ACADEMIC STAFF UNION OF POLYTECHNICS (ZONE D)

THE SCALE

AN INTER-DISCIPLINARY JOURNAL OF THE

ACADEMIC STAFF UNION OF POLYTECHNICS
ZONE D

Maiden Edition
Vol 1 No 1
December 2021

Editorial Board

Editor-in-chief: Udochukwu Precious Nwakodo

Editors:
Dr. Ogbogu Samuel A.
Dr. Bakpo Moses T.
Dr. Iloma Richard
Dr. Chike David

Secretary, Editorial Board: Iwezu Joseph Iwezu

Editorial Advisers:
Dr. Okpara Onyekwere
Abia State Polytechnic, Aba

Engr. (Dr.) Arimanwa Michael C.(FNSE)
Federal Polytechnic, Nekede,
Owerri.

Prof. F. Ezionye Eboh
Abia State University, Uturu

Prof. Ogujor Emmanuel Apoyi
(FNSE) Delta State Polytechnic,
Otefe-Oghara.

Mr. Anderson Ezeibe
Federal Polytechnic, Nekede,
Owerri.

Mr. Asomugha Chibuzo
Federal Polytechnic, Oko.

Dr. Ogonwa, Chika N.
Delta State Polytechnic, Ogwashi-uku.

Dr. TPL. (Mrs.) Okoye Vera
Abia State Polytechnic, Aba.

Mr. Chris N. Nkoro
Abia sate Polytechnic Aba

EDITORIAL

We are delighted to present to our esteemed readers The Maiden Edition of THE SCALE: Volume 1, Number 1, (December 2021) our inter-disciplinary journal. The journal which is a bi-annual publication of the Academic Staff Union of Polytechnics, (ASUP) Zone D, is envisioned to publish scholarly and professional articles and reports which meet acceptable class of global academic best practice. As an inter-disciplinary journal, it is committed to the provision of an academic platform for scholars and practitioners in all disciplines to ventilate intellectual view points and research findings on contemporary global issues.

In this edition, we serve you with seventy five (75) incisive and educative articles diligently peer-reviewed by our team of erudite scholars from Polytechnics and Universities. Many of the articles here are actually products of the 5th bi- annual ASUP ZONE D Conference held in March 2021 at Federal Polytechnic, Nekede-Owerri, Imo State, Nigeria.

UDOCHUKWU PRECIOUS NWAKODO

Editor-in-chief

All Articules for Publication should be sent to the Editor- in- chief

2021asupzonedconference@gmail.com.

COPYRIGHT.

No part of this publication may be reproduced, stored in a retrieval system, or transmitted in any form or by any means, electronic, mechanical, photocopying, recording or otherwise without the prior written permission from the copyright owner-Academics Staff Union of Polytechnics (ASUP) Zone D.

Published for
Academics Staff Union of Polytechnics (ASUP) Zone D.
By El- Supremo Printing & Computers
Plot 161 Tenant Road,Aba Abia State Nigeria
Tel: +234 8034917370
E-mail:
chidieberendubuisi66@gmail.com

ARTICLES AND CONTRIBUTORS

TECHNOLOGICAL INNOVATION FOR SUSTAINABLE ECONOMIC AND SOCIAL DEVELOPMENT IN A POST-COVID-19 NIGERIA
By PROF. F. **EZIONYE EBOH** Page **01**
A Lead Paper Presented at the 5th Academic Staff Union of Polytechnics (ASUP), Zone D National Conference 3rd-5th March, 2021, ASUP Complex, Federal Polytechnic, Nekede Owerri, Imo State

A CRITICAL EVALUATION OF INDUSTRIALIZATION STRATEGIES AND POLICIES IN NIGERIA (FROM 2002--2016) Page **11**
OGURU, Ayibamiebi Foster & **EKADI,** Ebikewen Imo Hannah

A PRAGMATIC STUDY OF THE LANGUAGE OF SPORTS IN SELECTED SPORTS DOCUMENTS page **16**
OKAFOR, Theodore Mad; **OGAYI,** Martin C. (Ph.D) **& EKECHI,** Christian

AN OPTIMIZED CLASSIFICATION OF BREAST CANCER: USING TREE-BASED PIPELINE OPTIMIZATION TOOL Page **26**
A. A**. ODUMOSU;** Q. A**. ALATISHE** & A. A**. ADEDEJI**

ANALYSIS OF THE GOAL OF ETHICS EDUCATION AMONG ACCOUNTANCY STAFF AND STUDENTS OF FEDERAL POLYTECHNIC BIDA, NIGER STATE Page **32**
SOLANKE, Abiola Abosede

ANALYTICAL COMPARISON BETWEEN FIRST AND SECOND WAVES OF COVID-19 INFECTION RATE IN NIGERIA Page **40**
MANSI Walamam Egbo

ASSESSMENT OF POLYTYPIC AROMATIC HYDROCARBON (PAH) DISTRIBUTION IN DRY SEASON OF AMBIENT AIR OF OIL PRODUCING COMMUNITIES OF EGBEMA, IMO STATE, NIGERIA. Page **53**
G.C. **ANYANWU** (Ph.D) & E. O. **OHAERI**

COVID-19 CRISIS AND ITS EFFECT ON SURVIVAL STRATEGIES OF SMALL-SCALE BUSINESS ENTERPRISES Page **60**
BROGHOMA, Lawal. M & **OGHOGHO**, Roseline O.

COVID-19 PANDEMIC AND THE SOCIO- ECONOMIC DEVELOPMENT OF NIGERIA: AN ASSESSMENT OF GOVERNMENT INTERVENTIONS
IWEZU Joseph Iwezu; **AGBOGWE** Cynthia & **ANIEMEKE** Frederick Page **68**

DESIGN AND DEVELOPMENT OF INTEGER LINEAR PROGRAMMING SOFTWARE USING VISUAL BASIC PROGRAMMING LANGUAGE
C.O. **AMGBARI**; T.O. **SUOWARE &** A. **KABIAMOWE**I Page 78

DETERMINATION OF SOME HEAVY AND PRECIOUS METALS FROM PRINTED CIRCUIT BOARD (PCB) FROM A TELEVISION SET BY ATOMIC ABSORPTION SPECTROPHOMETER Page 82
GBARAKORO, S. L. & **KONNE**, J. L.

DETERMINATION OF THE PHYSICAL AND MECHANICAL PROPERTIES OF NEGRO PEPPER UDA SEED (*XYLOPIA AETHIOPICA*) Page 86
AGU, Romanus S.,**OMEJE,** Cornelius, **OKORO,** Alex C , **AGU,** Valentine O., **IGWILO,** Ibezim J.

DEVELOPMENT OF A WELDING FUME EXTRACTOR. Page 96
UKWUOMA, Ugochukwu Francis, **EHIRIM**, Victor

EDUCATION AND TECHNOLOGICAL DEVELOPMENT IN NIGERIA: EMERGING ISSUES FROM COVID-19 Page 101
OBISIKE, Iheanyi Osondu (Ph.D) & **IDEOZU,** Mark U.

EFFECT OF INDIRECT TAXATION ON ECONOMIC GROWTH IN NIGERIA
ONYEWUCHI ,Veronica Eyuche(Ph.D) Page 107

EFFECT OF PROCESS VARIABLES ON PHYSICAL PROPERTIES OF EXTRUDED SNACKS PRODUCED FROM BLENDS OF SORGHUM, AFRICAN YAM BEAN AND MORINGA LEAF POWDER Page 119
NWAKALOR, Chizoba Nkiru

EFFECT OF SOIL SAMPLING DEPTH ON HEAVY METAL CONCENTRATION AND SOME PHYSIOCHEMICAL PROPERTIES OF SOIL AT TWO AUTOMOBILE MECHANIC VILLAGES IN OWERRI, IMO STATE
OKORO, A.C., **AGU,** R.S., **NWACHUKWU,** C.P.**, UGWU,** E.I. **& NZEKWE,** C.A Page **127**

EFFECT OF TECHNOLOGICAL INNOVATION ON FEDERAL TAX REVENUE, IMPLICATION FOR POST COVID-19 REVENUE MOBILIZATION: FROM VALUE ADDED TAX PERSPECTIVE Page **139**
OKORO, T. C. & **OBI** B. C. (Ph.D)

ELEMENTAL CONCENTRATION OF SOME NIGERIAN COAL SAMPLES BY INSTRUMENTAL NEUTRON ACTIVATION ANALYSIS
OMEJE, Cornelius U ;**AGU,** Romanus S; **OKORO,** Alex C; **AGU,** Valentine O & **IGWILO,** Ibezim J. Page **148**

EMERGING TECHNOLOGIES IN EFFECTIVE LIBRARY SERVICES: OPEN-SOURCE TECHNOLOGIES AND LIBRARY SOFTWARE
KALU, Chidi**;** Onuoha (CLN); **NWORIE ;** Josiah Chukwuma Ph.D (CLN) & **SABA,** Fatima Muhammad (CLN) Page **153**

EMPLOYEE PARTICIPATION INDECISION MAKING AND ACHIEVEMENT OF ORGANIZATIONAL GOALS: A STUDY OF ABIA STATE COLLEGE OF HEALTH SCIENCES AND MANAGEMENT TECHNOLOGY ABA ,2018-2019. Page **161**
UBANI,Goodluck Eguzoikpe; & **NWAKODO**, Udochukwu, Precious

ENHANCING PRODUCTIVITY IN AN ORGANIZATION THROUGH PERSONNEL TRAINING AND DEVELOPMENT: A CASE STUDY OF MTN NIGERIA, PLC. PORT HARCOURT BRANCH Page **153**
GIDEON, Mudiem Titus.

ENVIRONMENT AND IMPLEMENTATION OF LEGAL REQUIREMENTS IN CAPITAL PROJECTS
QS ONYEKWENA, Tobechukwu Page **184**

EVALUATION OF BACTERIOLOGICAL QUALITY OF SOYBEAN MILK BEVERAGE SOLD IN EKWULOBIA AND OKO METROPOLIS Page **191**
NDIFE, Rachael Chinaza **& CHUKWUMBAH,** Emmanuel Chukwuemeka .

EVALUATION OF DIFFERENT CONCRETE MIX USING PARTICULATE PALM KERNEL SHELL Page **198**
Engr. AZIEGBEMHIN, Ehiabhi Paul

EXAMINING THE EFFECTIVENESS OF BLENDED LEARNING AS A NEW NORMAL FOR SCHOOLS SURVIVAL IN POST-COVID-19 NIGERIA
ANHO, Erere Joy (Ph.D) Page **206**

FARMERS-HERDERS CRISES AND FOOD INFLATION IN NIGERIA: EVIDENCE FROM DELTA STATE Page **213**
OGANA Michael; **MORDI** Kenneth Ejime; & **OGALA** Sunday Christian

FEASIBILITY STUDY OF ANDROID APPLICATION IN NBTE- ACCREDITED CURRICULUM OF ARCHITECTURAL TECHNOLOGY EDUCATION
ONWUKWE, Chukwuemeka S.O; **ONYEKWENA,** Tobechukwu & **OGBUOKIRI**, Obinna A.C. Page **223**

FIRE PROTECTION AND SAFETY ON BUILDING SITE
Qs ONYEKWENA, Tobechukwu & **ONWUKWE**, Chukwuemeka Ozioma Stanislaus Page **234**

I.C.T AND EDUCATION MANAGEMENT IN PANDEMIC SITUATIONS IN NIGERIA: PROBLEMS AND PROSPECTS. Page **241**
IMUETINYAN, Sophia Osayomwanbor

IMPACT OF MULTIMEDIA CONTENTS IN BROADCASTING Page **250**
OHWO, Stephen O. **& ERIRHI,** Jonathan O. (Ph.D)

IMPERATIVES OF E-GOVERNANCE AND PUBLIC ADMINISTRATION IN NIGERIA Page **263**
OKAFOR, Okafor Ogbonnaya & **NWAKODO,** Udochukwu Precious

IMPLICATION OF MULTIPLE TAXES AND LEVIES ON SMES IN COVID-19 ERA: A THEORETICAL AND EMPIRICAL APPROACH. Page **271**
TEIDI, Emmanuel & **AGADA,** Franklin. A

IMPROVING THE IMAGE OF THE LIBRARY THROUGH RESEARCH AND INNOVATION FOR SUSTAINABLE DEVELOPMENT IN FEDERAL POLYTECHNIC OKO ANAMBRA STATE. Page **279**
OGUEDOIHU, Julia Chinwe & **ADINCHEZOR,** Ifeyinwa Patience (CLN)

INDIRECT TAXATION AND ECONOMIC GROWTH IN NIGERIA Page **293**
ONYEWUCHI,Veronica Eyuche (Ph.D)

INDISCRIMINATE LOCATION OF OUTDOOR ADVERTISEMENT: ITS ENVIRONMENTAL IMPLICATIONS IN ABA URBAN. Page **306**
NWAZUE,Stephen Chukwudi & **OKOROAFOR,** Humphery Kalu.

INFLUENCE OF TEACHER'S MOTIVATION AND CREATIVITY ON KNOWLEDGE OF SCIENCE PROCESS SKILLS AMONGST CHEMISTRY STUDENTS IN CALABAR EDUCATION ZONE CROSS RIVER STATE NIGERIA Page **322**
UGUMANIM, Andy Agbankwo & **OROK,** Bassey Etim

INFLUENCE OF TREASURY SINGLE ACCOUNT ON ACADEMIC PROGRAMME IMPLEMENTATION IN SOUTH-SOUTH NIGERIA: STUDY OF FIVE SELECTED FEDERAL INSTITUTIONS Page **322**
ADIGU, Richard & **ASOYA,** Nkem Patricia

MANDATORY AUDIT FIRM ROTATION AND AUDITING QUALITY: SURVEY OF FINANCIAL SECTOR IN NIGERIA. Page **330**
ONYEWUCHI, Veronica Eyuche (Ph.D) & **OGBONNA**, Martin Ifeanyi (Ph.D)

MEDIATING EFFECT OF CUSTOMER SATISFACTION ON BRAND EQUITY AND CUSTOMER LOYALTY: STUDY OF ELECOMMUNICATIONS CUSTOMERS IN ONITSHA. Page **339**
I**GWENAZOR**, Osita Nchekwube & **OBIESIE,** Michael Chuks

THE SCALE: MAIDEN EDITION VOL 1 NO 1 DECEMBER 2021

MORINGA OLIEFERA LEAF EXTRACTS, A NATURAL CORROSION INHIBITOR OF MILD STEEL IN SOME ACID MEDIA Page **354**
CHIKWE, I.S., **MADUAGWU** E.C., **AHANOTU** C.C., **IKEMEZIE** M. N. & **CHIKWE** O.B.

NATIONAL SECURITY AND DEVELOPMENT PROBLEMS IN NIGERIA: EXPLORING THE POLITICAL ECONOMY PARADIGM Page **361**
NNAA, Biiragbara Godpower, Ph.D

OPTIMIZATION MODELING OF PARTIALLY REPLACED RICE–HUSK-ASHGYPSUM POP BOARDS Page **370**
AKPAN, Paul P., **STEPHEN**,Ebuka I., **ENUEZE,** Justin B. & **OKPUZOR,** Ewere G.

OPTIMIZATION OF PROXIMATE COMPOSITION OF EXTRUDED SNACKS FROM THE BLENDS OF AFRICAN YAM BEAN, SORGHUM AND MORINGA LEAF POWDER -A RESPONSE SURFACE METHODOLOGY (RSM) APPROACH Page **375**
NWAKALOR, Chizoba Nkiru

OVERVIEW OF THE NUTRITIONAL QUALITY AND PHYTOCHEMICAL COMPOSITION OF SOYBEANS AND SOY PRODUCTS. Page **384**
OGBONNAYA, M.& **NWAKODO,** Chinenye

PEACE AND CONFLICT MANAGEMENT IN A POST COVID-19 NIGERIA THROUGH LITERARY ART: A STUDY OF CHIOMA NJOKU'S TABOO IN THE VILLAGE Page **392**
OKORO, Isabella Nnenna

PEACE AND CONFLICT MANAGEMENT IN A POST COVID-19 NIGERIA: IMPACT AND LESSONS. Page **402**
AKPAN, Nobert Sunday, **ARIAGA, Dickson & OYEBANJI,** Ademola Oyeleye

PHYSICO-CHEMICAL AND MICROBIOLOGICAL ASSESSMENT OF SELECTED BRANDS OF SACHET WATER PRODUCED IN OBOWO, IMO STATE, NIGERIA. Page **413**
Osuchukwu, C.O., **Onwusonye**, J.C., **Geoffrey**, H.I, **Joel**, O.M., **Onumonu**-Ikechukwu, C.C. and **KeKe**, B.A.

PHYTOCHEMICAL AND ANTIMICROBIAL ACTIVITY OF CHROMOLAENA ODORATA LEAVES Page **417**
IBIAM, J. A., **OMINYI**, C.E.,**Nwali**, U. I.,**OKO** N. A.& **OLOGWU**, R.

POWER FLOW SOLUTION FOR THE EXISTING NIGERIA POWER SYSTEM NETWORK Page **424**
JOHN E. ANANTI & **PATRICK** O. ANIEROBI

PREDICTING SURVIVABILITY OF HEPATITIS PATIENTS: USING MACHINE LEARNING APPROACH Page **435**
A. A. **ADEDEJI**, A. A. **ODUMOSU**, Q. A. **ALATISHE** & A. O. **OLUWABIYI**

PROMOTING NIGERIAN PIDGIN TO BECOME A NATIONAL LANGUAGE: PROBLEMS AND PROSPECT Page **440**
CHINEDU, ROSEMARY E. (MRS) & **OKOH,** ROSEVAL ZENEBOYENIMI (MRS)

REVIEW OF EXISTING METHODS USED FOR FAULT LOCATION ON TRANSMISSION LINE Page **447**
ANANTI JOHN EGBUNIKE & **ANIEROBI** PATRICK OGECHUKWU

ROLE OF NUTRITION ON COGNITIVE FUNCTIONING. A REVIEW.
AJI R. U . & **OGBONNAYA**, M Page **454**

SCRAMBLED MERCHANDISING AND BUSINESS SURVIVAL IN A PANDEMIC RAVAGED ENVIRONMENT
OBIESIE, Michael Chuks & **IGWENAZOR**, Osita Nchekwube

SOCIAL CULTURAL FACTORS AND ENTREPRENEURIAL DEVELOPMENT IN SOUTH-EAST, NIGERIA Page **474**
ANIEMEKE, Frederick O.

SOCIO-ECONOMIC STATUS, PEER PRESSURE AND THE PREVALENCE OF CYBERCRIME AMONG STUDENTS IN TERTIARY INSTITUTIONS IN DELTA STATE Page **489**
[1]**IWEZU**, Joseph Iwezu, **OPUBA** Vincent Erorogba & **ODUDU** Solomon

SPATIAL DISTRIBUTION ASSESMENTOF POLY CYLIC AROMATIC HYDROCARBON (PAH) IN AMBIENT AIR OF OIL PRODUCING COMMUNITIES OF EGBEMA, IMO STATE. Page **498**
ANYANWU, G.C. (Ph.D) & **OHAERI** E. O.

SUSTAINABLE APPROACH TO EFFECTIVE MATERIALS MANAGEMENT IN CONSTRUCTION SITES IN ABA ABIA STATE Page **506**
EMERY, Joseph Otah

TEACHERS' EFFECTIVENESS AND STUDENTS' ACHIEVEMENT IN ECONOMICS IN SENIOR SECONDARY SCHOOLS IN YENAGOA, LOCAL GOVERNMENT AREA OF BAYELSA STATE. Page **516**
GIDEON, Mudiem **Titus**

TECHNOLOGICAL INNOVATIONS AND MANAGEMENT OF COVID-19 PANDEMIC IN NIGERIA. Page 522
CHIMA, Promise Akunna & **NWANGWU,** Obinna Anthony (Ph.D)

TECHNOLOGICAL INNOVATIONS IN CITIZENSHIP DIPLOMACY FOR SUSTAINABLE ECONOMIC AND SOCIAL DEVELOPMENT IN A POST COVID-19 NIGERIA Page **531**
EDOBOR, Sunday Ernest & **IMUETINYAN**, Oke

TECHNOLOGICAL INNOVATIONS IN WASTE MANAGEMENT FOR SUSTAINABLE ECONOMIC AND SOCIAL DEVELOPMENT IN A POST COVID-19 NIGERIA Page **538**
ANIEKAN James,& **Uyo** G. Ned

TECHNOLOGICAL INNOVATIONS AND BANKING REFORMS IN NIGERIA Page **546**
AKOLOH,Humphrey Ogulaza

THE ASSESSMENT OF ICT KNOWLEDGE AMONG WOMEN IN PURDAH IN THE SOUTH-WEST NIGERIA Page 555
ODESANYA, Akeem Dele

THE CARD READER TECHNOLOGY AND CREDIBLE ELECTIONS IN NIGERIA: A STUDY OF THE PRESIDENTIAL ELECTIONS OF (2015 AND 2019) Page **564**
STOWEY, Junior Tarila

THE NEXUS BETWEEN GOVERNMENT CAPITAL EXPENDITURE, FOREIGN DIRECT INVESTMENT, ANDECONOMIC GROWTH IN NIGERIA
YAHAYA Kasimu Shaibu(Ph.D) & **YUSUF** Adamu Page **576**

THE RELEVANCE OF SMART LEARNING IN POST COVID-19 EDUCATION
Rev. Fr. **CHUKWUMA**,Stephen C.Esq, Page **584**

THE RISE OF ONLINE GAMBLING AMONGST ADOLESCENTS DURING COVID-19 LOCKDOWN AND THE EFFECT IN A POST COVID-19 NIGERIA
ANINWORIE, Onyekachi Godson & **UDECHUKWU,** Chisom Miracle
Page **594**

TOWARDS TACKLING THE CRISIS OF NOMENCLATURE IN LIBRARY AND INFORMATION SCIENCE SCHOOLS IN NIGERIA Page **594**
[1]**KALU,** Chidi Onuoha (CLN)., USIEDO, **BLESSING** Anegbemente (CLN)., **NZEH**, Chioma Onyinyechi (CLN) & **IZE-IYAMU**, Omon H.(CLN)

UNDERSTANDING BROKEN WINDOWS THEORY AND THE THEORY OF TERRITORIALITY IN URBAN CRIME ANALYSIS. Page **602**
OKEKE, Victor U.,**PETERS**, Chioma G. & **ORAGBA**, Chukwuebuka H.

USING WIND POWER PLANT TO MITIGATE AGAINST POWER SUPPLY IN NIGERIA Page **615**
EHIABHI, Paul Aziegbemhin (Engr.)

VAT COMPLIANCE INTENTION AMONG SMES IN NIGERIA: MENTAL TAX ACCOUNTING AND THEORY OF PLANNED BEHAVIOUR
GIMBA, Hannatu Yohanna(ACA)., **HAMIDU**, Shehu &
HALIMATU, Sa'adiya Ibrahim Page **620**

THE WRITER AND SOCIAL RESPONSIBILITY: SATIRICAL COLOURATIONS OF CHIMAMANDA ADICHIE'S HALF OF A YELLOW SUN Page **630**
MARTIN **AMAECHI**, Ph.D **&** NGOZI **OHAKAMMA**

THE IMPACT OF MULTIMEDIA RESOURCES IN ALEX EKWUEME LIBRARY FEDERAL POLYTECHNIC OKO, ANAMBRA STATE Page **634**
Julia Chinwe **OGUEDOIHU** CLN

TECHNOLOGICAL INNOVATION FOR SUSTAINABLE ECONOMIC AND SOCIAL DEVELOPMENT IN A POST-COVID-19 NIGERIA

A LEAD PAPER

PRESENTED AT THE

5TH ACADEMIC STAFF UNION OF POLYTECHNICS (ASUP),
ZONE D NATIONAL CONFERENCE
3RD-5TH MARCH, 2021

ASUP COMPLEX, FEDERAL POLYTECHNIC,
NEKEDE OWERRI, IMO STATE

BY
PROF. F. EZIONYE EBOH

INTRODUCTION

My experience of developments has led me to conclude that we need good people to have good government. However good the system of government, bad leaders will bring harm to their people. On the other hand, I have seen several societies well-governed in spite of poor systems of government, because good, strong leaders were in charge – Lee Kuan Yew (2000).

The COVID-19 Pandemic is a major 'landslide' that is re-shaping the entire global landscape. It has shaken virtually every nation to their very foundations, as the powerful, most developed nations seem to be the worst hit. Both rich and poor nations are crying at the same time. The devastations seem to be worse than any genocide recorded in human history. Things have, indeed, fallen apart, and the centre no longer hold. There is now the emergence of a 'new normal'.

The new normal entails that if schools any level, for instance, must remain open and continue with free flow of academic activities, measures must be put in place to minimize physical contacts. Ditto every other workplace economic and social activity. Simply put, everything involving the assemblage/gathering of people in affected. Since the later part of 2019, socio-economic activities of nations have suffered some kind of perennial paralysis, and for lack of a better expression, the economics of nations are at the brick of collapse.

The new normal also entails that we follow the necessary approved steps in minimizing physical contracts in our social relationships, and most importantly, step up efforts in designing and adapting to new technologies that are COVID-19 compliant. Even with the vaccines already in place in many countries, it is obvious that there must be sustainable, less disruptive technological inventions and innovations. The only way to attack this pandemic (and anything like it that may rear its ugly head in future) is through technology. Once beaten, twice shy! Beyond COVID-19 (and hoping that no such pandemic of sweeping proportion occurs again in future), technological drives remain the only vehicle at ensuring sustainable socio-economic development.

TECHNOLOGY DEFINED

In a very broad sense the concept of technology may refer to those aspects of culture which relate to the manipulation of the natural environment by man or that whole collection of ways in which the members of a society provide themselves with the material tools and goods of their society – the collection of artefacts and concepts used to create an advanced socio-politico-economic structure. Specifically, it could refer to sets of physical objects, designed and constructed by man. In an industrial society this term refers especially to artificial things and more particularly to modern machines.

Technology may also refer to a body of knowledge that is necessary to generate new rules for the design, construction, and application of technical possibilities to different types of problems (such as, for example, the control of environmental pollution). Here the term technology refers to the theory of the application (logia), not just to "artificial things", the ways in which they are used in practice and the transmission of this practical knowledge ("technics", German, die Technic French, la Technique).

INNOVATION DEFINED

Organizational innovation has been defined variously by component authorities. Whitefield (1975:7) defines innovation as the development of a creative idea into a finished article or process or system. This definition suggests that innovation is a complex problem-solving sequence which in some produces something novel, with creativity as an essential ingredient. Thompson (2004:7) maintains that innovation takes place when an organization makes a technical change, that is, produces a product or service that is new to it or uses a method or input that is new and original. If a direct competitor has already introduced the product or method then it is invention, not innovation. However, introducing a practice from a different country or industry rather than from direct competitor would constitute innovation. Markides (1997:9-24) remarks that innovation is the managed effort of an organization to develop new products or services or new uses for existing products or services. He argues that innovation is clearly important because without new products or services an organization will fall behind its competitors. It must be pointed out that creating an idea or inventing something along is not innovation but a part of the total processes ofinnovation. Creativity, however, is the ability of an individual to generate new ideas or to conceive of new perspectives on existing ideas (Grifflin et at, 1993:213-22). In other words, innovation relates to the creation of competitive advantage in the sense that the aim of innovation is to add value for the customer or consumer by reducing costs or differentiating the product or total service in some sustainable way. Innovation is a testimony to the capability of individual managers working in concert with like-minded fellows to win victories for themselves and their business organizations against any competition, however belligerent. The analogy between war and business has often been made increasingly true as world markets have grown much more combative (Heller, 2004:3).

The Innovation Process

Organizations actively seek to manage the innovation process. These steps illustrate the general life cycle that characterizes most innovations (figure 1). It should be borne in mind that just as with creativity; the innovation process will suffer subtly if it is approached too mechanically and rigidly.The organizational innovation process consists of developing, applying, launching, growing and managing the maturing and decline of creative ideas (Alan, 1986:54-59).

a. Innovation Development: Innovation development comprises the evaluation, modification and improvement of creative ideas. Innovation development can catapult a product or service with only modest potential into a product or service with significantly great potential.

b. Innovation Application: This is the stage in which an organization takes a developed idea and uses it in the design, manufacturing or delivery of new products, services or processes. At this stage, the innovation

emerges from the laboratory and is transformed into tangible goods, or services.

C. Application Launch: Application launch is the stage in which an organization introduces new products or services to the market place. The important question is not "Does the Innovation work?" but will customers want to purchase the innovative product or service? This is because history is replete with creative ideas that did not generate enough interest among customers to be successful. Some notable innovation failures include Sony's seat warmer, the Edsel automobile and Polarold's SX-70 instant camera (which cost three billion dollars to develop but never sold more than hundred thousand units in a year). Thus, despite development and application, new products and services can still possibly fail at the launch phase (Business Week, 1993:76-82; Sheremata, 2000:389-405).

D. Application Growth: Once an innovation has been successfully launched, it then enters the stage of application growth. This period is one of high economic performance for an organization because the product or service is often greater than the supply. Organizations that fail to anticipate this stage may unintentionally limit their growth as Gillette did by not anticipating demand for its March 111 razor blades. At the same time overestimating demand for a new product can be just as detrimental to performance. Unsold products can sit in the warehouse for years (Griffin, 2002:403).

E. Innovation Maturity: After a period of growing demand, an innovative product or service often enters a period of maturity. Innovation maturity is the stage in which most organizations in an industry have access to an innovation and are applying it in approximately the same way. The technological application of an innovation during this stage of the innovation process can be very sophisticated. Because most firms have access to the innovation, either as a result of developing the innovation on their own or copying the innovation of others. However, it does not confer competitive advantage on any one of them. The time that elapses between innovation development and innovation maturity varies remarkably depending on the particular product or service. In Nigeria, this phenomenon of innovation maturing has been witnessed in a number of sectors. Whenever an innovation involves the use of complex skills such as complicated manufacturing process or highly sophisticated teamwork, moving from the growth phase to the maturity phase will take longer. In addition, if the skills needed to implement these innovations are rare and difficult to imitate, then strategic imitation may be delayed and the organization may enjoy a period of sustained competitive advantage. In manufacturing parlance, this interval is called the "grace period".

F. Innovation Decline: Every successful innovation bears its own seeds of decline. Because an organization does not gain a competitive advantage from an innovation at maturity, it must encourage its creative scientists, engineers and managers to look for new innovations. This continued search for competitive advantage usually leads new products and services to move from the creative process through innovation maturity and finally to innovation decline. Innovation decline is the stage during which demand for an innovation decreases and substitute innovations are developed and applied (Griffin, 2002:903).

Typologies of Innovation Techniques

Each creative idea that an organization develops poses a different challenge for the innovation process. Innovations can be radical or incremental, technical or managerial and product or process.

a. Radical versus Incremental Innovation

Radical innovations are new products, service or technologies developed by an organization that completely replace the existing products, services or technologies in an industry (Sheremata, 2000:405). Incremental innovations, on the other hand, are new products, services or technologies that modify existing ones. Firms that implement radical innovations fundamentally shift the nature of competition and the interaction of firms within their environments. Firms that implement incremental innovations alter, but do not fundamentally change, competitive interaction in an industry.

B. Technical versus Managerial Innovations

Technical innovations are changes in the physical appearance or performance of a product or service, or the physical processes through which a product or service is manufactured. It should be pointed out that many of the most important innovations over the last fifty years have been technical. For instance, the serial replacement of the vacuum tube with the transistor, the translator with the integrated circuit and the integrated circuit with the micro chip has greatly enhanced the power, ease of use and speed of

operation of a wide variety of electronic products. Not all innovations developed by organizations are technical. However managerial innovations are changes in the management process by which products and services are conceived, built and delivered to customers. Managerial innovations do not necessarily affect the physical appearance or performance of products or services directly. For instance, reengineering which is the radical redesign of all aspects of the business to achieve major gains in cost, service or time (Stewart, 1993:41-48).

C. Product versus Process Innovations

Perhaps, the two most important types of technical innovations are products innovations and process innovations. Product innovations are changes in the physical characteristics or performance of existing products or service or the creation of brand-new products or services. Process innovations are changes in the way products or services are manufactured or offered. Whereas managerial innovations generally affect the broader context of development, process innovations directly affect manufacturing. For instance the development, implementation and adoption of robotics to certain productive systems is a process innovation. The figure 2.0 below shows the effect of product and process innovations on economic returns and it reveals that its prevalence or manifestations depend on the stage of the innovation product that a new product or service occupies.

At first during the development, application and launch the physical attributes and capabilities of an innovation mostly affect organizational performance. Thus, product innovations are particularly important during these beginning phases. Later, as an innovation enters the phases of growth maturity and decline, an organization's ability to develop process innovations such as fine-tuning manufacturing, increasing product quality and improving product distribution becomes important to maintaining economic return. In international manufacturing practices, it is known that the Japanese organization often excelled at process innovation. The market for 35mm cameras used to be dominated by Germans and other European manufacturers until in the early 1960s, when Japanese organizations such as Canon and Nikon began making cameras. Some of these early Japanese products were mainly imitations of the original 35mm cameras. However, these companies continued to invest in their process technology and today are able to improve and increase quality, while lowering manufacturing costs. Consequently, these Japanese organizations are today market leaders for 35mm camera technology, while the German companies because they were not able to maintain the same pace of process innovation, are just struggling to maintain market share and profitability.

What are the implications of innovation in economic and social life? The answer to this question, as one can argue, is based on the meaning of the term innovation. A widespread perception on innovation is one that refers to advanced technology solutions offered by using the

latest knowledge. Such innovations are mainly considered to be the result of highly skilled workforce and businesses activity with significant research and development intensity, having close linkages to the most important centres of excellence in the scientific world. The significance of innovation is, however, broader and includes innovations that are not achieved within high-tech industry mentioned above. From this last perspective, innovation do not include only new products or processes, but also cover the improved ones resulting from the so-called low-tech sectors, which may have cumulative economic and social effects as important.

We depict some common features of innovation processes:

I They imply exploring opportunities for achieving new/improved goods (products and services) based upon technical knowledge as well as the market demand change or a combination of the two. Investment efforts of technological innovation predominantly correspond to development and production engineering, in which knowledge is accumulated by experience in production, leaning by using and learning by doing (Pavitt, 1987, p.9);

ii It is impossible an accurate previous of costs and performances involved in the innovation process mainly based on research and development and the users reaction to the new artifacts.

iii Technological innovation does not have to be complex, but it has to be new and aim to implement the technology it embodies, in the market

DEVELOPMENT: DEFINITION AND DIMENSIONS

Okigbo (1987:46) posits that the process of development involves the application of national resources–human mineral-agricultural-for the enrichment of the lives of the population. It is this enrichment that constitutes development. He adds that within the concept of development we refer to such notions as the improvement in the standard of living of the population; it not only presupposes the growth in income economic growth but also requires improvements in certain indicators-health, sanitation, nutrition and education, reduction improvement in certain inequalities in income distribution-especially between areas or between households and functionally by groups however that group is defined.

It is appropriate to point out here the difference between economic growth and economic development. Economic growth refers to increase over time in a country's real output of goods and services. When an economy isable to produce more goods and services for each consumer, then without doubt, it is a period of economic growth (Zuvekus, 1979:7; Baurol and Hinder, 1998:57: Colander; 2001:534). As Vanghan (1974:146) puts it, economic growth refers to the increase in GDP or GNP at constant price.

As Onwumere and Ige (2006:1) have clearly captured, economic growth and economic development remained synonyms for a long time until the 1950s and 1960s, following general dissatisfaction with results during the first generation of development. Thus, there was a compelling need in refocus the strategies adopted in developing countries in order to meet the second-generation problems of development. The general dissatisfaction over the absence of well spread benefits even under conditions of rapid economic growth thus accentuated the clarion call for an alternative concept of economic development.

A clear distinction should, therefore be drawn between economic growth and economic development. While economic growth would be such as an increase in the productive capacity of the economy leading to an increased availability of goods and services in the economy over a given period of time (Ohale and Onyema 2001:238) or a quantitative sustained increase in the country's per capita output or increase accompanied by expansion in its labour force, consumption capital and volume of trade (Jhingan, 2003:106), economic development is growth accompanied by change (Zuvekas, 1979:7). As Todaro and Smith (2004:17) put it, economic development is a multidimensional process involving major changes in social structures, popular attitudes and national institutions as well as the acceleration of economic growth, the reduction of inequality and the eradication of poverty.Economic development therefore, subsumes economic growth. As Conable (1991:31) puts it, economic development is a sustainable increase in living standards that encompasses material consumption, education, health and environmental protection.

As Dudley Sears, the famous British economist asserts, the questions to ask about a country's development are what has been happening to poverty? What has been happening to unemployment? What has been happening to inequality? If all three of these have declined from high levels then beyond doubt this has been a period of development for the country concerned. If one or two of these central problems have been growing worse especially if all three have, it would be strange to call the result "development" even if per capita income doubled.

Sustainable Development

According to the World Commission on Environment and Development (1987), sustainable economic development, therefore refers to development thatmeets the needs of the present without compromising the ability of future generations to meet their own needs. In its report of "Our Common Future", the commission noted the following seven critical objectives for any sustainable **development policy:**

i reviving growth;

ii changing the quality of growth (with more emphasis on development that growth);

iii meeting essential needs of people for jobs, foods, energy, water and sanitation

iv ensuring a sustainable level of population

v conserving and enhancing the resource base

vi reorienting technology and managing risk and

vii merging environment and economics in decision making

viii as Adeniyi (1999:9) has observed, a key requirement for development is that it must have something to do with people being better off in some way on their own terms. It is perhaps for this reason that the World Bank observed in its 1999/2000 World Development Report that economic development must move beyond economic growth to encompass important social goals – reduced poverty, improved quality of life, enhanced opportunities for better education and health and more. It also noted that fifty years of development experience have yielded four initial lessons.

i First macro-economic stability is an essential prerequisite for achieving the growth needed for development

ii Second growth does not tickle down, development must address human needs directly

iii Third, no use policy will trigger development; a comprehensive approach is needed.

iii Fourth, institutions matter; sustained development should be rooted in processes that are socially inclusive and responsive to changing circumstances.

The World Bank adds that in any given country, progress in development depends on a constellation of factors and on shifts in their configuration that take place over time. What is required is to step beyond the debates over the roles of governments and

markets recognizing that they need to complement each other and to put to rest claims that any particular policy intervention in education, health, capital markets, or elsewhere is the magic formula that will inspire development in all times and places. In sum, it argues that the shift in development thinking is encapsulated under four headings:

1. Sustainable development has many objectives

2. Development policies are interdependent

3. Governments play a vital role in development, but there is no simple set of roles that tells them what to do

4. Processes are just as important as policies.

While agreeing that economic development subsumes economic growth. Onwumere (2006:5) is succinct in stating that there cannot be economic development in isolation of economic growth. He adds that economic development can be viewed as a process of growth which should be reflected in a high degree of self-reliance and abundant utilization of natural resources, including changes in the cultural, social, political and institutional arrangement in the economy, manifested in the character of the people and the attainment of better life for a vast majority of the population. This manifests itself as a process of increasing the choices available to individuals through better education, training, health, nutrition and gainful employment.

Pillars of sustainable Dev:
Economic sustainability refers to a system of production that satisfies present consumers without compromising future needs.

Social sustainability encapsulates notions of equity, empowerment, accessibility, cultural identity and institutional stability.

Environmental sustainability implies the natural environment and being productive and resilient to support human life.

Constraints/setbacks to Technological Innovation in Nigeria
There is a positive correlation between a country's level of development and its technological innovativeness and development. Technology propels development, and therefore, the more technologically advanced a nation is, the higher/greater its role of development, Nigeria remains a sad commentary in the drive for technological innovation. The reasons are obvious.

Policy instability: The issue of policy hiccups, somersaults and inconsistencies is a major setback in the nation's quest for technological advancement. Elsewhere, there is such a thing as agency immortality, whereby policies and programmes that are meant to advance the wellbeing of the citizens transcend partisanship and clannish interests, and therefore, survive beyond the parties or persons that initiated them. But sadly, not in this country!

The critical questions remain: what has happened to our technical colleges? Why are our polytechnics and specialized universities unable to fulfill their mandate? For how long are we going to continue in this macabre dance of one step forward and two steps backward. Technical education at all levels of the educational system must stimulate innovative ideas and scientific inquiries. How long shall we be patient before we get to the promise land?

Think of the power sector. No meaningful technological break- through can take place without reliable electricity. Why have we spent so much, yet have achieved very little? Why have we witnessed so much policy inconsistency in this sector? Many multinationals have had to leave this country for neighbouring Ghana because we are a nation in continuous darkness.
Absence of formidable institutions to drive technological innovations: A number of institutions exist to drive the country's rapid technological revolution like the National Office for Technology Acquisition and Promotion (NOTAP), Raw Materials Research and Development Council (RMARDC), and the Standards Organization of Nigeria. Yet, none has been able to tackle technological innovation in the country with the aggression and urgency it deserves.

Poor Investment in Research and Development: Investment in research and development (R&D), whether by the public or private sector, has been very discouraging. Neither the governments at the various levels nor key private sector players have invested quantum resources in R&D. Our technological institutions should be the hub of research efforts, and the human and intellectual capacities abound – yet, they must be funded in order to embark on this mission. Since the COVID-19, many countries have invested in their key institutions and their efforts are being rewarded.

Public Sector Dominance: The dominance of the public sector in the drive towards technological advancement seems to be another constraint. The private sector, not the public, should be the driver. The regulatory framework is not yet strengthened, to allow the private sector take control of our technological efforts. The COVID-19 experience in most countries is replete with private sector initiatives and ground-breaking efforts. In developed countries, even space stations are owned by private individuals and organizations. In this country, we cannot yet boast of institutions that offer research and training in the areas of robotic engineering and artificial intelligence (AI). Yet these areas are gold mines and constitute part of the 'new normal'.

No country today can successfully initiate technological innovations without placing premium on Information Communication Technology (ICT) and robotics, yet we continue here to wonder aimlessly in a blind endeavour to find a way out. The time has come for the government to unbundle the public sector, and empower the private sector, in our efforts to find meaning and relevance in the world of technology.
Ethnic/primordial interests: It's both comical and thought provoking that in today's hyper-competitive world, where nations are doing everything to outsmart one another, we still approach the issue of technological advancement with ethnic and primordial prejudices. So sad!

Corruption: This is at the epicentre of our underdevelopment, and consequent inability to make any modicum of progress in technology. Our public sector managers have continued to starch away funds meant for the development of the country.

Making Progress:
The most critical challenge before us as a nation, and this has been the problem from the beginning, is leadership. It is good, people-oriented leadership that drives development, and it is technology that gives bearing and relevance to development. It's time for our leaders to get serious. Better late than never!
Equally important, there should be some level of stability in critical policies and programmes. Policies and programmes that exist at the sufferance of the people must be allowed to endure. Enough of this game of musical chairs!

Our tertiary and vocational institutions that drive science and technology must wake up from their slumber. It's time to take the bull by the horn!And government must begin to create an enabling environment that engenders research and creativity and be prepared to fund research efforts and institutions. It's time to prioritize!The private sector must take the lead, and like the government, be prepared to fund public and private institutions in their research endeavours. After all, this is in their long-term interest. All hands must be on deck!

Conclusion:
According to the Zenith Economic

Quarterly (2019), Microsoft executives found that Nigeria had the fourth fastest-growing developer community on GitHub, a software engineer market place which the company eventually bought for $7.5billion …. There are 618 tech hubs in Africa, with Nigeria accounting for 85 of them. The point I want to make here is that, given the enabling climate and a level playing field, the intellectual and human capacity is available to commence a technological revolution in our time. Let me end this presentation with a statement whose author is unknown. It about the nation of Israel, but the comment is very illuminating.

Israel is a nuclear-armed state with sophisticated weapons capable of taking on their neighbours. It is not because they don't trust the God of Israel to protect them, but they know that the God of Israel won't do their duties for them. Israel has a thriving economy with high standards of hiring for the citizens. It is not that they don't trust the God of Israel that provided their ancestors with manna in the wideness, but they understand that God won't plant rice and harvest it for them. They have to do it themselves. Israel is not leaving the Gaza border in the hands of God and do nothing. No, they build an iron Dome that intercepts rockets fired into Israel Territory by the Palestinian militant Hammas. Israel has the best medical place and hospitals in the world. They won the highest Nobel prize in Science and research for humanity. It is not that they don't have confidence in the God of Moses and Elijah, but they understand that God of Israel gave them wisdom and knowledge to act decisively … Nigeria should borrow a leaf from Israel – source: Unknown.

