioelectronics), biotechnology new materials and new energy can potentially change all exist by production process and products both goods and services. The new innovative processes take advantage of several interrelated. It is salient feature of the new technological wave that its efficiency increases in complex economic systems.

SUMMARY OF SCENARIOS

Issues	Market Scenario	Conventional wisdom	New society
Growth	Higher	As in the 80's- 90's	Low
Employment	Full employment (dual workforce)	High unemployment	Full employment(work-sharing)
Social cohesion	Growing irregularities	Alternative solutions	High cohesion
Ecological balance	Low priority	Technological solution	Taxation policies
Relation with rest of the world	De-linking process	Co-operative process	Contractual solidarity
Technology policy	Demand pulled by individual needs	Supply-pushed and demand-pulled	Supply-pushed and demand-pulled by collective needs

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