



Robust Information Technology Industry In Nigeria: A Catalyst For Sustainable Economic Development

Chidi E. Akujor^{1,2}, I.M. Mejeha^{1,2}, Oluwasogo A. Ogungbenro¹, Felix K. Opara³, C. Etus⁴ and Genevieve Opara⁵

¹Department of Physics, ²Information and Communication Technology Center, ³Department of Electrical Electronics Engineering, ⁴Department of Information Management Technology, ⁵University Library, Federal University of Technology, Owerri

(Submitted: December 15, 2009; Accepted: April 12, 2011)

Abstract

Information and Communication Technology is now an integral part of the human society and development; it has developed from policies aimed at the rapid development of the various sectors of the economy. In this work, we examine the Global Information Technology landscape and the state of Information Technology policy development and implementation in Nigeria. We found that Information Technology facilities (both hardware and software alike) are gaining increasing use and adoption with both the setting-up of the Nigerian Communications Commission and the introduction of the national Information Technology (IT) policies including the various legal and regulatory frameworks. There is also appreciable appreciation of the benefits and impact of IT (~ 52%) by respondents who estimate an average 22% increase in profitability through IT deployment.

Keywords: Information Technology, IT Policies, Robust IT Industry and Economic Development,

1.0 Introduction

Information Technology (IT) as defined by the Information Technology Association of America (ITAA) is the study, design, development, implementation, support or management of computer-based information systems, particularly software applications and computer hardware (see Wikipedia 2010). It deals with the use of electronic computers and computer software to convert, store, protect, transmit and securely retrieve information. Infact, Information Technology (IT) and Information and Communication Technology (ICT) are basically different terminologies used for the same thing. IT or ICT is now an integral part of the human society and development and has itself developed from policies aimed at rapid development of various sectors of the economy through the “creation” and strengthening of IT sectors of nations. Consequently, this has led to some developed economies and strengthened many developed ones; this is referred to as Information-Led development, ILD (see Bajpai and Dokeniya 1999; Warschauer, 2001; Saheer and Westrup, 2003; Khasawneh, 2010; The Economist). Robust IT industry should thus be one that has the sustainable capacity of:

- i.** Manufacturing, customizing and enhancing the basic IT hardware and software that are in high demand both locally and internationally;
- ii.** Generating, gathering, storing and processing data into information;
- iii.** Disseminating and influencing decisions and implementations;
- iv.** Building, training and developing the people-ware to understand, use and maximize the various IT products;
- v.** Providing comparative advantage in the kind of services and products it offers;
- vi.** Improving efficiency and performance of every sector of the economy (see Hettick, 2003).

Any economy is viewed as the end result of a process that involves its technological evolution, history, social organization, geography, natural resources and endowments, and ecology among other factors (Sevcik, 2003; Graham and Bartex, 1978). Economic development is thus the sustained improvement of the economic wealth of countries or regions for the well being of her citizenry. By economic wealth, we mean the difference in the value of assets owned and liability owed at any given time.

Therefore, using IT as engine for development depends on standard economic criteria, example of which includes development functions like comparative advantages, complementarities, policies, logistics management, market standards and other dynamics of global economy.

2.0 IT and Development Functions

In this work, we examine the Global Information Technology landscape and the state of IT policy development and implementation in Nigeria. It is shown that strong impetus in IT deployment and resource development can lead to a sustained economic development.

Robust IT is an important source of economic development if the conditions are already established because, besides human development, every sector of an economy has to receive the positive impacts of the use of IT on products and services. This implies that IT in organizations is an important source of economic development if:

- i. There exists comparative advantage in the kind and quality of IT related products and services given;
- ii. There is a rapid increase in the global demand for such products and services, and
- iii. The growth of the IT industry (as it were) has positive spill-over benefits to the entire domestic economy.

Also, if indigenous innovation is given a central role, IT can serve as catalyst for greater economic developments especially in a country like Nigeria. The indigenous innovations can only be realized if there is capital input, monopolistic competition and new inputs through research and development efforts (Bajpai and Dokeniya, 1999; Singh, 2002; Saheer and Westrup, 2003; Onyenekwe, 2008; Akujor *et al.*, 2009; Khasawneh, 2010). Because of these associated externalities involved with monopolistic competition, an IT policy can influence comparative advantage.