REFERENCES

Adeniyi, P.O. (1999), Research Capacity Building for Sustainable Development in Nigeria Lagos, Unilag Consult.

Baurol, W.J. and Blinder, A.S. (1998). Macroeconomics: Principles and Policy 7th Edition, New York. The Dryden Press.

Colander, D.C. (2001). Economics 4th Edition , New York: MaGRAW Hill Company.

Conable, B.B. (1991), "The Challenge of Development". Would Development Report Washington D.C. Oxford University Press.

Eboh, F.E. (2010), Building Institutions and Frameworks for Sustainable National Development being paper presented at the 2010 Enugu State University of Science and Technology (Faculty of Management Sciences) Conference on the theme Public Policy Issues and Management Challenges and Strategies.

Eboh, F.E. &Igwe N.N. (2009), Innovation Networks: Challenges for the Survival and Growth of Nigerian Organization. In De-Caritas Journal of Management and Social Science (DJMSS) Vol. J. Nos. 2, May, 2009.

Federal Ministry of Education (2018), Education for change: A ministerial Strategic Plan (2016-2019), Revised 2018.

Freeman C., (1982), the Economics of Industrial Innovation (2nd Ed.), Frances Printer, London.

Heller R. (ed.) (2004). The Complete Guide to Modern management Mumbal: Jaco Publishing House.

Jhingan, M.L. (2003), Advanced Economic Theory, 12th Edition Delhi, Vrinda Publishers.

Lee Kuan Yew (2000), From Third World to First World: Singapore and the Asian Economic Boom, New York: HarperCollins Publishers.

Markides, C. (1997) "Strategic Innovation" Sloan Management Review

Nwuneli, O.E. (Ed) (1985). Mass Communication in Nigeria: A third of Reading Enugu: Fourth Dimension Publishers.

Obale, L and Onyema, J.I. (2001), Foundation of Macroeconomics, Owerri Springfield Publishers.

Okigbo, P.N.C. (1987), Essays in the Public Philosophy of Development: Issues in Nigerian Development, Enugu Fourth Dimension Publishers.

Onwumere, J.U.J, (2006). "Characteristics of Underdevelopment (Features of Developing Economics)" in Economics Development and Management. Onwumere, J.U.J. et al (Eds.), Lagos: Don-Vinton Publishers.

Onwumere, J.U.J. and Ige S. (2006). "Economic Development: Meaning, Measurement.

Sheremata, W.A. (2000) "Centrifugal and Centripetal Forces in Radical New Product Development under Time Pressure" Academic of Management Review 25 (2).

Stewart, T.A. (1993) "Reengineering – The Hot New Managing Tool" Fortune, August 23.

Thompson, J.L. (2004) Strategic Management Awareness and Change, London: Thompson Learning.

Todaro, M.O. and Smith, S.C. (2003). Economic Development (8th Edition) Delin Pearson Education Inc.

Tolls, G.J. and Golder, P.N. (1996). "First to Market, First to Fall, Real Issues of Enduring Market Leadership" Sloan Management.

Vaughan, G.D. (1974). An Introduction to Applied Economics: London Williams Heineinam.

Whitefield P.R. (1975). Creativity in Industry, 'Middleses: Pengium Books Limited.

World Bank (2000). Entering the 21st Century: World Development Report: 1999/2000 Oxford University Press.

World Commission on Environment and Development (1987). Our Common Future Oxford: Oxford University Press.

Zenith Economic Quarterly (2019), Facilitating a demographic dividend in Nigeria: the tech option, Vol. 15 No. 4, October 7. 27.

Zuvekas, C. (1979). Economic Development: An Introduction, London: Macmillan Press.

A CRITICAL EVALUATION OF INDUSTRIALIZATION STRATEGIES AND POLICIES IN NIGERIA (FROM 2002--2016)

OGURU, Ayibamiebi Foster
Department of Banking and Finance
Federal Polytechnic Ekowe, Bayelsa State
fosteroguru1@gmail.com
&
EKADI, Ebikewenimo Hannah
Department of Banking and Finance
Federal Polytechnic Ekowe, Bayelsa State
augustinehannah86@gmail.com

Abstract
This paper attempts to examine and evaluate industrial policies and incentives that had been put in place to stimulate the industrial sector over time. The problem of Nigeria's development is widely attributed to its mono-cultural economy. The economy largely depends on primary products, such as crude agricultural products, and petroleum products. There is urgent need to develop the industrial sector, preferably the manufacturing sub-sector, if the country will escape from the present state of underdevelopment. In using secondary data; the impact of government credit to the industrial sector and provision of foreign exchange for the importation of machinery and equipment on industrial output was examined. The OLS routine of econometrics methodology was employed, to run the multiple regression. Consequently, the following findings were reached. The explanatory variables, credit to private industrial sector and provision of machinery and equipment have positive impact on industrial output. The following recommendations were made among others. Industrial policies should be properly coordinated and implemented. Local resource strategy should be re-strategized and re-enforced. Government should promote and encourage Research & Development.

Keywords: *Industrialization, Strategies, Evaluation, Import substitution*

INTRODUCTION

Less- developed countries have meandered from various policies and strategies such as import-substitution, export –promotion, trade liberalization and creating all kinds of incentives to attract foreign investment. Nigeria in particular, has experimented various industrial policies for over five decades with the objective of diversifying the economic base of the country.The government had both at federal and state levels and different times made deliberate attempts at industrialization, particularly in the area of manufacturing. The aims as stated in plan documents and budget speeches were provision of employment opportunities, reducing the country dependence on foreign sources of manufactured goods and so on.

It is now widely accepted that the road to economic development of a country lies in the diversification of her economy, in which industrialization has crucial role to play. Industrialization is seen as the bedrock of economic growth and development of every country.

REVIEW OF LITERATURE

According to Onimode (1988), industrialization is the best index of economic progress, with respect to such attributes as the measurement of national productive capacity, manufacturing output, technological development, modern employment opportunities and overall standard of living. Bhagwati (1988), viewed industrialization in a broader way, according him, industrialization denotes the organization of production in business enterprises, characterized specially by division of labour and involving the application of technology, chemical and electrical power to supplement and replace human labour. According to Moro (1997), industrialization is seen as first of all establishing small scale industries as a nation first step whereby skill techniques and markets may be developed from large scale operations. This therefore, implies that, to start through small scale industries is the best way forward to grow large scale industries and industrialization parse.

Industrialization Strategies in Nigeria

Nigeria and other African countries have adopted some industrial policies in their development efforts. Anyanwu et al (1997), identified four industrialization strategies adopted in Nigeria as; import-substitution, export-promotion, balanced development strategy and local resource-based strategy.

Import-Substitution Strategy

This refers to a process of making at home some consumer and intermediate goods that were previously imported, thereby replacing some imported goods with domestic products.

Export-Promotion Strategy

This strategy enables a country lay emphasis on providing efficiently goods for export. Realizing pitfalls from the import substitution strategy, Nigeria adopted the export promotion policy. In order to encourage this, the Nigeria export promotion board was established.

Balanced Development Strategy

This strategy was adopted as a result of the lopsided development of the industrial sector. The aim of the balanced development strategy was to encourage balance development of all industries, so as to promote greater linkages within the sector. That is, to create intra and inter sectorial linkages, in order to increase inter industry transactions.

Local Resource Based Strategy

This strategy was adopted due to the stochastic nature of the petroleum sector. It is the local development and sourcing of raw materials by industries in the country .In order to pursue this strategy the Nigerian government had adopted various policies and established quite a good number of institutions, Example of such institutions is the Nigerian Content Development and Monitoring Board. The main objective behind the creation of this board is to improve the local content in the petroleum and manufacturing sectors in the country.

Government Incentives to Encourage Industries in Nigeria

The Nigerian government had over time adopted different specific policies to drive the industrialization process, with the aim to actualize the above broad strategies.

Tax holiday: Infant industries are exempted from the payment of profit tax for some years of operation, such as five years. The aim is to enable such industries build up enough funds for expansion purposes.

Tariff Protection: This is the imposition of heavy import duties on foreign goods so as to protect local industries from international competition.

Provision of loans: Government had through the bank of industry, central bank and other financial institutions provided loans to industries as a way to boost industrialization in the country.

Direct participation: Government had also

participated directly in certain strategic industries either alone or through joint participation with foreigners or local entrepreneurs. Example is the Ajaokuta steel company.

Besides the above-mentioned incentives, others such as provision of accelerated depression allowance, approved user scheme, export incentives and concessionary allocation of foreign exchange had been directed to the industrial sector with aim to building a strong industrial base in the country.

DATA/METHODOLOGY

Secondary data were used in the study. The data were collected from Central Bank Statistical Bulletin and National Bureau of Statistics. The OLS method of econometrics methodology was employed. Multiple regression method was used for estimation of parameters of the explanatory variables.

Specification of the model

$$Y = F\ x_1 x_2)$$
$$Y = \beta_0 + \beta_1 x_1 + \beta_2 x_2$$
$$Y = \beta_0 + \beta_1 x_1 + \beta_2 x_2$$
$$Y = \beta_0 + \beta_1 x_2 + \beta_2 x_2 + u$$

Where,

Y = Industrial output at current market prices in Billion Naira.

X_1 = Government credits to private investors; as incentives to industrial sector in Billion Naira.

X_2 = Imports on machinery and equipment: as proxy to industrial policy (in Naira Billion).

DATA PRESENTATION, ANALYSIS AND DISCUSSION

Table 1: Presentation of Data

Year	Industrial output at market prices (₦Billion) (Y)	Government credit to private investors (₦Billion) (X_1)	Value of imports on machinery & Equipment (₦Billion) (X_2)
2002	2,178.51	930.49	378.80
2003	2,902.81	1,096.54	498.80
2004	3,992.28	1,421.66	458.90
2005	5,080.16	1,838.39	613.40
2006	6,157.84	2,290.62	680.80
2007	6,800.15	3,680.09	856.70
2008	8,072.50	6,941.38	1,141.80
2009	7,518.88	9,147.42	2,359.30
2010	12,033.20	10,157.02	3,762.60
2011	15,626.42	10,660.07	3,219.30
2012	16,975.42	14,647.28	2,217.20
2013	17,614.29	15,751.84	2,166.30
2014	18,402.19	17,129.68	2,011.40
2015	15,073.78	18,675.47	1,996.20
2016	14,372.78	21,082.72	12,232.30

Source: Central Bank of Nigeria statistical bulletin, volume 27 December, 2016

Presentation of Results and Discussion

Table 2: Presentation of Results

Variable		Coefficient		Standard error	t-statistics
C		2625.4		1162.470	2.2585
X_1		0.6108		0.1232	4.9589
X_2		1.2478		0.8188	1.5241

Source: Computed from E view regression results

$$\hat{Y} = 2625.4 + 0.6108x_1 + 1.2478x_2$$
$$S_E(1162.470)(0.1231)(0.8188)$$
$$t_c(2.2585)(4.9589)(1.5242)$$
$$t_t 0.025 = 2.179$$
$$R_2 = 0.8558$$
$$\overline{R_2} = 0.8318$$
$$F_c = 35.6090$$
$$F_t = 3.ﻉ$$

at 5% significant level.

Where: R_2 is coefficient of determination

$\overline{R_s}$ is Adjusted coefficient of determination.

Statistical test of the significance of the estimates.

i. Student t-test

From the results $_1$ that is the parameters of variable X_1 are statistically significant: $t_c > t_t = 4.9589 > 2.179$.

$_2$is not statistically significant; $t_c < t_{tv}$ = $1.5241 < 2.179$.

ii. Test of overall significance – F-Ratio test

From the results the F- Statistic 35.6090 is greater than F- table value at 5 percent level of significance, which is 3.89; it then implies that on the overall, the parameters $_1$ and $_2$ of the variables are statistically significant. Hence, the regressors determine the behavior of the regress and.

The adjusted coefficient of determination R is 0.8318. This implies that the regression line has a good fit. It shows that 83 percent of total variation of industrial output in Nigeria is accounted for by the regressors - credit facility (finance) and provision of Machinery & Equipment.

It is evident from the results that there is positive relationship between the regressors and the regreand. Effective and efficient policy formulation and implementation in this regard will improve industrial output in the country.

CONCLUSION

Industrial policies had not yielded desired practical results.Local value-added from industrial output seems to be too low, as industries depend largely on foreign machinery and equipment and other raw materials.

RECOMMENDATIONS

Based on the findings of the study and the conclusions reached, the following recommendations are reached:

- Industrial policies should be properly coordinated and implemented.
- Industrial policies should be based on economic principles.
- Local resource strategy should be re-strategized and re-enforced.
- Government should promote and encourage Research & Development.
- Government should strengthen the campaign of"buy made in Nigeria products" to create market for domestic firms.

REFERENCES

Adejugbe, M.O.K. (2004) Industrialization, Urbanization and Development in Nigeria. Lagos, Concepts Publications Ltd.

Akin-George, J. (2002) Industrial and Economic Development in Nigeria (selected issues). Lagos, Malthouse Press Limited.

Anyanwu et al (1997) Structure of the Nigerian Economy from (1960 – 1977) Onitsha Nigeria, Joanee Educational Publishers Ltd.

Apere, T.O. (2005). Research Methodology (for management and social sciences). Port Harcourt, Davison Publications.

Bhagwati, J. (1988). The Economics of underdeveloped countries and Industrialization. London, Wielders Field and Nilson.

Central Bank of Nigeria Statistical bulletin, volume 27 December, (2016).

Hirschman, O. A. (1958). The Strategy of Economic Development. New Haven, Connecticut, Yale University Press.

Killby, P. (1969) Industrialization in an open economy: (Nigeria 1945 – 1956) Cambridge, Cambridge University Press.

Kautsoyiannis, A. (1977) The Theory of Econometrics. London, Macmillan Press Ltd.

Kuznets, S. S. (1968). Reflection on the economic growth of modern nations. New York, Norton Publishers.

Moro, R. S. (1995) Structure of the Nigerian Economy. Owerri, Springfield Publishers Ltd.

Tamuno, S. O. (1996) Historical dynamics of world economics. Owerri, Corporate Impression,

Ohimode, B. (1988) A political economy of African crisis. London, Zed Books Ltd.

Teriba, & Kayode, M. (1975). Industrial development of Nigeria. Ibadan University Press.

Tombofa, S. S. (2004) Development Economics: An introduction. Port Harcourt, Pearls Publishers.

A PRAGMATIC STUDY OF THE LANGUAGE OF SPORTS IN SELECTED SPORTS DOCUMENTS

OKAFOR, Theodore Madu
School of General Studies,
Imo State Polytechnic, Umuagwo.
Email: theodoreokafor2022@gmail.com

OGAYI, Martin C. (Ph.D)
Department of English and Literary Studies
Ebonyi State University, Abakaliki
&
EKECHI, Christian
School of General Studies,
Imo State Polytechnic, Umuagwo.

Abstract
Linguists analyze language using different perspectives which include semantics, syntax and pragmatics. This paper focused on the pragmatic analysis of the language of sports. As a pragmatic study, this research examined how sports texts could be interpreted contextually. Data for this study were drawn from selected sports tabloids. The analysis employed the Brown and Yule model of pragmatic analysis. The findings reveal that sports journalists often rely heavily on the pragmatic concepts of presupposition, implicature, inference and reference to project messages to their teeming audience. These extralinguistic features were found to be valuable in constructing readable and interesting sports stories. The study indicated that the reader requires more than ordinary knowledge of linguistic features to interpret sports texts. In some cases, the reader is expected to decode a sports text through a deduction process, while in some other cases, the reader may have to pay attention to words and expressions purposely used to maintain reference in order to enhance text interpretation and understanding. The study also showed that some sports reporters were often guilty of flouting certain maxims, especially those of quantity and relevance. Some sports documents are replete with more information than is necessarily required on a topic. This suggests that some sports documents provide unnecessary information and superfluous details that, not only confuse readers, but also render texts tautological.

Keywords: *Language, analysis, sports, contextually.*

INTRODUCTION

Man is constantly linked to others through language. The primary function of language is to convey ideas from one person to another. As a system of vocal and linguistic symbols used in a particular society, language is essentially a social institution. Communication cannot be effective unless the verbal messages stored in the minds of the individual members of the society are substantially the same.Ojo and Babayo (2014:160) observe that primary failure in communication is likely to be the result when the content of the message is not understood as a result of inappropriate language use.Language can be regional, dialectal, social or occupational and capable of being varied in a large number of unrelated

contexts.According to Crystal and Davy (1983:3).

When we talk about a language, we must not be misled into thinking that the label should in some way refer to a readily identifiable object in reality, which we can isolate and examine in a classroom as we might a test-tube mixture, a piece of rock or a poem.

Variation as a linguistic feature enables us to distinguish one social activity from another. Communication through language takes place within the context of identified field such as law, education, medicine, sports etc. Naturally, language use in these fields have much more in common than differentiates them as variants of the same language. But at the same time, each variety is definably distinct from all others; a distinction based on the social activity and context in which the language is used. In the words of Osuafor (2003:3), "The language user is constantly matching ideation and verbalization as are appropriate to particular social activities". AsStrangott and Pratt (1980:226), put it"language use is governed by awide range of contextual factors, including social and physical circumstances, identities, attitudes, abilities and beliefs of the participants and relations holding between participants".

The writer and the reader sometimes rely on their knowledge of the world to effectively communicate. Most sports stories have been found to be based on the assumption of what the reporter believes the reader knows. In this case, the reader appeals to the social contexts of the report to interpret the message.

Statement of the Problem

Quite a lot of sports stories are presented in a unique linguistic register which most sports followers find difficult to interpret. This is as a result of the presence of pragmatic features which convey meanings that are not literally expressed in sports texts.

Objectives of the Study

For decades we have observed an increasing popularity of sports as a media event. In fact, the presence of sports in the media has resulted in the language of sports becoming more significant. In this study, an attempt will be made to:

I. identify some pragmatic features of the language of sports

ii. explain these features in some details

iii. analyze the pragmatic features of stories in some selected documents especially as previous researchers have not examined this aspect in details.

Significance of the Study

Since man uses language to communicate his emotions, aspirations and ideas, it is important that football reporters get acquainted with both the linguistic and extra-linguistic devices that can enhance sports reporting. Thus, sports writers will find this research useful as many extra-linguistic devices often used by sports journalists have been identified and analyzed.For sports journalists to have a good sports text, a good knowledge of the uses of pragmatic strategies is important. An effective use of these devices helps to make sports stories exciting and, therefore, contributes immensely in promoting the game.

This study will also be useful to sports fans as it will expose them to the extra-linguistic strategies used by sports reporters. This will enhance interpretation of sports texts and ultimately increase sports followership. The research, no doubt, will constitute a worthy addition to the data on the inventory of discourse analysis, especially in the area of pragmatic studies.
Finally, this work will be of immense benefit to future researchers as the research procedure adopted in this study as well as the findings will provide useful basis for further research.

Scope of the Study

This study is limited to the pragmatic analysis of some selected sports documents. It aims at identifying, explaining and analyzing the pragmatic features of the language of sports. These features include presupposition, reference, implicature and inference.

LITERATURE REVIEW
Language of Sports Reports

Exploring the relationship between language and sports requires a reasonable understanding of the nature of the language of the media. The general objective of journalism is to inform, to educate and to entertain. Through the media, people are generally introduced to new knowledge and made to fully comprehend what they particularly know. Also, through the media, people are entertained through articles, cartoons, music, drama, sports among others.

Ike (2007:141) observes that "as in every other profession, journalism is highly influenced by jargons or specialized vocabulary with which every member of the profession is familiar or should be familiar". Sports journalists often translate jargons into ordinary English as much as possible. This forms the background of today's language of sports journalism which can be said to be generally synonymous with the language of the average educated man or woman in the society. It is essentially reportorial and thrives on essential grammar of the language. This suggests that the sports reporter obeys the rule of grammar asit makes his copy clear, concise and suitable.

Concrete words, short sentences, and paragraphs are carefully chosen to help the reader feel, see clearly and possibly taste and smell what is being described. To be concise, the sports journalist strives to avoid superfluous details by using as his lead only the essentials 5W[s] and H (Ike, 2007). These are who, what, why, where, when and how. Hence, articles (the, a, an) are purposely omitted whenever possible.

For suitability, the sports journalist employs words not in the least for the sake of it, but to match the subject, the mood, the context and space of the events being described or the needs of the reader. Language is used to arouse and maintain the interest of the reader throughout the reading. Extralinguistic features which help to project sports stories, arouse interest and promote understanding are freely used.Edward (1986), cited in Awurumibe (1997), defines sports as an activity having history, a tradition, stressing physical exhaustion through competitions within the limitations of pre-determined rules and regulations and carried out by individuals who represent formally organized groups, who are to achieve recognition of a set of goals by defeating the opponent.For Methany (1991) cited in Awurumibe (1997:8)

> ***Sports is a diverse set of activities or organization of human behaviour in which one or more persons designated as performers, move about in an environmental setting, which may be described in terms of time, space and terrain, performing actions which are directed towards an attempt to include or bring about a series of observable changes in the person and or configuration of certain specified objects, animals or persons.***

Generally, sports have been described as social phenomena which permeate all levels of social realities and articulate with other institutions such as education, politics, economics, mass media, religion, and so on. It is an institutionalized game that demands the demonstration of physical powers.

Concept of Pragmatics

For a proper understanding of the

concept of pragmatics, it is necessary to first differentiate between semantics and pragmatics, since the two concepts border on meaning. Prasad (2008: 41) captures pragmatics as:

> ***The study of the way in which language is used to express what somebody really means in particular situations, especially when the actual words used may appear to mean something different… while semantics attempts to relate meaning to logic and truth and deals with meaning as a matter primarily of sense relations within the language. Pragmatics endeavors to relate meaning with the context of utterance and it studies language as action performed by the speaker.***

From the above, while semantics seems to basically focus on meaning from the point of view of the sense or basic and literal implication of language, that is, from the words as they appear in the language, pragmatics seems all encompassing because it combines both aspects of semantics (what the language literally means) and even those other aspects of meaning that go beyond what a piece of language communicates. Amos (2015:155) asserts that "a closer look at pragmatics makes it look like it is an extension of semantics though with a different face."Levinson (1983:21) defines pragmatics as "the study of the relationship between language and context that are basic to an account of language understanding". This definition promotes the fact that in order for a piece of language to be interpreted accurately, certain things namely, language and context must be taken into consideration.

Yule (1996:1) states that "Pragmatics is concerned with the study of meaning as communicated by a speaker (or writer) and interpreted by listener (or hearer)". This suggests that the form of the message is not really the concern here, but the extra information that the speaker and the listener are able to supply. This simply means that the speaker actually communicates more than is said in words and the listener also interprets and gets more information than the words of the speaker seem to say. This is in tandem with Leech and Short's (1987:290), viewcited in Osisanwo (2003:54), that the pragmatic analysis of language can be broadly understood to be the investigation into that aspect of meaning which is derived not from formal properties of words and constructions, but from the way in which utterances are used and how they relate to the context in which they are uttered. Language, therefore, can only make meaning when it is interpreted within a given context that may include the time, environment and any other variables outside the linguistic item. Essentially, pragmatic meaning basically is concerned with those other items attached to a piece of language outside its grammatical properties. Ejele (1996:35) is apt in her definition of pragmatics as "the study of language usage". According to Ejele, pragmatics deals with how linguistic and nonlinguistic factors come into play and influence the choices of the variables involved in communication.

Osuafor (2003:32) adds that pragmatics is actually the crux of discourse analysis. Udofort (1998:81) observes that knowledge of pragmatics, for instance, enables one to interpret, not only the literal meaning of an utterance, but also the meanings that derive from the norms of formality and politeness that exist in the society where the language is used. It is also important to understand unstated meanings that derive from the shared previous knowledge of the speaker and hearer and the situation in which the utterances are used. In the words of Crystal (1997:120), pragmatics is seen as "the study of all aspects of meaning other than those involved in the analysis of sentences in terms of truth conditions".Through pragmatics, the discourse analyst assesses how words are

used and what speakers mean as well as relates texts to the physical, social and psychological world in which they take place. Thus, the appropriateness conditions of utterances are determined by matching sentences with the context in which they occur. For proper pragmatic analysis, some important concepts must be examined since these concepts are at the centre of the literature in the field.

Context:

Context refers to any background knowledge which is assumed to be shared by speaker and hearer and which aids the hearer to decode the meaning of the speaker's utterance."It is a subpart of the universe of discourse shared by speaker and hearer, and includes facts about the topic of the conversation in which the utterance should be interpreted on any occasion"(Eruchalu, 2012:205)There are different types of contexts, namely, linguistic context and physical context. The linguistic context is also called cotext and refers to the set of other words it occurs with in a sentence. This helps language users to interpret the exact meaning of the word which the speaker intends.The physical context includes the physical location of the person or thing referred to in the utterance, as well as when the utterance was made.

Deixis

Deixis is derived from the Greek adjective "deiktikos" which means "pointing" "indicative" via language. According to Jaszczolt (2002:191), 'deixis' is the phenomenon of encoding contextual information by means of lexical items or grammatical distinctions that provide this information only when paired with context. There exists in every language a small set of words which cannot be interpreted without reference to the physical context of the speaker. To interpret them, one must know who the participants in the speech situation are, who the speaker is talking about, the time of the utterance and where he is speaking from. Such words are called deictic expressions.

Deixis may be categorized as:

a. Person Deixis: These are the expressions used to point to a person. The pronouns "I "and "We" are used for the addresser (s), "you" for the addressee (s) and "he"/she/it/they" for others.

b. Place Deixis: This is also called spatial deixis. It points to a location. The demonstratives (this, these, that, those) and adverbs (here, there younder) are commonly used here.

c. **Temporary Deixis:** This is also called time deixis and used to point to a time. These are expressed by adverbs of time (now, then, tomorrow, last year etc).

d. **Discourse Deixis:** This is also called text deixis. Levinson (1983:85) notes that "It concerns the use of expressions within some utterance to refer to some portion of the discourse that contains that utterance (including the utterance itself)". For example:I have not been there for weeks now. That is all I know.'That' in the sentence above refers to the utterance "I have not been there for weeks now".

e. Social Deixis: This refers to the use of deictic devices to encode social relationships and social distinctions between the persons or things referred to. Examples include the use of title like 'His Grace', 'Your Worship, 'Mr. President' etc. to refer to Archbishop, Magistrate and President respectively.

Reference

According to Ojetunde (2014) discourse reference is used to indicate some items that are used to refer to some other items in a discourse. Reference is an act by which a speaker or writer uses language to enable a reader or listener to identify something. In the words of Mey (2001:52) "We use language to refer to persons and

things directly or indirectly". Allerton (1979:81) remarks that a listener makes an anaphoric (backward) or cataphoric (forward) reference in discourse in order to reconstruct missing information. He illustrates with these examples:

(A.1) (I've arranged for Peter to call in later). I thought you might like to have a word with him.

(A.2) I thought you might like to have a word with him. (So, I've arranged for Peter to call in later).

(B) (Sees listener has noticed Peter standing in the doorway). I thought you might like to have a word with him.

In the first two examples, the listener refers to the surrounding text in order to find out the identity of the "him" referred to. In (A1), he makes an anaphoric reference. But in (A.2), he makes a cataphoric reference. In the last example, we have a situational (or exophoric) reference where the listener is required to look around and think backwards or forwards in time for the most obvious referent.

Presupposition

This underscores what the speaker assumes the hearer knows or what is true. Messages are often designed on the assumption of what is true or what we believe the hearer or reader knows. To Verschueren (2003:27), it is the "aspect of meaning that must be pre-supposed, understood, taken for granted for an utterance to make sense". According to Yule (1996:137), "if someone tells you, your brother is waiting outside for you, there is an obvious presupposition that you have a brother". Similarly, if I ask "why did John arrive late?" there is an obvious presupposition that John arrived late.

Inference

According to Verschueren (2003:30) pragmatic inference is "the process of inferring meaning in a way that cannot be imagined without taking contextual information into account". It refers to the additional information which the listener or reader uses to link what the speaker or writer said to what he means to say. Brown and Yule (1983:61) define inference "as the process by which the discourse analyst arrives at an interpretation for utterances since he has no direct access to a speaker's intended meaning in producing an utterance." Through the process of deductions, the analyst makes inferences which are likely to be justified. The following dialogue between two students in a classroom illustrates an inference:

Chika: Could you lend me your Soyinka

Jane: It is on my desk.

It is through inference that both of them interpret "Soyinka" and 'it' as a book written by Wole Soyinka.

Implicature

This is a term used by Grice (1975) to distinguish the difference between what a speaker says as different from what he means or implies. There are conventional and conversational implicatures. Conventional implicature refers to implicit meaning that is determined by decoding the conventional meaning of the words used (Osuafor 2003). For instance, 'democracy' as a term has the implication of constitutional (as opposed to dictatorial) leadership. Under conversational implicature, Grice (1975:44) provides the tool for describing the type of meaning a speaker may convey by flouting some maxims derived from a general principle of conversation. Grice notes that the meaning of most utterances in a speech situation cannot be interpreted through an appeal to linguistic knowledge or conventional behaviour. Thus, it is expected that participants in a conversation are co-operating with each other by not saying more or less than is necessary, saying only what is true or what they have evidence for; saying something relevant; being orderly and clear. These expectations are generally referred to as the conversational maximsor co-operative principle and are articulated as maxims of quantity, quality, relevance and manner.The maxim of quantity requires the speaker to give only necessary information and not to over stuff the information channel.

The maxim of quality requires participants to say only what they believe is true and not what they lack adequate knowledge or evidence for.The maxim of relevance requires participants in a discourse situation to direct their contribution to issues related or connected to the subject matter.The maxim of manner holds that speakers should be orderly and careful in their speech. Speakers observe the co-operative principle when they adhere to the above Gricean maxims.

Theoretical Framework

This paper is anchored on the contextual theory. This theory of language was developed by J.R Firth, initially along sides Malinowski (1939). In their view, in order to completely interpret a given piece of language, so many things must be taken into consideration, and one of such is context. Context involves the language, its properties, the people involved, time and place and any extra information that aids interpretation.

Amos (2015:154) asserts that "no study of pragmatics is ever complete without a mention of context. Because of the important relationship between the two, one can simply conclude that "the general study of how context affects linguistic interpretation is pragmatics". Finegan aptly captures this fact when he says:

A grammarian can be viewed as a coin whose two sides are expression of meaning But language has a third face, so important in producing and interpreting utterances that it can override all else. That face is context and only in a particular context can an expression convey a speaker's intended meaning and be interpreted correctly by a hearer.

Ogbulogo (2005:7) observes that "the meaning of certain classes of words could be lost if meaning were treated as just entities". This is to say that a given utterance can only be interpreted to make meaning within a given situation of use but not because of the tag it bears or the grammatical items that it carries.Malinowski (1946) in Butari (2006:11) describes context as "the immediate concrete circumstances about what was going on while the words are said". As far as contextual analysis is concerned, meaning may prove inconsistent because something that is seen in one context may prove to be another in a different context. For instance, the word 'deficit' ordinarily means 'the amount by which payments exceed receipts'. However, in the context of sports reports, the meaning of the word changes:

Betis was trailing 4-0 in the 79th minute when on-loan Arsenal forward, Joel Campbell reduced the deficit, before two quickfire goals from Antonio and Tello made it 4-3 with six minutes of normal time remaining.

It is clear from the above context that the word "deficit" has nothing to do with "payments". Rather it means "margin" or "gap" in the number of goals scored. Thus, context of use aids, in no small measure, the interpretation of sports texts. In the words of Emezue, (1999:51) "a text is taken to constitute what we may define as language that is functional in the context of use". Sports reporters often take cognizance of the social context in which the game takes place.

Design/Methodology

This study is descriptive research. As a descriptive study, it attempts to unravel the essential elements and characteristics of the phenomenon under study. The study is aimed at investigating the pragmatic features of the language of sports. Data for the research were drawn from selected Nigerian tabloids: Sporting Sun, Sporting Life, Soccer Star, The Sun, and The Nation. The researcher explored the pragmatic strategies in the above sports

documents. The study looked at the pragmatic devices often employed by sports journalists in presenting their stories.

Data Presentation and Analysis

The corpus for this study comprises sports reports assembled from selected Nigerian tabloids. For the purpose of this analysis, the Brown and Yule (1983) model of pragmatic analysis is adopted. According to this model, reference, presupposition, implicature and inference are the pragmatic concepts in the analysis of discourse.

Data A (Presupposition)

1) Manchester City is reportedly expected to take on Barcelona for the signature of Borussia Dortmund midfielder, Julian Weigi next summer.

2) The Midfielder had made four appearances so far in the current campaign, scoring one goal.
(Sporting Sun, Wednesday, October 18, 2017).

Understanding the above text will largely depend on the reader's knowledge of the world of football. Here, the writer assumes (presupposes) that the reader is an ardent follower of the game of football. Ordinarily, Manchester City is a community in England just as Barcelona is a city in Spain. But it is not the cities that are referred to here, but football clubs based in these cities. Thus, the use of Barcelona and Manchester City in the data is based on the assumption of what the writer believes the reader knows.The second sentence in the data is also based on presupposition. To understand the phrase "current campaign", the reader has to rely on his knowledge of what is currently taking place in the football world. It is an appeal to the social context that helps the reader to interpret the phrase as "on going football league season".

Data B (Implicature)

Dembele casts doubt on Tottenham future

1. Reporter: Did the referee meet your expectations?
Coach: Well, I'm not sure he has handled a game of this magnitude before.

2. Musa Dembele has cast doubt over his Tottlenham future with no contract extension talks planned.

3. Dembele was already sparking talks of interest from Serie A champions, Juventus and appears reluctant to close the exit door. (Sporting Life January 9, 2018).

In the above dialogue (data 1), the speaker (coach) deliberately flouts a conversational maxim to convey an additional meaning not expressed literally. Here, the coach flouts the maxim of relevance as his response to the question is not in any way related to the question asked. However, his response has an additional non literal meaing, such as: "He is inexperienced".

Data 2 and 3 violate the maxims of quantity and manner. The utterances are not only ambiguous, but also superfluous. Whereas utterance 2 has the implicature: "Dembele will leave Tottenham", utterance 3 implicates that "Dembele is keen on joining Juventus". Both utterances contain so many unnecessary words and expressions which do not clearly express the speaker's intention.

Oftentimes, sports are guilty of flouting certain maxims as shown above. When this happens, sports texts may become unappealing to readers.

Data C Inference
Leicester City Sacks Shakespeare

1. Leicester City has sacked their manager, Craig Shakespeare.

2. Shakespeare took over the club from Claudio Ranieri after he was sacked last February.

3 . In the Summer, the club gave him the job on a permanent basis.

4.However, their relationship had deteriorated and Shakespeare had been relieved of his duties.

5. The Foxes won just one of their first eight league games while losing four--- a run that had seen them fell into the relegation zone for the first time since April, 2015, when Nigel Pearson was manager.

(The Sun, Wednesday, October 18, 2017)

Inference as a deduction process allows the reader to deduce meaning from what is written in a text. A study of data C shows that the reporter has not explicitly stated the reason for the manager's sack. It is only through deduction, that the reader understands that the coach was sacked due to poor performance. It is still possible to understand this interpretation because there is evidence for the deduction.

Data D: Reference
Becker Appears in Court

Becker was said to owe a substantial sum during his case at theBankrupcy and Companies Court Hearing in London, which lasted just 30 minutes.The 49-year-old was not present for the hearing with a judge describing him as someone who had tried to bury his "head in the sand".The tennis ace'slawyers had urged the court to adjourn the case for 28 days to enable him raise a Six Million Euro mortgage on a property in Spain.(The Nation, Thursday June 22, 2017).

Readers constantly make reference in texts in order to reconstruct missing information. In the above data, reference is maintained by the italicized words. In the first stanza, hisis the anaphoric reference to the antecedent Becker. Reference is also sustained in stanza two by the expression, The 49-year-oldand the pronouns, himand his: The trend continues in the last stanza where the writer continues to maintain reference to Becker by using the expression, the tennis aceand the pronoun him. These elements help to connect the referent, "Becker" to the world of sports. The use of reference, not only helps to achieve cohesion in texts, but also makes reading very interesting.

CONCLUSION

Pragmatics, in linguistic parlance, is a major approach to the study of meaning. It studies contextual interpretation of signs--an aspect of meaning not covered by semantic theory (Eruchalu, 2012:2014). Thus, pragmatics seeks to discover how users employ particular situations in which utterances are made to interpret them.

Sports journalists often employ words and expressions to match the subject, the mood, the context and space of the events being described or the needs of the reader. Language is carefully chosen to arouse and maintain the interest of the reading public throughout the reading. This is usually achieved with pragmatic features such as implicature, reference, inference and presupposition among others. A well-constructed sports text is one which takes into account the background knowledge which is assumed to be shared by the writer and the reader, and which aids the reader to decode the meaning of the writer's report.

REFERENCES

Allerton, D.J (1979). Essentials of grammatical theory: a concensus view of syntax and morphology. London: Routtledge.

Amos, D.T (2015:) A pragmatic analysis of Akurmi names and naming. Voices: a journal of English Studies, Kaduna State University. 7 (2).

Awurumibe, D (1997). Sports in international relations. M.Sc thesis, Abia State University, Uturu.

Becker appears in court (2017, June 22) The Nation p.33.

Brown, G and Yule, G (1983). Discourse Analysis. Cambridge: Cambridge University Press.

Butari, U. (2006). A pragmatic study of Jukun proverbs. An unpublished M.A Thesis, Ahmadu Bello University, Zaria.

City targets Weigi (2017, June 13) Sporting Sun P. 8

Crystal, A and Davy, D. (1983) Advanced

conversational English. London: Logman.
Crystal, D. (1997). Cambridge encyclopedia of language. Cambrige: C.U.P
Dembele casts doubt on Tottenham future (2018, January 9) Sporting Life P. 6
Ejele, J.E (1996). An introductory course on language. Port-Harcourt: UNIPORT Press.
Emezue, C.I (1999). Understanding discourse analysis. Owerri: Creature Educational Management Consultants.
Eruchalu, G.I (2012). An Introduction to general linguistics. Awka: FAB Educational Books.
Finnegan, E. (2004) Language, its structure and use. Boston: Thomson.
Grice, H.P (1975) "Logic and Conversation" in Cole, P and Morgan, P.(Eds) Syntax and Semantics: Speech Acts. New York: Academy Press.
Ike, N.J (2007). Sociolinguistics. Abuja: Wilbest Educational Services.
Jaszczolt, K.M (2002:19). Semantics and Pragmatics: meaning in language and discourse. Harlow: Pearson Education.
Leicester City sacks Shakespeare. (2016, October 18) The Sun P.51
Levinson, S.C (1983) Pragmatics. Cambridge: CUP
Martinez out for two matches (2017, October 18) Soccer Star P.12
Mey, J.L (2001). Pragmatics: An Introduction .U.S.A: Blackwell Publishing.
Ogbulogo, C. (2005) Concepts in semantics. Lagos: Sam Iroanusi.
Ojo, F.A and Babayo, M.A. (2014). Grice's conversation principle: An application on doctor-patient communication. Voices: A Journal of English Studies, Kaduna State University, 1(1).
Osisanwo, W.C (2003). Discourse analysis and pragmatics. Lagos: Fetop Publishers.
Osuafor, C.C (2003). Principles of discourse analysis. Port-Harcourt: Project and Books Ltd.
Prasad, T. (2008). A Course in linguistics. New Delhi: PHI.
Strangott, E and Patt, M.L (1980) Linguistics for students of literature. New York: Harcourt, Brace, Javonovich.
Udofot, I. (1998) English Semantics. Uyo: Scholars.
Verschueren, J (2003). Understanding Pragmatics. London: Hodder Arnold.
Yule, G (1996). The Study of Language. Cambridge: Cambridge University Press.

AN OPTIMIZED CLASSIFICATION OF BREAST CANCER: USING TREE-BASED PIPELINE OPTIMIZATION TOOL

A. A. ODUMOSU; Q. A. ALATISHE
&
A. A. ADEDEJI
Department of Computer Science,
Abraham Adesanya Polytechnic,
Ijebu-Igbo, Ogun State, Nigeria
Corresponding Author:
adesoladapo2000@gmail.com

Abstract
Breast cancer is the most common cancer in women both in developed and developing countries. Therefore, early detection to improve breast cancer outcomes and survival remains a cornerstone of breast cancer control units. With the rapid increase in data availability, scientists are realizing that Machine Learning (ML) isa very important tool in variety of fields including the health sector. This introduced the idea of training a machine to behave like an expert in the field. In this paper, the model was developed by training it with a dataset(Wisconsin Breast Cancer dataset) containing 32 genetic cancers (Benign and Malignant) with 32 traits and 569 cases using the Evolutionary Algorithm (EA) with the help of a Tree Based Pipeline Tool (TPOT) to choose the appropriate model after looking at the various benchmarks. ExtraTreesClassifier model was selected by TPOT with 100 as the number of speculators built with Anaconda Python with an accuracy of 0.972%. Patient data were used to test the model and the results demonstrated the power of the Evolutionary Algorithm to classify breast cancer using available clinical data. With this high accuracy, it is now possible to identify the type of cancer in a patient from the results of laboratory tests without the intervention of a specialist.

Keywords: *Breast cancer, Machine Learning (ML), Evolutionary Algorithm (EA), Tree-based Pipeline Optimization Tool (TPOT), Extra Trees Classifier*

INTRODUCTION

The most common type of cancer is breast cancer. It is known that it affects more than two million women every year. Breast cancer commonly presents as a solid mass that could be considered (by inspection, palpation or radiologically) as being different from the surrounding tissue (Ghanbariet. al., 2020). About 70% of cancer deaths occur in low- and middle-income countries (Gayathri et. al., 2016). The most common type of cancer in women is breast, lung and colorectal which completely represent half of all cancer cases. Also, 30% of all new cases of cancer diagnoses in women are breast cancer.

Cancerous cells are detected through various tests such as MRI, mammogram, ultrasound and biopsy. The database used for this project contains computer-generated digital features of the Fine Needle Apiration (FNA) chest weight biopsy.

Diagnosis of breast cancer is done by classifying the tumors which can be either benign or malignant. Malignant tumors are more harmful than the Benign.Unfortunately, not all doctors are able to differentiate

between benign and malignant tumorsand to detect this might take up to 48 hours. In the medical field, more sensitive approaches such as Classification and Data Mining methods are effective ways to categorize data. Computer and machine learning tools can be used extensively to help solve health care problems by helping doctors diagnose, and predict disease early by building expert systems.

Computer Aided Diagnosis (CAD) and medical expert system tools have become one of the leading areas of research in the field of medical diagnostics (Pang et. al., 2015). This led to the use of machines to learn to diagnose and predict various diseases because it reduces human error and saves time.

TPOT is an evolutionary algorithm, a type of algorithm inspired by biological evolution. This evolution algorithm seeks to find the best solution to the problem of optimization. While biological evolution aims at procreationof humans, TPOT aim is tofind machine learning pipeline which optimizes a performance measure, such as the accuracy of the model constructed. With the help of TPOT, the best solution (model) will be selected among others.

Related Works

Salmeet. al., (2015) proposed a BATELM a Bio-inspired model that combines Bat Algorithm (BAT) and Extreme Learning Machines (ELM) in the Wisconsin Database of Cancer Breast Prognostic (WBCP) which is a numerical database. The concept of BAT and ELM which had many advantages compared to the existing capabilities of their variants had encouraged them to develop a model that could predict medical data with high accuracy and minimal error. The accuracy was found to be 95.7% with an RMSE of 0.32. Another objective was to predict the recurrence time, the result was found to be 93.75% accuracy with a RMSE of 0.30.

Pan (2018) used a rank-based stochastic pooling neural network (RSPNN) to detect diseased breasts. In their paper, the authors compared three activation functions and six pooling techniques. Their best model achieved an accuracy of 94.0%. In addition to these studies, there are also numerous studies on information embedding (Li et. al., 2019, Zhang et. al., 2019, Zhang et. al., 2018, Wen et. al., 2020, Zhang et. al., 2020, Shen et. al., 2021)

Sivagamiet. al. (2015) developed a hybrid classifier; Support Vector Machines and decision trees at WEKA and achieved 91% accuracy.Moh'dRasoulet. al., (2016)wrote a paper on detecting breast cancer using a machine learning algorithm. In that paper they used the concept of image processing and two machine learning algorithms. The algorithms are Logistic Regression (LR) and Back Propagation Neural Network (BPNN) to detect breast cancer. The output was 0 for normal images and 1 for tumor images. Thus the accuracy of cancer detection using LR and BPNN algorithm exceeds 93%.

Gayathri et. al., (2015) used Linear Discriminant Analysis to select features and trained the datasets using one of the fuzzy inference methods called the Mamdani Fuzzy inference model and achieved 93% accuracy.

Hiba et. al., (2016) also produced a paper that predicted the risk and diagnosis of breast cancer using the following Machine Learning (ML) algorithms; Support Vector Machine (SVM), Naïve Bayes (NB), K-Nearest Neighbor (KNN), Decision Tree algorithms.The classification was based on data mining methods and used the Wisconsin breast cancer dataset containing 699 data. They concluded that among all the algorithms used, SVM gave the highest accuracy rate of 97.13%.

Gayathri et. al., (2016), presented the detection of breast cancer using the Relevance Vector Machine and obtained 97% accuracy using Wisconsin's original dataset

with 699 instances and 11 attributes.Islam et. al., (2020) compared five supervised machine learning methods called support vector machine (SVM), K-nearest neighbors, Random Forests, Artificial Neural Networks (ANNs) and Logistic Regression. Their results showed that ANNs obtained the highest accuracy, precision, and F1 score of 98.57%, 97.82%, and 0.9890, respectively, while 97.14%, 95.65%, and 0.9777 accuracy, precision, F1 score is acquired by SVM, respectively.

Li et. al., (2021) developed a breast cancer prediction model and model performance using ML that can be measured by the number of validated outcomes. Thirty-one studies that met the inclusion process were included, most of which were published after 2013. The most commonly used ML methods were Decision Trees (19 subjects, 61.3%), ANNs (18 studies, 58.1%), SVM (16 studies, 51.6%), and Ensemble learning (10 studies, 32.3%). The average sample size was 37256 (range 200 to 659820) patients, and the median predictor was 16 (range 3 to 625). The accuracy of 29 studies shows from 0.510 to 0.971. The sensitivity of 25 studies ranges from 0.037 to 1. The specificity of 24 studies ranges from 0.008 to 0.993. The AUC of 20 studies ranges from 0.500 to 0.972. Lastly,the precision of 6 studies ranges from 0.549 to 1. All models are internally certified, and only one was externally certified.

METHODOLOGY

The dataset used was Wisconsin Breast Cancer dataset with 32 attributes and 569 data's. The inputs are: ID number, Diagnosis (M = malignant, B = benign). Ten real-valued features are computed for each cell nucleus: radius (mean of distances from centre to points on the perimeter), texture (standard deviation of gray-scale values), perimeter, area, smoothness (local variation in radius lengths), compactness (perimeter ^2 / area - 1.0), concavity (severity of concave portions of the contour), concave points (number of concave portions of the contour), symmetry, fractal dimension ("coastline approximation" - 1).

Algorithm

1. Import libraries
2. Import Wisconsin Breast Cancer dataset
3. Clean and validate dataset
4. Select a random initial population P_t (S)
5. While (Stopping Criteria are NOT met) **do**
6. Evaluate fitness of the population
7. Select parents using a stochastic selection method
8. Apply crossover and mutation
9. Update P_t, ND and set t=t+1
10. End while
11. Return ND and P_t
12. End.

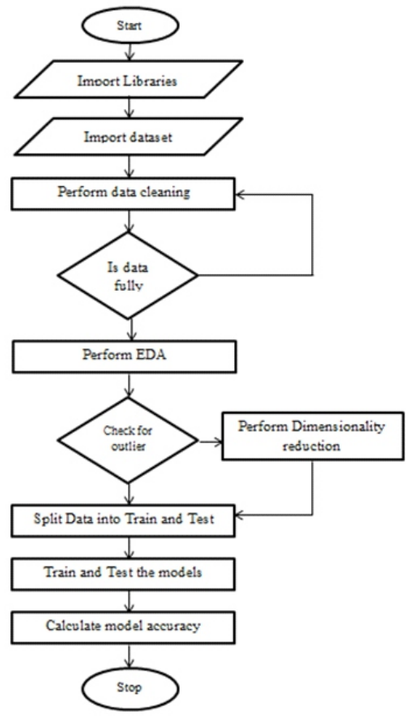


Figure 1: System Flowchart

Components of the System Model
Anaconda is a free and open source distribution of Python and R computer programming languages for scientific computing (data science, machine learning applications, big data processing, prediction analytics, etc.), which aims to simplify package management and deployment. Distribution includes data science packages suitable for Windows, Linux, and MacOS.

Hardware Requirements:

i. Processor: Core TM(i5)
ii. Processor Speed: 2.53 GHz
iii. RAM: 6.00 GB

Software Requirements:

i. Operating system: Windows 10
ii. Coding Language: Python
iii. Tool: Anaconda

Experimental Result

Best pipeline: ExtraTreeClassifier(BernoulliNB(VarianceThreshold(PolynomialFeatures(input_matrix, degree=2, include_bias=False, interaction_only=False), threshold=0.001), alpha=100.0, fit_prior=True), bootstrap=False, criterion=entropy, max_features=0.2, min_samples_leaf=13, min_samples_split=14, n_estimators=100).

```
TPOTClassifier(config_dict=None, crossover_rate=0.1, cv=5,
        disable_update_check=False, early_stop=None, generations=5,
        log_file=<ipykernel.iostream.OutStream object at 0x00000020CA8A62048>,
        max_eval_time_mins=5, max_time_mins=None, memory=None,
        mutation_rate=0.9, n_jobs=1, offspring_size=None,
        periodic_checkpoint_folder=None, population_size=100,
        random_state=None, scoring=None, subsample=1.0, template=None,
        use_dask=False, verbosity=2, warm_start=False)
```

Figure 2: The TPOT Classifier Configuration of the Best Pipeline

```
tpot.score(alat.drop('type',axis=1).loc[validation_indices].values,
        alat.loc[validation_indices, 'type'].values)

0.972027972027972
```

Figure 3: The Score from TPOT after the Fifth Generation.

```
etc.score(x_test_b,y_test_b)

0.972027972027972
```

Figure 4: The Test Result Gotten after Using the Configuration from TPOT.

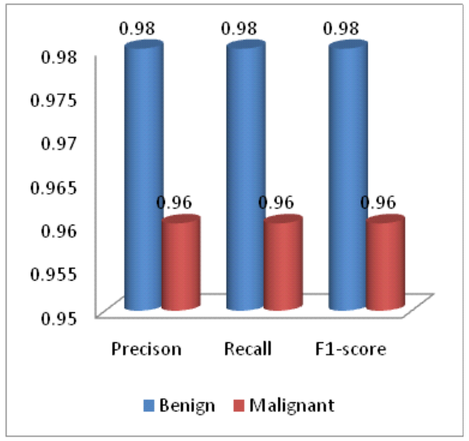


Figure 5: A Clustered Cylinder Showing the Precision, Recall and F1-Score from the Classification Report

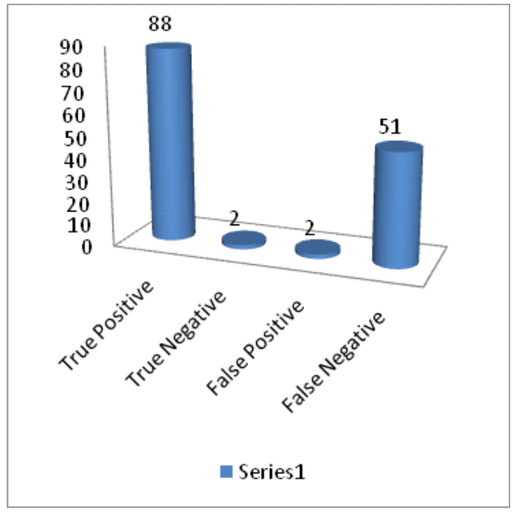


Figure 6: Clustered Cylinder Showing the Results from the Confusion Matrix Values

A patient's data was used to test the developed model and it was seen that the patient was suffering from Benign and not Malignant because the prediction probability for Benign is higher than that of Malignant (Fig.7). Also, somefeatures that predict Benign have higher value compared to that of Malignant.

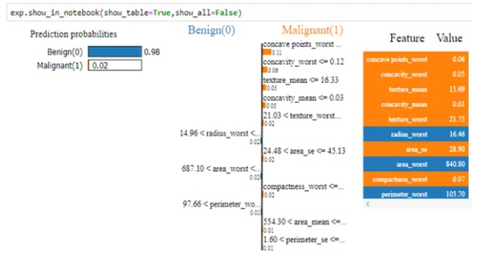


Figure 7: Testing the Developed Model with a Patient's Data Using LIME

CONCLUSION AND FUTURE WORKS

Extremely Randomized Tree is gotten by adding one more step to randomization. While similar to ordinary random forests in that they are an ensemble of individual trees, there are two main differences first, each tree is trained using the whole learning sample (rather than a bootstrap sample), and second, the top-down splitting in the tree learner is randomized. This value was selected from a uniform distribution within the feature's empirical range (in the tree's training set). Then, of all the randomly generated splits, the split that yields the highest score is chosen to split the node. Similar to ordinary random forests, the number of randomly selected features to be considered at each node can be specified.

From the generated TPOT output in figure 4 above, an accuracy of**0.972** is gotten which is very close to perfection. Also the confusion matrix results in figure 6 indicated very low False Positive and True Negative values, and a high True Positive value of (**0.88**) a good model evaluation result.Consequently, the high value of the F1- score (**0.98)** in Figure 5 collaborated or conformed to theefficiency of the model built. With the high accuracy of the model, employing TPOT to other datasets would be the next focus in order to generate an optimum model for best accuracy.

REFERENCES

Alarabeyyat, A., &Alhanahnah, M. (2016). Breast cancer detection using k-nearest neighbor machine learning algorithm. In 2016 9th International Conference on Developments in eSystems Engineering (DeSE) (pp. 35-39). IEEE.

Gayathri, B. M., & Sumathi, C. P. (2015). Mamdani fuzzy inference system for breast cancer risk detection. In 2015 IEEE International Conference on Computational Intelligence and Computing Research (ICCIC) (1-6).IEEE.

Gayathri, B. M., & Sumathi, C. P. (2016). Comparative study of relevance vector machine with various machine learning techniques used for detecting breast cancer. In 2016 IEEE International Conference on Computational Intelligence and Computing Research (ICCIC) (1-5).IEEE.

Ghanbari, A., Rahmatpour, P., Hosseini, N., & Khalili, M. (2020). Social Determinants of Breast Cancer Screening among Married Women: A Cross-Sectional Study. Journal of Research in Health Sciences, 20, 5. Article ID: e00467, Win.

Hiba, C. H. O. U. G. R. A. D., Hamid, Z. O. U. A. K. I., & Omar, A. L. H. E. Y. A. N. E. (2016). An improved breast tissue density classification framework using bag of features model. In 2016 4th IEEE International Colloquium on Information Science and Technology (CiSt) (405-409).IEEE.

Islam, M. M., Haque, M. R., Iqbal, H., Hasan, M. M., Hasan, M., & Kabir, M. N. (2020).

Breast cancer prediction: A comparative study using machine learning techniques. SN COMPUT SCI., 1(290), 1-14. https://doi.org/10.100/s42979-020-00 305-w

Li, J., Zhou, Z., Dong, J., Fu, Y., Li, Y., Luan, Z., & Peng, X. (2021). Predicting breast cancer 5-year survival using machine learning: A systematic review.PloS one, 16(4), e0250370.

Li, Z., Zhang, Z., Qin, J., Zhang, Z., & Shao, L. (2019). Discriminative fisher embedding dictionary learning algorithm for object Recognition. IEEE transactions on neural networks and learning systems.Pan, C. (2018). Abnormal breast identification by nine-layer convolutional neural network with parametric rectified linear unit and rank-based stochastic pooling. Journal of Computational Science, 27, 57–68.

Pang, Z., Zhu, D., Chen, D., Li, L., & Shao, Y. (2015). A Computer-Aided Diagnosis System for Dynamic Contrast-Enhanced MR Images Based on Level Set Segmentation and Relief Feature Selection. Comput.Math.Methods Medicine, 2015, 450531-1.

Salma, M. U. (2015). BAT-ELM: A Bio Inspired Model for Prediction of Breast Cancer Data. In 2015 International Conference on Applied and Theoretical Computing and Communication Technology (iCATccT) (501-506).IEEE.

Sivakami, K., & Saraswathi, N. (2015). Mining Big Data: Breast Cancer Prediction Using DT-SVM Hybrid Model. International Journal of Scientific Engineering and Applied Science (IJSEAS), 1(5), 418-429.

Zhang, Y.-D., Satapathy, S. C., Guttery, D. S., Górriz, J. M., &Wang, S.-H (2021): Improved Breast Cancer Classification through Combining Graph Convolutional Network and Convolutional Neural Network. Information Processing &Management, 58(2), 102439. Doi:10.1016/J.Ipm.2020.102439

ANALYSIS OF THE GOAL OF ETHICS EDUCATION AMONG ACCOUNTANCY STAFF AND STUDENTS OF FEDERAL POLYTECHNIC BIDA, NIGER STATE

SOLANKE, Abiola Abosede
Department of Accountancy,
The Federal Polytechnic, Bida, Nigeria
Email: mosunmolal1974@gmail.com

Abstract
Common unethical practice in the accounting profession includes lack ofpositive professional attributes such as integrity, competence, independence, objectivity and confidentiality. Suchunethical practices have serious consequences and implications for future credibility and integrity of the accounting profession. One of the strategies for eliminating these unethical practices is the implementation of ethics education within the curriculum of the accounting programme in tertiary institutions. However, evidence is scanty on how accounting students and academic staff perceive the goal of the ethics education strategy.The study investigated the limitation by investigating the perception and attitude of student and academic staff of Accountancy departmentin Federal Polytechnic, Bida, Niger State. The study employed primary data with the aid of a structured questionnaire. A sample size of 250 was purposively selected for the study. The selection was purposive because the subject of investigation required awareness of the ethics education in the Accountancy programme. The outcome variable was perception dichotomised into positive and negative perception. Data were analysed using frequency and percentages, as well as analytic weighted mean. The result showed that the goal of ethics education was perceived to be having a positive impact on accounting staff and students. The study concluded that it is important to strengthen the existing ethics education in tertiary institutions to enhance the overall goal of ethics education in the Accounting Profession.

Keywords: Perception, Goal, Awareness, Attitude, Ethics Education, Accounting profession

INTRODUCTION

Dealing with ethical issues in accounting education has begun to gain recognitionin the profession. What is right and wrong or what is good or bad professional practice has become an issue on daily basis as student and staff needs to conduct themselves within the limits of good ethical standards education.Karen (2018) described ethics as a part of philosophy that study human behavior and beings. It is a systematic approach to understanding, analyzing and differentiating matters of right and wrong, good and bad and admirable and deplorable as they relate to the well-being of and the relationship within perceive beings. Recent accounting standard and corporate failure have brought about research interest on ethics education among accountants globally.

The need for ethics education to be inculcated

into the teaching curriculum syllabus in tertiary institutions has become imperative to enable students prepare adequately to confronting ethical issues that may arise from future practice, as they must be grounded in ethics education in accounting so as to enhance moral credibility of future Accountants.Since ethics is a study of moral values and judgment (Rnjheta, Abdul and Zubiru 2017). According to Wyatt (2004), the issue revolving around ethics education in accounting is not a novel subject to the profession.However, the contemporary eruption of scandal surrounding the industry such as Enron and Arthur Andersen, and the subsequent passing of Sarbanes-Oxley Act in 2002 forced the industry to reexamine the ethical standards, or lack thereof, that accounting professionals were required to uphold. Arthur Andersen's collapse made evident the profession's ineffective attitude regarding professionalism.

Ethics is the rule involved in the actions of people and how these actions affect both ones welfare and the welfare of others. Ethics in accounting is narrowly identified with personal integrity or professionalism. Changgo (2009), Usang, Agbor andKabiru (2013) and Ofonime (2013)referred to ethics education in accounting to be a social life which influences the relationship between peoples on how to make right decision in contexts where ethical value, like integrity and professionalism conflict with other payoffs. Banerjee and Ercetin (2014) described ethics education in accounting to be a code of system or morals that differentiate between good and bad, wrong and rights about people's actions. Oyebisi, Wisdom, Ayodotun, Abimbola and Eche (2018) described it to be how person, community, organization generally communicate with one another and interact in a particular way.Obiora (2017) stressed thatethicseducation is a means through which the individual in the society gain access to opportunities, resources and Power which increase the value chain of any nation.

Statement of the Problem

The importance of ethics in accounting education is tailored towards improving individual student's ethical disposition before they are certified as accountant (Miller & Beker, 2011). According to Saputra (2013), ethics education is an important key that can be used in developing accounting profession in Nigeria. An ethics education is a relationship between perspective and descriptive, which is how people ought to act and not how people really act. Evidence is scanty on how accounting student and academic staff perceive the goal of the ethics education strategy. Aexandre, Liciane&Rogerio (2017) Abdulahi, Mubaraq& Ahmad (2018) Jushua& Xu (2018) have examined ethics education in different perspective but none of the studies examined goal of ethics education in tertiary institutions. This study addresses the limitation by assessing the perception and attitude of student and academic staff of Accountancy Department, Federal Polytechnic, Bida, to the goal of ethics education.

Research questions

1. To what extent does perceptiondiffer among students and staff of accounting?
2. Do gender and status account for differences in the perception of ethics education goal?

Objectives

1. To assess differences in perception of the goal of ethics education among accounting students and staff
2. To assess gender and status differences in the perception of ethics education goal among students and staff

Literature Review

Prior researcher has reported mixed findings on ethics education and the impact on students while other studies reported a positive relationship between student's ethical decision and ethics training and few

reported otherwise. Alexandre, LicianeandRogerio (2017) evaluate student's perception of professional ethics and founding's indicated that individual analyses in the study significantly influence ethical attitudes. The implication of this result is that ethical education has an important impact on the conduct and perception of the ethics of future professionals. Another study that makessimilar findings is that of Farah andRofayda (2018) who investigated the Lebanese professional perception with curriculum and study reveals that ethics education has positive correlation on Lebanese professional. This result shows that professional perception of accounting ethics education acknowledged and acceptedthe universities accounting program.

Empirical Review

Abdulahi, Mubaraqand Ahmad (2018) examined the impact of ethics education on the accounting student of universities in Nigeria. The study adopts a survey research design with the population of all accounting who have offered or offering courses in accounting ethics in the universities located in Kwara state using one way analysis of variance (ANOVA) and Kruskal-Wallis test. The study revealed positive relationship between learning of ethics and accounting students. However, theseresults indicated that learning of ethics in accounting education enhanced ethical consciousness, awareness, sensitivity and judgment making ability within the students with evidence that students agreed on the value-relevance of ethical education in other to resolve future ethical challenges in their practicing of their professions. Amelia (2017) empirically concluded that ethics education curriculum exists but they significantly differed from institution to institution.

Koumbladisand Okpara (2008) studied perception of ethical behavior among students in 5- year accounting programme and their view on the accounting profession in 21st century and beyond and founds out students are aware of the importance of ethics education and the effect on the economy as a whole, this makes student understand their responsibilities in connection to unethical issues or challenges. Jinhua and Xu (2018) found that ethics strength has minimum influence on the professional ethics perception of accounting. Umar andGungormus (2013) investigated accounting professional perceptions of ethics education awareness and result reveals most of the accountant practicing has not taking ethics education previously and conclude ethics education should be thought in secondary and high level in other for students to have the awareness from the starting point of education. Usang, Agbor andKabiru (2013) concluded some of the students are aware of ethics education, but the knowledge were not obtained from classroom but from other perspectives, this result shows that teaching of ethics education in accounting will produce ethically and responsible professional accountant in the nearest future

Martnov-BennieandMladenovie (2015) provided evidence whether providing an ethical decision making frame work alone or as part of comprehensive integrated ethics education effect on accounting student. Result reveals ethics frame work can only have impact on the student only if they have not been exposed to the frame work previously. The study of Low, Davey and Hooper (2008) found a negative result where it was indicated by the student that ethics education does not influence their ethical behavior. This means ethical education in accounting does not have any significant impact on their ethical attitude, though it should be included in their curriculum

Cooper, Leung, Dellaportas, Jackling and Wong (2008) provided significant evidence of group of students who have obtained formal knowledge in ethics education base on principles and rules. These findings indicated that students who are taught ethics education in accounting had

positive reactions to ethics education goal in accountancy. According to UwuigbeandOvia (2011) concluded ethics should be thought well as an independents course in the accounting curriculum so that future accountant would have imbedded in them, the required ethics needed in carrying out their responsibilities. This result is in line with the view of Warinda (2012) in his paper titled faculty views on the teaching of ethics to accounting students, the Zimbabwe perspective. Mele (2005) revealed goal of ethics education in accountancy is to impact on the ethical behavior of those receiving this education and not to provide theories to settle the future challenge, which is in line with the work of O'Leary (2000).

Khattab & El Hout (2018) in their study finds that ethics education is very important in their career in Lebaness and added a support to incorporate ethics education in the universities accounting programs. And Igbal, Furgan, Mapparessa&Tenriwaru (2019) concluded in their study that affectivity of ethics learning contributed to students' behavior and attitude in accounting practice. This finding shows importance is ethics education to accounting student and staff of tertiary institutions

Musa (2019) throw a support behind the study by recommending in their paper that corporate bodies should also established ethics compliance departments to enhance and increased the enforcement of ethical compliance in the various economy institutions including polytechnics and universities. Ahmed, Yusof, Mustaffa, Wahid & Halim (2019) findings reveled that Islamic ethics principle should also be incorporated in accounting curriculum in other to integrate Islamic ethics in their teaching and learning process. This means that ethics education should not be limited to accounting profession only. Hence it should be generalized in all courses

METHODOLOGY

The study utilised primary data with a structured questionnaire design for purposive sampling technique for moderate level of education and understanding of ethics education in accountancy. Data were collected from the FederalPolytechnic,Bida student and staff of accountancy department, two hundred and fifty (250) questionnaires were administered which resulted into sample size of 250. However, only 211 completed and returned questionnaire were analyzed in the study. The outcome variable was perception dichotomize into positive and negative perception.

Table 1: Distribution of Respondents' Characteristics

Characteristics	Frequency	Percentage
Gender		
Male	120	56.87
Female	91	43.13
Total		100.00
Status		
Staff	48	22.75
Students	163	77.25
Total		100.00
Age		
24 years	76	77.25
25-34	93	44.08
55 years above	42	19.91
Total	211	100.00

Table 2: Assessment of the Goal of Ethics Education among Accountancy Staff and Students of Federal Polytechnic Bida

Variables	Obs	Weight	Mean	SD	Gender		Status		Age-group	
					Z	p-value	Z	p-value	Kwallis	p-value
Statement 1 Ethics education is relevant	211	1028	5.98	1.64	-1.370	0.1708	-0.062	0.9501	0.607	0.7381
Statement 2 Including ethics in accounting education is important	211	1046	5.78	1.64	-1.110	0.2670	-0.364	0.7158	0.652	0.7219
Statement 3 Ethics education should be separated from general ethics	211	946	5.39	1.50	-1.208	0.2269	-2.010	0.0444*	9.736	0.0077*
Statement 4 The goals of ethics education in accounting should help students and staff relate accounting education to moral issues	211	1044	5.67	1.59	-1.452	0.1464	-0.401	0.6884	0.165	0.9209
Statement 5 The goals of ethics education in accounting should help student and staff develop a sense of moral obligation or responsibility	211	1096	5.88	1.36	1.006	0.3143	0.229	0.8185	0.249	0.8829
Statement 6 The goals of ethics education in accounting should help student and staff deal with real life ethical issues	211	1093	5.83	1.35	-1.175	0.2399	-0.470	0.6385	0.198	0.9058
Statement 7 The goals of ethics education in accounting should be to help student and staff recognize issues in accounting that have ethical implications	211	1127	5.89	1.28	0.554	0.5796	0.575	0.5652	0.083	0.9593
Statement 8 The goals of ethics education in accounting should be to set stage for change in ethical behavior	211	1133	5.94	1.19	0.852	0.3940	-1.179	0.2384	0.529	0.767
Statement 9 The goals of ethics education should be to help students and staff understand the history of ethics and its relationship to general field of ethics	211	1167	6.08	1.20	-1.384	0.1662	-0.518	0.6041	0.999	0.6068
Statement 10 The goals of ethics education in accounting should be to help student and staff learn to deal with exercising judgment in accounting practice	211	1196	6.21	1.11	-0.710	0.4780	0.242	0.8092	0.580	0.7481

RESULTS AND DISCUSSION OF FINDINGS

Table 1 summarized the characteristics of the respondents. More than half (56.87%) were male while the remaining (43.13%) were female. In addition, 22.75% of the respondents were students while more than three-quarter were student. The age distribution showed that slightly above one third (36.02%) were in age bracket less than 24years 44% belongs to age bracket 25 and 35years and (19.1%) were in age group 35years and above.

Table 2 presents the results of the assessment of goal of ethics education. The assessment was carried out with the aid of ten constructs (statements) thereafter, the relevance of the goal of ethics education were identified. All the questions were captured using seven-point Likert scale. Analytical weighted mean was employed to assess the relevance of goals of ethics education in accountancy. Analytic weights are inversely proportional to the variance of an observation typically, the weight are the numbers of the construct that give rise to the average. Thereafter, Mann-Whitney U test and Kruskal-Wallis test were used to examine the differences in the respondent's assessment of the goal of ethics education. Analytic weighted mean equals to 3.5 was considered as the cut-off point.

This implies that those constructs with weighted mean 3.5 and above are relevant. Similarly, weighted mean score that is close to seven indicated strong agreement with the relevant of the constructs while score close to one indicated strong disagreement with the statement. The findings as displayed in table two reflected that respondents strongly agreed with the entire ten constructs provided. This suggests that respondents agreed that the goal of ethics education among accountancy staff and student is relevant. Further analysis was carried out to examine whether existed difference on ethics education among respondents.

The difference was examined between male and female and the result indicated that

there was no difference in the assessment of goal of ethics education. Similarly, the difference was also examined by status, in terms of student and staff, the result also reveals that there is no difference in the assessment of goal of education between student and staff except statement three were difference existed. In addition, the age group result further showed that their existed no difference in assessment of goal of ethics according to age group except statement three where there existed a difference.

The study assessed perception of positive and negative of the goal of ethics education accountancy staff and student. In this study, it was found that both staff and student agreed that goal of ethic education is relevant in accountancy. This finding is consistent with previous studies that have demonstrated relevance of goal of ethics education in accountancy (Abdulahiet al. 2018). However, this finding contradicts that of Low et al. (2008) where negative perception of goal of education among accountancy was found. This implied that ethical education has no positive impact on their ethical attitude. In addition, assessment of goal of ethic education was not different among staff and student; male and female and across age group. It is against this setting that ethics education as a separate course should be thought in all tertiary institutions and supported by Nigerian accountancy student.

CONCLUSION AND RECOMMENDATIONS

Ethics education in accountancy will be of benefits to those who wish to be a practicing professional in future while discharging their professional duties. Initiatives should be developed to conquer any challenge ethics education will want to create in tertiary institutions running accounting programme and government should take steps to boost effective ethics education teaching in tertiary institutions in Nigeria.The study recommends that Ethics education in accountancy should be incorporated into the curriculum of accounting students both at the national and higher national diploma and should be thought separately as a course on its own.Government should develop dynamic initiatives for effective teaching of ethics education in tertiary institutions in Nigeria

REFERENCES

Alexandre, A.F.,Liciane, D. &Rogerio, J.S. (2017). Professional ethic and accounting students: analysis of intervening variables. Cad. EBADE.BR, 15, 2

Akadakpo, B.A &Enofe, A.O (2013). Impact of accounting ethics on the practice of accounting profession in Nigeria, Journal of Business and Management, 12, 1, 45-51

Amelia, L. (2017). An over view of accounting ethics course in undergraduate program curriculum in Indonesia, Akrual Journal Akutansi, 9, 2, 95-110

Ahmad, N. L., Yusof, R., Mustaffa, W. S. B., Wahid, H, B., & Halim, H. B. (2019). Developing ethical accounting students through incorporating Islamic ethics into accounting curriculum: the educator's perspectives. International Journal of Academic Research in Business and Social Sciences, 9, 11, 248-270.

Banerjee, S.&Ercetin, S.S. (2014). Chaos complexity and leader ship, Dordrecht; Springer

Science and Business Media Press Chang, O.H. (2009) accounting ethics education: an authentic value-based approach, The Journal of Value-Based Leadership, 2(2),1-11

Cooper, B.J, Leung, P., Dellaportas, B. &wong, G (2008).Ethics education for accounting students, a toolkit approach; Accounting Education, 17, 4, 405-430

Domene, M. (2005). Ethical education in accounting! Integrating rules! Values and virtues, Journal of Business Ethics, 5791, 97-109

Enofe, A.O, Utomwen, O.A, & Danjuma, E.J (2014). Ethics and accounting practice in Nigeria, International Journal of Advanced Academic Research-Social Sciences and Education 12, 1,45-51

Farah, K. &Rofayda, E. H. (2018) accounting professional perceptions of ethics education evidence from Lebanon. International Journal of Business and Management Studies, 7, 2, 143-148

Ha, J & Xu, C. (2018). Study on the influence mechanism and functions of accounting environment on accountant's professional ethics education. Educational Sciences: Theory and Practice, 18(5), 2438-2446

Ibidunni, O.M., Okere, W., Ibidunni, A., Joshua, A. & Okah, E. (2018). Accounting ethics and the performance of accounting firms in Lagos, Nigeria, Journal of Financial Mark, 2, 2,10-16

Ighal, M., Furgan, A. C., Mapparessa, N., &Teriwaru (2019). Ethics inclusion in accounting learning establishing a convergence model of educating stakeholdersmaccording to international federation of accountants. Universal Journal of Educational Research, 7, 10, 2068-2081. Doi:10.13189/ujer.2019.071004

Khattab, K., & El Hout, R. (2018). Accounting professionals' perceptions of ethics education: evidence from Lebanon. International Journal of Business and Management Studies, 7, 2, 143-158

Karen, P. (2018) teacher ethics code violations that result in licensure of certification sanction. A dissertation submitted in partial fulfillment of the requirements for the degree of Doctor of education learning and leading: University of Portland School of Education

Koumbladis, N. & Okpara, J.O (2008). Ethics and accounting profession: An exploratory study of accounting students in post-secondary institutions: International Review of Business Research Papers, 4, 5, 147-156

Low, M., Davey, H. &Hopeer, K (2008). Accounting scandals, ethical dilemma and educational challenges, Critical Perspectives on Accounting 19, 222-254

Miller, W. F. & Beker, D. A. (2011). Ethics in the curriculum; what is really being covered? American journal of business education 4, 10, 1-10

Martnov-Bennie, N. &Mladenovi, R. (2015). Investigation of impact of ethical frame work and Integrated ethics education on accounting students' ethical sensitivity and judgment; Journal of Business Ethics, 127, 1, 189-203

O' Leary, C. (2009). An empirical analysis of the positive impact of ethics teaching on accounting students, accounting education, 18(4-5), 505-520

Obiora, I. (2017). Ethics in higher education value-driven leaders for the future, Diya singh/christophstuckelberger (Eds0, Geneva: Globethics;net

Ofonime, J. (2013), Ethical consideration of human research. Novel Science International Journal of Medical Science, 1, 11-12, 304-307

Ranjheta, S., Abdul, B., & Zubair, H. (2017). Ethical behavior of accounting students and intention to make an academic offense. International Journal of Education, Learning and Training, 2, 1, 58-71. Doi:10.24924/iJelt/2017.04/v2.1ss/158.71

Saputra, (2020). Ethics in accounting education, is it matter?.International Conference on Business, Accounting, Finance and Economics (BAFE.2013). www.researchgate.net/publication

Salami,A.A.Sanni, M. & Uthman, A. B. (2018). Accounting ethics education in Nigeria: value-
improving or value-Deteriorating Too?Academic Journal of Economic Studies 4, 4, 116-126

Soetan, J. (2012). Accounting ethics and accounting education in selected tertiary institutions in Nigeria. International Journal of Business and General Management, 7, 3, 31-44

Sengur, E. D. (2008). Accounting ethics education in developing countries: the extent of accounting education in turkey, The Journal of International Research, 10, 53, 821-825

Togara, W. (2013). Faculty views on the teaching of ethics to accounting students; the Zimbabwean perspective, Asian Social Science, 9(2), 191-201

Uyar, A &Gungormus, A, H. (2013). Accounting professionals, perceptions of ethics education; Evidence from Turkey, 12(1) 61-75

Usang, O. U. E., Abgor, J. E. &Kabiru, I.D. (2013). Accounting ethics education in Nigeria: the case of two Nigeria Universities. Journal of Business Ethics Education, 3, 5-18

Uwuigbe, O. R. &Ovia, E. (2011). Ethics and accounting education in Nigeria: a study of selected universities, Indian Journal of Commerce and Management Studies, Special Issue, 23-27

Win,V. Y., Ismail, S. & Hamid, F.A (2014). Accounting educators' perceptions on ethics education in the accounting curriculum, Malaysian accounting review, 13, 1, 1-10

Wyatt, A.H. (2004). Accounting professionalism-they just don't get it. Accounting horizon, 18, 1,45-53

ANALYTICAL COMPARISON BETWEEN FIRST AND SECOND WAVES OF COVID-19 INFECTION RATE IN NIGERIA

MANSI Walamam Egbo
Bayelsa State Polytechnic, Aleibiri.
Email: egbomansi@yahoo.com

Abstract
Corona virus disease (COVID-19) IS a disease caused by virus known as SARS- COV-2. The disease emerged in Wuhan city of China in December, 2019. Since the disease outbreak, the world has never been the same as the disease has ruffled the global health system and economies. The world was gradually having decline in the infection rate in 2020 but suddenly there was an upsurge in emergence of new cases. As result, the spike in new case after the initial drop has been described as second wave of the disease. Nigeria also experiences this trend. In this study, statistical comparison of first and second waves of covid-19 infection rate has been evaluated. The aim of this study is to scientifically determine whether there is significant difference between first and second waves of COVID-19 infection rates in Nigeria. The first twenty weeks of covid-19 in the first and second waves in Nigeria were selected for this study.Result indicated as at 22nd April, Nigeria has recorded a total of 164,588 confirmed cases while a total of 69,333 confirmed cases were recorded as at 6th December, 2020. Students' – t analysis at 5% level of significance and 19 degree of freedom, $t_{0.925,19}$ = 2.09, that the second wave covid-19 infection rate is significantly higher than the first waveinfection rate.This study confirmed that indeed there was an upsurge of new cases of COVID-19 in Nigeria.

Keywords: Covid-19, first and second waves, infection rate.

INTRODUCTION

The world was thrown into turmoil in 2019, by the emergence of the dreaded novel coronavirus disease. As at 2019 – 2020, the disease overwhelmed the world health systems as there was no known cure and it was spreading at an alarming rate in Europe, America and other parts of the globe. It was only in 2021, that a vaccine has been produced that can provide pharmaceutical control of the disease.

Corona viruses are a family of viruses that cause ill health of varying degree of severity. The first known case of corona virus disease presented with severe acute respiratory syndrome (SARS) and it occurred in Southern China in 2002-2003.When the Federal Ministry of Health announced the first case of Covid-19 in Nigeria, many people's heart jump into their mouth due to fear because of the dread of the disease. The first case of the Covid-19 disease in Nigeria was confirmed on the 27th of February2020;it occurred in Lagos State and was announced by the Federal Ministry of Health. It was the first case to be reported in the country since the disease outbreak in China in December, 2019.This first case in the country was an Italian citizen who works in Nigeria and just return from Milan in Italy to Lagos on the 25th of February 2020. He was confirmed to be a Covid-19 patient by a virology Laboratory of the Lagos University teaching Hospital (NCDC, 2020).

The incidences of the disease continued to rise in 2020, in many countries without any known cure in sight. Countries adopted the World Health Organisation none pharmaceutical control measures which include restrictions of movement, maintenance of safe distance between persons, wearing of nose mask and face shield. Economy of many countries was locked down as countries imposed both internal and international movement restrictions. Nigeria was not left out. The lock down negatively affected many countries.

InNigeria, the economic impact of COVID-19, lock down was so severe and devastating like in many other countries. Firstly, the nation's economy suffered from drastic decline in crude oil revenue due to fall in oil price in the international market. This was as a result of the suspension of industrial production activities since internal and international movement restrictions were imposed in many countries. This seriously affected the amount of revenue available to be shared by the Federal, States and Local governments during the monthly Federal Account Allocation Committee meetings. This scenario lasted for months.

The aviation industry, tourism and hospitality industries were also seriously affected negatively as airports were closed against international and domestic flights. This resulted to laying off of staff by many airlines due to inability to pay workers' salaries. The entertainment and sports industries were not spared either, as many events were either suspended or cancelled. These include the international Olympics and the Nigeria national sports festival. Both large scales, medium and small scale businesses suffered serious setback, some closed down completely.

When the COVID-19 lock down was subsequently suspended or lifted as a result of the decline in infection rate in the third quarter of 2020. Nigerians heaved a sigh of relief, however, before people could roll out drums to celebrate the COVID-19, relief, countries began to experience sudden rise in new infection cases. For instance, while Nigerian experience drastic decline in Covid-19 new cases in September to early part of December, 2020, on the 17th December, 2020, the country suddenly witness upsurge in COVID-19 cases recording about 1,465 new cases on a single day. In other parts of Africa, Maragakis (2021) reported that, some locations that earlier experienced high number of cases followed by decline are now having a "second wave" of increased cases

The sudden rise in COVID-19 new case after the initial decline has been described as second wave of COVID-19. Many people describe this second wave as an upsurge in which the infection rate is higher than the first wave. This study is therefore aimed at comparing the infection rate in the first and second wave with view to statistically evaluate if there is any significant difference between infection rate in the first and second wave of COVID-19 in Nigeria so as to provide scientific evidence to guide management decision.

RESEARCH METHODOLOGY

Study area.

The area of the study is Nigeria. Nigeria is an African country located in the Western part of the continent. It situated at the extreme inner corner of the Gulf of Guinea on the west coast of Africa. The country occupies a land mass 923,768kmsq. According to the world encyclopedia, it is bordered by Chad republic on the North East, Cameroun on the East and by the Atlantic Ocean on the south and by the Benin on the West. The country is divided into 36 states and a Federal capital territory for the purpose of administrative convenience.The map of Nigeria, the study area is presented in Fig 2.1



Fig 2.1: Nigeria map showing the 36 states of the country and their locations ()
Research design

The research is basically a desk top study in which COVID-19 data in Nigeria were collected from Nigeria Centre for Disease control daily publications. Other information was collected from various journal sources published on the internet. The first twenty weeks of the first wave of COVID-19 infection and the first twenty weeks of the second wave of the disease infection in Nigeria were selected for this study. The first wave is assumed to start from 27th February, 2020 while the second wave of the disease is counted from 13th December, 2020 for the purpose of this study. The infection rate of the disease in the first and second waves in Nigeria is scientifically evaluated with statistical tool(t - test statistical analysis) in order to compare if there is any significant statistical difference of infection rate between the first and the second wave in the study area. This will help to provide scientific evidence any claim of any upsurge of the disease.

Research hypothesis

A research hypothesis was postulated to guide this research.
Null hypothesis
H_0:$\mu = \mu_0$ There is no significant difference between the mean environmental background noise level and the recommended daily noise standard
Alternative hypothesis
H_1:$\mu \neq \mu_0$, There is significant statistical difference between the mean environmental background noise level and the recommended daily noise standard.

Overview of covid-19

COVID-19 is the acronym for corona virus disease;2019.The disease is caused by a virus known as SARS-NCOV2. The virus is described as enveloped positive sense single stranded microorganism measuring between 80 and 160nm in length (Anupama, 2020). The virus is said have originated from animal (Bat). SARS-NCOV2 is one strain of virus belonging to a wide family of viruses that cause ill health of different level of severity (Mansi, 2020).The first known case of ill health caused by a corona virus presented with it Severe Acute Respiratory Syndrome (SARS), emerged in Southern China in 2002 and extended to 2003 (Kahn et al,(2005).

The second corona virus disease broke out in Saudi Arabia in 2012 and it was described as the Middle East Respiratory Syndrome (MERS). The current corona virus disease (COVID-19) threatening global population and redirecting life style emerged in China in 2019.The disease outbreak was reported in 1st December,2019, in the City of Wuhan in the Hubei province of China. The disease has so far spread across almost all continent of the world. ElZowalaty and Jarhult, (2020) reported that SARS Cov-2 virus is the third highly pathogenic Beta-coronavirus to infect human population in the twenty first century. According to (Mohamed., Sean and Joseph, 2020) SARS Corona virus (covid-19) is the first worldwide pandemic in history to be caused by a coronavirus.

In Europe, the COVID-19, outbreak was first reported in Bordeaux, France on the 21st January, 2020. It has since spread to over 57 territories. In North America, it was first reported in Snohomish County in Washington D.C also on the 21st of January, 2020, and as at 2 July, 2020, it spread across over 43 territories. While in South America, the disease outbreak was first reported on the

26th February, 2020, in Soa Paulo Brazil and as at 28thApril, 2021, it has spread across all federated units of Brazil (Wikipedia) . In Africa, the disease outbreak was first recorded in Cairo, Egypt on the 14th February, 2020, and as at 7th May, 2020, the World Health Organisation estimated that over 190,000 persons could die of the disease in the continent of Africa if appropriate control measures are not taken (WHO, 2020 in Mansi, 2020). In Australia, Covid-19 outbreak was first reported in Melbourne, Victoria. As at 20th March, 2020, the Australia border was forced to close against all non-residents in a bid to control the spread of the disease in the country (www.health.gov.au/covid-19).

According to worldometer (2021), the COVID-19 pandemic has since its outbreak on the 1st December, 2019 spread across 202 countries and territories of the world. As at 3rdMay, 2021, the total confirmed cases in the world stood at 153.5 million while total global death is over 3.5 millionaccordingto (John, 2021).

SARS – NCOV- 2 genomic characteristics and mode of transmission

SARS – NCOV- 2 is the virus that caused the novel corona virus disease (COVID-19). Scientists described the virus as an enveloped positive sense single stranded virus of zoonotic origin, measuring between 80 and 160nm in length (Anupama,2020 and, Mansi, 2021). Structure wise, the virus is reported to have a strong biding site which makes the virushave high affinity for human cells. Kristian et al, (2020) reported that the virus has two notable genomic characteristics which include the presence of a Receptor Binding Domain (RBD) and a spike protein which has a functional poly basic furin cleavage site through which the virus nucleotide fuse with the human cell. (Ahmad et al,2020., Zhang et al, 2020 and Philip et al, 2021) reported that the initial infection of the virus requires the viral entry into the host cell. The report further stated that the binding of the virus to the host cell is medicated by S-glycoprotein, followed by the fusion of the virus and the host cell. Afsane and Gordon (2020)described the s-glycoprotein as astructural protein that accounts for the crown like shape of the corona virus. The genomic structure of the Covid-19 virus is presented in Fig 2.2

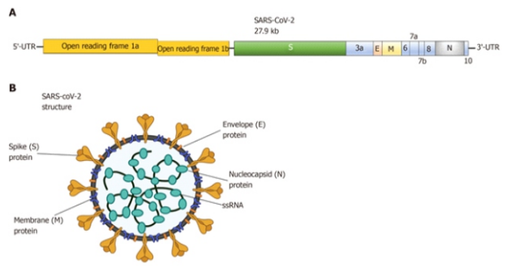


Fig 2.2: Genomic structure of SARS – NCOV- 2(Ning et al, 2020)

Ben et al, (2020) reported that genetic evidence suggests that SARS-NCOV-2 is a natural virus which genetic protein has full size of 1,273 amino acids longer than SARS-COV. The report further has it that the SARS-NCOV-2 is the newest member of Beta corona virus which has almost 79% and 50% sequence identity with SARS-COV the Middle East Respiratory Syndrom (MERS) virus.

Mode of covid-19 transmission.