2.1 Comparative Advantage and Complementarities

Comparative advantage can be determined by relative factors, endowments and / or technological differences. For example, India's pool of work force with software and programming language skills that

are valued in the international market has been the source of India's comparative advantage to some other software developing countries when some segments of their software industry are considered (Singh, 2002). The case is like Nigeria's crude oil that is highly valued because it is sulphur-free.

Regulation effect is very important in IT industries especially those that export their products and services. Such industries can develop strong niches in other countries. Regulation in the domestic market is also very essential for favourable competition in order to ensure complementarities with non-indigenous IT products and services. A good example of complementarities is easily noticed when we consider the impact of internet on the number of individuals with personal computers. Again, monopoly of the internet gateways coupled with the general poor state and high cost of telecommunication infrastructures are part of the complementarities that affect IT deployment. Complimentarities between IT sector and other sectors have brought about increase in efficiency in accounting, data analysis, procurement, inventory management, decision management, policy formulation and production operations, just to mention a few. The quality of services and products is enhanced by the use of IT. Automation has improved efficiency in the stock market, educational and financial institutions, manufacturing and production industries, transport and environmental industries and even in the human capacity outfits.

2.2 IT Policies, Related Initiatives and Logistic Management

The Nigerian communication commission (NCC) was set up to regulate the activities of the communication industry in Nigeria in 1992. However, it was in 1993 that the NCC Board was constituted, thus marking the beginning of liberalization of the industry with the encouragement of private sector participation in the industry. This was fully realized in 2000 with the launching of a telecommunication policy document and issuance of licenses to some private telecommunication operators (Ndukwe, 2000). The introduction of the national IT policy in 2001 with the review of the legal and regulatory framework to protect investors, through the communication act enacted in 2003, the local content policy in 2004 and the other related

policy initiatives on poverty reduction and microcredit gave rise to active participation of private and public sectors in the IT industry in Nigeria (see NCC, www.ncc.gov.ng/index_e.html). It can be recalled that the overall goal of the 2001 policy was to make Nigeria an IT capable society by the year 2005 through the use of IT as the engine for sustainable development and global competitiveness. The policy was therefore meant to:

- i. Establish an adequate institutional framework for IT at all tiers of government;
- ii. Develop human resource capacity through education, awareness and increase access to IT;
- iii. Utilize IT opportunities to restructure relations between government, business and the general public for better governance; and
- v. Improve trade and commerce, administrative effectiveness and provision of services.

Logistics deal with the flow and storage of goods and related information (Hold, 1999). This involves planning, implementation and efficiency target, cost effectiveness, flow and storage of raw materials and finished products and services, in-process inventory, etc. Previously viewed as a clerical function involving adversarial relations between suppliers, customers and transportation providers, logistics is emerging as a key source of competitive advantage and a leading reason for the emergence of inter-organizational systems. Purchasing, inventory control, warehousing, transportation, packaging and service support are some of the main components of the logistic functions. Many of these activities have been barriers to organizational change but IT is now transforming these into catalyst for rebirth. The major factors driving logistics include shorter product life-cycles, increased product proliferation, more demanding customers or consumers with higher expectations, just-in-time manufacturing and globalization of the market place. Recent innovations in IT related to logistics have emphasized the use of information to provide better visibility of physical goods. This approach emphasizes the use of information as a supporting element of the value-added process, rather than as a source of value itself. However, a new parallel virtual value chain can emerge from the physical value chain that currently defines logistics functions as in the case of Federal Express (FEDEX) Company which creates value through information by providing a World Wide Web

home page, <http://www.fedex.com>, where customers can check on the current location of a shipment by entering the waybill number. This creates “market spaces” which will eventually lead to the establishment of new relationships with customers beyond those that exist in the physical world (Wanlas, 1992).