Earlier studies on COVID-19 disease suggested that SARS-NCOV-2 emanated from Bat as the primary host and was transmitted to humans through an intermediate host animal known as Pangolin. Ben et al, (2020) described the SARS-NCOV-2 virus as a highly transmissible and pathogenic virus. Many peopleinfected by the disease manifested mild to moderate ill health with high fever and difficulty in breathing as symptoms.

The mode of transmission of the virus from person to person is through oral or nasal droplets from an infected person. This can be transmitted from the infected person to others through sneezing, coughing yawning

talking. (nhsinform, 2020InMansi, 2021) described cough as a reflex action to clear the throat of mucus or irritants such as dust, during which the corona virus can easily be discharged into the air and then inhaled by near neighbor (WebMD, 2020 in Mansi, 2021) reported that virus stimulated cough can produce germy mucus from the lungs. Mansi, (2020), reported that COVID-19 has significant environmental health aspect that makes the disease transmission very easy and common. Environmental aspect is described as the elements of human activities, services or products which can interact with the environment and have the potential to impact on it (ISPON, 2019, and Mansi, 2020). The environmental health impact of COVID-19, are those elements of human lives and the control of COVID-19 that can interact with the environment and further lead to the transmission of the disease to members of the public or household (Mansi, 2020)

The environmental health aspect of COVID-19, constitute mode of transmission of the disease. The virus is said to be transient as it stays for only hours on objects and on human skin. A publication in the New England journal of medicine reported that the virus can live for 4 hours on copper, 24 hours on cardboard and up to 72 hours (3 days) on plastics and steel. The mode of transmission of the virus is simply through human fluid droplets via body cavity into the body. This fluid droplet is usually discharged by sneezing, coughing and saliva discharge while talking. Cycle of mode of transmission of covid-19 is presented in Fig 2.

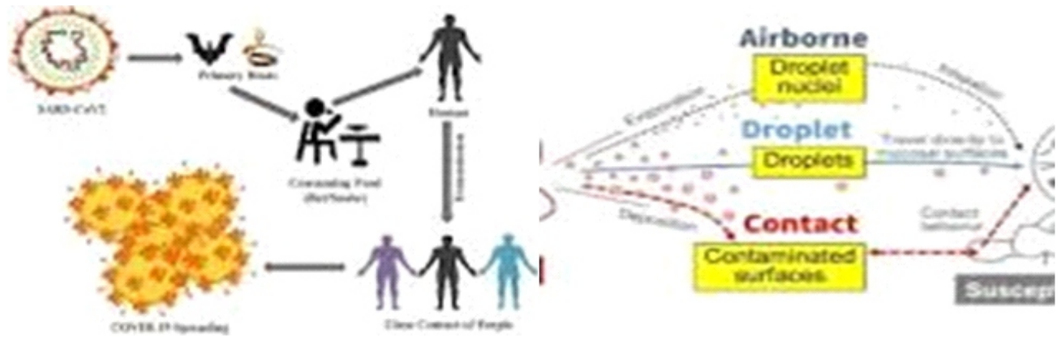


Fig 2.3: Mode of transmission of SARS-COV-2 ()

COVID-19 lock down the socio-economic implications in Nigeria.

Corona virus disease otherwise known as COVID-19 is a highly contagious and fast spreading disease. This can be attested to when viewed against the background of the disease genesis and how soon it became global pandemic. For instance, in 1st December, 2019, the World Health Organisation (WHO) in China was informed by the Chines authority that there was a strange respiratory disease outbreak in the country within the Hubei province. On 30th January, 2020, WHO declared the disease a public health emergency of a global concern according to (WHO, 2020). Hans announced that on 11th March, 2020, WHO declared the disease a global pandemic due to its global spread within short period of it's out break.As at 2020, the disease did not have any known cure, hence, all that the world could do was to adopt none pharmaceutical control measures in which

The impact of COVID19 is of global dimension and cut across different sectors of international economies such Tourism, entertainment, aviation and sports. Nigeria was impacted in all these sectors like other countries. Kwaw et al, (2021) reported that four major impacts of COVID-19 in Nigeria

include; governor revenue shortfalls, reduction in foreign remittance 23% drop in Gross domestic product (GDP). Kazeem and Olorunfemi (2020) reported that Covid-19 lockdown negatively impacted on retail, recreation, grocery and pharmacy, parks, transit stations and workplaces.

In the aviation sector, the global aviation sector was completely grounded for months since nations closed their air ports to both international and local flights.This caused loss of revenue to airlines. In Nigeria, NAN (2021) reported that handling firms in the aviation industry were grounded and this subsequently accounted for revenue losses due to the pandemic lock down. Jolly and Jasper (2020) reported that the crises caused by the COVID-19 in the aviation industry is the worst in the history of the industry

The sporting sector was not spared either by COVID-19 lock down as global sports were suspended. In football, many national leagues were suspended. The global sports fiesta such as the Olympics was postponed. The summer Olympics was originally scheduled to take place on 24 July, 2020 in Tokyo Japan but has been postponed to 23 July 2021 (Mansi, 2021). The world games, which was originally scheduled to hold in July 2021 was postponed to 2022. In Nigeria the national sports festival was earlier scheduled to hold in the month of June in Benin City Edo state but was postponed indefinitely. That festival was just concluded in April 2021

Political landscape of the world also suffered from Covid-19. It caused suspension of legislative activities, isolation and death of notable politicians and rescheduling of elections due to fear of the pandemic. In Nigeria the Benue state house of assembly to suspended plenary sitting to allow members to undergo coronavirus disease testing to ascertain their COVID-19 status.). Notable politicians died of covid-19 in 2020. This include, the immediate past governor of Oyo state and national vice chairman of the all progressive congress (APC) chief Abiola Ajimobi, Ondo state commissioner of health (Wahad Adegbenro) and a Senator representing Lagos senatorial district (Tunde Braimoh). Not less than five sitting governors in Nigeria tested to positive of covid-19.

In a positive note, the covid-19 lock down resulted to reduction in atmospheric pollutants such as Nitrogen dioxide (NO_2) according Fuwape et al, (2020). On the whole, the Nigeria economy suffered significantly from COVID-19 Lock down in 2020. According to Yomi (2020), many Nigerians were made unemployed by Covid-19 as economy contracted by 6.1% year on year in 2020.

Covid-19 Infection Data in Nigeria.

The data of Covid-19 infection in the first and second waves in Nigeria are presented in Table 3.1 and Table 3.3respectively.While table 3.2 and 3.4 are presentation of the statistical analysis of the data.

Table3.1: First twenty weeks of first wave of covid-19 data in Nigeria3

S/N	Date interval (days)	Weeks	Confirmed cases	Increased	Percentage increase
1	27/2/20	1	1	1	1
2	9/3/20	2	2	1	100
3	16/3/20	3	2	0	0
4	24/3/20	4	44	42	2100
5	31/3/20	5	139	95	215.9
6	7/4/20	6	254	115	82.733
7	14/4/20	7	373	119	46.85
8	21/4/20	8	782	409	109.65
9	28/4/20	9	1,532	750	85.03
10	5/5/20	10	2,950	1,418	92.55
11	12/5/20	11	4,787	1,837	62.27
12	19/5/20	12	6,401	1,617	33.77
13	26/5/20	13	8,344	1,943	30.35
14	2/6/20	14	10,819	2,475	29.66
15	9/6/20	15	13,464	2,645	24.45
16	16/6/20	16	17,148	3,684	27.36
17	23/6/20	17	21,371	4,223	24.63
18	30/6/20	18	25,694	4,323	20.23
19	7/7/20	19	29,789	4,095	15.94
20	14/7/20	20	33,616	3,827	12.85

Source :(NCDC, 2020)

Table 3.2:First wave of Covid-19 statistical computation

{b	/ ▪Ż▒śŕ l'Ăśℓ	Ll'ŋśĂśŕ f(X))	ó -Ā	ó -Ā²
و	و	و	1,679.9	وهيهوويو
و	و	و	1,679.9	وهيهوويو
ى	و	ه	1,680.9	ويىويويويو
ى	ىى	وى	1,638.9	وىىلآيييو
ي	لأىو	يلا	1,585.9	ويديهيويو
ي	ييو	يوو	1,565.9	ويوىهويىو
ٮ	ى ىى	لاوو	1,561.9	ويوىيلاىىو
ٮ	و ٮٮ	لاهى	1, 271.9	729.61 ,يويو
لا	وىيو	يٮ	930.9	ويىىيييٮ
هو	يٮلاو	يوىو	262.9	وىيووالاي
وو	ٮٮيىى	ىيايو	وييو	وو ىيىىو
وو	وهيي	يويو	63.9	ووىىهى
ىو	ىىىٮ	ىىلآو	وويو	وىيلاىيي
يو	لاويهو	يىيو	ويلا ٮ	ويىيلاىيٮي
يو	ىىىىو	ييىو	ويىلا	ويٮىيىلاولا
يو	ىيو ىيو	ىيىى	1ىههو	ويلاهىووهى
يو	ووىىو	ىووى	وويىو	462,272. 41ي
يو	يلاىيو	ىووى	وويىو	ويولاىهيلاي
لاو	لا ٮيلاو	يلاهى	وىىوىو	ويٮيٮيايو ايي
هو	ىوىىى	يوايى	وىىووو	ووىىيىيهىى
وو	Çh Ç! [ىوىى	□Ið =□Ẅ□□		□(X-Ā² =59,661,849

$$\bar{\bar{X}} = {}^{fX}/_{N} \qquad = {}^{33616}/_{20} \qquad 1$$

$$= 1,680.90$$

$$\text{Standard deviation } S_1 = \sqrt{\frac{1}{n}(X - \bar{X})^2} \qquad 2$$

$$= \sqrt{\frac{1}{20}50,661,849} = \sqrt{5.9912}$$

$$= 1,591.57$$

Table3.3: First twenty weeks of second wave of covid-19 data in Nigeria

S/N	Dates	Weeks	Number of confirmed cases	increase	Percentage increase (%)
1	13/12/2 0	1	73,175	3,920	8.17
2	17/12/20	2	76,207	3,031	4,14
3	24/12/20	3	81,963	5,756	7.55
4	31/12/20	4	87,510	5,547	6.77
5	7/,1/21	5	95,934	8,424	9.63
6	14/1/21	6	105,478	9,544	9.95
7	21/1/21	7	116,655	11,177	10.60
8	28/1/21	8	127,674	11,017	9.44
9	4/2/21	9	136,030	8,356	6.54
10	11/2/21	10	143,516	7,486	5.50
11	18/2/21	11	150,246	6,730	4.69
12	25/2/21	12	154,472	4,226	2.81
13	4/3/21	13	157,671	3199	2.07
14	11/3/21	14	159,933	2,262	1.43
15	18/3/21	15	161,409	1,476	0.92
16	25/3/21	16	162,275	866	0.54
17	1/4/21	17	162,997	722	0.44
18	8/4/21	18	163,581	584	0.36
19	15/4/21	19	164,080	499	0.31
20	22/4/21	20	164,588	504	0.31

Source :(NCDC, 2021)

Table 3.4: second wave of Covid-19 statistical computation

S/N	Confirmed cases	Increased f(X))	X-$\bar{\bar{X}}$	(X-$\bar{\bar{X}}$)^2
1	73,175	3,920	-4,309.40	18,570,928.36
2	76,207	3,031	-5,198.40	27,023,362.56
3	81,963	5,756	-2473.40	6,117,707.56
4	87,510	5,547	-2682.40	7,195,269.76
5	95,934	8,424	194.60	37,869.16
6	105,478	9,544	1,324.60	1,754,565.16
7	116,655	11,177	2,947.60	8,687,166.76
8	127,674	11,017	2,787.60	7,770,713.76
9	136,030	8,356	126.6	16,027.56
10	143,516	7,486	-743.40	552,643.56
11	150,246	6,730	-1,499.40	2,248,200.36
12	154,472	4,226	-4,003.40	16,027,211.56
13	157,671	3199	-5,030.40	25,304,924.16
14	159,933	2,262	-5,967.40	35,609,862.76
15	161,409	1,476	-6753.40	45,608,411.56
16	162,275	866	-7363.40	54,219,659.56
17	162,997	722	-7507.40	56361,054.76
18	163,581	584	-7645.40	58,452,141.16
19	164,080	499	-7,730.40	59,759,084.16
20	164,588	504	-7725.40	59,681,805.16
21	TOTAL=164,588	? I$\check{O}$ =□□W□□		? (X-$\bar{\bar{X}}$)^2= 464,002,269.90

$$\bar{\bar{X}} = {}^{fX}/_{N} \qquad = {}^{164,588}/_{20}$$

$$= 8,229.40$$

$$\text{Standard deviation } S_2 = \sqrt{\frac{1}{n}(X - \bar{X})^2}$$

$$= \sqrt{\frac{1}{20}(464,002,269.90)} \qquad = 4,816.65$$

Statistical comparison of first and second wavesof covid-19 infection rate.

$$t = = \frac{\bar{X}1 - \bar{X}2}{S\sqrt{\frac{1}{N1} - \frac{1}{N2}}}$$

$$\bar{X}_1 - \bar{X}_2$$

Where X_1= mean of the covid-19 infection cases in the first wave

Where X_2 = mean of the covid-19 infection cases in the second wave

$X_1 - X_2$ = 1,680.90 - 8,229.40 = - 6.548.50

S= the combine standard deviation of the first and second wave covid-19 distribution.

$$S = \frac{S1 + S2}{2} = \frac{1,680.90 + 8,229.40}{2} = \frac{9.910.30}{2} = 4,955.15$$

$$t = \frac{-6,548.50}{4,955.15\sqrt{\frac{1}{20} - \frac{1}{20}}} = \frac{-6,548.50}{4,955.15(0.2736)} = \frac{-6,548.50}{1,355.86} = -4.83$$

Scientific judgment.

Based on Students' – t distribution table, at 5% level of significance and 19 degree of freedom, $t_{0.925,19}$= 2.09. Since the calculated t (4.83) is higher than the table value, the difference between the infection rate in the first and second waves is significance hence, the null hypothesis is hereby rejected.

DISCUSSION

Since the novel corona virus disease outbreak in 2019, leaders of many countries have been restless thinking of possible solution to the menace of the ravaging disease. The disease existence has been classified into first wave and second wave owing to an upsurge in new case after initial drop in third quarter of 2020 in many countries. However this decline did not last long as many nations began to experience spike in covid-19 cases. The results of COVID-19 confirmedcases in Nigeria during the first wave are presented in Table 3.1. The results of the second wave infection rates are presented in Table 3.3. The results indicated as at 6thDecember, 2020, a total of 69,225 cases were confirmed in Nigeria. By 22nd April, 2021, a total of 164,588 cases were confirmed. According to the Minister of health Osagie enhanire, the upsurge in infection as at late mide December 2020 was as a due to communities' infection and returning travellers.The mean weekly infection rate as evaluated in this study during the first wave is 1,689.90, while the mean weekly infection rate in the second wave is 8,229.40. The first wave has a standard deviation of 1,591.57; the second wave infection has a standard deviation of 4,816.65.Statistical evaluation showed that Students' – t distribution table, at 5% level of significance and 19 degree of freedom, $t_{0.925,19}$ = 2.09 and the calculated t (4.83). This result indicates that the computed t is higher than the table value and the difference between the infection rate in the first and second waves is significant.Hence, the null hypothesis is rejected. This scientifically justify the claim by many people that the second wave COVID-19 infection is an upsurge and more severe than the first wave in Nigeria.Heiko (2021) reported that in Germany covid-19 infection and death rates were higher in the second wave than in the first wave. Vincent et al (2021) reported that in Madrid Spain, first wave of Covid-19 infection started in mid-March 2020 and lasted for three months. While the second wave started in mid-September 2020 and extended to December 2020. However, the infection was clinically less severe in the second wave than in the first wave. This was attributed to increasing social distancing, increasing use of face mask and restricted gathering. The result of this study is line with the report of Heiko (2021)

CONCLUSION

COVID-19 infection has taken a toll on the global system. The disease has stressed world economy, health systems and practitioners. It is threatening human lives and putting world population at risk. The disease is also redirecting people way of lives since its outbreak in China in 2019.The first and second waves of Covid-19 infection rate in Nigeria have been scientifically evaluated.

Based on the results obtained in this study, the researcher conclude that, there is in indeed an upsurge of Covid-19 infection in the world and Nigeria indeed is experiencing the second wave of the disease infection. The infection rate in the second wave is statistically more significant than in the first wave of the disease in Nigeria.

RECOMMENDATION

Based on the study, the following recommendations have been made.

I. Nigerians should continue to follow the COVID-19 prevention guidelines put in place by the government and the World Health Organisation (WHO)

II. Government should make every effort to increase community testing of the disease.

III. Citizens should go out for voluntary testing.

IV. Control measures put in place at entry/exit point of the country should strictly be enforced.

V. Government should step up COVID-19 vaccination public enlightment and sensitization drive,

REFERENCES

Ahmad Abu., Turab Naqvi., Kisa Fatima and Md, Imtaiyaz Hassan (2020).Insight into SARS CoV-2 genome, structure, evolution, pathogenesis and therapies: Structural genomicsapproach. BiochimBiophys Acta Mol Basis Dis, 2020, Oct 1.1866 (10).www.ncbi.nlm.nih.gov Accessed on 1 May, 2021.

Anupama Sapkota (2020). Structure and genome of SARS-COV-2 (COVID-19). www. Microbenote. Com. Accessed 5 July, 2020.

Mohamed E. ElZowalaty., Sean G. Young and Josepg D. Jarhult (2020). Environmental impact of Covid-19 Pandemic- a lesson for the future. Infection Ecology and Epidiology. Vol 10(1):13. Accesed online on the 12thMarch, 2021.

ElZowalaty M. E and Jarhult J. D. (2020).From SARS to Covid-19, a previousely unknown SARS related coronavirus (SARS-COV-2) a pandemic potential infecting human- call for a one health approach. One health, 2020; 9:100124

AfsaneBahramin and Gordon A. Ferns (2020). Genetic and pathogenic characteristics of SARS – COV-2: a review. Future medicine. Retrieved from www.turemedicine.com on the 14th April, 2021.

Ben Hu., Hua Gu and Zheng-Li Shi (2020). Characteristics of SARS-COV-2 and COVID-19, Nature Reviews Microbiology. (19):141 – 154. Retrieved from www.nature.com on the 14th April,2021.

Datonye Christopher Briggs and Kattey Amos Kattey (2020). Nigeria Parents knowledge of COVID-19 and effects on monthly earnings. An online survey. Pan African medi journal. 37(1):53 www.panafrican-medjournal.com. Accessed on 2nd May, 2020.

Fuwape I.A., OkpalaonwukaC.T and Ogunjo S.T (2020).Impact of COVID-19 pandemic lock down on distribution or inorganic pollutants in selected cities in Nigeria. Air Qua Atmos Health. 2020 Sept 5: 1-7. www.ncbi.nlm.nih.gov. Accessed on 2nd May, 2020.

Heiko (2021). What is the difference between the first and the second wave of COVID-19?Germany perspective. J Orthopaedics. www.Pubmed.ncbi.nlm.nih.gov Accessed on 3rd May, 2021

ISPON (2019). General health, safety and environment, training manual. (2019 Revised Edition). Firstborn3trinity link publisher. Port Harcourt. Pp. 106-107

John Elfein (2021). COVID-19 cases, recoberies, deaths in most impacted

countries as of May3, 2021. Health, Pharma &Medtech.May 3, 2021. www.statista.com. Accessed on 3rd May, 2021

Jolly Jasper (2020). Airlines may not recover from COVID-19 crises for five years, says airbus. The guardian of 29 April, 2020

Kazeem Bello Ajide and OlorunfemiYasiruAlimi (2020).Estimating the impacts of lock down on COVID-19 cases in Nigeria.Transportation Research interdisciplinary perspectives, Vol 7 Sept 2020, 100217

KwawAndem., Hyacinth Edeh and James Thurlow (2021).Impacts of COVID-19 on foodsystems and poverty in Nigeria. Advances in food security and sustainability,2025 : 145 – 173. www.ncbi.nlm.nih.gov. Accessed on 2nd May, 3021.

Kahn Jeffrey, S. And Mcintosh Kenneth, MD (2005). History and recent advances in corona virus discovery. Pediatric infectious disease journal, 24(11):223-227.

Kristian G. Anderson., Andrew Rambaut and Robert F. Garry (2020). The proximal origin of SARS - COV-2. Nature Medicine. (26): 450 – 452.

Lisa Maragakis, M.D (2020). www. Honkinsmedicine.org.)

Md. Farhad Hossain., Sharifa Hasana., Abdullah Al Mamun., Md. Sahab Uddin., Mir Imam IbneWahed., SabarniSarke., TapanBehl., Irfan Ullah., Yesmin Begum., Israt Jahan Bulbul., Md. Shah Amran., Md. Habibur Rahman., May N. Bin-Jumah., Saad Alkahtani., Shaker A. Mousa., LotfiAleya and Mohamed M. Abdel-Daim (2020). COVID-19 Outbreak: Pathogenesis, Current Therapies, and Potentials for Future Management. Front. Pharmacol., 16 October 2020 https://doi.org/10.3389/fphar.2020.563478 Accessed on the April, 2020.

Mansi WalamamEgbo (2021).Environmentalaspective of the novel Coronavirus disease and its global impact;Journa of applied Science, Engineering, Technology and edu

NAN (2021). Nigeria aviation in turbulent 2020 COVID-19 pandemic. www.nannews.ng. Accessed on 2nd May, 2021.

NCDC (2020). First case of corona virus disease confirmed in Nigeria. www.ncdc.gov.ng

Ning Wan.,ShiboJiang and Lanying DU (2020). Subunit VaccinesAgainstEmerging Pathogenic Human Coronaviruses. Front. Microbiol, 28 February, 2020 | https://doi.org/10.3389/fmicb.2020.00298

Philip V Kovski., Anaika Kratzel and Volker Thiel (2021). Coronavirus biology and replication: implications for SARS-CoV-2. Nature Review Microbiology, 19:155-170

Vincente Soriano Octavio., Pilar Gamado-pinilla., Miguel Sanchez-Santos., Corral Pablo Barreiro and Carmen de-Mendoza Show (2021). Main difference between the first and second waves of COVID-19 In Madrid Spain. Short communication. Volume 105: 374 – 376. www.ijidonline.com Accessed on 3rd May, 2021

WHO, (2020).Statement on the meeting of the International Health Regulations (2005) Emergency Committee regarding the outbreak of novel coronavirus (2019-nCoV) -WHO, January 23, 2020

WHO (2020). COVID-19 public health emergency of international concern (PHEIC), Global research and innovative forum. 12 February, 2020. www.who.int

Yomi Kazeem (2020). Here's how COVID-19 has battered Africa's largest economy. www.weforum.org Accessed on 2nd May, 2020.

Zhang H., Penninger J.M., Li Y., Zhong N and Slutsky A.S (2020). Angiotensin converting enzyme2 (ACE2) as SARS-Cov-2 Receptor; Molecular mechanisms and potential therapeutic target. Intensive care Med. 2020; 1-5

ASSESMENT OF POLYCYCLIC AROMATIC HYDROCARBON (PAH) DISTRIBUTION IN DRY SEASON OF AMBIENT AIR OF OIL PRODUCING COMMUNITIES OF EGBEMA, IMO STATE, NIGERIA.

G.C. ANYANWU[1*](Ph.D) & E. O. OHAERI[2]
[1]Department of Chemistry, University of Agriculture and Environmental Sciences Umuagwo, Imo State, Nigeria.
Email: anyanwugogo901@yahoo.com

[2]Department of Science Laboratory Technology, Federal University of Technology Owerri, Imo State, Nigeria.
Email: evangelina.ohaeri@futo.edu.ng

Abstract
Mosses plants (pleuroziumschreberi) was used to trap Poly cyclic aromatic hydrocarbon in ambient air of oil producing areas of Egbema, where the distribution and assessment of pollution in ambient air from six locations were harvested for Six months (Dry Season). Gas chromatography was used to analyze the samples where the mean average of PAH recorded Pyrene with highest concentrations of 9.74(µg/kg) followed by Fluoranthane with 4.50(µg/kg). Lowest concentration was Indeno(123)perylene with 0.13(µg/kg) while locations thatrecorded highest were AQOWH, AQEOJ with 2.86(µg/kg) followed by AQEWH and AQEWFS with 1.73(µg/kg) and 1.87(µg/kg) respectively. AQEOJ and AQOWH have largest variation spread of PAH in all locations, while Fluorathene recorded highest variation spread in all Locations.This research is used to ascertain the level of concentration of Polycyclic Aromatic Hydrocarbon during the dry season in various locations of Oil producing communities using a Bio indicator (pleuroziumschreberi), and to understand the variability of natural environmental conditions and, at the same time, a significant diversity of anthropogenic influences in air quality of Egbema Oil producing communities in Imo State.It is also noted that not only oil exploration generates PAH spread in Egbema, there are other vices that contribute to daily exposures of PAH which is associated with increased incidences of premature death, chronic asthma and as well as respiratory problems in children.

Keywords: *PAH, concentration, variability, exposure, toxicity.*

INTRODUCTION

PAHs are subset of a set of compounds known as poly cyclic organic matters (POM). They are, originally, organic compounds primarily that are formed from the incomplete combustion of organic materials or pyrolysis of organic material. These compounds are related to the use of oil, gas, coal and wood in energy production [7].Polycyclic aromatic hydrocarbons (PAHs) are transported in the atmosphere in gas and/or particle phases and they are deposited by wet and dry deposition. Daily exposures to particulate matter associated with increased incidences of premature death, chronic asthma and increased hospital admissions as well as respiratory problems in children [2].

Several PAHs and their epoxides are highly toxic, mutagenic and/or carcinogenic to microorganisms as well as to higher systems including humans. The polycyclic aromatic hydrocarbons compounds (PAHs) require activation to electrophilic metabolites to exert their mutagenic or carcinogenic effects [5].Exposure to PAHs always involves complex mixtures that may induce synergistic or antagonistic effects on the nontoxic properties that make risk assessment more difficult. Assessment of exposure to PAHs is important due to the widespread presence of PAHs in the environment and their toxicological relevance.

The biological impact in terms of the total PAHs intake into the body via respiratory, dermal, and gastrointestinal routes should be monitored precisely [3].It was early discovered that terrestrial moss (pleuroziumsohreberi) samples has the ability to be used for monitoring of atmospheric deposition of pollutants. Within the European network on monitoring of environmental pollutants it has been discussed that moss also can be utilized for sampling other types of contaminants such as e.g. persistent organic pollutants (POPs)and polycyclic aromatic hydrocarbons (PAHs) [1]. It has earlier been discovered that environmental samples (pleuroziumsohreberi) may well serve as passive samplers of organic contaminants. Already in the early 1980 it was discovered that mosses (pleuroziumsohreberi) and lichen successfully sampled chlorinated pesticides and PAH, [1].

Materials and Method

Six sampling sites distributed in the Oil producing areas were used. The sampling sites were selected taking into account the areas where mosses (Pleuroziumsohreberi) plants were abundant.The sites with the highest percentage of tree cover and the location of the site with respect to air currents and sources of pollution in an area was considered. Material from selected sites was collected in order to test the feasibility of using mosses as indicators for PAHs. The research was done in six locations of oil producing areas of Egbema, Imo State. In each of the six locations, samples of (Pleuroziumsohreberi) moss were collected. All sites were within areas with different human created activities, such as oil exploration and heavy vehicular movements, construction and building activities etc. (Pleuroziumsohreberi) materials were collected in the field for six months. Samples were placed in sealed polythene bags and labeled against their locations of collection and were transported in a portable cooler to the laboratory where they were kept frozen until used for analysis, [2]. After removal of the nylon bag, one half of each sample was extracted for 24hrs with 200ml of acetonitrile in a Soxhlet extractor. The dry weight of the other half was recorded by exhaustive drying at 50°C.

Theacetonitrile extract was mixed with 600 ml of distilled water and 100 ml of pentane. The pentane fraction was separated, dried with anhydrous sodium sulphate and concentrated to 0.5 ml in a Kuderna-Danish apparatus. The concentrate was fractionated over a silica column, and eluted with 4 ml of hexane and 15 ml of dichloromethane/pentane. The latter eluate was concentrated, and taken up in 1 ml of acetonitrile. An aliquot of the concentrate was injected into a liquid chromatograph (Hewlett-Packard 1090M). Identification and quantification of the PAHs was carried out by GC/LRMS on an Agilent 6890N gas chromatograph coupled to an Agilent 5973 mass spectrometer in an electron impact mode, [4].The PAHs were identified by their retention times, and, whenever the diode array signal allowed, by their relative peak heights at different absorbance wavelengths. The PAHs were quantified by their respective peak areas.

Resultsand Discussion

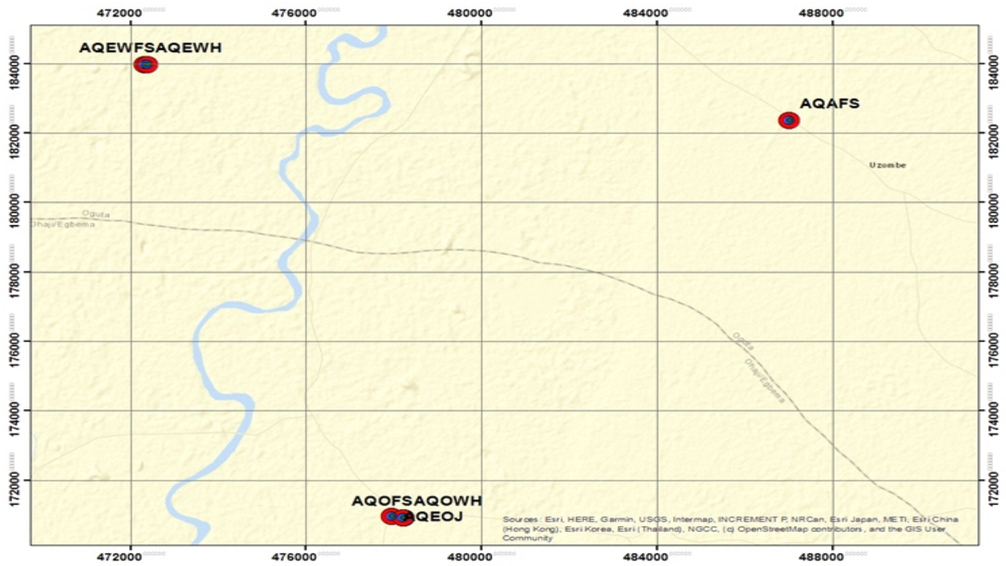


Plate 1: Map of sample Locations in Egbema Oil producing area of Imo State

Results on poly cyclic aromatic hydrocarbon (PAH) in Egbema

Table 1: MEAN PAH CONCENTRATION DISTRIBUTION IN OIL PRODUCDING COMMUNITIES OF EGBEMA.

PAH	AQAFS	AQEWFS	AQEWH	AQEOJ	AQOFS	AQOWH	Mean AV	MEAN AV (µg/kg)
naphthlene	0.008	0.006	0.004	0.004	0.007	0.007	0.006	0.54
acenaphthalene	0.006	0.015	0.010	0.010	0.021	0.017	0.013	1.7
acenaphthene	0.021	0.004	0.007	0.008	0.002	0.000	0.007	1.53
florene	0.017	0.017	0.008	0.006	0.015	0.015	0.013	2.4
phenathrene	0.004	0.004	0.001	0.005	0.001	0.006	0.004	3.9
anthracene	0.007	0.006	0.003	0.005	0.078	0.006	0.018	3.7
fluoranthene	0.031	0.006	0.021	0.146	0.006	0.096	0.051	4.5
pyrene	0.165	0.164	0.100	0.103	0.172	0.172	0.146	9.74
Benzo(a)anthracene	0.004	0.010	0.090	0.090	0.021	0.052	0.045	3.13
chrysene	0.030	0.018	0.004	0.034	0.020	0.022	0.021	1.78
Benzo(b)fluoranthren	0.004	0.010	0.004	0.002	0.013	0.007	0.006	0.43
Benzo(a)pyrene	0.001	0.012	0.002	0.002	0.009	0.011	0.006	4.0
Benzo(k)fluoranthene	0.007	0.008	0.010	0.013	0.013	0.011	0.010	0.62
Indeno(123)perylene	0.003	0.004	0.002	0.001	0.002	0.001	0.002	0.13
Benzo(g,h,i)Perylene	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.00

Table 2: TOTAL PAH CONCENTRATION DISTRIBUTION IN URBAN AND OIL PRODUCDING COMMUNITIES OF EGBEMA. (DRY SEASON)

PAH	AQAFS	AQEWFS	AQEWH	AQEOJ	AQOFS	AQOWH
naphthlene	0.008	0.006	0.004	0.004	0.007	0.007
acenaphthalene	0.006	0.015	0.010	0.010	0.021	0.017
acenaphthene	0.021	0.004	0.007	0.008	0.002	0.000
florene	0.017	0.017	0.008	0.006	0.015	0.015
phenathrene	0.004	0.004	0.001	0.005	0.001	0.006
anthracene	0.007	0.006	0.003	0.005	0.078	0.006
fluoranthene	0.031	0.006	0.021	0.146	0.006	0.096
pyrene	0.165	0.164	0.100	0.103	0.172	0.172
Benzo(a)anthracene	0.004	0.010	0.090	0.090	0.021	0.052
chrysene	0.030	0.018	0.004	0.034	0.020	0.022
Benzo(b)fluoranthren	0.004	0.010	0.004	0.002	0.013	0.007
Benzo(a)pyrene	0.001	0.012	0.002	0.002	0.009	0.011
Benzo(k)fluoranthene	0.007	0.008	0.010	0.013	0.013	0.011
Indeno(123)perylene	0.003	0.004	0.002	0.001	0.002	0.001
Benzo(g,h,i)Perylene	0.000	0.000	0.000	0.000	0.000	0.000
TOTAL PAH	**30.8**	**28.0**	**26.6**	**42.9**	**38.0**	**42.9**
TOTAL AV PAH	**2.05**	**1.87**	**1.73**	**2.86**	**2.53**	**2.86**

From Table 1, Pyrene recorded 0.146(µg/kg)as highest mean average concentration followed by Fluoranthene with 0.051 (µg/kg) concentrations. Also Benzo(g,h,i),Perylene and Indeno(1,2,3)Perylene recorded lowest concentration of PAH, with 0.002(µg/kg)and 0.000(µg/kg) respectively. This indicates that the latter has little or no pollution presence in oil producing communities of Egbema.

Also from Table 2, AQEOJ and AQOWH locations recorded an average PAH as 42.9(µg/kg)and 2.86(µg/kg)respectively, while AQEWFS location recorded 28.0(µg/kg)and 1.87(µg/kg)concentration of PAH respectively. This can tell the type or volume of pollution caused by oil exploration and its activities which are carried out within such locations. These explanations suggested that natural gas/oil exploration activities may be contributing significantly to PAHs in air at levels that are relevant to human health. [4].

Statistical analysis of PAH in oil producing communities of Egbema

Table: 3 Descriptive Statistics: AQAFS, AQEWFS, AQEWH, AQEOJ, AQOFS, AQOWH,, ...

Variable	N	N*	Mean	SE Mean	StDev	Minimum	Q1	Median	Q3
AQAFS	14	0	0.0289	0.0147	0.0549	0.0030	0.0040	0.0105	0.0278
AQEWFS	14	0	0.0266	0.0144	0.0540	0.0040	0.0055	0.0135	0.0187
AQEWH	14	0	0.0412	0.0183	0.0684	0.0020	0.0040	0.0095	0.0572
AQEOJ	14	0	0.0417	0.0188	0.0702	0.0010	0.0037	0.0075	0.0592
AQOFS	14	0	0.0335	0.0145	0.0544	0.0010	0.0088	0.0160	0.0260
AQOWH	14	0	0.0378	0.0150	0.0562	0.0020	0.0087	0.0140	0.0393

It is good to note that AQEOJ and AQOWH locations has the largest variation (spread) of PAH element while AQEWFS location has the lowest spread of PAH in Egbema oil producing communities in Imo State. Hence, the location AQEOJ is most volatile area with PAH element and this is evident in the Maximum value of the variables

Variable	N	N*	Mean	SE Mean	StDev	Minimum	Q1	Median	Q3
NAPH	10	0	0.00740	0.00107	0.00337	0.00400	0.00400	0.00650	0.01100
ACHTHA	10	0	0.02500	0.00702	0.02220	0.00600	0.00775	0.01750	0.03550
ACTHE	10	0	0.01900	0.00518	0.01637	0.00200	0.00700	0.01050	0.03450
FLORE	10	0	0.03030	0.00930	0.02941	0.00600	0.01425	0.01850	0.03850
PHENA	10	0	0.0559	0.0234	0.0740	0.0010	0.0040	0.0085	0.1588
ANTHR	10	0	0.0677	0.0236	0.0747	0.0040	0.0060	0.0445	0.1180
FLUORA	10	0	0.0861	0.0282	0.0890	0.0080	0.0245	0.0515	0.1553
PYRENE	10	0	0.1172	0.0265	0.0837	0.0130	0.0352	0.1100	0.2077
BENZOa	10	0	0.0400	0.0142	0.0448	0.0000	0.0030	0.0210	0.0762
CHRYSE	10	0	0.02120	0.00495	0.01564	0.00200	0.00550	0.02200	0.03700

It is observable that FLUORANTHENE has the largest variation (spread) of PAH element while NAPHTHALENE has the lowest spread of PAH in Egbema oil producingcommunities in Imo State. Hence, the location FLUORANTHENE is most volatile PAH element and this is evident in the Maximum value of the variables.

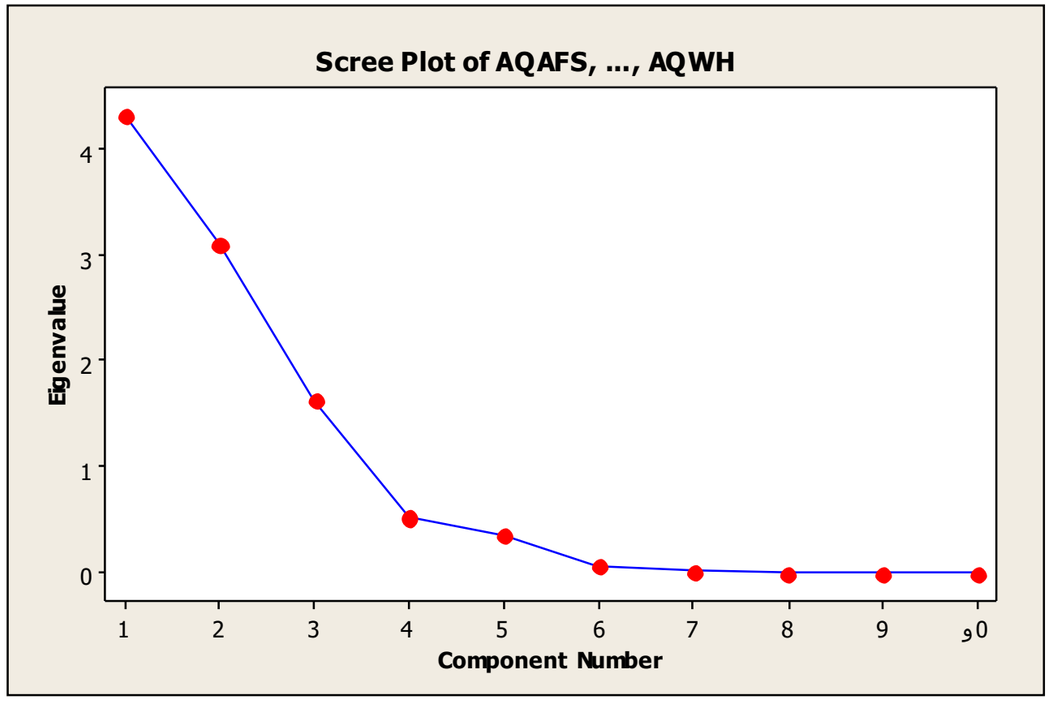


Plate 1. Screen Plot of AQAFS, AQEWFS, AQEWH, AQEOJ, AQOFS, AQOWH
From plate 1, the first two and the first three **principal components** represents from 74.2% to 90.5% of the total variability in the location of PAH. Thus, most of the data structure can be captured in two or three underlying dimensions. The remaining **principal components** account for a very small proportion of the variability and are probably unimportant. The Screen plot provides this information visually.

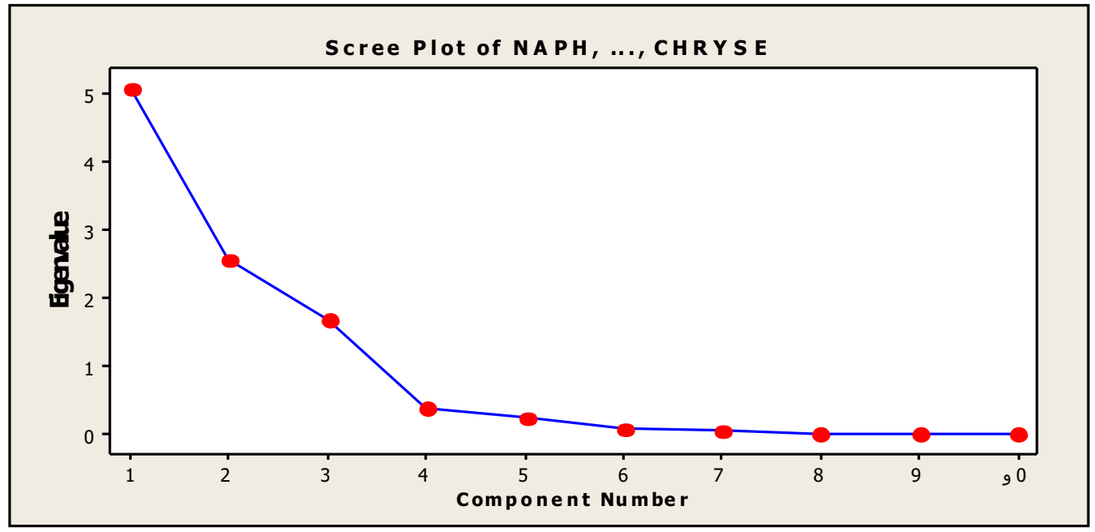


Plate 2: Screen Plot of NAPH, ACHTHA, ACTHE, FLORE, PHENA, ANTHR, FLUORA,

From plate 2, the first two and the first three **principal components** represent 76.3% and 93.1%, respectively, of the total variability in PAH. Thus, most of the data structure can be captured in two or three underlying dimensions. The remaining **principal components** account for a very small proportion of the variability and are probably unimportant. The Screen plot provides this information visually.

CONCLUSION

Generally, the PAH level determined in moss (pleuroziumschreberi) collected around Oil exploration sites were considerably higher for the heavier PAHs than the PAH level found in moss (pleuroziumschreberi) collected at background sites. This applies in particular to the mosses (pleuroziumschreberi) collected in AQOWH and AQEOJ especially for the heavier PAHs such as fluoranthene and pyrene, while in AQEWH location recorded lower PAH such as Indeno(123)perylene and Phenathrene.

It is likely that the elevated levels determined in moss (pleuroziumschreberi) are related to emissions from industries and exploration activities within these locations. However, the ratio of selected congeners indicates that combustion of organic material other than fossil fuel may contribute to the PAH level at several locations.The highest levels within the individual locations were found in PAH deployed closest to the exploration/ industrial sites in the prevailing wind direction. Still there is no clear indication that the industries and oil exploration activities is the only source to the levels of PAHs concentration. The most dominating PAHs within all the locations was the lighter PAHs such as 2-4 ring PAHs, whereas 4-7 ring PAHs where dominating in the moss samples. Hence, results from this study, illustrates that moss (pleuroziumsohreberi) samples together provides more comprehensive information regarding the spatial distribution of PAH around the oil exploration locations of Egbema communities. That said, information regarding local parameters such as wind direction and topography is important to consider in order performing an adequate sampling technique.

Polycyclic aromatic hydrocarbons (PAHs) are transported in the atmosphere in gas and/or particle phases and they are deposited by wet and dry deposition. Daily exposures to particulate matter areassociated with increased incidences of

premature death, chronic asthma and increased hospital admissions as well as respiratory problems in children [1]. Though there is very low concentration of PAH in oil producing communities of Egbema, Imo State, the biological impact in terms of the total PAHs intake into the body via respiratory, dermal, and gastrointestinal routes should be monitored precisely and continuously in order to build up a consistent and more comparable body of data on the composition and trend of PAH on ambient air across oil producing communities of Egbema in Imo State.

REFERENCES

Agency for Toxic Substances and Disease Registry, (2009) Toxicological Profile for Polycyclic aromatic hydrocarbon (PAHs). Accessed 12.09.95

D.Piraga, G.Tabors, O. Nikodemus, Z. Zigure and G. Brumelis (2017), Current content of selected pollutants in mosses, humus soil and plants bark and long-term radial growth of pine trees in the Mezaparks forest in Riga. Environ. Sci. Pollution. Res, 24, 11964–11977.

K.Becker (2002). Environmental pollutants in the blood of the German population. International Journal of Hygiene and Environmental Health, 205: 297–308.

M.S. El-shaharwa, and A. Harmza (2010) an overview on the accumulation, distribution, transformations, toxicity and analytical methods for monitoring of POP. 80: 1587-1597.

M.B Paoliello,and E.M. De Capitani (2005). Environmental contamination and human exposure to lead in Brazil. Reviews of Environmental Contaminationand Toxicology, 184:59–96.

M.Ikeda (2000). Urban population exposure to lead and cadmium in east and Southeast Asia. Science of the Total Environment, 249:373–384.

M.Jones (2019),"Gas Chromatography-Mass Spectrometry", American Chemical Society, Retrieved 19 Nov 2019.

Agency for Toxic Substances and Disease Registry, (2009) Toxicological Profile for Polycyclic aromatic hydrocarbon (PAHs). Accessed 12.09.95

D.Piraga, G.Tabors, O. Nikodemus, Z. Zigure and G. Brumelis (2017), Current content of selected pollutants in mosses, humus soil and plants bark and long-term radial growth of pine trees in the Mezaparks forest in Riga. Environ. Sci. Pollution. Res, 24, 11964–11977.

K.Becker (2002). Environmental pollutants in the blood of the German population. International Journal of Hygiene and Environmental Health, 205: 297–308.

M.S. El-shaharwa, and A. Harmza (2010) an overview on the accumulation, distribution, transformations, toxicity and analytical methods for monitoring of POP. 80: 1587-1597.

M.B Paoliello,and E.M. De Capitani (2005). Environmental contamination and human exposure to lead in Brazil. Reviews of Environmental Contaminationand Toxicology, 184:59–96.

M.Ikeda (2000). Urban population exposure to lead and cadmium in east and Southeast Asia. Science of the Total Environment, 249:373–384.

M.Jones (2019),"Gas Chromatography-Mass Spectrometry", American Chemical Society, Retrieved 19 Nov 2019.

COVID-19 CRISIS AND ITS EFFECT ON SURVIVAL STRATEGIES Of SMALL-SCALE BUSINESS ENTERPRISES

BROGHOMA, Lawal. M
Department of Business Administration
School Of Business Studies
Delta State Polytechnic, Otefe-Oghara
Delta State
broghomunir@gmail.com
&
OGHOGHO, Roseline O.
Department of Office Technology and Management
School Of Business Studies
Delta State Polytechnic, Otefe-Oghara
Roselineoghogho26@gmail.com

Abstract
The study examined the effect of covid-19 crisis on survival strategies of small-scale business enterprises in Nigeria. The study was anchored on the prospect theory because it enables business owners to make decision during uncertainty. The study made use of descriptive research design where primary data is collected through the administration of structured questionnaire to one-hundred (100) selected small scales business at Textile Mill Road in Egor Local Area of Edo State, Nigeria and the ordinary least square regression technique was adopted in testing the formulated hypotheses. The results revealed that Covid-19 crisis has a significant positive effect on the funding of small-scale business enterprises in Nigeria and Covid-19 crisis has an insignificant positive effect on the survival strategies of small-scale business enterprises in Nigeria. The study recommended that the government needs to do more to protect SMEs from the effects of the covid-19 crisis by assisting them with funding to ensure their survival.

KEYWORDS: *Covid-19 Crisis, Funding of SMEs, Prospect Theory, Survival Strategies SMEs*

INTRODUCTION

The covid-19 crisis became a pandemic because it spreads to over 216 countries and territories around the world and induced the most economic death toil since the great depression (World Health Organization, 2020; International Monetary Fund, 2020). Covid-19 was first identified in Wuhan, China, in December, 2019 and has caused colossal death and has spread to almost all parts of the world (Akanni & Gabriel, 2020). Akpoveta and Joy (2020) asserted that the world economy faces the worst ever economic recession due to the outbreak of the covid-19.

The global economy is expected to account for economic losses in the area of small-scale business sector especially household consumption, and international trade. Covid-19 pandemic has put pressure on policy makers and supervisory institutions across the globe, sparking of several

mitigating initiatives by government agencies to combat the potential negative social economic impacts on households and small-scalebusinesses. The covid-19 outbreak is likely to cause bankruptcy for many well-known brands in many industries as consumers stay at home, and economies are shutdown. The impact of covid-19 on the global economy is likely to be unprecedented since the 1930s great depression (Igwe, 2020).

The small and medium scale enterprises (SMEs) play a vital part in social inclusion, innovation in rural areas, and local employment. The SMEs sector suffers most in times of crisis and the least prepared for all organizations. There is lack business of continuity plans. Having a strong business continuity plan may help minimize any negative impact on business during a pandemic. Covid-19 has created severe challenges for SMEs all over the world. The adverse effects include interruptions of supply chains, cash flow problems, weaker demand for imported goods and services, inability to meet delivery dates, and increased risk aversion in financial markets (DECD, 2020). SMEs are vital to the smooth functioning of any economy by ensuring that goods are delivered during and after public emergencies (Burton, Confield, Gasner, & Weisfuse, 2011).Against this backdrop, thisstudy is to empirically examine the effect of COVID-19 crisis on survival strategies small scale business enterprises in Nigeria and to the best of researchers' knowledge, none of the studies looks at SEMs Egor Local Government Area of Edo State. This is the research gap the study is addressing.The, objectives of the study are as follows;

(i) To examine the relationship between the covid-19 crisis and the funding of small-scale business enterprises in Nigeria.

(ii) To determine the relationship between the covid-19 crisis and survival strategies small scale business enterprises in Nigeria.

REVIEW OF LITERATURE AND HYPOTHESES DEVELOPMENT

Covid-19 Crisis in Nigeria

The covid-19 crisis in Nigeria is part of the worldwide pandemic of corona virus disease 2019 (Covid-19) caused by severe acute respiratory syndrome corona virus 2 (SARS-COV-2). The first case of covid-19 in Nigeria was identified on February 27, 2020. According to WHO (2020), as of July 28, 2020, 1pm (GMT+1), the total number of confirmed cases worldwide was 16,301,736, while there were confirmed deaths of 650,069 in 216 countries, areas or territories of the world. On 31 January, following the developments of Covid-19 pandemic in Mainland China and other countries worldwide, the federal government of Nigeria set up a corona virus preparedness group to mitigate the impact of the virus if it eventually spreads to the country. On the same day, the world health organization listed Nigeria among other 13 African countries identified as high-risk for the spread of the virus. As of July 28, 2020, the Nigerian centre for disease control (NCDC) reported 41,804 cases, 18704 discharged patients, and 868 deaths, and the number of tests in Nigeria was 267,842 (in a population of about 200 million people). Lagos State is one of theout of the 36 States in Nigeria that was most affected because of the high population density of more than 20m(Idowu, 2020). As of July 28, 2020 Lagos state has a total of 14,848 cases in Nigeria (NCDC). This is about 36% of the number of cases in Nigeria.

The pandemic has led to severe global socio economic disruption, the postponement or cancellation of sporting religious, political, and cultural events, and widespread shortages of supplies. In China, a fall in consumption combines with interruptions to production has disrupted global supply chain affecting firms across the world (Ozili, 2020). Nigeria and her people are no exception like Albert Einstein famously

proclaimed. Amid every crisis lies great opportunity for managers, the covid-19 crisis creates an opportunity to foster transiliency and thus better cope with the next pandemic (Craighead, Ketchen & Darby, 2020).

Small Scale Business Enterpriseand Covid-19 Crisis

Small scale businesses are the major drivers in developing an economy by generating employment opportunities all over the world (Elimam, 2017). Nkaegbu (2020) states that, prior to the introduction of the structural, adjustment programme in Nigeria small and medium scale industries were virtually neglected in all the development plans of the country. Ifekwem and Adedamola (2016) asserted that SMEs contribute the following to the Nigerian economy: Mobilization of local resources, employment opportunities, equitable distribution of income, services of raw material, mitigation of rural urban drift, generation and conservation of foreign exchange and distribution of industries.

Despite the multiple challenges confronting SMEs, they contribute immensely to the economic development of Nigeria, micro, small, and medium enterprises (MSMEs) are engines of social economic transformation globally. SMEs contributed 49.78 percent to Nigeria's Gross Domestic chosen for simplicity, because it is more explanatory easy to interpret and it is understandable to the reader of the project. The Nigerian economy especially the small scale business enterprises have experienced devastating effects as a result of covid-19 due to the inability to borrow and to service loans, disruption of the global supply chain, drop in revenue and also the closure of small scale business enterprises by government directives to avoid community spreading of the corona virus (Ozili, 2020).Thus, SMEs are at high risk for permanent closure after large scale disasters partially because they cannot pay for their expenses while being shut down. The role of SMEs in any national economy cannot be over emphasized (Murtala, Awolaja, & Bako, 2015). SMEs are important to the development of the local economy especially in job creation, economic growth, and poverty alleviation. SMEs drive the economic development of a country (Obi, Ididunmi, Tolulope, Okpundun, Amaihian, Borishade & Fred, 2018).

The role of SMEs in any national economy cannot be over emphasized (Murtala, et al, 2015). SMEs are important to the development of the local economy especially in job creation, economic growth, and poverty alleviation. SMEs drive the economic development of a country (Obi, et al, 2018). SMEs are considered the backbone of any economy (Rouse, Hart, and Kumar, 2020). SMEs contribute immensely to the growth of a country's GDP, generation of employment and improvement in the standard of living (Radu, 2018).

The corona virus (covid-19) pandemic has created major disruptions in the economy and the lives of businesses worldwide, where many jobs were lost in the process(OECD, 2020). The covid-19 pandemic outbreak has made a lot of business shutdown, leading to a monumental disruption of trade and commerce in many industrial sectors. Retailers and brands face many short term challenges relating to workforce, health and safety, cash flow, supply chain, consumer demands sales, and marketing. A lot of markets, especially in hospitality and tourism, no longer exist, where online shopping, online communication and online entertainment, have witnessed unprecedented growth (Donthum & Gustafsson, 2020).

Funding of Small-Scale Business Enterprise and Covid-19 Crisis

The small-scale business enterprises in Nigeria are hindered by the presence of covid-19 outbreak where some financial institutions were carrying skeletal services to

closure business organizations. SMEs have a lack of financial resources as the biggest challenge to short- and long-term recovery in the covid-19 situation (Donthum, & Gustafsson, 2020).Business owners can take advantage of various government initiatives, like loans rescheduling, various palliative measures, and loans at low interest rates made available by the government e.g. 50billion naira loan packages made available to individuals and SMEs.

The consequence of covid-19 on the economy and financial markets in Nigeria; economic lockdown of major cities (Abuja Lagos and Ogun state) on March 30, 2020, leading to economic loss especially for daily income earners from small medium scale businesses, withdrawal of money by investors from the stock exchange market and fall in oil prices (Ozili, 2020). He and Harris, (2020), conducted a survey of more than 580 SMEs, between March 28 and April 4, 2020. The result revealed that there were mass layoffs, closure of business, different beliefs, about the likely duration of the covid-19 related disruptions, many businesses are financially on the brink, and most business planned to seek funding. This implies that Covid-19 has caused a significant economic shock.Beglaryan and Shakhmuradyan(2020) studied the impact of COVID-19 pandemic on small and medium-sized enterprises in Armenia and established from the logistic regression results that a significant relationship exists between COVID-19 pandemic and SMEs laying-off employees and pay reduction. This means that government should give financial assistance to SMEs and low-skilled workers in area of funding.The following hypothesis is formulated that Covid-19 crisis has a significant effect on the funding of small scale business enterprises in Nigeria.

Survival Strategies of Small-Scale Business Enterprisesand Covid-19 Crisis

Survival strategies ofsmall-scale business enterprises (SMEs) is the ability of the business to create new opportunities for employment, maximization of profit margins, harness skills and competencies from the population, create bargaining power, enhance financial accessibility, promote investment, provide access to market, and improve living standards and eradication of poverty among the growing population (Wangui, 2020).However, SMEs need to consider survival strategies in area of digitalization.

Digital marketing through social media is like marketing products and services without a boarder. SMEs can also consider their staff working on alternative days, working from home, usage of contract staff, leave for idle staff, temporary pay cuts, revision of variable pay schemes, staff rotation, salary restructuring, hazard pay for frontline staff that cannot work from home (KPMG, 2020). SMEs owners need to motivate and galvanize their staff to achieve the maximum possible. SME owners can also collaborate in the areas of information technology, research, and development. SME owners can become hybrid entrepreneurs by investing in order forms of business to boost their income.The few studies show that the last millennium's major historical pandemics have typically been associated with subsequent cow returns as assets (Rouse, Hart, & Kumar, 2020).

The study of Bourletidis and Triantafyllopoulos (2014) documented that thesurvivalstrategies of SMEs adopted in the times of economic hardshiplike that of corona virus pandemic enhance the process of leveraging on financial resources, technological processes, managerial and human capabilities. Wangui (2020) study in Kenya on the effect of innovation strategies, marketing strategies and operational strategies on the growth of SMEs businesses where 649 SMEs operating within Narok Town were sample through convenience sampling technique. The regression results showed that there was a positive association between innovation strategies, marketing strategies and operational strategies and the growth of SMEs while operational strategies had an insignificant negative effect on the growth of a business. The following hypothesis is formulated that Covid-19 crisis has a significant effect on the survival strategies of small scale business enterprises in Nigeria.

Theoretical Review

The study was anchored on prospect theory.

Prospect Theory

Prospect theory is based on decision making during uncertainty as witness by covid-19 pandemic (Nkaegbu, 2020). This makes this theory suitable for situations like pandemics. Decision makers are premised on how a problem is framed. It is better to describe a situation in positive terms than negative terms, which will make riskiest choices (Craighead, et, al, 2020). Sensational or inflammatory coverage of Covid-19 news by the media increases negativity and potential risks. Though in some countries, the press plays potential risks (Radu, 2020). The prospect theory is relevant in this study because it helps to predict how a manager and venture owner will react under a pandemic situation.

METHODOLOGY

Research Design

The descriptive research method was adopted in this study where primary data were collected through the administration of structured questionnaire to one-hundred (100) selected small scales business at Textile Mill Road in Egor Local Area of Edo State, Nigeria. The sampled SMEs were randomly selected based on the staff strength above two (2) persons.

An instrument is said to be valid and reliable when it measures what it ought to measure. The reliability of the research instrument (questionnaire) was tested using Cronbach Alpa coefficient while the instrument was constructed based likert scale questions. The result of Cronbach Alpa coefficient revealed corona-19 crisis has a Cronbach Alpa coefficient value of 0.69 which approximately 0.70, funding of SMEs has a Cronbach Alpa coefficient value of 0.71 and business survival of SMEs has a Cronbach Alpa coefficient value of 0.76. This implies that the variables of the research had a Cronbach alpha of above or equal to 0.7, therefore indicating internal consistency of the research instrument. The data gathered for study through the questionnaire were analyzed using ordinary least square regression technique with help of SPSS21.0.

DATA ANALYSIS AND PRESENTATION

The data collected were analyzed using the ordinary least square regression to examine the effect of Covid-19 crisis on survival strategies of small-scale business enterprises. The effect of Covid-19 crisis on funding of small-scale business enterprises is presented in table 1 below;

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.295[a]	.087	.073	.51126	1.854

a. Predictors: (Constant), FSMS

Ľ□5 ś♫ś■fś■Čë Äח╜ĂĽ▄ś□/ ë 5 /

It was observed from table 1 above that R^2 value of 0.087 accounts for about 9% systematic variation in Covid-19 crisis is explained by funding of small-scale business enterprises. The t-test was used to test the formulated hypothesis and it was presented in table 2 below;

Table 2: Test of Hypothesis

Model	Unstandardized Coefficients	Standardized Coefficients	t	Sig.
	.	.		
C{a {	لا يو	ي لا و	ي و ي	يو ه

Ă 5 ś ■ ś ■ Ċ ë Ă n Ă ’ é / ë 5 /

It was observed from table 2 above that funding of small scale business enterprises (FSMS) has a positive coefficient (0.27) and statistically significant at 5% level. This implies that the presence of Covid-19 crisiswould significantly lead to increase in funding of small scale business enterprises in Nigeria because it was statistically significant at p-value <0.05. The finding was in agreement with the findings of He and Harris, (2020) and Beglaryan and Shakhmuradyan (2020) that a significant relationship exists between COVID-19 pandemic and funding of SMEs. This means that the hypothesis should be accepted that Covid-19 crisis has a significant effect on the funding of small scale business enterprises in Nigeria.

To examine the effect of Covid-19 crisis on survival strategies of small scale business enterprises, ordinary least regression techniques result conducted is presented in table 3 below;

Ç Ă ’ é ى 9 ź ź ś l ’ Ċ ¤ ź / ¤ ō ╬ -19 Crisis on Survival Strategies of SMEs

a ■ ŕ ś l	w	w {ij Ă ś	! ŕ ╬ ŕ Ġ ś ŕ w Square	{Ġ 9 ’ n ¤ n ¤ ź the Estimate	5 ĵ ’ ł ╬ ■ Watson
و	يي و [a]	يو ه	ى و ه	يى يوي	يي ي و

Ă t ’ ś ŕ ╬ Ġ n / ■ ŕ Ċ Ă ■ Ċ ë . {Ç
Ľ 5 ś ♫ ś ■ ŕ ś ■ Ċ ë Ă n Ă Ľ é / ë 5 /

It was observed from table 3 above that R^2value of 0.028 accounts for about 3% systematic variation in Covid-19 crisis which is explained by survival strategies of small scale business enterprises. The t-test was used to test the formulated hypothesis and it was presented in table 4 below;

Table 4: Test of Hypothesis

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.971	.203		9.702	.000
	BST	.140	.104	.168	1.353	.181

a. Dependent Variable: CVDC

The results from table 4 above revealed that survival strategies of small scale business enterprises (BST) has a positive coefficient(0.14) and statistically insignificant at p-value < 0.05 level. This implies that the presence of Covid-19 crisis would significantly lead to survival strategies of small scale business enterprises in Nigeria because it was statistically insignificant at p-value <0.05. The finding was in disagreement with the findings of Bourletidis and Triantafyllopoulos (2014)that the survivalstrategies of SMEs adopted in the times of economic hardship like that of corona virus pandemic enhance the process of leveraging on financial resources, technological processes, managerial and human capabilitiesandWangui (2020) thatcovid-19 crisis and survival strategies of small scale business enterprises were positively and significantly related. This means that the hypothesis should berejected that Covid-19 crisis has a significant effect on survival strategies of small scale business enterprises in Nigeria.

CONCLUSION AND RECOMMENDATIONS

The covid-19 crisis became a pandemic because it spreads to over 216 countries and territories around the world and induced the most economic death toil since the great depression. The global economy is expected to account for economic losses in the area of small scale business sector especially household consumption, and international trade. Covid-19 pandemic has put pressure on policy makers and supervisory institutions across the globe, sparking of several mitigating initiatives by government agencies to combat the potential negative social economic impacts on households and small scale businesses. The ordinary least square regression technique revealed that Covid-19 crisis has a significant positive effect on the funding of small scale business enterprises in Nigeria and Covid-19 crisis has an insignificant positive effect on the survival strategies of small scale business enterprises in Nigeria. The study recommended that:

1. The government needs to do more to protect SMEs from the effects of the covid-19 crisis by assisting them with funding to ensure their survival.

2. The venture owners of SMEs should change their business models to become more online based as survival strategies.

3. The government both at the state and federal level should create an enabling environment for SMEs owners to operate effectively and also help to explore the use of renewable sources of energy (such as solar and wind) as an alternative to power supply from the national grid.

REFERENCES

Akanni, L.O., & Gabriel, S. C. (2020). The Implication of Covid-19 on the Nigerian Economy, Centre for the Study of the Economics of Africa, Retrieved from cseaafrica.org.

Akpoveta, A., & Joy, O. (2020). Covid-19 Pandemic: Nigeria's Economic and Business Disruptions, 19.

Bourletidis, K., & Triantafyllopoulos, Y. (2014). SMEs survival in time of crisis: strategies, tactics and commercial success stories. Procedia-Social and Behavioural Sciences, 148, 639-644.

Burton, D., Confield, E., Gasner, M., & Weisfuse, I. (2011). A qualitative study of pandemic influenza preparedness among small and medium-sized businesses in New York City, Journal of Business Continuity and Emergency Planning, 5(3), 267-279.

Craighead, C.W., Ketchen, D.J., & Darby, J.L. (2020). Pandemics and supply chain management research: Toward a Theoretical Toolbox, Decision Sciences.

Donthum, N., & Gustafsson, A. (2020). Effects of Covid-19 on Business and Research, Journal of Business Research, 15, 117-120.

He, H., & Harris, L. (2020). The impact of the Covid-19 pandemic on corporate social responsibility and marketing Philosophy, Journal of Business Research, 116,176-182.

Ifekwem, N.,&Adedamola, O. (2016). Business Research Methodology in Covid-19 Pandemic, Delta State Polytechnic, Otefe-Oghara.

Igwe, P.A. (2020). Corona virus with looming global health and economic doom.African Development Institute of

Research methodology, 1,1-6.
KPMG (2020). Covid-19 and employee rewards, KPMG Nigeria, Retrieved from www.kpmg/ng.
Muritala, A. T., Awolaja, A., Bako, Y.A. (2015). Impact of Small and Medium Enterprises on Economic Growth and Development, American Journal of Business and Management, 1: 18-22.
Nkaegbu, A. (2020). Covid-19 Economic Downturn – the Implication for Corporate Debts and Recovery Actions in Nigeria, SSRN Electron.
OECD (2020). Covid-19 and responsible business conduct. Tackling corona virus (Covid-19. Contributing to a global effort, Retrieved from www.mneguidelines.oecd.org.
Ozili, P. (2020). Covid-19 pandemic and economic crisis: The Nigerian Experience and Structural Causes, SSRN Electronic Journal, 1-19.
Radu, S. (2020). How global media covers the corona virus, Retrieved from www.usnews.com.
Rouse, J. Hart, M., & Kumar, A. (2020). Covid-19, critique and proposals to develop more comprehensive and inclusive support for the self-employed, ERC Research Report, Retrieved from Enterprise Research.ac.uk.
Wangui, M. (2020). Influence of business survival strategies on growth of Small and Medium Enterprises in Narok Town, Narok County, Thesis, Strathmore University, 1-76. http://hdl.handle.net/11071/10426

COVID-19 PANDEMIC AND THE SOCIO-ECONOMIC DEVELOPMENT OF NIGERIA: AN ASSESSMENT OF GOVERNMENT INTERVENTIONS

[1]IWEZU Joseph Iwezu;
[2]AGBOGWE Cynthia
&
[3]ANIEMEKE Frederick
[1&2]Department of Arts & Humanities
School of General Studies, Delta State Polytechnic, Ogwashi-uku
[3]Department of Mass Communication Delta State Polytechnic, Ogwashi-uku
Email: ssjoseph1@yahoo.com

Abstract:
Since the Nigerian economy is largely dominated by informal workers, the preventive measures (lockdown, movement restriction, social distancing and interstate travel ban) occasioned by Covid-19 pandemic will affect socioeconomic livelihood in Nigeria. Relying on secondary sources, this study examines socioeconomic challenges of Covid-19 pandemic in Nigeria, analyses and evaluates government response to curbing its effect on livelihood in Nigeria. Results from the study find bearings between Covid-19 pandemic and low socioeconomic livelihood in Nigeria. Palliative measures introduced by the government to minimize the effect of Covid-19 pandemic are largely ineffective owing to poor coordination, human right violations as well as inadequate fiscal policy. Recommendations from the study draws on the need for the government to diversify the economy by promoting the informal and agricultural sectors, facilitate infrastructural development and improve health facilities, to avoid economic recession of post Covid-19 pandemic in Nigeria.

Keywords: *Nigeria, Socioeconomic, Informal Economy, Covid-19 Pandemic, Lockdown*

INTRODUCTION

Government exists for the preservation of human lives and properties. Meyer and Meyer (2016) propose a social contract through the establishment of a legitimate authority to protect life, property and liberty of those who lived within the state. The role of the government in this regard is to provide enabling environment for economic efficiency and growth through protection of private property. These functions of the government become imperative for citizens to invest their resources and energies in productive process for the overall development of the country (Ismail and Imoughele, 2015; Meyer and Meyer, 2016).

Although, socioeconomic problems such as poverty, unemployment, low income, inequality, poor housing, ineffective health facilities, epileptic power supply etc. are present in developing countries (Adeniran and Sidiq, 2018; Kyambalesa, 2009), the outbreak of Covid-19 pandemic may further confound socioeconomic livelihood in Nigeria where more than half of the population lives below international poverty line of US $1.25 a day (Central Bank of Nigeria, 2015; World Bank, 2014). To this end, this study examines government response to

socioeconomic impact of Covid-19 pandemic in Nigeria.

CONCEPTUAL CLARIFICATIONS

Socioeconomic and Informal Economy

Socioeconomic is a combination of two words 'socio and economic'. Socio means society or social issues, while economic relates to means of income. Therefore, socioeconomic refers to societal and economic factors. It is a broad term used to describe the social and economic standing of individual in the society (Hellmich, 2015; Mark 2009). Socioeconomic covers a variety of ways that explains individual work experience, household, as well as access to basic needs and resources (Heath, Martin and Beerten, 2003). While various indices may be applied in determining socioeconomic condition of the individual, major indicator includes occupation, income and education (Darin-Mattsson, Fors and Kåreholt, 2017; Hellmich, 2015). Darin-Mattsson, et al (2017) further maintains that these major indicators (occupation, income and education) affect the other, in the sense that, individual's type of occupation largely corresponds to their income which in turns determines their level of education.

Studies (Baizidi, 2019; Heath, Martin and Beerten, 2003) agreed on a typical model of socioeconomic classification such as the upper, middle, working and lower classes. Individual in the upper class is rich and wealthy, but few in number and controls larger part of the society's wealth (Akhbar-Williams, 2010). Two types of groups exist in the upper class viz: the upper-upper class e.g aristocrat who has been rich from generations and the lower-upper class such as the capitalist (Heath, Martin and Beerten, 2003). The middle class, also known as the sandwich class, are largely white collar or professional workers characterized by moderate incomes and affordable basic needs (Baizidi, 2019; Liu, 2010). Based on their level of education, individual in the middle class are further divided into two groups. This includes the upper middle class, categorized as skilled workers or highly educated professional with high incomes and, the lower middle class typically comprises of less educated people with lower incomes such as secretaries, retailers, teachers etc. (Akhbar-Williams, 2010; Stephen, 2016).

Otherwise known as blue collar class, the working class are made up of unskilled workers who are engaged in manual or strenuous labour (Akhbar-Williams, 2010; Heath, Martin and Beerten, 2003). This category of people includes electricians, plumbers, carpenters etc. The last classification on the social rung is the lower or the underclass, characterized by poverty, unemployment and homelessness (Brown, 2009; Darin-Mattsson, et al, 2017). Individual in the lower class is excluded from mainstream society, lack medical care, education, housing, food, clothing and vocational training.

Informal economy is a shadow, gray, black or underground business enterprise, not fully regulated by the government. It can also be defined as the type of economic enterprise that is not taxed nor included in a country's GDP or economy projection (Ogbuabor and Malaolu, 2013). Informal economy covers a wide range of labour market activities including street trading, carpentry, motorcycle services photography, catering, hairdressing, fashion designing, painting, media personality etc. Informal economy is said to be widespread in developing countries due to scarcity of earnings opportunities and economic hardship (Awojobi, Ayakpat and Adisa, 2014; Nastav and Bojnec, 2008).

In Nigeria, the informal economy is significant because it provides employment opportunities for the teeming unemployed citizens and the medium to meet the needs of poor consumers through cheaper and accessible goods and services (Ogbuabor and Malaolu, 2013; Yusuf, 2014). Also, due to the ease and flexibility attached to the operations of informal enterprises, the sector is devoid of bureaucratic regulatory framework with little or no formal

educational requirements (Awojobi, Ayakpat and Adisa, 2014; Fapohunda, 2013). Information in table 1 shows percentage contribution of the formal and informal sectors to Nigeria's economy in 2019. Analysis from the table indicates that informal sector contributed 58% to GDP and 80% to employment generation in 2019. Despite rebasing its GDP to incorporate informal enterprises in the economy, Nigeria's informal sector has largely been underestimated by the government. The lack of accurate data on the growing rate of informal enterprises in Nigeria poses challenges for effective targeting of economic policy and control measures (Kwanga, 2015; Awojobi, Ayakpat and Adisa, 2014). Yet, informal business is seen as a source of employment and livelihood in Nigeria (Fapohunda, 2013; Amasi, 2016).

Table 1: Percentage Contribution of the Formal and Informal Sectors to Nigeria's Economy in the Year 2019

	Formal Sector	Informal Sector
GDP	42%	58%
Employment	20%	80%

Source: National Bureau of Statistics, 2019.

Due to its vast population and abundance natural resources, Nigeria is arguably one of the largest economies in Africa. However, the paradox of these potential factors continues to manifest in low socioeconomic livelihood among its citizens. Socioeconomic problems in Nigeria are compounded by increasing unemployment, inadequate social welfare, ineffective health care facilities etc., which continues to widen inequalities and disparities between the rich and the poor, thus weakening social cohesion and citizen's trust in government (Adeniran and Sidiq, 2018).

Covid-19 Pandemic and the Nigerian Experience

Covid-19 is a new genre of Coronaviruses that causes illnesses such as Common Cold, Severe Acute Respiratory Syndrome (SARS) and Middle East Respiratory Syndrome (MERS) (Centers for Disease Control and Prevention, 2020; WHO, 2020). It is an infectious disease that spreads mainly through driblet of spittle or release from the nose when an infected person coughs or sneezes (Nigeria Center for Disease Control, 2020; WHO, 2020). The novel coronavirus is said to originate from Wuhan City in China (WHO, 2020; Wuhan Municipal Health Commission, 2019). Empirical investigations (Peiris, Lai and Poon, 2003; WHO, 2020) reveal that coronavirus diseases such as SARS-CoV and MERS-CoV was contracted from animals in China in 2002 and Saudi Arabia in 2012 respectively. However, Covid-19 is a novel virus because it has not been previously identified in human system. Common symptoms of Covid-19 include fever, cough, Dyspnea and tiredness (NCDC, 2020; WHO, 2020). The suffix '19' as used after Covid correlates to the year of discovery of the virus in 2019 (Ohia, Bakarey and Tauseef, 2020; WHO, 2020).

A pandemic is a widespread epidemic that affects people in many countries and continent. It is a term used to substantiate the rapid rate of contagious disease raging from endemic and epidemic (Muthu, 2005; Qiu, Rutherford, and Mao, 2017). An endemic disease is an infectious disease that is common in a particular region or community, while epidemic is an outbreak of infectious disease in a community at a particular time (Chakraborty, 2017; Qiu, Rutherford, and Mao, 2017). A pandemic occur when an epidemic becomes widespread and affects people in many countries. The contagious effect and rate of spread of Covid-19 globally justify the pandemic nature of the virus (see

table 2 for the number of countries, confirmed cases and death rate of Covid-19 as at June, 22 2020). The WHO confirms Covid-19 as a pandemic on 11 March, 2020 (CDC, 2020; WHO, 2020). Historical accounts of similar cases of Covid-19 pandemic includes: Spanish Flu, 1918-1919; Asian Flu, 1957-1958; Swine Flu, 2009-2010; SARS, 2002-2003; Ebola, 2014-2016; MERS, 2015-present (WHO, 2020).

Table 2: Number of Countries with Confirmed Cases and Death of Covid-19, as at June, 22 2020

No of Countries	No of Confirmed cases	No of Death
188	8,860,331	465,740

SOURCE: WHO, 2020

Across polities, governments have continued to introduce a number of precautionary measures such as self-isolation and lockdown to curb the spread of Covid-19. Further still, personal hygiene practices such as frequent washing of hands with soap and water or use of alcohol-based hand sanitizer, wearing of face mask, maintaining social and physical distancing at least 1 meter away in public gathering etc., has been suggested as means to minimize the spread of Covid-19 (WHO, 2020; NCDC). While global effort to develop vaccine to contain the spread of the novel coronavirus is ongoing, the movement restriction, lockdowns and social distancing occasioned by the pandemic has continued to cause structural changes in economy and social system globally. Based on the high rate of contagious effect of Covid-19, the WHO (2020) observes that developing countries may face inadequate testing capacity due to weak and ineffective health system.

The index case of Covid-19 in Nigeria was recorded on 27 February, 2020 when an Italian citizen tested positive for the virus in Lagos (NCDC, 2020). However, the number of confirmed cases and death of Covid-19 in Nigeria has continued to increase. Analysis in table 3 shows that 20,244 confirmed cases, 6,879 recovery and 518 deaths of Covid-19 were recorded across states in Nigeria as at 22 June, 2020. The effect of Covid-19 pandemic on socioeconomic livelihood in Nigeria implies negative consequences for larger part of its citizens who are engaged in the informal sector of the economy and lives below international poverty line of US $1.25 a day (Central Bank of Nigeria, 2015).

The outbreak of Covid-19 pandemic in Nigeria is hinge on conspiracy theories. One of such belief is that Covid19 is nonexistence but a means for the government to divert public fund to private pocket. This position pervades public domain since public's trust in government is low (Odima, 2020). Another belief is that Covid-19 is a disease for the elites and wealthy individuals. This position seems catchy resulting from news from government officials, business leaders, celebrity, social and media personality who tested positive for the virus or died from Coronavirus related illness (Campbell, 2020). Thus, despite public awareness on preventive measures of Covid19, the lower class in the society perceived government regulations as a sham, thus increasing the rate of community transmission of the virus in Nigeria (Campbell and McCaslin, 2020).

RESEARCH METHOD

The study made use of secondary data. Therefore, relevant literatures on socioeconomic challenges and Covid19 pandemic in Nigeria were purposefully selected for content analysis. Covid-19 pandemic is ongoing as at the period of conducting this research. Thus, the enforcement of social and physical

distancing, movement restrictions as well as lock-down by the government could not allow for a field study.

Socioeconomic Challenges of Covid-19 Pandemic in Nigeria

(a) Monolithic Nature of Nigeria Economy: Nigeria is a monolithic economy that relies on crude oil as major a source of government revenue and foreign exchange inflow (Al-Ghwell, 2020; Oladipo and Fabayo, 2012). The depletion in the prices of crude oil amid Covid-19 pandemic portends negative growth in Nigeria GDP. Analysis in table 4 shows Nigeria's GDP growth rate in Nigeria from 2010 to the First Quarter of 2020. While economic recovery has been relatively slow since the 2016 recession, the depletion in the prices of crude oil and its attendant decline in the GDP by the First Quarter (FQ) of 2020 will worsen socioeconomic problems in Nigeria. More so, since government relies on external borrowing to finance public expenditure, the implication of crude oil depletion is further manifested on debt serving which is a major bane of economic development in Nigeria (Aluko and Arowolo, 2010). Amid Covid-19 pandemic, the House of Representative approved the President request to borrow $5.513 billion to finance 2020 deficit budget (Nlebem, 2020).

Table 3: Nigeria GDP Growth, 2010-FQ 2020

Year	GDP Growth	Performance Indicator
2020 (FQ)	1.87%	Decrease
2019	2.3%	Increase
2018	1.9%	Increase
2017	0.81%	Decrease
2016	-1.62%	Decrease (Recession)
2015	2.65%	Decrease
2014	6.31%	Decrease
2013	6.67%	Increase
2012	4.23%	Decrease
2011	4.9%	Decrease
2010	11.3%	Increase
2009	8.4%	

Source: National Bureau of Statistic (NBS), 2020.

(b) Difficulties in Maintaining Social Distancing: Another major socioeconomic challenge of Covid-19 pandemic in Nigeria relates to the problem of maintaining social and physical distancing as well as good hygiene practices in high density and poor houses typical of rural and urban residence in Nigeria. Adesoji (2014) found that most residential houses in Nigeria are without good toilets, sewage, and drainage systems, as well as inadequate waste disposal facilities, space and setback. Several other studies (Babanyara, Usman and Saleh, 2010; Olotuah and Taiwo, and 2013) reveals that increased rural urban migration and urban housing deficit accounts for the proliferation of slums in many towns and cities across states in Nigeria. Since individual's position on the socioeconomic rung correlates to their health status (Michael, 2004; Olotuah, 2015), inadequate access to sanitation will further aid the spread of Covid-19 pandemic in Nigeria.

© Effect on Informal Workers: The 'stay at home' directive by the government to mitigate the spread of Covid19 affects socioeconomic livelihood of the informal workers. Analysis in table 1 shows that 80% of

the Nigeria labour force are employed in the informal sector. To this extent, Covid-19 pandemic and its attendant coping measures (lockdown, restriction on movement etc.) portends grave consequences for citizens who based their income on daily access such as face-to-face interactions and customer flow to meet basic needs. These challenges are not without negative consequences on low income, savings and consumption expenditure. In the same vein, Covid-19 pandemic creates uncertainty in global markets and interrupts supply chain. As a result, some industries and companies resort to layoff or salary modification to cope with economy downturn of Covid19 pandemic (Arinze, Ogwu and Aliyu, 2020; Olorunbi, 2020). According to the NBS (2020), out of the over 200 million Nigeria's population, 23 million persons, aged between 15 and 35 years old are either unemployed or underemployed in the year 2019. Moreover, given the economy downturn of Covid-19 pandemic, it is not in doubt to postulate a steady increase in Nigeria's unemployment rate.

(d) General Belief that Covid-19 is Nonexistence: The outbreak of Covid-19 pandemic in Nigeria is hinge on conspiracy theories. One of such belief is that Covid-19 is nonexistence but a means for the government to divert public fund to private pocket. This position pervades public domain since public's trust in government is low (Odima, 2020). Another belief is that Covid-19 is a disease for the elites and wealthy individuals. This position seem appealing due to news from government officials, business leaders, celebrity, social and media personality who tested positive for the virus or died from Covid-19 related illness (Campbell, 2020). Consequently, despite public awareness on preventive measures of Covid-19, the lower class in the society perceived government regulations as a sham, thus increasing the rate of the virus in Nigeria (Campbell and McCaslin, 2020).

GOVERNMENT RESPONSE TO COVID-19 PANDEMIC IN NIGERIA

(a) Lockdown and Movement Restrictions: The federal government announced a lockdown on 30 March, 2020 in Lagos and Ogun states, as well as Abuja (Federal Capital Territory) and later Kano state, which are considered as the epicenter of Covid-19 pandemic in Nigeria (NCDC, 2020). This was followed by similar directive by some state governments culminating into closure of school, religion, social and sport gathering as well as movement restriction and interstate travel ban. The federal government also institutes the Presidential Task Force (PTF) to keep update with the management of Covid-19 in Nigeria (NCDC, 2020). This is coupled with the establishment of Emergency Operations Centers as a rapid response strategy to flattening the curve of Covid19 pandemic in Nigeria (NCDC, 2020).

(b) Distribution of Palliative: Another major response by the government to cushion the effect of Covid-19 pandemic in Nigeria was the distribution of palliatives such as food items and 'conditional cash transfer' to the poor and vulnerable citizens. The beneficiaries of the 'conditional cash transfer' were estimated to cover 3.6 million citizens who depend on daily wage and persons with disabilities, whose means of livelihood has been negatively affected by Covid-19 lockdown and movement restrictions (Njoku, Ebiri, Olumide, Musa, and Agboluaje, 2020). Private individual and Civil Society Organizations also supported the government through cash donations and distributions of parcels of food items to the needy (Abara, 2020). Similarly, the government also continued the Home-grown School Feeding Programme aimed at addressing malnutrition and ensuring provision of food ration to schoolchildren amid Covid-19 pandemic (Onwuzoo, 2020).

(c) Fiscal Stimulus Measure: Fiscal stimulus such as interest rate reductions, tax cuts and tax holidays were implemented to mitigate the effect of Covid-19 pandemic on Small and Medium Scale enterprises. For instance, the government implemented tax holidays for small businesses against company income tax, while tax rate for medium businesses were revised downwards from 30% to 20% (Nnanna, 2020). The CBN also approved uniform exchange rate system for Inter-Bank market to ease pressure on Foreign Exchange rates (Onyekwena and Ekeruche, 2020). Other stimulus measures include the establishment of #50 billion Intervention Fund to improve health facilities in the country (Nnanna, 2020; Onyekwena and Ekeruche, 2020).

EFFECTIVENESS OF GOVERNMENT RESPONSE TO COVID-19 PANDEMIC IN NIGERIA

Government response to Covid-19 pandemic in Nigeria was not without challenges that further aggravates socioeconomic livelihood.

(a) Human Right Abuse: The enforcement of lockdown, movement restrictions and curfew by the security agents were met with human right violations, degrading treatment, illegal confiscation of properties, extortion and unlawful arrests. The National Human Rights Commission (2020) reveals that security forces used excessive or disproportionate force leading to deaths in Kaduna, Abia, Delta, Niger, Ebonyi and Katsina States. The NHRC (2020) also identifies the Nigeria Police Force, the Nigeria Army and Nigeria Correctional Service to be responsible for the highest cases of human right violations during Covid-19 lockdown and movement restrictions. In the same vein, various cases of gender-based violence including rape, and domestic violence such as spousal violence, and parent-child abuse were largely reported during Covid-19 pandemic lockdown in Nigeria (Amnesty International, 2020; NHRC, 2020).virus is highly contagious, ineffective coordination of Covid-19 lockdown and protocols in one part of the state will aggravate the spread of the virus in the country.

CONCLUSION

The outbreak of Covid-19 pandemic portends negative consequences for socioeconomic livelihood in Nigeria. Government response to mitigate the effect of Covid-19 pandemic lockdown on the poor and sustaining the economy are largely defective. The aforementioned observation is considered in relation to the informal workers which accounts for Nigeria's largest economy, but bear greater brunt of Covid-19 pandemic lockdown in Nigeria. To guide against post Covid-19 pandemic recession, there is need for the government to expand the economy by promoting the informal and agricultural sectors which accounts for Nigeria's largest revenue. The government should also create an enabling socioeconomic environment through the provision of social amenities to facilitate economic growth and improve health facilities, thereby creating job opportunities and increasing GDP.

REFERENCES

Akanni, L.O., & Gabriel, S. C. (2020). The Implication of Covid-19 on the Nigerian Economy, Centre for the Study of the Economics of Africa, Retrieved from cseaafrica.org.

Akpoveta, A., & Joy, O. (2020). Covid-19 Pandemic: Nigeria's Economic and Business Disruptions, 19.

Bourletidis, K., & Triantafyllopoulos, Y. (2014). SMEs survival in time of crisis: strategies, tactics and commercial success stories. Procedia-Social and Behavioural Sciences, 148, 639-644.

Burton, D., Confield, E., Gasner, M., & Weisfuse, I. (2011). A qualitative study of pandemic influenza preparedness among small and medium-sized businesses in New York City, Journal of Business Continuity and Emergency Planning, 5(3), 267-279.