2.3 IT, Market Standards, Manufacturing and Service Delivery

The design of secured-networked computer systems was an exclusive initiative of the military and was extensively used by them before banks and other institutions followed closely with similar designs of secured communication systems to confirm funds and information transfer. Banks today remain one of the forefront developers of sophisticated security systems for global electronic commerce. The global integration and mass market attained with the use of internet has created a large but developing potential market especially for financial service providers who are developing wholly new management information systems based on internet standards, and as a result, are achieving rapid growth with little overheads (O'Brien and Marakas). The use of portals with its increasing popularity and acceptability for example, has reduced the volume of airplane ticket sales by independent travel agents to 60% as customers can now afford to book and pay for flights online (see Olubamise and Awe, 2007).

Musich (2002) opined that the manufacturing sector is witnessing a widespread adoption of IT in planning and control, factory automation and general business management. This implies that the application of IT in manufacturing has resulted in accelerating the entire manufacturing process rather than single steps that make-up the entire process. At all stages of design and manufacture, IT also facilitates the systematic capturing of information, thus promoting a scenario whereby important inputs are supplied to control and logistics, strategic planning and total quality management. Further improvements extend to waste management, pollution control, energy reduction and general efficiency of a manufacturing plant. Environmental issues have become strategic and of great concern to organizations on the global front due to the growing realization of environmental degradation and pollution and its associated adverse impact on both life and environment (obasikene,

Adinna and Uzoечи, 2000).

On the other hand, service delivery to a large extent also depend on IT through consumer preferences for flexibility. For instance, the travel industry has especially proved to be one of the fastest growing segments of the internet, while the information needs of international tourism industry is enormous. Both are associated with frequent flyer programmes, flexible holidays, ticket travels, cyber offers, video brochures, website and online travel agency services (Musich, 2002). The component service delivery involves interrelated IT systems which includes computerized reservation system (CRS), teleconferencing, videotext, video brochures, management information systems (MIS), airline electronic information systems, electronic funds transfer systems, digital telephone networks, smart cards, satellite printers, mobile communication, e-mail and internet.

2.4 Recent Developments In Broadband Communications Media In The African Sub-Regions

Accessing statistical data and information in the 21st century depends much on reliable, fast internet, and good ICT facilities; this in turn is a function of adequate broadband communications infrastructures. Kotecha (2010) suggests that this is best conceived

of in a series of layers, beginning at the bottom with campus-level infrastructure and ICT staff (a well managed network, sufficient computers and the optimization of available bandwidth), national infrastructure (including fibre-optic cable networks and affordable bandwidth secured through the development of national and regional networks), regional interconnectivity between national networks and connections to international networks through undersea cables and arrangements with regional networks in other parts of the world. This has both infrastructural and financial implications, as well as policy, strategic and managerial dimensions. Figure 1 shows the existing and projected undersea fibre-optic cables by 2011. Herein, several substantial undersea cable projects, some already operational with further cables being laid, have the potential to transform internet access on the continent by delivering much greater bandwidth thereby improving connection speeds between Africa and the rest of the world. Cable deployments currently benefit coastal locations most, but terrestrial infrastructure is improving in some other parts of the world.

Previously, the entire country depended on only the SAT-1 satellite system and SAT-3 cable system under the monopoly of NITEL for cost-efficient high-speed access. The SAT-1 and SAT-3 were designed to provide internet connectivity, data, voice and video