Craighead, C.W., Ketchen, D.J., & Darby, J.L. (2020). Pandemics and supply chain management research: Toward a

Theoretical Toolbox, Decision Sciences.
Donthum, N., & Gustafsson, A. (2020). Effects of Covid-19 on Business and Research, Journal of Business Research, 15, 117-120.
He, H., & Harris, L. (2020). The impact of the Covid-19 pandemic on corporate social responsibility and marketing Philosophy, Journal of Business Research, 116,176-182.
Ifekwem, N.,&Adedamola, O. (2016). Business Research Methodology in Covid-19 Pandemic, Delta State Polytechnic, Otefe-Oghara.
Igwe, P.A. (2020). Corona virus with looming global health and economic doom.African Development Institute of Research methodology, 1,1-6.
KPMG (2020). Covid-19 and employee rewards, KPMG Nigeria, Retrieved from www.kpmg/ng.
Muritala, A. T., Awolaja, A., Bako, Y.A. (2015). Impact of Small and Medium Enterprises on Economic Growth and Development, American Journal of Business and Management, 1: 18-22.
Nkaegbu, A. (2020). Covid-19 Economic Downturn – the Implication for Corporate Debts and Recovery Actions in Nigeria, SSRN Electron.
OECD (2020). Covid-19 and responsible business conduct. Tackling corona virus (Covid-19. Contributing to a global effort, Retrieved from www.mneguidelines.oecd.org.
Ozili, P. (2020). Covid-19 pandemic and economic crisis: The Nigerian Experience and Structural Causes, SSRN Electronic Journal, 1-19.
Radu, S. (2020). How global media covers the corona virus, Retrieved from www.usnews.com.
Rouse, J. Hart, M., & Kumar, A. (2020). Covid-19, critique and proposals to develop more comprehensive and inclusive support for the self-employed, ERC Research Report, Retrieved from Enterprise Research.ac.uk.
Wangui, M. (2020). Influence of business survival strategies on growth of Small and Medium Enterprises in Narok Town, Narok County, Thesis, Strathmore University, 1-76. http://hdl.handle.net/11071/10426

DESIGN AND DEVELOPMENT OF INTEGER LINEAR PROGRAMMING SOFTWARE USING VISUAL BASIC PROGRAMMING LANGUAGE

C.O. AMGBARI[1], T.O. SUOWARE [1],A. KABIAMOWEI[1]
Department of Mechanical Engineering
Technology Federal Polytechnic, Ekowe[1].
charlesamgbari@gmail.com

Abstract
This paper focuses on developing software for the integer linear programming problems. Such model will heighten effective decision and policy formulation for any profit-oriented organization. It is in light of this that integer linear programming software became very imperative, with the aim of adopting the best design and development principles that could solve the problem at hand, visual basic programming language was employed for the implementation of the integer linear programming model because of the nature of the problems it solves, the object-oriented nature of the programming language, also its simplicity and time saves benefits for the manager. To implement the design and development of integer linear programming software using visual basic programming language, the application was tested and debugged. The validation was ensured by using a number of benchmark examples of integer linear programming problem, guaranteed that the model simulated effectively the textbook problems and the result printed out successful.

Keywords: *Gomory's cut, Object-oriented programming, integer linear programming, computer aided design (CAD) and decision.*

INTRODUCTION

In linear programming, **Jayalakshm M 2010, Shama 2010** each decision variable as well as the slack variable is allowed to take any real value, there are some real life problems in which the fractional value of the decision variables has no significance. **Shama 2010** For instance, suppose we were buying warehouses to store finished goods, where a warehouse comes in a set size then a model that suggests we purchase 0.7 warehouses at some location and 0.6 somewhere, would be of little value. Warehouses come in integer quantities.

In designing the relevant algorithms, for this software, we followed standard designing methodologies well treated in a numbers of operation research text book Akpobi, 2005.

The purpose of this work is basically to develop and implement computer software that would greatly enhance productivity of an industrial engineering outfit. As, Decision making is the whole process of the problem through generation and evaluation of alternatives and finally to the choices itself. (okoliee at. 2014).

OBJECTIVE OF THE STUDY

- To provide visual display of solution, so as to easily and speedily interpret the solutions.
- To provide very accurate and efficient solutions.

There is little or no literatures in this area of research, in this work, we presented the relevant design equations used in developing the software in section 2.0, while in section 3.0 the program testing is presented using a number of typically industrial engineering design problems from standard textbooks. Discussion of the programme's performance is presented in section 4.

SOFTWARE MODEL DESIGN AND DEVELOPMENT

In developing this software, the relevant equation for Pure all integer linear programming was put to use. These equations form the fundamental principles used in designing the software (Akpobi 2015). The software presented in this work was compiled using the object-oriented programming techniques tools of Visual Basic 2010, how to program, (Deitel et al 2010). The integer linear programming problems is well treated in many operations research text books (Sharma J.K 2010).
The pure integer linear programming problems in its standard form can be stated as follows

Maximize= Z - C^X-L + C_2X_2 + . +C_nX_n

Subject to the constraints
$a_{11}x_l + a_{12}x_2 + -a_{ln}x_n = a_{12}x_2 + a_{ln}x_n = bi$
$a_{11}x_l + {}_{12}x_2 + -a_{ln}x_n = a_{12}x_2 + a_{ln}x_n = bi$

$a_{11}x_l + a_{12}x_2 + -a_{ln}x_n = a_{12}x_2 + a_{ln}x_n = bi$
$x_{lt}x_2 ...x_3 > 0$ and are integer

A systematic procedure called the Gomory's all- integer algorithm for generating "cuts (additional linear constraints. So as to ensure an integer solution to the given LP problems in a finite numbers of steps, Gomory's algorithm have the following properties

- Additional linear constraints never cut off that portion of the original feasible solution space that constraints a feasible integer solution to the original problem.
- Each new additional constraint or hyper plane cuts off the current non-integer optimal solution to the linear programming problem.

Suppose the basic variable **xr** has the largest fractional value among all basic variables, restricted integers. The **r**th constraints equation row from the simplex table can be written as;
$x_{Br}(= b_r) - 1.x_r' + (a_{r1}x_1 + a_{r2}x_2 + \ ) = x_r + \{a_{rj}x_j$ **2**

Where Xj(j = 1,2,3, ...) represents all the non-basic variables in the **r**th constant (row, except the variable x_r and $b_r(= x_{Br})$ are the non-integer value of variable **xj** Let us decompose the coefficients of xj,x_r variables andx_{Br} to integer and non-negative fractional parts in equation 2 shown below

$$[x_{Br}] + fr = (1 + 0)x_r + \sum_{j \neq r} \{[a_{rj}] + f_{rj}\}x_j \qquad 3$$

Where x_{Br} and (ar J) denote the largest integer obtained by truncating the fractional part from $x_{Br}(= b_r) = l.x_r$ respectively Rearranging Equation 3 so that all the integer coefficients appear on the left-side, we get

$$f_r + \left\{[x_{Br}] - x_r - \sum_{j \neq r}[a_{rj}]x_j\right\} = \sum_{j \neq r} f_{rj}x_j \qquad 4$$

Where Fr is strictly a positive fraction (0</Ff< 1) while f_{rj} is a non-negative fraction (0</Ff< 1) . Since all the variable including slack are require to assume integer values, the terms in the left-hand side in Equation 4 is **fr** plus a non-negative number, we may write it in the form of the following inequalities

$$f_r \leq \sum_{j \neq r} f_{rj}x_J$$

Or $\sum_{j \neq r} f_{rj}x_j = f_r + s_g or -f_r = s_g - \sum_{j \neq r} f_{rj}x_j \qquad 6$

Where sg is a non-negative slack variable and is called the Gomory's slack variable.
Equation 6 represents Gomory's cutting plane constant. When this new constant is added to the bottom of optimal simplex table, it would create an additional row in the table along with a column for the new variable**sg**

STEPS FOR GOMORY'S ALL INTEGER PROGRAMMING ALGORITHMS

An iterative procedure for the solution of all integers programming problem by Gomory's cutting plane method can be summarized in the following steps bellow.

STEP 1 INITIALIZATION

Formulates the standard integer LP Problems, if there are any non-integer coefficient in the constraint equations, convert them into integer coefficients. Solve the problems by the simplex method, ignoring the integer requirements of variables.

STEP 2 TEST THE OPTIMALITY

A, examine the optimal solution, if all basic variables $(i.e.\ x_{Bi} = b_i \geq 0)$ have integer values, the integer optimal solution has been derived and the procedure should be terminated. The current optimal solution obtained in step 1 is the optimal basic feasible solution to the integer programming.
B, if one or more basic variables with integer requirements have non-integer values, then go to step 3

STEP 3 GENERATE CULTING PLANE

Choose a row **r** corresponding to a variable **xr** that has the largest fractional value **fr** Now generate the cutting plane (a Gomory's constraints) as explained earlier in Equation 6.

$$-f_r = s_g - \sum_{j \neq r} f_{rj}x_j$$

Where $0 < /_{rj} < 1$ and $0 < f_r < 1$

STEP 4 OBTAIN THE NEW SOLUTION

Add the cutting plane generated in the step 3 to the bottom of the optimal simplex table, as obtained in step 3. Fine a new optimal solution by using the dual simplex method, i.e. choose a variable that is to be entered into the new solution having the smallest ratio

$\left\{\frac{(c_j - z_j)}{y_{ij}}; y_{ij} < 0\right\}$ and return to step 2. The process is to be repeated until basic variables with integer requirements assume non-integer values.

PROGRAM DESCRIPTION

The program was created using the basic equation above, modeled with visual basic.net object-oriented programming language. Accompanied in this work are the program algorithm and the flowchart. The module of operation of this program is basically in the three faces (input, analysis and output).

INPUT PHASE

In this section information is obtain using window form, textbox, prompt commend to display input boxes for collecting data.

ANALYSIS

Codes in conformity with correct syntax were assemble in the code editor window to effectively analyze the inputs data to supply accurate results of the objective function (Z)and the basic variable (Xj) as output. This result is displayed in scale of fair timing depending on the processor speed of the computer system being used.

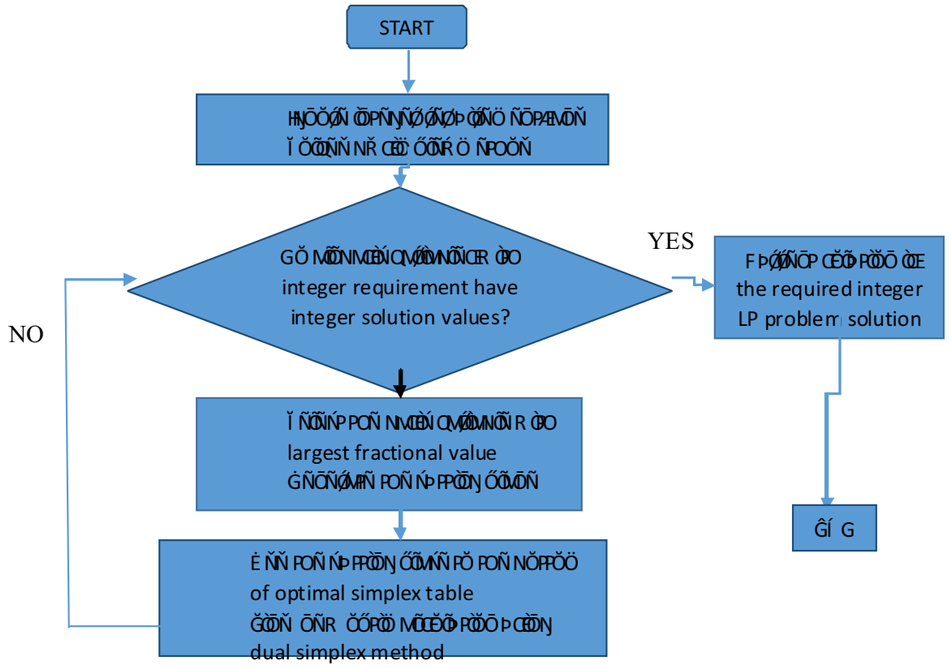
OUTPUT PHASE

This shipping section takes information that the computer has processed and place it on varies output devices to make it available for use outside the computer.

ALGORITHM

The pseudocode used in the developing of this software is presented as follows;
Start
Select design
Select all integer linear programming
Enter number of variables
Enter problem type (maximization or minimization)
Enter variable of choice (AtoZ)
Enter variable for objective function
Enter value for constraints
Compute desired parameter (AtoX**j**)
END IF
END

FLOW CHART



EXAMPLES TO ILLUSTRATE THE USE OF THE SOFTWARE

We consider in this section benchmark examples to illustrate the accuracy of the software.

Example 1

Solve the following integer programming problem using Gomory's cutting plane algorithm

Maximize z= $x_1 + x_2$

Subject to the constraints

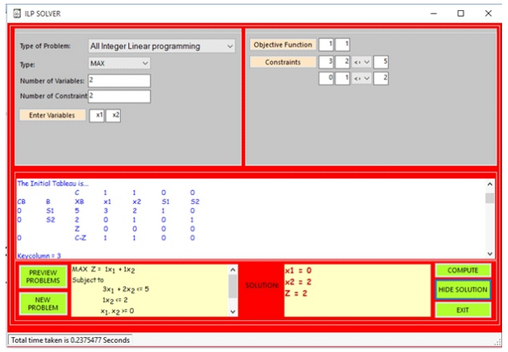
$$(i)\ 3x_1 + 2x_2 \leq 5$$

$$(ii) x_2 \leq 2$$

$$x_1, x_2 \geq 0\ and are integers.$$

(Madras Univ., BE., 1990)

Solution



Example 2

A manufacturer of toys make two types of toys, A and B. processing of these two toys is done on two machines X and Y. The toy A requires two hours on machine X and six hours on machine Y. Toy B requires four hours on machine X and five hours on machine Y. There are sixteen hours of time per day available on machine X and thirty hours on machine Y. The profit obtained on both the toys is same i.e. Rs 5 per toy. Formulate and solve this problem as an integer LP problem to determine the daily production of each of the two toys? (Delhi Univ., MBA 1998)

Solution

Formulating the LP problem

Let x_1 and x_2 Number of units of toy A and toy B, respectively to be produced

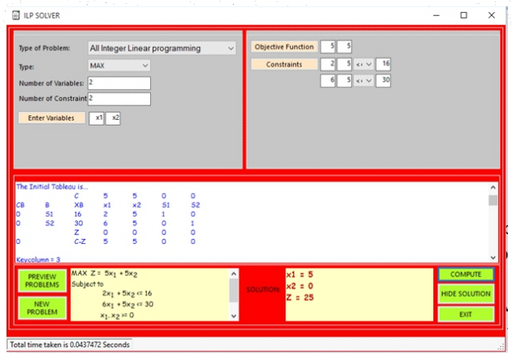
$$Maxz = 300x_1 + 200x_2$$

$$\text{Subject to } (i)2x_1 + x_2 \leq 60$$

$$(ii)x_1 \leq 25$$

$$(iii)x_2 \leq 35$$

$$\text{And } x_1, x_2 \geq 0\ and are integers.$$



V**example 3**

The ABC Electric Appliances company produces two products: Refrigerators and Ranges. The production of these takes place in two separate departments. Refrigerators are produced in department 1 and Ranges in department 2. Both these are sold on a weekly basis. Due to the limited facilities in the departments the weekly production cannot exceed 25 refrigerators. The production of one refrigerator requires two man weeks of labour and of one range one man-week. A refrigerator contributes a profit of Rs 300 and a range Rs 200. Formulate and solve this problem as an integer LP problem to determine the units of refrigerator and ranges that the company should produce to realize the maximum profit? (Delhi Univ. MBA 2003).

Solution

let X_1 and X_2 = Number of units of refrigerator and range respectively to be produce

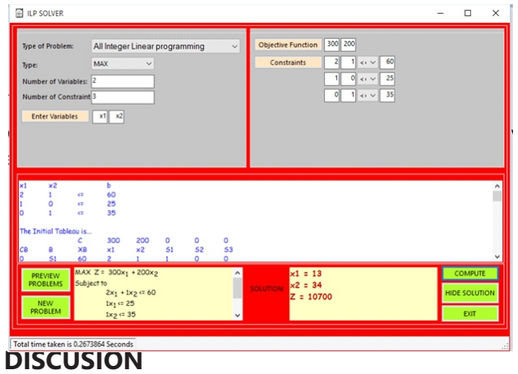
$$Maxz = 300x_1 + 200x_2$$

$$\text{Subject to } (i)2x_1 + x_2 \leq 60$$

$$(ii)x_1 \leq 25$$

$$(iii)x_2 \leq 35$$

$$\text{And } x_1, x_2 \geq 0\ and are integers.$$



DISCUSION

The software functionality was tested on numerous industrial model examples on all integer programming problems. The software displays result for easy accessibility using rich textbox and also displaying the tableaus for all iteration. The software is consistency with results obtained by manual computation available from standard text books. Finally the time taken to solve each complex industrial model mathematical problems is less than 0.5 seconds using this software.

CONCLUSION

The integer programming software was developed to ease the manual computational complexity in solving industrial base problems and as an aid to managers by providing the best solutions to a variety of integer linear programming problems and those who will always want to optimize production and maximize profit.

REFERENCES

Akpobi John, computer aided design of bolts. Department of production engineering university of Benin 2015

Akpobi John and Imafidon A. Lawani, computer aided design of flywheels. Department of production engineering university of Benin. Advance in engineering software,

2015
Pandian P and Jayalakshmi M., 2010 A new method for solving integer linear programming problems with fuzzy variables. Applied mathematical sciences, Vol. 4, 2010, page 20,997-1004
Paul Deitel and HaeveyDeitel, 2010 Microsoft Visual Basic 2010, How to programming, published by pearson Education, Inc Upper Saddle River, New Jersey 07458
Sharma J.K. 2010 Operations Research theory and applications 4th edition, published by Rajiv Beris for Macmillan publishers India Ltd page 206-219

DETERMINATION OF SOME HEAVY AND PRECIOUS METALS FROM PRINTED CIRCUIT BOARD (PCB) FROM A TELEVISION SET BY ATOMIC ABSORPTION SPECTROPHOMETER

[1]GBARAKORO, S. L. &[2]KONNE, J. L.

[1]Department of Science Laboratory Technology,
School of Applied Sciences, Kenule Beeson Saro-Wiwa Polytechnic, Bori, Rivers State, Nigeria.

[2]Department of Chemistry, Rivers State University,
Port Harcourt, Nigeria.

Abstract
The concentrations of some heavy and precious metals from printed circuit board (PCB) of a television set were determined using Atomic Absorption Spectrophotometer (AAS) in order to identify elements with higher concentration as target source of raw materials for metal recovery. The metal fractions attached to the PCB were subjected to mechanical separation, placed inside a 75ml Kjeldahl flask and thereafter digested with a 20ml nitric acid (HNO_3). The prepared sample was filtered, then made up to 100ml using distilled water and analysed using AAS (Shimadzu model AA6300). The results showed the presence of some heavy metals such as: (Fe,0.0644mg/l, Pb, 0.0732mg/l, Cu,0.0627mg/l, Ni, 0.1076mg/l and Cd, 0.0001mg/l) in higher concentrations (apart from Cd) than the precious metals (Au, 0.0297mg/l, Pd, 0.0042mg/l, Ag, 0.0316mg/l and Li, 0.0019mg/l). This confirmed that the PCB which is an electronic waste was largely made up of heavy and precious metals. Thus, metals can be determined effectively from electronic waste using HNO_3 and AAS. It is therefore, recommended that proper recycling methods should be put in place in order to reduce the pollution caused by these electronic wastes.

Keywords: *Electronic waste (e-waste), printed circuit board, metal recovery, AAS, HNO_3*

INTRODUCTION

In the world today, there is an exponential increase in the consumer demand for modern electrical and electronic equipment (EEE), as a result of the latest technological development in their manufacturing and designing. These high demands as well as change in consumer tastes have unwittingly shortened the useful life of these electrical and electronic devices. Thus, these out-of-date devices are continually being discarded into the environment, where they infiltrate into soil and groundwater aquifer, causing environmental pollution. The discarded devices have contributed in no small measure to the global generation of huge quantities of waste electrical and electronic equipment (WEEE) (Sinha-Khetriwalaet al., 2005) that needs to be properly managed.

Isildaret al., (2019) viewed electronic wastes (popularly called e-wastes) as dangerous since they contain hazardous

materials such as minerals, energy and chemicals used for their manufacturing. Their hazardous natures also depend on their condition and density (Kavitha, 2014). E-waste comprises of all the components, sub-assemblies and consumables, which are part of the product at the time of discarding (Khaliq et al., 2014). It contains a mixture of ferrous, non ferrous, plastic and ceramic materials (Khaliq et al., 2014) and more than 1000 different substances which are classified as hazardous when discarded (Dave et al., 2016). E-waste also contain precious metals (PMs) such as gold (Au), silver (Ag), palladium (Pd), platinium (Pt),rhodium (Rd), iridium (Ir), etc and heavy metals such as lead (Pb), nickel (Ni), zinc (Zn), iron (Fe), copper (Cu), mercury (Hg), cadmium (Cd), etc. Cui and Zhang (2008) noted that precious metals are widely used in the manufacture of electronic appliances due to their high chemical stability and good conducting properties. E-wastes are categorized as discarded computers, television, call phones, refrigerators, copiers, fax machines, electrical lamps and batteries.

The generation of e-waste globally is increasing exponentially (Debnath et al., 2018) and is expected to skyrocket far beyond human imagination, in the near future (Ongondoet al., 2011; Isildaret al., (2019). At present, 20 to 25 million tons of e-waste are being generated globally in a year with Europe, United States of America and Australia taking the lead (Khaliq et al., 2014). In the developing countries, there is a substantial increase in e-waste generation. This is as a result of the forecasted economic growth (Yamane et al., 2011). Astudy carried outby Schmidt (2006) showed that an average of 5 million secondhand computers weighing 60,000 tonnes entered Nigeria through Lagos port, out of which nearly 30,000 tonnes were non-functional or irreparable.

The composition of e-waste differs chemically and physically from domestic and industrial wastes. Chemically, it consists of metals, metalloids, halogenated compounds and radioactive elements (Dave et al., 2016). Physically, we have printed circuit boards (PCBs), cathode ray tubes (CRTs), epoxy resins, rubber and so on (Privadarshini, 2011). PCBs are commonly found in consumer electronics such as televisions, mobile phones, laptops and computers(Khaliq et al., 2014). PCBs are essential parts of almost all electrical and electronic equipment, and they constitute about 3% of the total electronic scraps by weight (Li et al., 2004). PCB contains noble metals, rare metals; platinium group metals (PGMs), resin and glass (Itoh, 2014). Ogunniyiet al., (2009) and Khaliq et al., (2014) discovered that PCBs are 40% metals, 30% plastics and 30% ceramics.Yamane et al.,(2011) investigated the composition of spent PCBs from mobile phones and personal computers and discovered that PCBs from mobile phones had higher (34.5%) copper contents while personal computer (20%).

Although, it is on record that researchers from countries like India, Japan, Korea, Australia, Turkey and Norway have extracted, recovered and even recycled wastes and precious, base and heavy metals from electrical and electronic equipment in their countries, according to their legislation, employing mechanical processing, hydrometallurgical (Kim et al., 2011), pyrometallurgical (Hall and Williams, 2017, electrometallurgical routes and biometallurgy (Ilyas and Lee, 2014), there is no report on the determination and recovery of potentially toxic elements from e-wastes obtained from electronic or computer villages in Nigeria using Atomic Absorption Spectroscopy (AAS). For this reason, the PCB from a discarded television set was chosen to be studied. Therefore, this study is aimed at determining heavy and precious metals from PCB of a television set by the use of AAS. The study will be beneficial economically and environmentally. The determined metals will help to provide a new source of cheap and easily available metals which might be relevant for use in our industries.

Materials and Methods

Materials

The materials and equipment used include 5g of sample, 20ml HNO_3, 75ml Kjeldahl flask, 100ml volumetric flask, whatman No. 42 filter paper, AAS, analytical weighing balance, pipette, distilled water.

Methods

Sample collection

The PBC part attached to the Sony television waste were separated and collected at a refuse dumb at computer village Port Harcourt, Rivers State, Nigeria and transported to Jach Petro- Analytical Laboratory Limited, Rumuokwurusi, Port Harcourt for sample preparation and analysis.

Sample preparation

The e-waste was subjected to mechanical separation were the plastic parts and hazardous parts were separated and disposed safely without creating any harm to the environment. After the separation, 5g of the sample was weighed and placed in a 75ml kjeldahl flask. Twenty ml [20ml] of HNO_3 was measured using a pipette and poured into the flask containing the weighed sample. These were allowed to stay for 48hours, in order for the sample to properly digest all of its oxidizable metals into the solvent (HNO_3). The contents of the flask were digested until the brown fumes of nitrous oxide ceased to appear. The prepared samples were filtered using Whatman No.42 filter paper into a 100ml volumetric flask. Distilled water was used to make up the solution to 100ml.

Sample Analysis

The concentrations of Fe, Pb, Cu, Ni, Cd, Au, Pb, Ag and Li were analyzed using AAS [Shimadzu model AA6300]. The instrument was calibrated based on the individual metals. The data were analyzed in triplicate and the mean concentration values were recorded.

Results and Discussion

The concentrations of each of the metals analysed in mg/l, mg/kg and weight percent are shown in Table 3.1 below.

Concentration of metals from PCB of a television

S/N	Metals	Concentration (mg/l)	PPM (mg/kg)	Weight percent (wt %)
1	Fe	0.0644	1.288	0.0001288
2	Pb	0.0732	1.464	0.0001464
3	Cu	0.0627	1.254	0.0001254
4	Ni	0.1076	2.152	0.0002152
5	Cd	0.0001	0.002	0.0000002
6	Au	0.0297	0.594	0.0000594
7	Pd	0.0042	0.084	0.0000084
8	Ag	0.0316	0.632	0.0000632
9	Li	0.0019	0.038	0.0000038

The results indicate that the PCB of a television set contains higher amount of Ni (0.1076mg/l), followed by Pb (0.0732mg/l) as compared to other heavy metals analysed. Among the heavy metals analysed, Cd (0.0001mg/l) was the least metal found in a television PCB. Amongst the precious metals analysed, Ag (0.0316mg/l) had the highest concentration while Li (0.0019mg/l) recorded the least concentration. Although, the values of the concentrations in weight % of the heavy metals differ significantly from those recorded by Debnath et al., (2018): Fe (20.4712%), Pb (6.2988%),Cu (6.9287%), Ni (0.8503%), the weight precent values of only Ni matched with the weight percent values recoded for rare earth and valuable metals by Debnath et al., (2018): Au (0.0016%), Pd (0.0003%), Ag (0.0189%), Ni (0.0002%) and Cd (0.0094%). The high concentrations of heavy metals such as Pb and Cu as shown in Table 3.1 could be attributed to their use for

soldering or preventing oxidation and conductive properties respectively. Also, the weight % value obtained in this study fall within the values obtained by Isildaret al., (2019) for PCBs: Au and Pd (1-100ppm), Fe and Ni (100-10,000ppm) and Cu (>10,000ppm).

CONCLUSION

Heavy and valuable metals are found in printed circuit board of a television set. Among the heavy metals analysed, Ni recorded the highest concentration while Ag had the highest concentration among the precious metals. Determination of these metals from television PCB using $HN0_3$ as a solvent and AAS showed favourable presence for the metals. Thercfore, AAS is another promising analytical technique for the determination of metals from electronic waste.

REFERENCE

Cui, J. and Zhang, L. (2008). Metallurgical Recovery of Metals from Electronic Waste: A Review. Journal of Hazardous Materials, 158: 228-256.

Dave, S. R., Shah, M .B. and Tipre, D. R. (2016). E-waste: Metal Pollution Threat or Metal Resource? Journal of Advanced Research in Biotechnology, 1(2): 1-14.

Debnath, B., Chowdbury, R. and Ghosh, S .K. (2018). Sustainability of Metal Recovery from E-waste. Front Environ. Sci. Eng., 1 (6): 1-12.

Hall, W.J. and Williams, P.T. (2007). Analysis of products from the pyrolysis of plastics recovered from the commercial seele recycling of waste electrical and electronic equipment. J. Anal Appl. Pyrolysis, 79(1): 375-386.

I lyas, S. and Lee, J.C. (2014). Biometallurgical recovery of metals from waste electrical and electronic equipment: a Review.ChemBioEng Reviews, 1(4): 148-169.

Isildar, A., Hullebusch, E. D. V., Lenz, M., Laing, G. D., Marra, A., Cesaro, A., Panda, S., Akcil, A., Kucuker, M. A. and Kuchta, K. (2019). Valuable and Critical Raw Materials from Waste Electrical and Electronic Equipment (WEEE)-A Review. Journal of Hazardous Materials, 362: 467-481.

Itoh, H. (2014). The Recent Trend of E-waste Recycling and Rare Metal Recovery in Japan. WIT Transactions on Biology and the Environment, 180: 3-14.

Kavitha, A. V. (2014). Extraction of Precious Metals from E-waste. Journal of Chemical and Pharmaceutical Sciences, 3: 147-149.

Khaliq, A., Rhamdhani, M. A., Brooks, G. and Massod, S. (2014). Metal Extraction Processess for Electronic Waste and Existing Industrial Routes: A Review and Australian Perspective. Resources, 3: 152-179.

Kim, E.Y., Kim, M.S., Lee, J.C. and Pandey B.D. (2011). Selective recovery of gold from waste mobile phone PCBs by hydrometallurgical process. J hazard mater. 198: 206- 215.

Li, J., Shrivastava, P., Gao, Z. and zhang, H.C. (2004). "Printed circuit board recycling: A state of the art survey."IEEE transactions on electronics packaging manufacturing, 27,1:33-42.

Ogunniyi, I. O., Vermaak, M. K. G. and Groot, D. R. (2009). Chemical Composition and Liberation Characterization of Printed Circuit Board Comminution Fines for Beneficiation Investigations. Waste Manag., 29: 2140-2146.

Privadarshini, S. (2011). A Survey on Electrical Waste Management in Coimbatore. International Journal of Engineering, Science and Technology, 3(3):99-104.

Schmidt, C. W. (2006). Unfair Trade: E-waste in Africa. Environ Health Perspect, 114 (4): 232-l.

Sinha-Khetriwala, D., Kraeuchib, P. and Schwaninger, M. (2005). A Comparison of Electronic Waste Recycling in Switzerland and India. Environ. Imp. Assess. Rev., 25 (5): 492-504.

Yamane, L. H., De-Moraes, V. T., Espinosa, D. C. R. and Tenorio, J. A. S. (2011). Recycling of WEEE: Characterisation of Spent Printed Circuit Boards from Mobile Phones and Computers. Waste Manag., 31: 2553-2558

DETERMINATION OF THE PHYSICAL AND MECHANICAL PROPERTIES OF NEGRO PEPPER (XYLOPIA AETHIOPICA) UDA SEED

AGU, Romanus S.
Department of Agricultural Technology
Enugu State Polytechnic, Iwollo
E-mail: aguromanus72@gmail.com

OMEJE, Cornelius U.
Department of General Studies and Entrepreneurship
Enugu State Polytechnic, Iwollo
E-mail: omejecu@gmail.com

OKORO, Alex C.
Department of Agricultural Technology
Enugu State Polytechnic, Iwollo
E-mail: merciescds@yahoo.com

AGU, Valentine O.,
Department of General Studies and Entrepreneurship,
Enugu State Polytechnic, Iwollo
E-mail: aguval704@yahoo.com

IGWILO,Ibezim J.
Department of Animal Health and Production Technology,
Enugu State Polytechnic, Iwollo

Abstract

Selected physical and mechanical properties of negro pepper (XylopiaAethioapica) were studied at two moisture content levels of 2% and 13% (w_b). Compression strength characteristics were conducted under quasi-static compressive force at longitudinal and latitudinal (lateral) loading positions and the rupture forces, compressive strength, toughness, stiffness and force at bio-yield point determined as the mechanical properties at the two loading positions. Results indicated that volume (0.000022 – 0.00018mm^3), surface area (0.00166 – 0.0478mm^2), geometric mean diameter (0.0478 - 0.0494mm) and weight (0.02557 – 0.0259g) of negro pepper seed increased linearly with increase in moisture content. Also, bulk density, specific gravity (1438.889 - 1162.3g/mm^3), sphericity (0.7319 - 0.7317) and aspect ratio (0.684 - 0.674) decreased linearly with increase in moisture content. These indicate that negro pepper has wide size ranges and no single sample of the grains can effectively represent the other. In the case of the force-deformation characteristics, result indicates that the force and corresponding deformation at rupture of negro pepper seeds were found to vary from 25N, 0.625mm in longitudinal loading position to 137.5N, 0.75mm in lateral loading position at 13% moisture content and 112.5N, 0.88mm in longitudinal loading to 125N, 0.47mm in lateral loading at 2% (w_b) moisture

content. The bio-yield force, compressive strength, stiffness and toughness of the negro pepper seeds varied from 17.5N, 87.5N/mm^2, 62.5N/mm and 41J/mm^3 respectively in longitudinal loading position to 80N, 200N/mm^2, 62.5N/mm^2 and 183.5N/mm^2 respectively in lateral loading position at 13% moisture content and 37.5N, 150N/mm^2, 15N/mm and 130J/mm^3 respectively in longitudinal loading and 42.5N, 270.5N/mm^2, 125N/mm and 267J/mm^3 respectively in lateral loading at 2% (w_b) moisture content. Generally, the compressive strength of the negro pepper seeds is higher at lateral loading position than at the longitudinal loading position.

Keywords: *Physical and Mechanical Properties, Negro pepper, Moisture content, Loading Positions.*

INTRODUCTION

Negro Pepper is seeds from an African tree that can be used as a condiment or as a substitute for pepper. The tree, sometimes called the "Peppertree", is an evergreen tree that grows in tropical parts of Western Africa (Ameyaw, Y. and Owusu-Ansah, E., 2005). The tree grows (50 to 100) feet (15 to 30) metres tall, with a trunk (24 to 28) inches (60 to 70) cm wide. The seeds grow inside pods, each pod will have anywhere from 5 to 8 flat seeds in it. When harvested, the pods are bright green. In West Africa, the tree can flower and produce two crops of pods a year. The pods grow in clusters joined at the top, in similar manner that a bunch of bananas does and the pod is aromatic itself, but not the grain/seed. Negro pepper is an aromatic tree which bears peppery fruit and the seeds have a musty flavor and can be used as pepper substitute (Adewoyi F. B. et al., 2006). The pods aren't very long, only (1 to 2) inches (2.5 to 5.0) cm. They are dried-up for a week under the sun after harvesting. While the pods are drying, they are often smoked as well to give a smoky taste. When the pods are dried, they are reddish-brown, and you can see the shape of the seeds through them. The seeds are removed from the pods and crushed to be used as the spice called "Negro Pepper." Negro Pepper has a very sharp, pungent taste with a slightly bitter after-taste. Negro Pepper, through its various synonyms, is sometimes confused with Grains of Paradise, but Grains of Paradise are actually a separate spice. Negro pepper is distinguished by its pungent peppery musky flavor. Xylopia aethiopica (Negro pepper) is of the family Annonaceae. It is commonly known as “uda” in Igbo (Nigeria). Xylopia is a compression from Greek word xylonpikron “bitter wood” aethiopica refers to the origin of tree (though most of it grows in Ghana) (Osmak, I.T., 1954). In West Africa, the tree can flower and produce two crops of pods a year (Makajuola, G.A., 1972). Figures 1 and 2 below shows ripening and dried fruits of negro pepper respectively.



Fig. 1: Ripening fruits of negro pepper



Fig. 2: Dried fruits of negro pepper

Also, they are often smoked and ground and used to season fish and are key ingredient in Nigeria spices (Makajuola, G.A., 1972). Ghanaians normally use negro pepper for making their spicy black pepper sauce known as shito.

The key constituents in Negro pepper (Uda) are diterperic and xylopicacide, copper, manganese and zinc and they have strong taste of aroma which make them useful (Makajuola, G.A., 1972). They are mainly used for pregnant women and also serve as a key ingredient in spices. Every part of the Negro pepper plant such as the bark seed, stem, print leaves are of great importance in folk medicine for therapeutic purposes. Negro pepper contains anti-oxidizing, calmative, laxative and antimicrobial properties (Abolaji O. A. et al., 2007). It can be used for culinary purpose for assorted food dishes such as soups and for the treatment of respiratory diseases (Osmak, I.T., 1954). It is also used for the treatment of cough, fever, flu and cold. It helps to reduce pain, stimulate appetite and helps the breast milk to flow in lactating mothers. It is also used for the treatment of gastrointestinal problems such as dysentery, treatment of Rheumatism, dermatological problems such as skin eruption (Osmak, I.T., 1954). Negro pepper is used in the manufacture of cosmetics such as cranes soap, foaming liquid, and perfumer's repellents. A thorough knowledge of the mechanical and physical properties of grains and other agricultural product is essential in the optimal design of handling, processing and storage equipment. Since most agricultural products are subjected to a series of static and dynamic forces during the course of handling and processing such properties as compressive strength, force/deformation under static and dynamic loading constitute important characteristics or deterring factors in the design of industrial equipment for these operation (Datrell, R.J. and S. Walner, 1980). Negro pepper requires threshing, cleaning, grading, etc. These unit operations require good knowledge of the physical and mechanical characteristics of Negro pepper, such as shape, size, volume, density, porosity, surface area, sphericity, roundness etc, and therefore, it is very important to study and determine the various physical and mechanical properties of Negro pepper relevant to harvesting, handling, processing and packaging. Determining the relevant physical and mechanical parameters is the major challenge of this study. The result of this study will constitute important parameters in the design of industrial equipment for handling and processing of Negro pepper.

Methodology

Sample Collection and Preparation

The Negro pepper seeds (xylopia aethiopica) used in this work were collected from a farm in Akpugo in Nkanu West Local Government of Enugu State, Nigeria. The samples were dehulled and cleaned to remove dirt. After cleaning, the seed were packed and taken to the Agricultural and Bioresource Engineering laboratory of the University of Nigeria, Nsukka where the physical properties were conducted. Some apparatus used includes a 0 – 12 cm range micrometer screw gauge used to measure the major, minor and intermediate diameters of the seeds, a mettle Toledo electronic weighing balance, model XP204 used for all weight measurements. In all, 30 seeds were randomly selected and the major, minor, intermediate diameters and the weight were determined.

Determination of the Physical Properties of Negro Pepper

Physical properties, such as shape, size, volume, surface area, density, colour and appearance that are associated with design of a specific machine or analysis of the behaviour of the product in handling processes were determined (Mohsenin, N. N., 1986). Some of these physical characteristics are inseparable in describing an object and were used to determine the size and sphericity of the seed using equations as

reported by (Galedar, M. N. et al., 2008, Mohsenin, N. N., 1986). The average diameters were calculated using arithmetic mean and geometric mean of the three axial dimensions as expressed in equations (1) and (2);

$$AMD = \frac{a+b+c}{3} (1)$$

$$GMD = (abc)^{1/3} (2)$$

In the above equations, a, b and c respectively represents the major diameter, minor diameter and the thickness of the seeds while AMD and GMD represents the arithmetic and geometric mean diameters.

Sphericity

The geometric foundation of the concept of sphericity rests upon the isoperimetric property of a sphere. According to Curray, J. K. (1951), sphericity, (S) can be determined using equation (3);

$$S = \frac{(abc)^{1/3}}{a} (3)$$

Surface Area

The knowledge of the surface area and the diameter of agricultural products are essential for determination of terminal velocity, drag coefficient, and Reynolds number (Mohsenin, N. N., 1986) which are observed in conveying solid materials by air or water. According to Gannett, R. E. and Brooker D. B. (1965), the surface area (A) of the seeds of spherical shape can be evaluated from the expression in equation (4);

$$A = \frac{\pi D^2}{4} (4)$$

In (4), A is surface area of the seeds of spherical shape in mm^2, D is the minor diameter of the sphere in mm and

$$\pi = \frac{22}{7}$$

Volume

The unit volume of the 30 individual seeds was determined from the values of major, minor and intermediate diameters (a, b, c) from the following relationship in equation (5). $V = \frac{abc}{6} (5)$

A mettle Toledo electronic weighing balance, model XP204 and 0.000lg sensitivity was used to determine the weight of the seeds. Measurements were replicated for 30 times and the total weight of the seeds was determined.

Bulk Density and Specific Gravity

Density and specific gravity of food, material and agricultural, product play an important role in many application such as drying and sorting of hay (Day, C.L. and Panda, H. H., 1966); design of silos and storage bins (Otis, O. K. and Pomroy J. H., 1967); mechanical compression of ensilage (Graham, J. R., 1965); separation from undesirable material and maturity evaluation (Muak, L. O., 1957) are some examples where bulk density has found application. The Bulk density could be determined from the expression given in equation $Bulk\ density = \frac{Ws}{Vs}$ (6)

Where Ws is the weight of materials in grams and Vs is the volume of material in mm^3.

Aspect Ratio

As stated earlier, measurements were replicated for 30 times and the total weight of the seeds determined. The aspect ratio (Ra) is used in classification of grain or seed shape and it was calculated using equation (7).

$$Ra = \frac{b}{a} (7)$$

Moisture Content

The presence of moisture on rubbing surfaces may cause an increase in friction due to increase in adhesion (Osmak, I.T., 1954). The oven-drying method of moisture content (M. C.) determination was used to determine the moisture content (wet basis) of the seeds. The weight of dry samples (Dw) and the weight of wet samples (Ww) were determined and the moisture content evaluated from the expression given in equation (8);

$$M.C. = \frac{Ww - Dw}{Dw} (8)$$

Determination of Mechanical Properties of Negro Pepper

According to Mohsenin, N. N. (1986), mechanical properties are those properties (load-deformation characteristics) that have to do with the response or behavior of agricultural products when subjected to forces during handling and processing. A poor knowledge or in appropriate application of the mechanical and other properties of biomaterials in the designing of processing and handling equipment will cause mechanical damage to the products. Mechanical damage to seed and grain which occurs in harvesting, threshing and handling can seriously affect viability and germination power, growth vigor and quality of the final products from the study of Osmak, I.T. (1954).

Compressive Test

The compression test were taken to Agricultural and Bioresources Engineering materials laboratory, University of Nigeria Nsukka (UNN) the test were carried out using Monsanto tensiometer to determine the force deformation characteristics of the Negro pepper seed (xylopiaaethopia) samples in longitudinal and lateral loading positions at two different moisture content of 2 and 13% (wet basis). The Negro pepper seed sample were placed in two loading positions on the compressions jaws, making sure that the centre of the tools was in ailment with the peak of the curvature of the sample force was applied by turning the load of the tasting machine at 2.5mm/min and the seed load to a point of maximum breath (rupture point) this was accompanied by the corresponding drop on the force deformation graph, which was plotted concurrently by the crusor and its attached needle which punctured the graph sheet of frequent intervals, thereby recording the force and corresponding deformation the resultant graph produced by joining the successive punctures shows force-deformation curve indicating bio yield points and the rupture force points which were measured at different loading positions and moisture contacts. Three replications of the test were taken for Negro pepper seed the test room temperature was maintained at 29°C. After the experiments, the rupture forces, deformation modulus of deformability toughness and stiffness of the test sample were determined. Figure 3 shows the block diagram of orientations of Negro Pepper (Xylopia Aethiopica) under compressive loading.

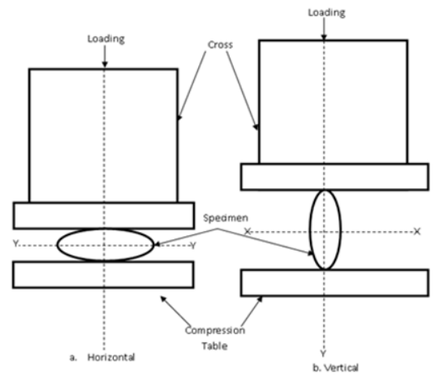


Figure 3: Block Diagram of Orientations of Negro pepper under Compressive Loading

Toughness

Toughness is the amount of work or energy required to bring about rupture in a material. It was determined by computation of the area under the force-deformation curve before rupture expressed as obtained in equation (9) (Mohsenin, N. N., 1986).

$$Toughness = \frac{Rupture\ energy}{volume\ of\ material}$$

Stiffness

Stiffness was computed using equation (10), as reported by Maduako J. N and Faborode M.O. (1994).

$$Stiffness = \frac{Force\ at\ rupture}{Deformation\ at\ rupture} (10)$$

Deformation Energy

Deformation energy was computed using equation (11); Deformation energy = Rupture force x Deformation at rupture (11).

Compressive Strength

The maximum compressive stress (which a material is capable of sustaining) is the

normal stress due to forces directed towards the plane on which it acts and was calculated from the maximum load during a compression test and the original cross sectional area of the specimen. The compressive strength is calculated using equation $rc = \frac{Fc}{a}$ (12) . Where, rc is the compressive strength in N/mm^2, Fc is the maximum load at fracture in Newton and a is the cross sectional area of specimen in mm^2.

Bio-yield Point

In some agricultural products, the presence of this bio-yield point is an indication of initial cell rupture in the cellular structure of the material (ASAE standard, 1980). The bio-yield point may occur at any point beyond the point of inflection (Linear Limit) where the curve deviates from the initial straight line portion.

Rupture Point

The rupture point is a point on the force deformation curve at which the axial loaded specimen ruptures under a load (Mohsenin, N. N., 1986). In biological materials, rupture may cause punctures of shell or skin cracking or fracture planes. This point is detected by a continuous decrease of the load in the force deformation curve. In a force deformation curve the rupture point of specimen may occur at any point on the curve beyond the yield point (Kranzler, G.A. and Witz R. L., 1976).

RESULTS AND DISCUSSION

Table 1 shows the mean physical properties of 30 samples of negro pepper. The dimensions increased with an increase in moisture content. This shows that there is an increase in the dimensions which contributed to expansion as a result of moisture intake within the negro pepper seed. As presented in Table 1, the sphericity of the xylopiaaethopia decreased with an increase in moisture content. At 2% moisture content, the sphericity was 0.7317 but increased at 13% moisture content to 0.7319. This shows that relative proportional changes occurred in the dimensions of the xylopiaaethopica. The finding is similar to that of (Asoegwu S. et al., 2006) who reported that the sphericity increased with decrease in the seed size with the small sized seeds having the highest sphericity.

Table 1: The mean physical properties of negro pepper (Xylopia aethiopica) at different moisture contents.

Moisture content	Major diameter (mm)	Minor diameter (mm)	Thickness (mm)	Geometric mean (mm)	Sphericity	Weight (g)	Volume (mm^3)	Bulk density (g/mm^3)	Surface area (mm^2)	Specific gravity	Aspect ratio
13%	0.0653	0.049	0.038	0.0494	0.7317	0.0259	0.000022	1438.889	0.0152	1162.3	0.674
2%	0.0673	0.046	0.0392	0.0478	0.7319	0.02557	0.00018	1262.3	0.00166	1438.889	0.684

Each value is the mean of 30 test samples

The volume of the xylopia increased with an increase in moisture content in table 1. The volume increased from 0.000022/mm^3 to 0.00018 at 2% and 13% moisture content respectively. This increase in volume may be attributed to expansion in size dimensions which was as a result of increase of the xylopiaaethopica that resulted to the displacement of more liquid (Mohsenin, N. N., 1986).

Table 1 also showed that the bulk density of the negro pepper varied from 1262.3g/mm3 at 2%moisture content to 1438.889g/mm3 at 13% moisture content while the specific gravity varied from 0.001166 to 0.0152 at 2% and 13% moisture content respectively. This result indicates a decrease in bulk density and specific gravity with an increase in moisture content. This implies that there was an increase in weight of the sample owing to the moisture in the negro pepper which was lower than the volumetric expansion of the bulk agro-material, as reported by Mwithiga G and Sifuna M. M. (2006) for sorghum seeds.

Similarly, the surface area of the xylopiaaethopica increased with an increase in moisture content. The surface area increased from 0.00166mm^2 at 2% moisture content to 0.0152mm^2 at 13% moisture content. This result indicates that the increase in the values may be attributed to their dependence on the size dimensions of the negro pepper which are similar to the report of Oluka, S.I. and Nwuba, E.I.U. (2001) for cowpeas.

Table 1 shows that the weight of the seeds increased with an increase in moisture content. The weight increased from 0.0256g to 0.0259g at 2% and 13% moisture content respectively. Also, Table 1 showed that the aspect ratio increased with decrease in moisture content. The aspect ratio was 0.684 at 2% moisture content but decreased to 0.674 at 13% moisture content.

Table 2: Mechanical properties of Negro Pepper at two different moisture content and at two loading positions.

Moisture content %	Loading position	Bioyield force (N)	Rupture force (N)	Deformation at rupture (mm)	Compressive force (N/mm^2)	Toughness (J/mm^2)	Drag force (N)	Deformation energy (J)	Stiffness (N/mm)	Hardness (N/mm)
13	Longitudinal	16.5	17.5	0.625	87.5	41.0	2.25	15.88	42.5	30.245
	Lateral	125.0	42.5	0.75	200	183.5	20.78	146.88	62.5	31.51
2	Longitudinal	25.0	37.5	0.88	150	130.0	14.14	100.0	115.0	31.51
	Lateral	137.5	80.0	0.47	270.5	267.0	48.31	38.75	125.0	31.47

Each value is the mean of 30 test samples

Table 2 represents the mechanical properties of negro pepper (Xylopia Aethiopica) at two different moisture contents (2% and 13%wb) and at two loading positions (longitudinal and lateral positions).

The rupture force presented in table 2 above increased significantly at 2% moisture content in lateral loading position. In longitudinal loading position at 2% moisture content, the rupture force records 25N while in lateral loading position at the same moisture content, the rupture force increased to 137.5N. At 13% moisture content, the rupture forces were 112.5N and 125N at longitudinal and lateral loading positions respectively.

The Bio-yield force in table 2 indicates highest at 2% moisture content in lateral loading position and lowest in longitudinal at 2% moisture content. The bio-yield force at 2% moisture content were 17.5N and 80N in longitudinal and lateral loading positions respectively while at 13% moisture content they were 37.5N and 42.5N in longitudinal and lateral loading positions respectively.

Compressive strength in table 2 indicates highest at 2% moisture content (w_b) in lateral loading position (200N/mm^2) and lowest at 13% moisture content (w_b) in lateral loading position (27.5N/mm^2). This indicates that little force is required to cause rupture on the seed as reported by Maduako, J. N. et al., (2001) on Bambara groundnut.

The deformation energy of the seed was highest at 2% moisture content in lateral loading position. The deformation energy at 2% moisture content both in longitudinal and lateral loading positions were 146.88J and 15.88J respectively while at 13% moisture content they were 100J and 58.75J in longitudinal and lateral loading positions respectively.

The toughness of the Negro pepper seed indicates highest at 2% moisture content in lateral loading position and lowest at 13% moisture content in longitudinal loading. At 2% moisture content, the toughness of the seed increases from longitudinal loading position (130J/mm^3) to lateral loading position (267J/mm^3) and increases from longitudinal loading position (41J/mm^3) to lateral loading position (183.5J/mm^3) at 13% moisture content.

The stiffness of the seeds significantly increased at 2% moisture content in lateral loading position and decrease at 13% moisture content in longitudinal loading position.

At 2% moisture content, the stiffness of the seed increased from (115N/mm) in longitudinal loading position to 125N/mm in lateral loading positions while at 13% moisture. The stiffness were (42,5N/mm) and (62.5N/mm) longitudinal and lateral loading positions respectively.

The negro pepper seed easily deformed at 13% in longitudinal loading but less deformed at 2% moisture content in lateral loading position. The deformation at rupture at 2% moisture content in longitudinal and lateral loading positions were 0.88mm and 0.47mm respectively, While at 13% moisture content, the deformation at rupture both in longitudinal and lateral loading positions were 0.625mm and 0.75mm respectively.

SUMMARY

Considering the effects of moisture contents on the physical and mechanical properties, result shows that, at 13% (wb) moisture content, the values obtained were higher in the physical properties than at 2% moisture content. However, in compressive test (mechanical properties), the obtained values at 2% moisture content were higher than the values at 13% (wb) moisture content. Therefore, the deformation of the negro pepper (Xylopia Aethiopica) was affected significantly with increase in moisture content.

The force at breaking occurred highest at 2% moisture content (80N) and rupture point occurred highest at 2% moisture content (137.5N). This indicates that any force beyond these points at this moisture content may cause damage to the negro pepper seed.Lateral loading positions records higher values than longitudinal loading positions.In general, the effects on the size for rupture force, deformation and toughness indicates that the force required to initiate negro pepper rupture was greater in lateral loading positions than in longitudinal loading positions.

CONCLUSION

Physical and mechanical properties of negro pepper seed depended on its moisture content. The axial dimensions of negro pepper seeds increased with an increase in moisture content. This situation is due to water absorption by negro pepper seeds. Geometric mean diameter, volume, surface area and weight of the negro pepper (Xylopia Aethiopica) also increased with increasing moisture content. Bulk density, specific gravity, sphericity and aspect ratio of the negro pepper seeds decreased with an increase in moisture content. The toughness of the seed decreases as the moisture content increases from the initial value of 2% to 13% (wb) where it becomes easy to break. To break the seed, moisture content at 13% (wb) will be appropriate. The result also revealed that the value of the seeds compressive force at horizontal orientation was higher than that of vertical orientation. This information can be used in the design and development of processing and general handling of legume seeds and other post harvest processing machines. It is therefore, recommended that other properties of negro pepper (Xylopia Aethiopica) seed such as thermal and nutritional characteristics be determined and changes of these properties be examined as a function of moisture content.

REFERENCES

Ameyaw, Y. and E. Owusu-Ansah (2005). Morphohistological studies of two plant species used in ethnomedicine. Ethnobot. Leaf lets.

Adewoyi F.B., Odaibo A.B. and Adewunmi C.O. (2006). Mosquito repellent activity of Piper guineense and Xylopiaaethopica fruit oils. African Journal of Traditional Complementary Alternative Medicin 3(2): pp. 79-82.

Osmak, I.T. (1954). Physico Mechanical Properties of Corn (In Russian) Sels, Khozmashina (4); 10-15.

Makajuola, G.A. (1972). A Study of Some Physical Properties of Melon Seeds J. Agric Engineering Research 17: 128-137.

Abolaji O.A., Adebayo A.H. and Odesanmi O.S. (2007). Nutritional Qualities of Three Medicinal Plants Parts Xylopia aethiopica. Blighiasapida and Parinaripolyandra commonly used by Pregnant Women in the Western Part of Nigeria. Pakistan Journal of Nutrition. 6: pp; 665-667.

Datrell, R.J. and S. Walner. (1980). Dynamic Mechanical properties of the Apple Cortex in Relation to Ripening J. of texture Studies, 10L 217-229.

Mohsenin, N.N. (1986). Physical Properties of Plant and Animal Material. Vol 1 Gardonand Breich Series Publication London, pp.825-837.

Galedar, M. N., Tabatabaeefar, A., Jafari, A. Sharifi, A. and Rafiee, S. (2008) Bending and Shearing Characteristics of Alfalfa Stems. Agricultural Engineering International: CIGR Journal.

Curray, J.K. (1951); Analysis of Sphericity and Roundness of Quartz Grains M.S. Thesis in Mineralogy. The Pennsylvania State University, University Park. Pa pp 280-294.

Gannett, R.E. and Brooker D.B. (1965). Aerodynamic Grag of Farm Grains trans of ASAE 8(1): 49-52.

Day, C.L. and Panda, H.H. (1966). Effective to Moisture Content, Depth of Storage and Length of Cut on Bulk Density of Alfalfa hay Trans of ASAE 9(3): 428-432.

Otis, O. K. and Pomroy J. H. (1967). Density, a Tool in Silo Research. Agricultural Engineering 38 (11); 806-807.

Graham, J. R. (1965). Compressive Characteristics of Corn Silage M.S. Thesis in Agric Engineering. The Pennsylvania State Univeristy, University Park, Pa pp340-385.

Muak, L. O. (1957). Die MechnicaheTrennung Von kartoffeln Unstained (The Mechanical Separation of Potatoes and Stones) Translated by W.E. Klinner. LandtechnischeForsching 7(3):91 Transaction No.35, National Institution of Agricultural Engineering. Silsve Bedford Shire, England.

Maduako J. N and Faborode M.O. (1994). Characterization of Breaking behaviour of whole coca pods. Journal Agric. Engineering Research, 59: pp 89-96.

ASAE standard, ASAE S386.1 (1980). Compression Test of Food Materials of Convex Shape. Agricultural

Engineering Year Book. Pp 354-358.
Kranzler, G.A. and Witz R.L. (1976). Some mechanical Properties of Frozen High-moisture Barely. ASAE Pper No. 67-811, Am. SOC of Agric Engrs. Saint Joseph Michigan.
Asoegwu S., Ohanyere S., Kanu O. and Iwueke C. (2006). Physical properties of African Oil Bean. Agricultural Engineering International; CIGR E-journal vol. 8; manuscript Fp 05006.
Mwithiga G and Sifuna M. M. (2006). Effect of moisture content on the physical properties of the three varieties of sorghum seeds. Journal of food Engineering, Vol. 75; pp. 480 – 486.
Oluka, S.I. and Nwuba, E.I.U. (2001). Physical and Aerodynamic Properties of Cowpea Seeds. Hills and Stalks JEAS. Vol 1 No. 1 pp35-43.
Maduako, J. N. lstifanus, A. B. and Maunde, F. A. (2001). Determination of some Mechanical Properties of Bambara Nuts Vigna ubterranea Verds] Relevant to Shelling. Department of Agric. Engineering, Federal University of Technology, Yola. pp 1-10.

DEVELOPMENT OF A WELDING FUME EXTRACTOR.

UKWUOMA, Ugochukwu Francis
Department of Mechanical Engineering
Imo State Polytechnic Umuagwo, Nigeria.
ugochukwufrancis122@yahoo.com

EHIRIM, Victor
Department of Mechanical Engineering
Imo State Polytechnic Umuagwo, Nigeria.
vickkoman@yahoo.com

Abstract
The aim of this study is to develop a welding fume extractor that will be able to remove welding fumes generated during welding process to a safer place outside the confine of the welding shop. Welding fumes can present possible health hazard if not controlled. There is the need to remove the welding fumes outside the exposure of the welders, to reduce the health hazard posed by welding fumes. Extreme amount of carbon monoxide produced during welding reduces the amount of oxygen in the brain causing intoxication and lack of reasoning.The welding fume extractor is developed to extract welding fume at source and channel it to a safer place outside the confine of the welding shop, thereby improving ventilation of the welding shop, protecting the machine tool, improving the comfort of the welders and other people in the welding workshop. Effective removal of the welding fumes will reduce the health hazard in the welding workshop.

Keywords:*Welding shop, Fumes, Hazard, Extraction, Ventilation.*

INTRODUCTION

Joining of metals goes back several millennia, called forge welding from Bronze age. Welding was used in the construction of iron pillar in India, erected about 310AD and weighing 5.4 metric tons. The Middle Ages brought advances in forge welding in which blacksmiths pounded heated metals repeatedly until bounding occur. World Warcaused a major surge in welding processes, with various military powers attempting to determine which of the several new welding processes would be the best. During the 1920's major advances were made in welding technology. Shielding gas welding became a subject receiving much attention as Scientists and Engineers attempt to protect welds from the effect of oxygen and nitrogen in the atmosphere.In 1942, the Linde Company obtained a license to develop the Gas Tunsgsten-arc (GTAW or TIG), process used today (Rayond, 1984). The use of aluminum and magnesium by industries increased at a rapid rate as a result of the development of GTAW (TIG).Welding is a fabrication or sculptural process that joins materials, usually metals and thermoplastic, by causing fusion. Welding fumes are not good for health. Welding fumes and grinding dust are produced during welding and grinding in the workshop. While all fumes are bad, some fumes are recognized as more hazardous than others. One of such fumes is hexavalent chromium, which is produced when welding of stainless steel and other materials containing chromium. During welding process, the chromium is heated, oxidationoccurs and it is converted into hexavalent chromium.

Hexavalent chromium is also

designated by Chromium vi, Hex chromium, Cr(iv), Chromium +6 and Cr+6. It is classified as a carcinogen (Merger et al, 1994). There are other elements present in some welding fumes, such as manganese, that is very harmful to the welder, trainee welders (students), and others in the welding shop (Merger et al, 1994).

The Occupational Safety and Health Administration (OSHA) regulation requires that employers must assess their worker exposure to hexavalent chromium for a time weighted 8-hours average (8-hour TWA) for each work area and for welding activities in that space(OSHA, 1990). If the level is 50% greater than Permissible Exposure Level (PEL), the space must be monitored every six months. If the employee can demonstrate that the fumes for the space are less than 10% of the PEL, monitoring does not have to be performed.

Local exhaust ventilation is an engineering system to protect operators from hazardous substances(Yuth et al, 2017). To have an effective system it is important that all it is well designed and installed, used correctly and properly maintained. To ensure that the quality of welding fumes and grinding dust remain below legal limit, a high quality extracting system with effective stack exhaust is a necessity.

Welding is the process of joining two similar or dissimilar metals by fusion, with or without the application of pressure and with or without the use of filler metals. The fusion of metals that take place is by means of heat. The heat may be obtained from blacksmith fire, electric, arc, electrical resistance or by chemical reactions.Welding is extensively used in fabrication as an alternative method for casting or forging and as a replacement bolted on oriented join.Welding can be traced to the historical development back in ancient times. The earliest examples of this come from Bronze and Iron Ages in Europe and the Middle East. The Middle Ages brought about advances in forge welding, in which blacksmiths, pounded heated metal repeatedly until bonding occur in 1800 Sir Humphry Davy discovered the "short-pulse" electrical arc and presented result in 1801.
Resistance welding was developed during the final decades in 19th century, with the first patents going to Eliha Thomson in 1885.

World War 1 caused a major surge in the use of welding processes, with the various military powers attempting to determine which of the several new welding processes would be the best.
Recent developments in welding include 1958 breakthrough of electron beam welding, making deep and narrow welding possible through the concentrated heat source. Magnetic Pulse Welding (MPW) is industrially used since 1967. Friction stir welding was invented in 1991 by Wayne Thomas at the welding institute (UK), and found high – quality application all over the world.

International health organization recognize the importance of preventing health risk associated with welding fumes generated during welding processes. In many countries,strict personal exposure regulations and standards such as Occupational Safety and Health Administration (OSHA)are heavily enforced to minimize workers exposure to hazardous metal particulate that can be present in welding fumes (WHO, 1987).

Ventilation is the primary solution step to mitigate employee welding fume exposure. Because welding fumes is a thermal process, the particulate is suspended in the ambient air. When fumes plume cools, the particulate settles on the work place. It built up on the work station infiltrates machinery and electrical cabinets, which can cause additional housekeeping to clean up the dust.

Control of the exposure to welding fumes can usually be achieved with the help

of extraction and ventilation. The choice of technique depends on the circumstance. The aim to capture the welding fumes as does as to the source as possible. This protects not only the work but also other workers stand machinery.

Extraction at source is the most effective method of capturing and removing welding and similar fumes using this method the risk of a welder or operator being subject to hazardous fumes is minimized. Welding touch with integrated extraction allow the welder to work over large areas as well as inside partially enclosed space. It reduces heating and cooling cost by reducing the amount of heat/cooled air extracted from the premises letting the extraction system to run when not in use is a big waste of energy. Not only to the fan motor energy, but cost of heating or cooling make-up air, to replace the air exhausted outside.

The major health risk with welding fumes are:

a. Cancer of the lings
b. Brain damage
c. Neurological diseases
d. Decreased lung capacity
e. Pneumonia
f. Asthma
g. Allergies etc (Chandra et al, 1984).

Extreme care must be taken when welding or cutting some materials because of possible health hazards. Care must be taken when welding or cutting the materials listed below, along with their sources, can present possible health hazards if not controlled.

Table 1: Sources of Possible Health Hazards

Material	Source	Possible Health Hazard
Arsenic	Electrode coating, fluxes, base metal	Lung, lymphatic cancer, respiratory irritant
Beryllium	Base metal	Lung cancer
Cadmium oxide	Plating of steel	Lung cancer, and kidney disorder
Chromium	Electrode coating – stainless steel	Lung cancer, skin disorder
Copper fumes	Wire coating- non-ferrous metal	Fume fever
Fluoride	Coating and flux core of electrode, flux	Kidney and bone disorder
Lead	Electrode coating, lead paint	System poisoning
Manganese	Welding rod, alloy steel	Nervous system disorder
Molybdenum	Welding rod, alloy steel	Respiratory disorder
Nickel	stainless steel, Nickel steel	Lung cancer, skin disorder
Tin oxide	Nonferrous alloys, tin coated steels	Irritating dust
Vanadium	Welding rod, alloy steel	Lungs, eye, skin disorder
Zinc oxide	Zinc – covered steels, electrode coating, nonferrous steel	Fume fever
Carbon monoxide	Oxygen flame, carbon – arc cutting, electric arc	Large amount can cause death.
Nitrogen dioxide	Electric arc and various flame welding processes.	Breathing disorder
Ozone	Titanium and aluminum welding	Lungs and breathing disorder
Phosgene	Base metal covered with chlorinated hydrocarbon solvent	Lungs and respiratory disorders

Source: Essentials of welding.

STATEMENT OF THE PROBLEM/JUSTIFICATION

Welding fumes inhaled is a health hazard for welders, trainee welders and other people in the welding shop.Welding hazardous fumes are generated during welding processes at least 13 metals, including manganese (Mn), Beryllium (Be), Cadmium (Cd), Chromium (Cr), Cobalt (Co), Copper (Cu), Iron (Fe), Lead (Pb), Mercury (Hg), Antimony (Sb), and Vanadium(V)(OSHA, 19950). Welders are known to be at risk, particularly for chronic exposure to airborne manganese, which is one of the major coating materials in welding products.

OBJECTIVES OF THE STUDY

The objective of this study is based on the problem posed by the exposure of welder to welding fumes. Specifically, the study will.

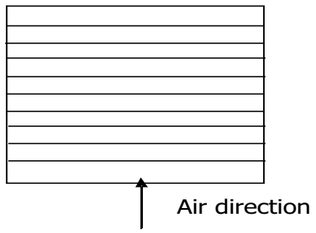
(a) Develop an appropriate design for welding fumes extractor that will reduce the exposure of welders to welding fumes.

(b) To reduce the health hazard posed by the exposure of welders to welding fumes during welding process.

(c) To improve the ventilation of welding shop.

MATERIALS AND METHODS

Direction of air movement:
The direction of air movement should carry air contaminant and fumes away from the breathing zone.



DESIGN VELOCITY

All ventilation systemoperate most effectively within a given air flow range usually measured by hood face velocity.
For an enclosure capture velocity at enclosed opening, for theoretical unbounded suction source.

$Q = VA$
$= V4\pi r^2$

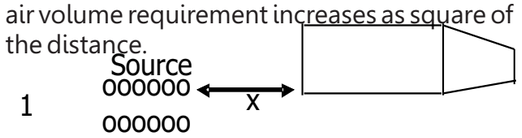
Q = Airflow into suction point (m^3/min)
V = Velocity art distance x (m/min)
A = $V4\pi r^2$ = area of a sphere
r = radius of the sphere
For unbounded line source
$Q = VA$
$= V\ 2\pi r x L$

Where
L = Length of line source (m)
In general equation used $Q = V(10x^2 + A)$
Where Q =Air flow (m^3/min)
X = distance from the hood (m)
Center line velocity at x distance from the hood (m/min)
A = Area of hood opening (m^2)
D= Diameter of hood or side of essentially square hoods. (m).
Air velocity (m/s)

V = Air velocity = 1096 . 5 x $\sqrt{\frac{\text{Velocity pressure}}{\text{Density of gas}}}$

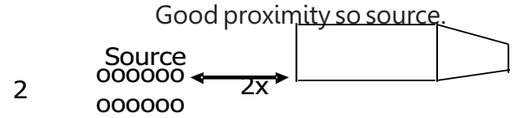
PROXIMITY AND EXHAUST VOLUME

To maintain the desired captive velocity the hood will be close to source as possible. The air volume requirement increases as square of the distance.



Smaller volume of hood is needed (m^3). Good location

Good proximity so source.



ie more volume of the hood is needed (m^3).

Bad location

Bad proximity so source.

RESULT AND DISCUSSION

Fume extractor system increases the visibility of the operator, thereby improving the efficiency and weld quality. Smoke swirls up away from the arc,and the rotating fan blade extract and channel it away through the pipe. The welding fume extractor comprise of units which was joined together by various joining operational, which include welding, soldering and bolted joint. These units include metal sheet, extractor fan, exhaust manifold, PVC suction flexible corrugated plastic etc.
The metal sheet was marked to the dimension of fan hood cut and welded. Exhaust manifold (enlarger and reducer) was welded to the rear and the PVC suction flexible corrugated plastic attached.

The welding table was welded to the extractor unit. The hood placed above the welding table. It was observed that during welding the fume produce was extracted by the extractor fans. The fume was channeled through the manifold to the PVC suction plastic outside the welding workshop. The ventilation of the welding shop was greatly improved by the removal of the welding fumes.

CONCLUSION

The welding fume extractor will be effective in extracting the welding fumes from the welding shop. Fumes extracted will be channeled away to a safer place outside the confine of the welding shop. This will reduce the health hazard associated by exposure of welders and other workshop attendance to welding fume. The ventilation of welding shop will be greatly improved by the extraction of the welding fumes, and generally improve the effectiveness of the welder by reducing discomfort and health hazard associated with inhaling of fumes. The use of a welding gun equipped with exhaust fumes device to reduce the volume of exhaust fumes produced during welding is highly recommended.

REFERENCES

Chandra, S.V, Shukla, G.S, &Srivastawa, R.S. (1981). An exploratory study of manganese exposure to welders. (Clin Toxicol).

Mergler, D, Hucl G, &Bowle R. (1994). Nervous system dysfunction among worker with Long term exposure to manganese. Environ. Res.

Occupational Safety and Health Administration (OSHA) (1990) regulation. US department of labour. Retrieved 12th Nov 2020 from www.osha.gov/pls

Occupational safety and health administration (OSHA) (1995). Welding fumes (Total particulate) Chemical sampling information.

Raymond, J.S. (1984). Essentials of welding. Bennett Publishing Company Peoria, Illinois 61615.

World Health Organization (WHO) (1987). Air Quality Guidelines, Regional Office for Europe.

Yuth, C. W, Wul, W. H &Xic, Y. (2017). Mechanisms of dust diffuse pollution under forced exhaust ventilation in full-mechanized excavation faces by CFO –DEM power technology.

EDUCATION AND TECHNOLOGICAL DEVELOPMENT IN NIGERIA: EMERGING ISSUES FROM COVID-19

OBISIKE, IheanyiOsondu (Ph.D)
School of Foundation Studies
Rivers State College of Health Science and Management
TechnologyPort Harcourt
osonduobisike@yahoo.com
&
IDEOZU, Mark U.
School of Engineering and Biomedical Technology
Rivers State College of Health Science and Management
TechnologyPort Harcourt
idemac2000@yahoo.co.uk

Abstract
Education, in the sense of a planned process of developing an individual's knowledge, skills, attitudes and understanding in a certain area of life, is the twin brother of technology, which refers to application of scientific knowledge and skills for practical purposes. Considering the fact that a nation's educational system is a repository of her technologies for enhancement of productivity, this paper juxtaposed the overall aim of Higher Education Institutions (HEIs) and Nigeria's technological development as exposed by the COVID-19 pandemic. The paper specifically spotlighted the Agriculture and Health sectors in the wake of the pandemic. Based on qualitative analysis of ideas, the paper argued that HEIs in Nigeria have not explored fully technologies in their repositories to deal with some challenges facing the nation and it therefore suggested that managers of HEIs in Nigeria should galvanize strategies that would bring about innovative solutions to meet global and local needs through technology.

Keywords: *Education, technology, development, COVID-19.*

INTRODUCTION

Coronavirus disease (also) called COVID-19, a global disease which originated from Wuhan in China in 2019, has opened different chapters of economic and political histories for different countries; each chapter lends itself towards the peculiarities of the country. It opened introductory chapter of economic theories for some nations; opened chapter of economic policy assessment for others. For Nigeria, the COVID-19 lockdown was a blessing, a lesson and an opportunity to take stock of her journey into all spheres of life as a nation; it is a chapter on economic policy assessment for Nigeria to see her weaknesses and strengths. More importantly, there is a great lesson for the education sector, a wake-up call to rise to the challenges of the nation.

Education holds the key that unlocks the potentials of a nation; it is the last hope of every nation; it cannot accept the luxury of failure when other sectors have failed. It is for this reason that we see education as the substratum for overall development of society. For Nwafor and Nwogu (2014), education enhances an individual's intellectual power and capability to function effectively in society so that in any given circumstance they can respond to the challenges of life. This means that a country's educational system, based on her philosophy of education, should produce citizens who are cerebral enough to tackle her problems as they arise. Otherwise, what is the usefulness of education if it cannot provide solutions to societal challenges? Ozturk (2008) avers that education plays an important role in the economy of nations. According to Ozturk, education boosts productivity and creativity of individuals, promoting their entrepreneurship and technological thrusts.

Here, technology connotes the application of scientific knowledge to art (Singh et al., 2008). According to Scott and Marshall (2005), technology is a relationship that exists between a technical organization and mechanization of work. In this context, every institution of learning is a technical organization, hence expected to express some degree of technology in its activities. It is the responsibility of the education sector to provide the lead in technological advancement of a nation in all areas of life. To state the obvious, we cannot overemphasize the importance of education in the development of any society. As nations pass through different phases of history, education is retooled to confront their emerging challenges. According to Ojule (2020), tertiary institutions are established to achieve economic development, and they use technological innovation in solving the challenges which confront societies. Ojule concludes that it is incumbent on managers of universities to think out of the box by organizing innovative technologies that will "turn the tide against Coronavirus negative impacts" (p. 87). This conclusion is connected to the goals of tertiary education in Nigeria: to contribute to national development (Federal Republic of Nigeria, 2008).

This paper also lends itself to the goal of Global University Network for Innovation (GUNi) which was founded in 2014 by UNESCO, the United Nations University (UNU) and the UniversitatPolitecnica de Catalunya-BarcelonaTech (UPC) after the first UNESCO World Conference on Higher Education (1998). The goals of GUNi are to:

- promote the exchange of resources, innovative ideas and experiences, while allowing for collective reflection and co-production of knowledge on emerging higher education issues.

- contribute to and reflect on the role of higher education and the implementation of the 2030 Agenda and the SDGs for a better and more sustainable future (GUNi, 2019).

The 2030 Agenda for Sustainable Development, which was adopted by all member states of UN in 2015 to chart a roadmap towards realization of improved health and education, reduction of inequality and enhancement of economic growth, is encapsulated in a 17-target plan known as 17 Sustainable Development Goals (SDGs). How far has Nigeria fared in her journey towards 2030 targets? The COVID-19 pandemic has fast forwarded and provided the basis for lucid reflection on this journey, spotlighting the Agriculture and Health sectors in the wake of the pandemic. This global strategy demands a hands-on commitment of tertiary institutions in Nigeria for its success. At the heart of its realization is the symbiotic relationship between education and technology. This is the main thrust of this paper, and this objective shall be accomplished through discourse under the following subheadings:

1. Education as a repository of technologies

2. Agriculture and health sectors in the wake of COVID-19

3.Conclusion

4. Suggestions

Education as a Repository of Technologies

The idea that education is a repository of technologies finds expression in the overall philosophy of education of any country. The school as an agent of socialization has the responsibility of producing skilled workforce needed for technological advancement of the society. To transmit knowledge and values is one basic role of schools (Sadker&Sadker, 2005). This responsibility is explicitly captured by Federal Republic of Nigeria (2008, p.12) while stating the goals of education: "development of appropriate skills, mental, physical and social abilities and competencies to empower the individual to live in and contribute positively to the society".

For the purposes of development of technological skills, every nation looks up to her higher education institutions which are otherwise known as tertiary institutions. They primarily do research services in order to provide solutions to problems confronting their countries. According to Marginson and Wende (2019), tertiary institutions are strategic as means of achieving a wide range of technologies and products in a country. To state the obvious, higher institutions are established to promote specialties in all areas of human endeavour, including technologies, creativity and innovations to address sustainable development challenges (Ahmadein, 2019). This is also the view of Martin (2021, p.1): the "strength of higher education institutions lies in their interdisciplinary teaching and research, and in their capacity to develop innovative solutions to global and local problems". GUNi (2019) avers that the 2030 Agenda has provided a platform to redefine the role of HEIs in terms of research and specific economic innovations. GUNi contends that, the 2030 Agenda as a call for collective action, HEIs have various roles to play in this direction. The COVID-19 experiences have made the call on tertiary institutions more lucid and imperative especially in Nigeria.

This call on HEIs in Nigeria to rise to the occasion of providing technologies that will drive the economy is achievable. Unfortunately, lack of action on the part of HEIs in Nigeria has always been explained on the altar of "funding". GUNi (2019) believes that tertiary institutions can achieve the targets of 2030 if they:

- create awareness
- involve in strong partnerships
- lobby for an improved policy environment and
- give support for trans disciplinary works among themselves and between other organizations.

Agriculture and health sectors in the wake of COVID-19

COVID-19 has spurred countries to re-examine their crisis management capacities in all areas of polity, and Nigeria must show honest attempts to be part this revolution occasioned by the pandemic. We examine briefly here Nigeria's agriculture and health sectors, and how education can be used to address the country's challenges in these areas as exposed by COVID-19.

(a) Agriculture in Nigeria

The Federal Government of Nigeria under the leadership of Muhammadu Buhari took a bold initiative by banning the importation of rice, and the strategy brought about increase in the quantum of rice produced locally that was available to the nation during the closure of boarders as a result of the COVID-19 lockdown. The ban encouraged Nigerian rice farmers to rise to the challenge of producing tons of rice to serve the teeming population of the country. Yet, the supply was overwhelmed by the demand, an indication of lack of the needed technology in the rice production chain, mainly because the local farmers lack the knowledge and the wherewithal. The inter-state border closures which were part of government's responses to curtail the spread of COVID-19 exacerbated the already existing food crisis in the country, resulting in unprecedented hike in the prices of food items.

Consequently, Ayinde et al. (2020) and Okafor et al. (2020) posit that Nigeria is facing the challenge of food insecurity which has been worsened by unending spate of conflicts, terrorism, kidnapping and Boko Haram insurgency. Their position reflects the rate of poverty in Nigeria which the National Bureau of Statistics (NBS, 2020) has revealed. According to NBS, over 82.9 million Nigerians were considered poor based on the Nigeria Living Standards Survey (NLSS) of 2018 -19. The NLSS is predicated on the consumption aggregate of a household on food and non-food goods and services. The NLSS situates the importance of agriculture in the life of the Nigerian state.

The foregoing discuss should be a source of concern to government. But unfortunately, there seems to be no feasible solution in sight because primarily, those in government are not la crème of technocrats and researchers. Schools are built to provide solutions to societal challenges. Therefore, universities and polytechnics should not continue to abdicate this responsibility; the society looks up them in this direction. Managers of higher institutions in Nigeria are always quick to complain of poor funding in everything, including land space and manpower to drive their projects. A look at the geography of institutions of higher learning in Nigeria shows that many of them have enough land space with full perimeter fencing. What manpower is greater than the student population in terms of agricultural activities?

The problem of food crisis can be overcome if managers of universities and polytechnics wish to. They can start exploring the advantage of land space, student population, agricscience based departments that provide information on agrobiology, agrochemical, agroforestry, agronomy among others. This paper is also mindful of the role of equipment in mechanized farming. This can be taken care of by redirecting Tertiary Education Trust Fund(TETFUND) allocations to purchasing of tractors and other motorized tools for agriculture.

(b) Health Sector in Nigeria

The health sector also contributes is the assessment of poverty rate in Nigeria; health is part of the non-food goods and services that aremeasured in Nigeria Living Standards Survey. Nigeria spends over one billion US Dollars annually on medical treatment abroad and according to the Nigerian Economic Recovery & Growth Plan 2017 – 2020; Nigeria's healthcare system lacks the level of service needed to meet the health needs of her population (Medic West Africa, 2019). The Nigeria's problem in this sector is not lack of manpower and equipment; it is negligence and misplacement of priorities on the part of government. If Nigeria recognizes the importance of health in the economy, doctors and other health personnel will be treated like judges who enjoy security and other juicy benefits. Most doctors in teaching hospitals have private clinics hence may not give quality time to patients in public health facilities. This can be nipped in the bud by granting them the incentives they need to drive reliable health services.

The money spent on medical tourism has a colossal impact on the economy, especially on foreign exchange transactions. The HEIs can set the pace in this direction by

galvanizing their resources for better health delivery services in their medical centres. This requires commitment on the part of management team and the personnel in the health facilities. Health facilities in institutions of higher learning should provide solutions to health challenges through research. Technological advancement in the health sector has become inevitable considering the deficiencies in the sector which COVID-19 has exposed such as lack of drugs, diagnostic and personal protective equipment. What is wrong if tertiary institutions begin to produce drugs, leveraging the expertise of lecturers in Pharmacy departments? What is wrong if Engineering departments begin to produce hospital equipment and devices?

CONCLUSION

Technology means doing something with ease and speed in order to cover more grounds which otherwise could have been impossible. Technology goes with the territory of modernization and mechanization which must result in large scale production to meet the demands of the populace. The essence of technology is to enhance productivity in the economic chain. The commitment needed from managers of tertiary institutions in Nigeria ensues from their disposition towards corruption. If they utilize the resources available to them, the challenges confronting Nigeria in most areas of life will be surmounted. The challenges have become more glaring with the turn of COVID-19, a pandemic that affected all areas of human endeavour. Education as the hope of every nation in terms of meeting national aspirations and goals must rise to the occasion of providing solutions to the challenges facing human race. What Nigeria needs in this regard is the technology to drive the solutions which society has deposited in the education sector, particularly in tertiary institutions.

SUGGESTIONS

1. Tertiary education should go beyond rhetoric of classroom by creating mini-industries as demonstration centres for their students. This will boost production of goods and services in the country.

2. Managers of Higher Education Institutions (HEIs) in Nigeria, through their Consultancy Units, should show interest in goods and services provided by other organizations and sectors in order to attract partnerships with them.

3. Education should be treated like a business enterprise in terms of improved research and visible outputs.

4. HEIs should be made to function as centres of excellence where best products and services can be seen and accessed.

REFERENCES

Ahmadein, G. (2019). Obstacles and opportunities for achieving the SDGs at higher education institutions: Aregional Arab perspective.In Global University Network for Innovation. implementing the 2030 agenda at higher education institutions: Challenges and responses.http://www.guninetwork.org/files/guni_publication_-_implementing_the_2030_agenda_at_higher_education_institutions_challenges_and_responses.pdf

Ayinde, I. A., Otekunrin, O. A., Akinbode, S. O. &Otekunrin, O. A. (2020). Food security in Nigeria: Impetus for growth and development. Journal of Agricultural Economics and Rural Development, 6(2), 808 – 820

Federal Republic of Nigeria (2008). National policy on education. NERDC.

Global University Network for Innovation (2019). Implementing the 2030 agenda at higher education institutions: Challenges and responses. http://www.guninetwork.org/files/guni_publication_-_implementing_the_2030_agenda_at_higher_education_institutions_challenges_and_responses.pdf

Marginson, S. & Wende, M. (2019). The new global landscape of nations and institutions. In Centre for Educational Research and Innovation. **Higher education to 2030 – volume 2: Globalisation.** https://cyber.harvard.edu/communia2010/sites/communia2010/images/OECD_2009_Higher_Education_to_2030_Volume_2_Globalisation.pdf

Martin, M. (2021). Higher education on the road to 2030. http://www.iiep.unesco.org/en/higher-education-road-2030.

Medic West Africa (2019). 2019 healthcare market insights: Nigeria. https://www.medicwestafrica.com/content/dam/Informa/medic-west-africa/english/2019/HealthcareInsights.pdf

National Bureau of Statistics (2020). Poverty and inequality in Nigeria. www.nigerianstat.gov.ng/download/1092

Nwafor, N. H. A. & Nwogu, U. J. (2014). Dynamics of classroom communication (2nd ed.).Sambiz.

Okafor, C., Aluko, L. &Asaolu, I. (2020). Beyond COVID-19: Addressing food insecurity in Nigeria. Devex.com/news/opinion-beyond-covid-19-addressing-food-insecurity-in-nigeria-98658

Ojule, L. C. (2020). Managing university education in Nigeria during a period of COVID-19 pandemic for system functionality. In C.M. Uche, S.O. Oluwuo& N. M. Abraham (eds.). Management of education in the era of COVID-19, social distancing and social connections: Challenges and prospects in Nigeria (pp. 81 – 94).

Ozturk, I. (2008). The role of education in economic development: A theoretical perspective. https://ssrn.com/abstract=1137541

Sadker, M. P. &Sadker, D. M. (2005). Teachers, schools, and society (7th ed.). McGraw-Hill.

Scott, J. & Marshall, G. (2005). Oxford dictionary of sociology. Oxford University Press.

Singh, Y. K., Sharma, T. K. &Upadhya, B. (2008). Educational technology: Teaching learning. APH Publishing.

EFFECT OF INDIRECT TAXATION ON ECONOMIC GROWTH IN NIGERIA

ONYEWUCHI,Veronica Eyuche(Ph.D)
School Of Financial Studies
Accountancy Department
Federal Polytechnic
Oko

Abstract
The mono-product nature of the Nigerian economy has hindered it from achieving its economic growth objectives. This inadequacy is further worsened by the fact that its revenue from its mono-product source is facing dwindling fortune. Over the years, it has been observed that revenue generated from indirect taxation has been substantial and constantly on the increase. This study therefore explored the effect of indirect taxation on economic growth as a possible means of diversifying the Nigerian revenue. Time series data were applied in carrying out this research work. Ordinary Least square (OLS) method of analysis was adopted after determining the stationary of the variable using Augmented Dickey fuller technique and finding ample long run and short run relationship among variables using the Johansen cointegration and Vector Error Correction Mechanisms respectively. The result showed that of the two indirect tax sources, Value Added Tax and Customs and excise duties, Value Added Tax that had a positive significant relationship with economic growth. Customs and excise duties on the other hand had a negative relationship but was tested and found to be insignificant. But the overall relationship between the indirect tax sources and economic growth was found to be significant. Against the above result, the researcher recommended among others that the number of goods on the VAT list should be increased and the burden of custom duties should be lessened on infant industries, all aimed at boosting indirect tax revenue accruing to the country and ultimately stimulating economic growth.

Keywords— Taxation, Value Added Tax, Custom and Excise duties, real GDP, economic growth.

INTRODUCTION

The mono product nature of the Nigerian economy has received series of criticism in recent times. According to Okonjo Iweala (2012) without diversification, the Nigerian economy will soon collapse. In order for the country to achieve the requisite level of economic growth, it needs to diversify from crude oil being the sole driver of the economy. Anyaehie and Areji (2015) in their research, found that economic diversification has the propensity to meet the basis for development (sustained growth) like meeting the poor basic needs which revolve around the provision of jobs, food, health, clothing and shelter by opening diverse avenues of economic activity which accommodates a broad spectrum of people.

Economic diversification is a process of broadening the range of economic activities both in the production and distribution of goods and services. It does not necessarily entail increase in output but it enhances stabilization of economies by diversifying their economic base. The mono-product nature of the Nigerian economy is such that it depends majorly on crude oil export for its revenue. In the current year 2015, Nigeria's dependence on crude oil export for revenue based on the projected price and the assumed production is 53% of the total revenue (Okonjo Iweala; 2015 Budget Speech). During the second quarter of 2012, oil revenue accounted for over 76% of government revenue (Ebosele and Adekoya, 2012). The implication of this overly dependence on oil revenue is the boom -and -burst nature of the economy (Akpokodge; 2000). In the 2015 budget speech, the following was pointed out, "...

The IMF in October 2014 revised downwards its projection on global growth to 3.3% and 3.8% respectively. So, ladies and gentlemen, the message I want to pass across here is that the world economy is not in shape over the short to medium term. On the back of this weak global growth performance comes the recent steep drop and incredible volatility in the price of oil -a phenomena that affect us greatly. This steep price decline of about 49% so far this year, has come as result of demand from our biggest markets and a supply glut that involves the arrival of new oil producers in Africa and increased exploitation of shale oil and gas in the U.S" (Okonjo Iweala; Budget speech, 2015).Taxation forms part of the non-oil revenue sector of the economy. In the first quarter of 2014, non-oil sector became the main driver of the Nigeria economy recording 7.89% growth in real terms in the same period (National Bureau of Statistics, 2014). Tax revenue on its part, is made up of two broad components and several sub components, the broad components being Direct and Indirect taxation.

Following Atkinson (1977), the researcher defines direct taxes as those taxes that may be adjusted to the individual characteristics of the tax payer and indirect taxes as those that are levied on transactions irrespective of the circumstance of the buyer or the seller. Due to the fact that direct taxes are dependent on the individual characteristics of the tax payer, it is at the mercy of the subjective assessment of the individual paying the tax. In such a case, some contra principles of taxation such as tax evasion (reduction of actual income value in order to earn reduced tax) and avoidance tend to abound. Indirect taxation on the other hand has limited cases of evasion and avoidance as it is not subject to the individual characteristics ·of the tax payer. Indirect tax sources include Value Added Tax (VAT), excise duties, customs duties and tariffs. Taxation has been a major source of revenue to the government contributing about 25.5% of government revenue in 2002. These revenues come mostly from indirect sources of VAT, import and export duties (custom duties). Indirect taxes contribute up to 15% of the government revenue with which it carries out certain developmental expenditures; this percentage can still be increased. Researches, carried out by Bleaney and Gemmel (1999); Bird (2003); Arisoy and Unlukaplan (2010); and Scarlet (2011) found a positive relationship between indirect tax and economic growth. This research work therefore is an attempt to provide a channel for Nigeria to diversify its economy and achieve economic growth.