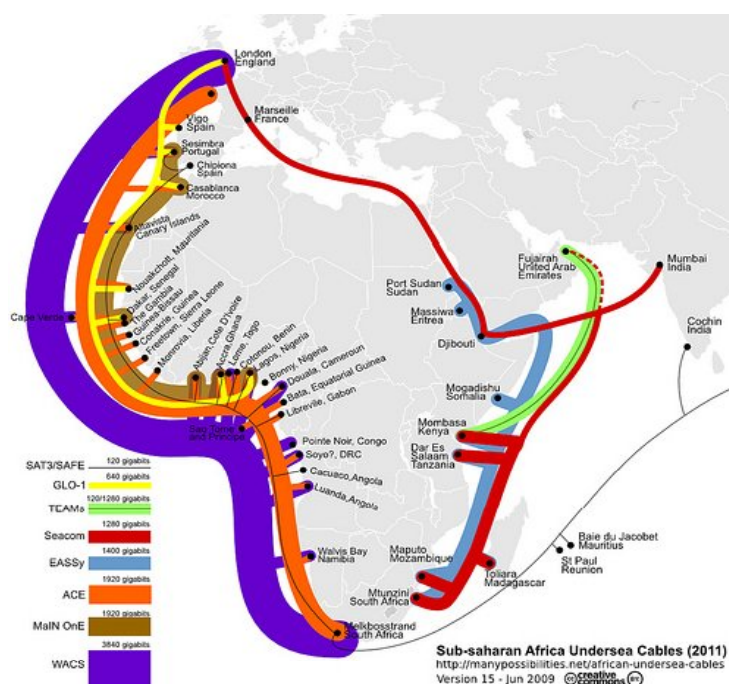


Figure 1: Existing and projected undersea fibre-optic cables by 2011 (Source: Google Images).

communications to rural and underserved communities including educational institutions in the country.

Globacom's undersea cable linking Nigeria with Europe touched down in Lagos on September 5, 2009. The **GLO-1** submarine communications cable is a 2-fibre pair cable system along the West coast of Africa between Nigeria and the UK (Osuagwu, 2009). The project jointly executed by Globacom and its partners, Alcatel Lucent, has main cable landing points at Lagos (Nigeria), Accra (Ghana), Dakar (Senegal), Nouakchott (Mauritania), Casablanca (Morocco), Sesimbra (Portugal), Vigo (Spain) and Bude (United Kingdom). This is in addition to the existing individual international submarine communications cable systems off the west coast of Africa, which includes: ACE, ATLANTIS-2, Main One, SAT-2 (cable system), SAT-3/WASC, and WACS (Wikipedia, 2010).

The GLO-1 submarine cable system is 9,800 km long, and became operational in 2010 with a minimum capacity of 640 Gbit/s and has been described as an information super-highway that transmits voice and data at speed close to that of light over a range of frequencies with lower losses, as well as, lower error rates; this is capable of eliminating the problems associated with satellite and microwave transmission media (especially weather). The cable which is of the 32 STM 64 type (see Wikipedia, 2010) has virtually infinite capacity and therefore offers sufficient capacity for traffic for the Globacom's mobile, fixed and internet telecommunication services.

In Nigerian cities like Bonny, Lagos and Abuja, SATZ/SAFE 340 Gbits sub-Sahara undersea cable is already activated just as the TEAMs network - a 1280 Gbits. Also in the second quarter of 2010, a 1920 Gbits optic fibre network called MAINOnE Backbone was laid coupled with a 2500 Gbits Glo-1 network. Furthermore, a major undersea cable backbone of capacity 5120 Gbits tagged WACS is to be put in place by the second quarter of 2011 for the Western part of the African continent through London upto South Africa (Song, 2010). With these data superhighways obviously, the ICT bandwidth problems in the African subregions will be reduced, hence the anticipated positive effect on ICT exploi-

tations in research, quality of service (QoS), ease of traffic and data acquisition worldwide. These undersea fibre-optic facilities promise services and socio-economic expectations which include:

- i.** Impacts on telecommunication cost (cost control and management for price regime); less (cheaper) payments for recurrent bandwidth and support charges.
- ii.** Delivery of high-speed transmissions of data, voice and broadband Internet and multimedia services over a range of frequencies (with more robust connectivity for voice, data and video).
- iii.** Provision of excess bandwidth to all the cities connected to it.
- iv.** More digital telecommunication access to underserved communities and locations.
- v.** Improvement in the quality of education and healthcare.
- vi.** Support for the growth of internally generated revenue.
- vii.** Enhanced interaction between government and its citizens, in addition to job opportunities and more employment generation and poverty alleviation.
- viii.** Translation into many possibilities in the Information and Communications sector of the Nigerian economy.
- ix.** Lead in telemedicine, e-Commerce and e-governance among other practices that transform economies.
- x.** Direct connectivity between West Africa, the UK and the rest of the world (see Osuagwu, 2009).

Indeed, these facilities can also yield monetary benefits to the country. For example, the Federal Government has declared 175,000.00 pounds sterling (about N3 billion) as satellite monitoring royalties from the Nigeria Sat-1 in the orbit earned by the capturing and analyzing of imagery and supply of imagery to other countries of the world (Dennis, 2010). The building and launch of the Nigerian second earth observation satellite (Nigeria SAT-2) which is to be launched in the first quarter of 2011 will bring about the revolution of high resolution data in Nigeria and the rest of the world. When Nigeria SAT-2 becomes functional, it would also provide valuable data for the realization of the Millennium Development Goals (MDGs), the seven- point agenda and the vision 20 2020 in the key sectors of the national economy.

3.0 Survey and Analysis of IT Deployment In Nigeria

With the advent of Global System for Mobile Telecommunication (GSM) and Internet facilities - two of the benefits of deregulation in telecommunication sector, industries that use IT products expanded in Nigeria. This is such that tertiary school students could collaborate with their counterparts overseas to do their research online and manpower development for efficient performance are done through different IT trainings of public and private workers among other numerous benefits. To these effects, the percentage analysis of IT deployment in the Nigerian industries based on data variables collated from respondent IT-based organizations are analyzed and presented in Tables 1-6.

3.1 The Survey

Questionnaire giving information on the deployment of Information Technology in Nigeria were the main survey instrument used for data collection in this study. The questionnaire were sent to a hundred and fifty respondents in selected states of Nigeria (namely Imo, Abia, Enugu, Rivers, Lagos and Abuja). Eighty of them were returned and analysed. This is to evaluate the level of deployment of modern IT infrastructure in Nigeria's IT establishments and the level of IT appreciation by associated staff as well

Table 1: Names and service-types of the Respondent IT Organizations

Name	Service-type
Computer.com	ICT monthly newspaper
Multilink	Telecoms and Internet
Hyperia	Internet and VSAT
Starcomm	Telecom and Internet
Technology Distribution	Computer Vendor
Sky Bank	Online banking service provider
Link serve Limited	Internet Service Provider
Zinox	Computer Manufacturer
Omatek	Computer Manufacturer
Jidaw.com	Training and certification
I-cell	Cellphone Vendor
Direct-on-PC	Internet and VSAT
Direct.net	ICT4D research consult
MTN	Mobile Communication
GLOBACOM	Mobile Communication
ZAIN	Mobile Communication
ETISALAT	Mobile Communication
Data Sciences	Software Production
JKK	Software Production
FUTO	Education, Research and Development

as the challenges.

3.2 The Analysis and Presentation

All data obtained from the questionnaires were analyzed and presented in Tables 1 to 6. We have listed the names of some IT related organisations in Nigeria (in Table 1) from which the respondents were drawn. Table 2 presents some IT hardware

Table 2: IT Hardware and Software facilities in Nigeria

Facilities	In Use (%)	Not in Use (%)	Not applicable (%)
Mainframe Computer	12	32	56
Mini Computer	56	24	20
Micro Computer	68	12	20
Telephone	92	8	0
Fax	84	8	8
Telex Machine	52	24	24
LAN	52	12	36
WLAN	22	28	50
Radio Messaging Devices	32	16	52
Other hardwares (CCTV, WebCam, Sensors, Actuators, etc)	12	4	84
Word Processing Packages	84	0	16
Accounting & Statistical Packages	80	12	8
DBMS Packages	60	20	20
Career / Professional Packages	24	28	48
Other software Packages (Drivers, Utilities, etc)	20	20	60
Average	50	16.5	33.5

Table 3: IT applications in Nigeria

Application	Used Always (%)	Used Occasionally (%)	Never Used (%)	No Ideas (%)
Data analysis	86	4	0	10
Information Processing	88	8	4	0
Data storage and retrieval	96	4	0	0
Information transfer and Dissemination	80	12	0	8
CD-Rom Access	68	20	4	8
Peer-to-Peer chanting / Socialization	46	4	30	20
Teleconferencing	28	0	30	42
General Management	70	20	0	10
Telephone	100	0	0	0
Fax and Telex	42	20	30	8
Radio Messaging	56	18	10	16
E-mail	70	30	0	0
Traveling and Tourism	46	4	30	20
Information surfing, tracking and browsing	52	40	0	8
Website hosting	40	20	10	30
Forecasting and prediction	10	10	75	5
Modeling and Simulation	10	20	60	10
Graphic designs	40	45	15	0
Editing	68	20	8	4
Accounting and Inventory	40	20	40	0
Research and Development	86	10	4	0
e-commerce, trading and procurement	80	12	8	0
e-payment & e-government	65	25	10	0
CAD / CAM and remote process control	20	15	35	30
Strategizing and logistics	10	5	65	20
e-library and e-learning	42	32	24	2
e-passport and licensing	9	5	74	12
Others (Gopher, etc)	8	0	0	92
Average	52	15.1	20.2	14.7

and software facilities in Nigeria and their current percentage use of IT. Table 3 elaborates on the IT applications obtainable and their percentage rates of use. IT benefits (also in percentage) as evident in the Nigerian service and industrial sectors are shown in Table 4. Table 5 shows the profitability index resulting from IT deployment in Nigeria, while most of the challenges and constraints of IT deployment in Nigeria are presented in Table 6.

Impacts of IT deployment in Nigeria abound today; indigenous IT companies (such as ZINOX and Omatek Companies which started with sales of

computers only) are now into manufacturing of Nigerian-made computers, not only for local use but also for the international market. Other IT enabled services such as customer call centres, accounting services, business processing, back office operations, insurance claims processing, medical transcription, legal database, digital content, online education, data digitization, waybill and website services, and so on are also rendered at various levels of expertise by the different IT companies in Nigeria. The data analysis and presentation reveal that an average of 50% IT facilities (which represents a good number of them) are generally in use whereas

Table 4: Benefits of IT in Nigerian service and industrial sectors

Benefits	High (%)	Average (%)	Low (%)
Increase in productivity	98	0	2
Better records	91	0	9
Increase in Competition	80	12	8
Timely and accurate information	91	8	11
Better financial and market control	96	0	4
Improve operation procedures	96	2	2
Better accounting system	88	4	8
Enhancement of organization's image	89	4	7
Faster and right decision making process	84	0	36
Better communication networks	100	0	0
Tremendous growth in research activity	78	9	13
Expanded information database	91	0	9
Better management control	89	4	7
Cost effectiveness / cost saving	69	25	6
Better risk management	50	9	41
Healthier expansion and investments	90	2	8
Improved quality of services / products	83	16	1
Increase in sales / employees	60	27	13
Reduction in processing / service delivery time	48	47	5
Time reduction in producing reports / proforma invoice	69	18	13
Reduction in access time	47	48	5
Material Saving	70	20	10
Precision and automation	90	10	0
Others (Utilitarian benefits, etc)	45	0	55
Average	78.8	10.0	11.2

Table 5: Profitability index due to IT deployment in Nigeria before and after 1992

Profitability Criteria (averages)	Pre-adoption periods (%)	Post-adoption periods (%)
Raw Materials ordering cost*	19	5
Product / service cost**	5	3
Fixed Cost / Capital cost***	25	35
Inventory cost	9	3
Maintenance cost	12	9
Personnel / Management cost	20	15
Re-investment index	10	30
Average profitability margin	23	45

(*Raw materials for services represent cost of input materials and consumables. **Product cost is the cost of branding and packaging. ***Fixed / capital cost of business development, buildings, machineries, discounts, and advertisements. The Pre-adoption and Post-adoption periods are before and after 1992)

about 16.5% and 33.5% of IT facilities respectively are either not yet in use or not applicable in Nigeria currently. We also note a well above average i.e. ~52% IT applications frequently used, 15.1% occasionally used and about 34.9% rarely used. A high percentage (amounting to 78.8%) benefits from

IT applications is now evident in Nigeria (Table 4). Interestingly, an average profitability margin indicates about 22% increase between the pre-adoption and the post-adoption periods of IT in Nigeria.

Table 6: Challenges and Constraints of IT in Nigeria

Constraints	Strongly agree (%)	Disagree (%)	Indifferent (%)
Irregular power supply	85	12	3
Insufficient training opportunities in IT	48	9	43
Poor financial support for indigenous development	50	22	28
Lack of in-house IT experts	60	35	35
Incompatibility of existing systems	45	25	30
Insufficient top management support/impaired vision	33	35	35
Scarce support services and technical information on IT Technologies	44	30	26
Poor Maintenance culture	50	25	25
High cost of installation and maintenance of IT facilities	80	5	15
Heavy information traffic/congestion due to inappropriate bandwidth allocation	40	40	20

4.0 Discussion on IT Impacts Assessment In Nigeria

IT, so far, has both directly and indirectly impacted tremendously on the Nigerian economy. This assertion is further discussed in two parts vis-à-vis resultant impacts and challenges and constraints of IT deployment in Nigeria.

4.1 Resultant Impacts

Based on the result of the analyses in the preceding section, it is pertinent to point out that the major impacts of IT include great improvements in operational efficiency, capacity utilization, higher production capacity, drastic reduction in operation time, good increase in business returns or profitability, more job opportunities, faster, accurate and more reliable information processing in Nigerian service and production companies.

The fear that IT adoption will lead to redundancy of staff was debunked by the analyses from which it can be inferred that the adoption opened up training and employment opportunities for many unemployed. Other areas where the impacts were significantly felt include more investment opportunities, better business prospects and more

friendly business environments. Many organizations which were at a state of comma before the adoption of IT now have revived operations and improved economy despite some challenges and constraints encountered.

4.2 Challenges and Constraints of IT Deployment in Nigeria

The achievements and progress made in the IT industry notwithstanding, the industry is beset with a number of challenges and constraints such as lack of IT skilled labour, financial constraints, discrimination against Nigerian made goods, lack of infrastructures like electric power and water supply, outdated government policy, unstable education sector, insecurity caused by hacking, kidnapping, hostage taking, boko haram, and so on. Again, the Nigerian IT industry is in short supply of experts in software (programmers) and skilled software administrators, thus expatriates are employed thereby increasing the cost of operations. But a good solution to this is to offer scholarships to Nigerian students to train abroad and then come back and train others; with the establishment of IT institutes for training and retraining. Related to the dearth of skills is the issue that indigenous software developers have their services and products discriminated

against for fear that they are sub-standard compared to foreign services and products. Indigenous developers should be encouraged to strive for standardization and good reputation as mere advertisement may not change the attitude of customers towards their products.

As for financial constraints, Onyekwere (2008) pointed out that banks often describe funding indigenous IT as not bankable. One wonders how initiatives such as setting up of Nigerian Bank of Industry (BOI) by the government in 2001 for local manufacturers can become bankable. This calls for a revision and amendment of the outdated 2001 IT policy. Unfortunately power fluctuations, unstable educational sector and insecurity appear to be perennial problems in Nigeria and the IT industries are not left out of these road blocks. Good alternatives have been resorted to pending when these problems will be finally put to rest hopefully by massive infrastructural developments, value re-orientation, review and full implementation of improved IT policies, stabilization of the polity, peace and security. These are paramount to the building and success of robust IT industry in any nation.

5.0 Conclusion

Nigeria has the capacity to build a robust IT industry if the major or attendant constraints can be reduced. Investigations show that more organizations are adopting IT in their operations and these have good impacts on the efficiency and profitability of these organizations, with consequent upward pull effect on the economy despite these attendant challenges.

Given the foregoing, the adoption of IT in Nigeria has widespread, albeit differentiated impact in the various sectors of the economy, industry and the nation at large. These impacts include change in the structure or organization and performance of industries, services, training, management and administration. This will affect the operations in the various sectors of the economy. These sectors and some possible areas of application include:

i. Education sector: with the creation and management of national virtual library, education management information system (EMIS), distance learning program, e-learning, computer in school initiatives;

ii. Health sector: with medical transcription, telemedicine, networking of healthcare institutions;

iii. Agricultural sector: with information database on agricultural produce, weather monitoring and reporting, exchange of other agricultural business related transactions such as placement of adverts and online requests for supply of goods and services;

iv. Transportation sector: with vehicle tracking, weather monitoring and communications;

v. Security sector: with enhancing of communication among security personnel and the public, tracking warheads and nuclear devices, surveillance purposes, etc.;

vi. Business sector: with mobile enterprise, resource planning, e-audit, e-banking, e-accounting, e-monitoring, back office and payroll operations, etc.;

vii. Human capacity development: training and retraining of personnel;

viii. Governance: with e-governance, computer aided registration, consolidated bill payment sites, computerized civil service commission, and so on.

References

- Akujor, C.E., Dozie, I.N.S., Onwuliri, C.O.E., Ogungbenro, O.A., Ugwoke, R.E., Alozie, G.A. and Mejeha, I.M. 2009, "Information and Communication Technology (ICT) As a Tool for the Achievement of Millennium Development Goals in Nigeria", *Advances in Science and Technology*, **3** (2), 138-145
- Bajpai, N. and Dokeniya, A. 1999, "Information Technology-Led Growth Policies: A case study of Tami-Nadu", *Havard Institute for International Development* **729**, 1-30.
- Boye, I. 1999, "Policies and measures for poverty alleviation." Central Bank publication, 1999.
- Dennis, M. 2010, "FG Earns #3 Billion As Royalties From Nigeria Sat-1, in Abuja", *Daily Sun Publishers*, **6** (1948), www.sunnewsonline.com, Dec. 20, 2010, P.47.
- Federal Express (FEDEX), <http://www.fedex.com>
- Google Images, http://www.google.com/imgres?imgurl=http://blog.foreignpolicy.com/files/images/090618_africa_underseas_cables.jpg&imgrefurl=http://blog.foreignpolicy.com/category/...
- Graham, B. and Bartex, R.E. 1978, "The Penguin dictionary of economic book." Great Britain, 1978.

- Hettick, L. 2003, "Building Blocks for converged Applications." *Business Communications Review*, June 2003.
- Hold, D. 1999, "Building Business Networks." *Business Week* July 12, 1999.
- Karanja, J. 2010, "Research, Technology and Commonwealth Universities, Woburn House, London, UK.
- Khasawneh, A. 2010, "E-government and Jordan-led development", *Electronic Government, an International Journal* 7 (2), 203-212.
- Kotecha, A. 2010, "Dazzling Technologies", www.feast-project.org, ARCADIA
- Musich, P. 2002, "Project gets helping hand." *eWeek*, November 25, 2002. www.eweek.com.
- Ndukwe, E.C.A. 2000, "Telecommunication Challenges for Nigeria in the 21st century." March 28, 2000. <http://www.ncc.gov.ng/speeches-presentation>
- Nigerian Communications Commission, NCC, www.ncc.gov.ng/index_e.html
- Olubamise, B. and Awe, J. 2007, "Nigeria: ICT4D Annual Review" <http://www.jidaw.com>
- Onyekwere, C. 2008, "Indigenous Participations in Nigeria ICT sector Technology Times Outlook." Feb. 27, 2008. www.technologytimes.com.ng
- Obasikene, J.I., Adinna, E. N., and Uzoechi, F. A. 2000, "Man and environment." Computer edge publishers Obiagu, 2000
- O'Brien, J. and Marakas, G.M. "Management information systems." New York, NY: McGraw-Hill Irwin.
- Osuagwu, P. 2009, "Glo 1 Submarine cable lands in Lagos", *vanguard online edition*, pp1. Saheer, A. and Westrup, C. 2003, "Jordan and ICT- led development: towards a competition state?", *Information Technology and People*, 16 (1), 93-110.
- Sevcik, P. 2003, "How fast is fast enough?" *Business Communications review*, March 2003.
- Singh, N. 2002, "Information Technology and India's Economic Development", UC Santa Cruz, July 2002. <http://129.3.20.41/eps/dev/papers>
- Song, S. 2010, "Credit: Steve song-<http://manypossibilities.net/african-undersea-cables>, Data as of April 2010.
- The Economist, *Wiring Up: Technology-led development in the emerging world*, A report from the Economist Intelligence by Microsoft AMD Smarter.
- Wanlas, D. 1992, "The emergency and impact of Electronic Banking." *Journal of banking, CBN statistical bookletting* 4.
- Warschauer, M. 2001, "Singapore's Dilemma: Control versus Autonomy in IT-led development", *The Information Society* 17, 305-311
- Wikipedia 2010, "Economic Development", http://en.wikipedia.org/wiki/economic_development
- Wikipedia 2011, "GLO-1 Cable System", [http://en.wikipedia.org/wiki/GLO-1_\(cable_system\).html](http://en.wikipedia.org/wiki/GLO-1_(cable_system).html).