STATEMENT OF PROBLEM

The mono-product nature of the Nigerian economy has posed a lot of problem to the Nigerian economy, amongst which is the creeping growth rate of the Nigerian GDP. This has made it impossible for Nigeria to attain its vision in the areas of overall development of its economy. The current running Nigerian national development plan is vision 2020 and this plan has not materialized in terms of achieving its

objective as a result of over-dependence on crude oil and its inherent price and demand instability. The vision 2020 aims at placing Nigeria among the top 20 ranking economy in the world by the year 2020, by attaining a GDP of about $900 billion and ensuring that the GDP of Nigeria grows by at least 10% every year till the year 2020 (Adeleke; 2012). So far, this has remained utopian, as the GDP of Nigeria has not been able to attain such a growth rate nor is it close to the required GDP figure with just 2 years left in the plan. This shortcoming has exposed the need to find and develop other economic variables which has the potentials of fast tracking the growth rate of the country's national income. One of such variables is indirect taxation.

It is of no doubt that indirect taxation has had strong positive effect on the revenue of the government. In 2016, Nigeria raked in 830 billion Naira from Value Added Tax and 890 billion Naira from custom and excise duties (National Bureau of Statistics, 2014), but, there is need to know if this progress recorded in the area of revenue has translated to helping the economy grow. This study ended with mixed and diverse findings on the effect of indirect taxes on economic growth. Of this work done, to the best of my knowledge none has significantly ascertained the effect ofindirect taxes on economic growth in Nigeria. Therefore, to fill the knowledge gap, this study empirically ascertains the effect of indirect taxes on economic growth in Nigeria.

Objectives of the Study

The broad objective of this study is to assess the effect of tax revenue on economic growth in Nigeria while the specific objectives are;
(i) To determine the effect of value added tax on economic growth in Nigeria
(ii)To evaluate the effect of custom and excise duties on economic growth in Nigeria

Research Questions

The following research questions were stated:
a) What is the effect of Value added tax (VAT) on economic growth in Nigeria
b) What is the effect of Custom and Excise duties on economic growth in Nigeria

Research Hypotheses

The following research hypotheses were formulated;

HO1: Value added tax has no significant effect on economic growth in Nigeria.

HO2: Custom and excise duties have no significant effect on economic growth in Nigeria.

LITERATURE REVIEW

Concept of Indirect Taxes

These are taxes levied on persons or groups who are not intended to bear the burden or incidence but who will shift them to other people. They are normally levied on commodities or services in which incidence does not fall directly on the producer or first payer but the final payers and consumers. That is in most cases, consumers end up paying some or all of any indirect tax introduced into a market. The bulk of government income in developing countries like Nigeria is principally derived from indirect taxation, while in the developed countries like the USA, the bulk of government revenue is rather derived from direct taxation (Igweonyia, 2011).In this study, indirect taxes selected are value-added tax (VAT), and custom and excise duties.

Value Added Tax in Nigeria

VAT is the acronym for valued added tax. This tax which is in other words called consumption tax and is being defined as the amount charged by the government for every goods or service purchased from time to time. This means it can only be paid when there is a consumption of goods or services, and its burden is bored by the final consumer. VAT as an indirect tax is imposed on goods and services at each stage of production, starting from raw materials to the final product. This assertion is affirmed by the definition of Ajakaiye (2000) that VAT is a "multi-stage tax imposed on the value added to goods and services as they proceed through various stages of production and distribution. VAT is adopted in virtually all countries of the world including Nigeria.

It was introduced in Nigeria in 1993 by the General Ibrahim Babangida administration to replace sales tax which hitherto generated revenue for the state governments. It was to be federally-collected and a uniform rate of 5 percent was fixed on all affected items while VAT proceeds are shared among the three tiers of government at an agreed proportion. Currently, with the passage of the new finance bill into law in January 2020, a new VAT rate of 7% took effect from February 2020. There are mixed reactions on how effective this new VAT rate will enhance the economy and brings about economic growth. To some it will impact positively on the economy whereas to others it will increase the hardship on Nigerians.

Custom and Excise Duty

Custom Duty is a major source of revenue for the Federal Government which is payable by importers of specified goods. Custom duties also serve as protection to indigenous industries against foreign industries. Whereas, excise taxes are charges imposed by the government on specific commodities produced in a country at differing rates to raise revenue and to discourage the manufacturing and consumption of certain goods deemed harmful to people's health like tobacco and alcohol. In summary, custom duties are taxes levied on imported items while excise duties are taxes levied on the manufacture of domestic commodities.

Adegbie and Falike (2010) in their study on the development and growth of the Nigerian economy stated that there is a strong relationship between customs and excise duties and the economic development of Nigeria; meaning that this is a source of income that Nigeria should rely on and develop. The Nigeria Customs Services is saddled with the responsibility of collecting customs duties, excise, fees, tariffs, and other levies so imposed by the Federal Government on imports, exports, and statutory rates.

Concept of Economic Growth

According to Salami et al. (2015), economic growth can be defined as the sustained increase in a country's productive capacity, and per capita national output or net national product over a while. These increases are the basic causes of economic growth. Fiscal policy is one of the most important too is that have a significant effect on all economic sectors and have a real effect on economic variables like the Gross national product, inflation, unemployment, etc.

Taxes can be seen as a fiscal policy, macroeconomic and internal revenue mobilization tool for the attainment of economic growth. Economic growth can be proxied, using different economic indicators, ranging from Real Gross Domestic Product (GDP), for economic growth (the dependent variable) and value added tax, customs and excise duty, inflation (explanatory variables). Inflation is included in the model to cancel out the effect of price changes on indirect tax revenues.

Theoretical framework

This study beckons on the expediency theory. This theory explains an economy's effectiveness and efficiency in tax collection instrument for enhanced economic growth. This theory further asserts that every tax proposal must pass the test of practicality. Anyanfo (1996) and Bhartia (2009) explained that the expediency theory is based on a link between tax liability and state activities. It assumes that the state should charge the members of the society for the services provided by it.

This reasoning justifies the imposition

of taxes for financing state activities by inferences, which provides a basis, for apportioning the tax burden between members of the society. Accordingly, a tax system should not be designed to serve individual members of society but should be used to cure the ills of society as a whole. This theory is appropriate for this study because it enable us to assess the extent to which indirect taxes have to enhance economic growth in Nigeria.

Empirical Review

Ikeokwu and Leyira (2019) examined the influence of indirect taxes on economic growth in Nigeria. Secondary data were extracted from the CBN statistical Bulletin data base and FIRS. Ordinary Least Square (OLS) Multiple Regression was adopted to test the data gathered. The study revealed that in direct taxes has a significant influence on economic growth in Nigeria. In a related study, Enokela (2010) examined the relationship between value-added tax and the economic growth of Nigeria. Secondary data were extracted from CBN statistical Bulletin database while multiple regression was used to analyse the data gathered.

From the analyses done, the study revealed that Gross Domestic Product (GDP) is positive and statistically significant to Value Added Tax, while Gross Domestic Product per Capita (GDPPC) is negative and statistically significant to Value Added Tax. Owino (2019) carried out an empirical investigation on the relationship between value added tax and economic growth in Kenya from 1973 to 2010. Econometric exposition adopted while the ordinary least square technique was used to estimate the model. The study revealed a positive and insignificant relationship between value added tax and economic growth in Kenya. Also, Akwe (2014) used the OLS regression technique to explore the impact of non-oil tax revenue on economic growth in Nigeria from 1993 to 2012. The study revealed that non-oil tax revenue has a positive association with economic growth in Nigeria.

Ebiringa and Emeh (2012) examined the impact of various taxes on the economic growth in Nigeria, using a period of 1985-2011. Results showed that customs and excise duties were negatively related to gross domestic product, implying that an inverse relationship existed between customs excise duties and economic growth in Nigeria. In the same vein, Abomaye -Nimenibo et al. (2018) carried out a study on tax revenue and economic growth in Nigeria from 1980 to 2015. The ordinary Least Square (OLS) method was used to analyse the data gathered. The study revealed that there is no significant relationship between custom and excise duties and economic growth in Nigeria. Also, Nmesirionye et al. (2019) carried out an empirical investigation on the impact of indirect taxes on the economic performance of Nigeria for a period of 1994-2017. Secondary data were used and extracted from the central bank of Nigeria Statistical Bulletin and the National Bureau of Statistics. OLS multiple regression technique was used in the data retrieved. The study revealed that value-added tax has a positive and insignificant impact on the real gross domestic product of Nigeria while custom and excise duties have a positive and significant impact on the real gross domestic product of Nigeria. In a related study, Akhor et al. (2016) examined the impact of indirect tax revenue on economic growth in Nigeria. Secondary data were collected from the Central Bank of Nigeria statistical bulletin from1993 to2013.Time series research design was used while the data collected were analysed through correlation, unit root test, co-integration test, and error correction model regression. The result revealed that value-added tax had a negative and significant impact on real gross domestic product. It also revealed that custom and excise duty had a negative and weakly significant impact on real gross domestic product.

Also, Inyiama and Ubesie (2016) examined the effect of value added tax, customs and excise duties on Nigeria economic growth. Secondary data was extracted from the CBN statistical bulletin and analysed with the simple regression technique and correlation analysis. The study revealed that all the non-oil tax revenue affects Nigeria Gross Domestic Product. Oladipupo and Ibadin (2015) examined the impact of indirect taxes on the economic growth of Nigeria. The study employed a time series data spanning a thirty-four-year period, from 1981 to 2014. The unit root test and the Error Correction Model were utilized in the study.

The study revealed a positive and significant impact of VAT, PPT on the RGDP. In the same vein, Stailova and Patonov (2012) examined the impact of taxes on economic growth from 1995-2010. Regression analysis was used to test the data gathered. The study revealed that the impact of direct taxes on economic growth is significant. Also, Ilaboya and Mgbame (2012) examined the relationship between indirect tax and economic growth in Nigeria. The study adopted a combination of co-integration and error correction mechanism to check the adequacy of the specified model. The study revealed a negative and insignificant relationship between indirect tax and economic growth in Nigeria.

Research Methodology

The ex post facto research design was adopted for this study. Time series data were applied in carrying out this research work. Ordinary Least square (OLS) method of analysis was adopted after determining the stationary of the variable using Augmented Dickey fuller technique

Sources of Data

Data used was secondary data which was sourced from the Central Bank of Nigeria Statistical Bulletin from 2003-2018, World Bank development indicators and various credible journal articles.

Model Specification The model is **specified as follows:**

GDPR= f (VAT, CED, INF)
This function may be further represented in a linear econometric format thus:

LnGDPR = Bo + B1LnVAT + B 2LnCED + B 3INF+ Ui

Where:
GDPR= Real Gross Domestic Product
VAT= Value added Tax

CED = Customs and Excise Duty
INF = Inflation

B's = Slopes or the parameters of the coefficient of the regression model

Ui=Stochastic disturbance or error term.
The above model is stated in the natural logarithmic form, to standardize the variables and aid interpretation.

DATA PRESENTATIONAND INTERP RETATTION

The use of OLS method of regression analysis is based on the assumption that the values of the variables have no unit root and hence are stationary.

Table.1.1 Summary of the Augmented Dickey Fuller Unit Root Test

st Difference	Variables	ADF Test Statistics	5% Significance Level	Lag length	Remark
	LNGDPG	-4.410302	-2.948404	1	Stationary
	LNVAT	-6.879544	-3.004861	1	Stationary
	LNCED	-6.202937	-2.948404	1	Stationary
	INF	-5.522626	-2.948404	1	Stationary

From the result on Table 1 above, shows that it is clear that all the variables are stationary after the first difference. Using the AIC (Akaike Information Criterion), the appropriate lag length was determined as 1. Therefore, we proceed to carry out the Johansen co-integration test to find out if there exists any relationship among the variables.

Table.2: Summary of Johansen Co-integration test

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.746929	54.26869	47.85613	0.0111
At most 1	0.454772	24.03883	29.79707	0.1988
At most 2	0.297259	10.69470	15.49471	0.2310
At most 3	0.124846	2.933826	3.841466	0.0867

Source: Author's Computation
Trace test indicates 1 co integrating eqn (s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level

I**nterpretation of table 2:** Table 2 above shows the existence of at least one (1) co integrating equation between the variables as we reject the hypothesis of none as denoted by the asterisks sign. It is therefore necessary to test the existence of short run adjustments between the variables, using the error correction model.

Error Correction:	D(LOG(GDPR))	D(LOG(VAT))	D(LOG(CED)	D(INF)
CointEq1	-0.065369	-0.071621	0.035011	-17.34673
	(0.04429)	(0.08019)	(0.24689)	(2.84866)
	(-1.47586)	(-0.89310)	(0.14181)	(-6.08943)
D(LOG(GDPR(1)	0.152916	-0.269039	0.070651	19.86363
	(0.22940)	(0.41534)	(1.27872)	(14.7540)
	[0.66659]	(-0.64775)	(0.05525)	(1.34632)
D(LOG(VAT(-1)))	0.185234	0.452654	0.267423	-4.990453
	(0.11562)	(0.20933)	(0.64447)	(7.43591)
	(1.60214)	(2.16239)	(0.41495)	(-0.67113)
D(LOG(CED(-1)))	-0.026818	-0.095861	-0.181987	0.514946
	(0.04558)	(0.08253)	(0.25407)	(2.93152)
	(-0.58837)	(-1.16158)	(-0.71628)	[0.17566)
D(INF(-1))	0.000165	0.001921	0.002016	0.111365
	(0.00115)	(0.00208)	(0.00642	(0.07403)
	(0.14357)	(0.92183)	(0.31418)	(1.50439)
C	0.012732	0.112950	0.125346	-2.552928
	(0.03009)	(0.05447)	(0.16771)	(1.93505)
	(0.42318)	(2.07346)	(0.74740)	(-1.31931)

Source: Author's Computation

Interpretation of Table 3:
The result of the co integration equation shows that the short run adjustments exist among the variables. The adjustment in real GDP, Value Added Tax, Custom and Excise duties complete in less than one year shown by their coefficients which is less than one, while inflation completes it adjustment in more than one year shown by its large coefficient. Having established ample long run and short run relationships among the variables, we can proceed to the OLS estimates and assess fully the impact of indirect taxation on economic growth.

Table.4: OLS Regression Estimates

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	22.08539	0.735402	30.03174	0.0000
LOG (VAT)	0.355007	0.059373	5.979244	0.0000
LOG (CED)	-0.003554	0.07 2382	-0.049105	0.9613
INF	0.004937	0.001915	2.577748	0.0180

R -squared	0.944140	Mean dependent var	31.26735
Adjusted R –squared	0.935761	S.D. dependent var	0.469910
S.E. of regression	0.119101	Akaike info criterion	-1.266682
Sum squared resid	0.283700	Schwarz criterion	-1.070339
Log likelihood	19.20018	Hannan -Quinn criter.	-1.214592
F- Statistic	112.6790	Durbin - Watson stat	1.214627
Prob(F- statistic)	0.000000		

Source: Author's Computation

Interpretation of table 4:
From the estimates shown above, VAT revenue and Inflation have significant positive relationships with economic growth proxied by real GDP. While a percentage in VAT on average will cause a 35% percent increase in the real GDP, holding all other variable constant, increasing inflation as well will lead to 0.4% increase in the real GDP on average, holding other variables constant. The fact that the probability figures of both VAT and Inflation are less than 0.05 depicts that both variables are significant in the model. On the other hand, Customs and Excise duties (CED) showed an insignificant negative relationship with economic growth. Such that a percentage increases in Custom and Excise duties on average will reduce real GDP by 0.3%.Inoverall, the model has been shown to be significant: Considering the high F value and the very low probability figure of the F value (0.000), we can conclude that the model is significant. Also the coefficient of determination (R2) has a value of 0.944140 and the Adjusted R2 value of 0.935761 which still gives give credence to the validity of the model. It follows that at least, 93% of changes in the dependent variable are explained by the regressors.

Discussion of Findings

The findings of this research, suggests the existence of ample long run and short run relationships between the various components of indirect taxation and economic growth proxied by Real GDP. Based on the hypothesis formulated earlier, the following has been discovered from the research;

a) Value Added Tax (VAT) has a positive

significant relationship with economic growth, such that increase in VAT revenue will in effect boost economic growth in Nigeria. This can be explained that increase in VAT revenue will translate to increased government expenditure in direct consumption or investment activities which will spur economic activities in the country.

b) Custom and Excise Duties (CED) on the other hand had an insignificant negative relationship with economic growth such that an increase in custom duties will stunt economic growth. This can be explained in the context that Nigeria is a consuming nation and that most of the goods consumed, traded and sold in the country come from external sources. Imposition of customs and excise duties will make such good expensive and discourage demand. It may even get to the stage where companies that source for raw materials abroad will have to close shop or move to countries with fairer custom and excise duties.

c) Inflation on the other hand showed a positive relationship with economic growth, but the small coefficient of 0.4% shows how infinitesimal this positive effect is. This can be as a result of the fact the inflation requires people to spend just a little bit more to obtain basic goods and services andthence, this extra expense and such extra expenses will translate into a positive effect on economic growth.

CONCLUSION

In executing this study, the Ordinary Least Squares (OLS) was applied after determining the co-integration of variables using the Johansen technique. From the results obtained from the OLS, it was observed that all independent variables, Value Added Tax (VAT) and Inflation (INF), had a positive relationship with economic growth in Nigeria, while Customs and Excise duties (CED) had a negative effect, of which VAT and INF that had a significant effect on economic growth in Nigeria. In conclusion, therefore, value-added tax has a significant effect on economic growth whereas custom and excise duties have an insignificant effect on economic growth.

RECOMMENDATIONS

The following recommendations were made in respect to the findings of the study.

i. The government should put in place mechanism to close up the loopholes in the VAT collection system since its effect on gross domestic product is negative and insignificant.

ii.The government through its agency Nigerian custom service should computerize all its tax collection processes with adequate internal control system so as to boost revenue generated from custom and excise duties.

iii. Government should Increase the Number of goods and services on the VAT list to account for more sectors that have become more productive since 1994. For instance, pharmaceutical products.

iv. Companies remittance of VAT revenue should be addressed by the government to ensure full compliance.

v. Government should ensure that manufacturing industries sourcing for raw materials abroad should not be charged excessive custom duties, to enable them thrive most especially the infant industries.

vi. Government should ensure that VAT revenue is properly utilized in the provision of autonomous capital investment as against paying salaries.

REFERENCES

Abomaye-Nimenibo, W. A. S., Michael, J. E. M., & Friday, H. C. (2018). An empirical analysis of tax revenue and economic growth in Nigeria from 1980 to 2015. Global Journal of Human-Social Science: Political Science, 18(3), 9-40.

Akhor, S.O., Atu, E. C., &Ekundayo, O.U. (2016). The impact of indirect tax revenue on economic growth: The Nigeria experience. Igbinedion University Journal of Accounting,2(1), 62-87.

Anyaehie. M., &Areji, A. (2015). Economic Diversification for Sustainable Development Nigeria. Open Journal of Political Science. 5, 87-94.

Akwe, J. A. (2014). Impact of Non-Oil Tax Revenue on Economic Growth: The Nigerian Perspective International Journal of Finance and Accounting.3 (5), 303-309.

Adeleke, A. (2012). Issues, Challenges and Prospects of Vision 20:2020; Conference Paper, Yaba College of Technology Conference and Research air. Lagos, Nigeria

Arisoy, I., &Unlukaplan, I. (2010). Tax Composition and Growth in Turkey: An Empirical Analysis. International Research Journal of Finance and Economics.59, 51 –61.

Adegbie, F., &Falike, A. (2010). Customs and excise duties contribution towards the development and growth of Nigerian economy. European Journal of Economics, Finance and Administrative Sciences, 29, 133-144.

Ajakaiye, O.D. (2000). Macroeconomic effect of value added tax in Nigeria: a computable general equilibrium analysis, AERC Research Paper, 92.

Atkinson, A. (1977). Optimal Taxation and the Direct versus Indirect Tax Controversy. The CanadianJournalof Economics. 10(4), 590-606.

Anyanfo, A. M. O. (1996). Public finance in a developing economy: The Nigerian Case. Department of Banking and Finance, University of Nigeria, Enugu Campus. Enugu.

Budget Analysis (2015, January 30). 2015 budget shows government not committed to austerity. Premium times.

Bird, R. (2003). Taxation in Latin America: Reflections on Sustainability and the Balance Between Equity and Efficiency. Joseph L. Rotman School of Management, University of Toronto ITP paper 036.

Bhartia, H. L. (2009): Public Finance. 14th Edition. Vikas Publishing House PVT Ltd.

Bleaney N. S., &Germmel , M. P. (1999). The impact of income tax rates (ITR) on the economic development of Botswana. Journal of Accounting and Tax Revenue, 1(1), 8-22.

Barro, R. (1990). Government Spending in a Simple Model of Endogenous Growth. Journal of Political Economy. 98, S103 -S125.

Barro, R., & Sala-Martin, X. (1992). Public Finance in Models of Economic Growth. Review of Economic Studies, 59, 645- 661.

Central Bank of Nigeria (2013). Statistical Bulletin.

Central Bank of Nigeria (2010). Annual Reports and Accounts.

Cremer, H., Pestieau, P., & Rochet, J. C. (2001). Direct versus Indirect Tax: The Design of the Tax Structure Revisited. International Economic Review, 42 (3), 781-799.

Dahlby, B. (2003). Restructuring the Canadian Tax System by Changing the Mix of Direct and Indirect Taxes. In H. G.Grubel, Tax Reform in Canada: Our Path to Greater Prosperity. Vancouver British Columbia Canada: The Fraser Institute, 77-108.

Ebosele, M., & Adekoya, F. (2012). Worries Over Great Reliance On Oil, Neglect of Real Sector. The Guardian 29 (12,303), 2.

Ebiringa, O. T., &Emeh, Y. (2012). Analysis of tax formation and impact on economic growth in Nigeria. International Journal of Accounting and Financial Reporting.2 (2),367-385.

Enokela, S. A. (2010). The impact of value added tax on economic development of Nigeria. Journal of social and management

Sciences, 3(2), 19-40.
Emran, S., & Stiglitz, J. (2005). On Selective Indirect Tax Reform in Developing Countries. Journal of Public Economics. 18, 599-620.
Federal Ministry of Finance, (2015). A Transition Budget. http://finance.gov.ng
Greenidge, K., & Drakes, L. (2009). Tax Policy and Macroeconomic Activity in Barbados.
http://www.centralbank.org.bb.
Gujarati, N. (2007). Basic Econometrics, 5th Edition. New Delhi: McGraw-Hill Education (India)
Pvt Limited.
Gujarati, N. (1995). Basic Econometrics, 2ndEdition. New York : Oxford University Press.
Harmon, J.K. (2007).Improving the Nigeria Tax System from Canadian Experience. Wordsmith
Printing and Pack aging ltd, pages 101-104.
Harris, D. (1995). Using Cointegration Analysis in Econometric Modeling. 1stEdition.New
Jersey:Prentice Hall Publishers.
Harberger, A. (1964). Taxation, Resource Allocation and Welfare. In NBER, and the Brookings
Institution: The Role of Direct and Indirect Taxes in the Federal Reserve System.
Princeton: Princeton University Press 25 – 75.
Ikeokwu,Q.C.,&Leyira, C.M. (2019).Indirect taxes and economic growth in Nigeria. Advance
Journal of Management, Accounting and Finance, 4(4), 13-31.
Inyiama, O. I., &Ubesie, M. C. (2016). Effect of value added tax, customs and excise duties on
Nigeria economic growth. International Journal of Managerial Studies and Research
(IJMSR), 4(10), 53-62.
Ilaboya, O. J., &Mgbame, C. O. (2012). Indirect tax and economic growth. Research Journal of
Finance and Accounting, 11(3), 70-82.
Igweonyia, Y. T. (2011). Value added tax and export: The case of selected countries around the
world. Journal of Economics and Behavioural Studies. 2(2), 2-15. Investopedia.com
Jhingan, M. L. (2010). Macroeconomic Theory. 5thEdition.New Delhi: Vrinda Publishers
Johansen, S. (1988). Statistical Analysis of Cointergrating Vectors. Journal of Economic
Dynamics and Control, (12), 231 - 254.
Jarque, C.M., &Bera, A.K. (1987). A Test for Normality of Observations and Regression
Residuals. International Statistical Review. 55 (2), 16-172.
Koch, F, Schoeman, J., & Van -Tonder, J. (2005). Economic Growth and the Structure of Taxes
in South Africa: 1960-2002. South African Journal of Economics, 73 (2), 190-210.
Kneller, R., Bleaney, F., & Gemmell, N. (1999). Fiscal Policy and Growth: Evidence from
OECD Countries. Journal of Public Economics, 74, 171-190.
Musgrave, R. A and Musgrave P. B. (2004). Public Finance in Theory and Practice (5th ed.).
New Delhi: McGraw Hill Publishing Company.
Musanga, B. (2007). Effects of Taxation on Economic Growth (Uganda's experience: 1987-
2005). Unpublished Misc Qualitative Economics. University of Makerere.
Martinez-Vazquez, J., Vulovic, V., & Lui, Y. (2009). Direct Versus Indirect Taxation: Trends,
Theory and Economic Significance. International Studies Program Working Paper, 09 –

11.Georgia State University.
National Bureau of Statistics, (2018). www.Nigerians tat.gov.ng
National Bureau of Statistics, (2014). www.Nigerians tat.gov.ng
Nmesirionye, J. A., Jones, E., &Onuche, E. V. S. (2019). Impact of indirect taxes on economic
performance of Nigeria (1994-2017). European Journal of Accounting, Finance and
Investment, 5(4), 32-39.
Nzotta, S.M., (2007) Tax evasion problems in Nigeria: A critique. Nigeria Account. 40(2), 40-43

Owino, O. B. (2019). An empirical analysis of value added tax on economic growth. Evidence
from Kenya data set. Journal of Economics, Management and Trade, 22(3), 1-14.
Oladipupo, A. O &Ibadin, P. O.,(2015). Indirect taxes and economic growth in Nigeria, EKON.
MISAO I PRAKSA DBK. GOD XXIV. (2015.) BR. 2. (345-364).
Okonjo-Iweala, N. (2014). In Bassey Udo; Amid revenue uncertainties, Nigerian consumers may
pay more VAT. Premiun Times, December 17.
Okonjo-Iweala, N. (2012). Diversification of Nigeria Economy. Sunday Punch, 18, (19), 685:57.
Olatunji, O. (2009). A Review of Value Added Tax (VAT). International Business Management.3 (4) 61-68.
Salami, G. O., Apelogun, K. H., Omidiya, O. M., &Ojoye, O. F. (2015). Taxation and Nigerian
economic growth process. Research Journal of Finance and Accounting, 6(10), 93-101.
Stailova, D., &Patonov, N. (2012). An empirical evidence for the impact of taxation on
economy growth in the European Union.Tourism and Management Studies, 3, 1030-1039.
Scarlet, N. T. (2011). Macro Economics: Dimension of Competitive Indicators and Policy
Performance. Dominus Press.
World Bank Data, (2017). http://data.worldbank.org
Ukpabi A. L. (2019). The Consequences of Indirect Taxation on Consumption in Nigeria.
Taiyuan University of Technology, 030024, Taiyuan, Shanxi, China.

EFFECT OF PROCESS VARIABLES ON PHYSICAL PROPERTIES OF EXTRUDED SNACKS PRODUCED FROMBLENDS OF SORGHUM, AFRICAN YAM BEAN AND MORINGA LEAF POWDER

NWAKALOR, ChizobaNkiru
Department of Food Technology, Federal Polytechnic
Oko, Anambra State, Nigeria.

Abstract
A three- factor three level central composite rotatable design (CCRD)was adopted to study the effect of feed composition (X_1), feed moisture content (X_2) and barrel temperature (X_3) on expansion ratio (ER) and bulk density (BD) during extrusion of snack from the blends of sorghum, African yam bean and moringa leaf powder. Fifteen composite blends were prepared using sorghum, African yam bean and moringa leaf powder. Extrusion cooking was carried out using a locally fabricated single screw extruder at the temperature range of 100°C-140°C and die diameter of 0.4cm. Physical properties of the extrudates namely bulk density and expansion ratios were analyzed. The regression model for the data indicates that the proposed model was adequate, possessing lack of fit and with satisfactory coefficients of R^2=99.5%and 93.5% for expansion ratio and bulk density respectively, suggesting good fit. The CCRD was effective in optimizing the process condition of the extruded snacks as influenced by feed composition, feed moisture content and barrel temperature. Response variables predicted with model equations under optimum conditions were in general agreement with experimental data.The data obtained from the physical properties could be used for control of product characteristics and possible projection for the commercial production of extruded snack.

Keywords: Sorghum, African yam bean, Moringa leaf powder and physical properties

INTRODUCTION

Cereals and legumes play important rolesin the diets of many people in Africa and Asia, and are the major sources of proteins, calories, vitamins and minerals (Nkamaet al.,2009). The functionality of these components in the different cereals determines, to a large extent, their uses as food and industrial raw materials. There has been wide advocacy for cereal/legume blending in the face of deepening problems of hunger and malnutrition in the least developed countries. Several reports have shown that complementation could be achieved by mixing legumes and cereals which abound in the tropics (Anuonyeet al., 2007; 2009). Even though cereals are deficient in lysine, they have sufficient amounts of sulphur-containing amino acids which are limiting factors in legumes (Enwere, 1998).

The increasing inclusion of legumes in the manufacturing of various functional food products is due to their high protein, energy and micronutrient content (Asgaret al., 2010). African yam bean (AYB) is one of the lesser known legumes (Apata and Ologhobo, 1990) and widely cultivated in the southern parts of Nigeria. AYB is rich in lysine but deficient in sulphur amino acids.In Nigeria and indeed in many African countries, sorghum has been used in the formulation of ready-to-eat cereal products. Akpapunam and Darbe (1994) noted that it is possible to improve the nutritional quality of cereal proteins by combination with cheaper and more available plant protein sources such as legume to form part of the infant and adult snack food.

Moringa oleifera is an example of the underutilized crops that has great potentials. Moringa leaves have been reported to be rich in nutrient with dry leaves containing as much as 30% protein. The leaves are sources of Sulphur- containing amino acid such as methionine and cystine which are often in short supply in most legumes (Martin et al., 1998). The amino acid balance and micronutrient content is also very good.

Extrusion cooking is a popular means of preparing snacks and ready to eat foods. It is versatile and efficient method of converting raw materials into finished foods. Its advantages include energy efficiency, lack of process effluents and versatility with respect to ingredient selection, and the shapes and textures of products that can be produced. Extrusion processing is used for processing of starch as well as proteinous materials. Despite increased use of extrusion processing, extrusion is still a complicated multiple – input – multiple output process that are yet to be mastered. Small variations in processing conditions can affect process variables as well as product quality depending on the extruder type, screw configuration, feed moisture and temperature profile in the barrel session, screw speed, die configuration and feed rate (Neelam et al., 2006).

The objective of this work was to study the effects of process variables (feed composition, feed moisture content and barrel temperature) on the physical properties (expansion ratio and bulk density) of extruded snacks from blends of sorghum, African yam bean and Moringa leaf powder mixtures using response surface methodology (RSM).

Material & Methods

Flour preparation from African yam bean

Five kilograms of the AYB seeds were sorted, washed and sun dried. The AYB seeds were roasted for 10minutes, milled (attrition mill) and sieved into fine flour with 1mm mesh sieve.

Flour preparation from sorghum

The sorghum flour was prepared using the method of Murty and House, (1980). Five kilograms of sorghum seeds were sorted, cleaned, dehulled, winnowed, milled (attrition mill), sieved into fine flour to remove the dust and contaminants.

Preparation of Moringa leaf powder

Moringa leaves were washed and dried at room temperature. The dried leaves were milled into powder and sieved with sieve of 0.3mm aperture size to get Moringa powder.

Blend Preparations and Moisture Adjustment

Sorghum flour (SF) and African yam bean flourwere mixed at various weight ratios, and the total moisture contents of the blends adjusted to the desired values with a mixer as described by Zasypkin and Tung-Ching Lee, (1998). Weights of the components mixed were calculated using the following formula:

$$C_{SF} = \frac{[r_{SF} \times M \times (100-w)]}{[100 \times (100-w_{SF})]} \quad \text{---------- (1)}$$

$$C_{AF} = \frac{[r_{AF} \times M \times (100-w)]}{[100 \times (100-w_{AF})]} \quad \text{---------- (2)}$$

$$W_X = M - C_{SF} - C_{AF} \quad \text{----------(3)}$$

Where C_{SF} and C_{AF} are the masses of sorghum flour and African yam bean flour respectively, r_{SF} and r_{AF} are the respective

percentages of sorghum and African yam bean flour in the blend, (r_{SF} +r_{AF}= 100%); where M is the total mass of the blend; w, the moisture content of the final blend, percentage wet weight basis (w.w.b); Wx is the weight of water added; and W_{SF} and W_{AF} are the moisture contents of S_F and A_F respectively. One percentage Moringa leaf powder was added to each formulation; and the samples were put in closed plastic buckets and stored overnight (32±2°C).The feed materials were then allowed to stand for 3hrs to equilibrate at room temperature prior to extrusion exercise.

Extrusion Cooking Processing

Extrusion cooking was performed in a locally fabricated FST 001 single screw extruder at the Department of Food Science and Technology, University of Nigeria, Nsukka. The extruder was fed manually through a conical shaped hopper mounted vertically above the end of the extruder. The die has 0.4cm diameter and the variables considered were feed composition, feed moisture content and barrel exit temperature. The barrel temperature ranges were between 100-140^{0}C and feed moisture content was set at 20-30%.

Experimental Design and Statistical Analysis

The extrusion conditions were optimized with a threefactorthree-level central composite rotatable design (CCRD)(Box and Hunter, 1957). Response Surface Methodology (RSM) was used to investigate the effect of the independent variables on the responses. Feed composition (X_1), feed moisture content (X_2) and extruder barrel temperature (X_3) were the independent variables considered and the qualities of the finished products were the response variables measured. In order to objectively define the experimental ranges, preliminary experiments were conducted to establish the narrower, more effective ranges ofthe independent variables (X_1, X_2, and X_3) prior to the experimental runs.

As the design value ranges were established, THEY WERE CODED TO LIE AT ±1A FOR THE factorial points, 0 FOR THE CENTER POINTS AND ±1A FOR AXIAL POINTS. THE EXPERIMENTS were randomized to maximize the effects of unexplained variability in the observed responses due to extraneous factors, while three replicates at the center of the design were used to allow for estimation of pure error sum of square and lack-of-fit. Analysis of variance (ANOVA) was conducted to determine significant differences among the mean treatment combinations.

Process Optimization

A second order polynomial regression equation was modeled on the basis of the experimental data and optimumparameters defined using MINITAB 14.13 Software. From the resulting values, for each of the response variable, the coefficients of the polynomial equation(BO, BIand BIJ) are determined and the equation simplified based on the influence of the factors on the final response. The responses were then expressed as second-order polynomial equation according to Eq. 4.

$$Y = f(y) = \beta_0 + \sum_{i=1}^{k} \beta_i X_i + \sum_{i=1}^{k} \beta_{ii} X_i^2 \sum_{i=1}^{k} \quad \sum_{i=1}^{k} \beta_{ij} X_i X_j + \varepsilon \text{.....(4)}$$

Where Y is the predicted response used as a dependent variable, k is the number of independent variables considered in the experiment; BO constant coefficient and BI, BIJand BII arethe coefficient of linear, interaction and square terms respectively, while E is the random error term. Multivariate regression analysis with model equation (4) was carried out on the data using MINITAB 14.13 statistical software(Manitab Inc. USA) to yield equation 5 which was used tooptimise the productréponses (Filliet al., 2011).

$$Y = B_o + B_1X_1 + B_2X_2 + B_3X_3 + B_{11}X^2_1 + B_{22}X^2_2 + B_{33}X^2_3 + B_{12}X_1X_2 + B_{13}X_1X_3 + B_{23}X_2X_3 + E \text{....(5)}$$

Expansion Ratio (puff ratio)

Expansion ratio can be of two indices, diametral and longitudinal as described by Sopadeand Le Grys (1991). Diametral expansion is defined as the diameter of the extrudate whilst longitudinal expansion is defined as the length per unit dry weight. The diameter was determined after cooling of the extrudate, 10 samples were assessed for each extrudate and for each sample; diameters at three different positions were taken using vernier calipers and the result averaged. Expansion ratio was expressed as the diameter of the extrudate to the diameter of the die.

Bulk Density of ExtrudatesTHE BULK THE bulk density extrudates was calculated using the methods described by Qing-Bo et al. (2005) as follows: Density (× ṁ)/ × D2 × L) where ṁ is the mass of extrudates with length L and diameter D. The samples were randomly selected and replicated 10 times and the average result value taken.

RESULTS AND DISCUSSIONS

Model Description

Studies was conducted using the response surface method in modeling the physical properties of extruded snack as affected by the process variables feed composition level (X_1), feed moisture (X_2),and barrel temperature (X_3). The independent and dependent variables were fitted to the second –order model equation and examined for the goodness of fit. The analysis of variance were performed to evaluate the lack of fit and the significance of the linear, quadratic and interaction effects of the independent variables on the dependent variables. The lack of fittest is a measure of the failure of a model to represent data in the experimental domain at which points were not included in the regression (Varnaliset al., 2004). Coefficient of determinant, R^2, is defined as the ratio of the explained variation to the total variation and isa measure of the degree of fit (Singh et al., 2007).

It is also the proportion of the variability in the response variables, which is accounted for by the regression analysis (Mclarenet al.,1977). When R^2 approaches unity, the better the empirical model fits the actual data. The smaller is R^2, the less relevant the dependent variables in the model have in explaining the behavior of variation (Myers and Montgomery, 2002). If a model has a significant lack of fit, it is not a good indicator of the response and should not be used for prediction (Myers and Montgomery, 2002). We may probably conclude that the proposed models approximate the response surfaces and can be used suitably for prediction at any values of the parameters within experimental range.

Expansion Ratio (ER) and Bulk Density (BD)

The expansion characteristic of extruded snacks is important especially for the acceptability by the consumer. Most extruded snack products are expected to have a puffed structure. Property index such as expansion ratio and density may be used to quantify this structure. Sectional expansion is a measure of sectional expansion area of the extruded snack. The mean values of expansion ratios (ER) and bulk density (BD) of the extruded snack are shown in (Table 2). From the result it shows that lowest value for the ER was 1.425 and the highest value was 1.850representing (32% feed composition, 25% feed moisture and 86.36^{0}C) and (50% feed composition, 20% feed moisture and 100^{0}C) respectively.

It appears that ER decreased with increasing moisture content. The expansion ratio is a vital factor for instant products because of the short hydration time for which this study was intended. Bulk density has been linked with the expansion ratio in describing the degree of puffing in extrudates. The observed values for the bulk density (BD) varied from 0.886 – 1.974gcm^3 for both samples (15% feed composition, 20 % feed moisture and 140^{0}C barrel temperature and 15% feed composition, 20 % feed moisture and 100^{0}C barrel temperature) respectively. Response surfaces analysis was

applied to the experimental data and a quadratic polynomial regression response surface model Table 1 was fitted to all the response parameters. The multiple regression equation representing the effect of processing variables on ER and BD is given by the second order model; the models explained the variability in the experimental data obtained. The sign and magnitude of coefficients in Table 1 indicate the effect of parameters on the response. A negative sign of coefficient indicates a decrease in the response when the level of the parameter is increased, while a positive sign indicates increase in the response with increase in the level of the parameter:

Table1: Second - order quadratic models developed for response variables

Response variable	Second-order quadratic models	Regression coefficients (%) R^2	R^2_{adj}
Expansion Ratio	$2.29+0.01X_1-0.01X_2-0.02X_3+0.0002X_1^2+0.001X_2^2+0.0001X_3^2-0.001X_1X_2+0.0001X_1X_3-0.00003X_2X_3$	99.5	99.3
Bulk Density	$-1.02-0.08X_1-0.03X_2+0.07X_3-0.0002X_1^2-0.001X_2^2-0.00X_3^2+0.002X_1X_2+0.0001X_1X_3-0.0004X_2X_3$	93.5	91.8

where X_1 refers to coded value of feed composition, X_2 refers to the coded value of feed moisture content, X_3 refers to coded value of screw speed. Analysis of variance indicates that the linear effects of the independent variables (feed moisture content and barrel temperature) significantly ($P<0.05$) affected the expansion ratio (Table 1). The model of the regression equation showed good fit with R^2 =99.5%for ER and R^2=93.5% for bulk density. This suggests a very good fit to the experimental data and the model could be used to describe the process. The negative significant ($P<0.05$) effect of linear coefficients of feed moisture indicated that this variable influenced the ER in reverse order. This observation is in agreement with Kokiniet al. (1991) who reported that moisture plays a key role in the mechanism responsible for expansion. Harmann and Harper (1973) postulated two factors in governing expansion: (a) dough viscosity and (b) elastic force (die swell in the extrudate). The elastic forces will be dominant at low moisture and temperature. The bubble growth, which is driven by the pressure difference between the interior of the growing bubble and atmospheric pressure resisted primarily by the viscosity of the bubble wall, will usually dominate the expansion at high moisture content and high temperature (Padmanabhan and Bhattacharyya, 1989).

A viscoelastic melt in a food extruder expands due to flashing of moisture at the die exit. The expansion process can be described as nucleation in the die,extrudate swelling immediately beyond the die, followed by bubble growth and collapse(Kokiniet al., 1991). Increased water content in the melt would soften the amylopectin molecular structure and reduce its elastic characteristics to decrease diametral expansion (Alvarez-Martinez et al., 1988). Feed moisture has been identified as the main factoraffecting extrudate expansion and density (Gujralet al., 2001). Extrudates can expand inboth the cross-sectional (diametrical) direction and the longitudinal direction (Launary andLisch, 1983). A porous, expanded, sponge-like structure is formed inside extrudates as a result of many tiny steam bubbles created by

the rapid release of pressure after exiting the die (Conway, 1971). Increased feed moisture during extrusion would provoke change in the amylopectin molecular structure of the material reducing the melt elasticity thus decreasing the expansion and increasing the density of extrudate (Qing-Bo et al., 2005).

Extruded snacks possess the typical texture of puffed, light and crispy. Some physical properties of extruded snack were reported including bulk density of 48-64 g/L, 50-160 g/L (Moore, 1994) and 59 10g/L (Boonyasirikoolet al., 1996) and expansion ratio of 3.1 - 3.8 (Mohamed, 1990) and 4.03 (Boonyasirikoolet al., 1996). These relationships have been reported elsewhere for corn and wheat-based snacks (Iloet al.,1999).

Table 2:Experimental design and observed values of expansion ratio (ER), bulk density (BD) and proximate composition (%) ofextruded snack

Runs	X_1(%)	X_2(%)	X_3 ^{0}C	BD(g/cm^3)	ER
1	15	20	100	1.197	1.600
2	50	20	100	1.316	1.725
3	15	20	140	0.886	1.675
4	50	20	140	1.111	1.500
5	15	30	100	1.974	1.450
6	50	30	100	1.606	1.850
7	15	30	140	0.886	1.675
8	50	30	140	1.892	1.450
9	3.41	25	120	1.655	1.550
10	60.59	25	120	1.441	1.675
11	32	25	86.36	1.526	1.425
12	32	25	153.6	1.188	1.675
13	32	16.59	120	1.137	1.500
14	32	33.41	120	1.149	1.550
15	32	25	120	1.400	1.500

Values are means of triplicate determinations. X_1=Feed composition, X_2=Feed moisture X_3= Exit barrel temperature

Optimization

Numerical optimization was carried out for the process variables of the extruded snacks from sorghum, African yam bean and Moringa leaf powder mixtures for obtaining the best product. Desired goals were assigned for all the parameters for obtaining the numerical optimization values for the responses. All the processing parameters were kept in range. Expansion ratio was maximized while bulk density was minimized. The optimum values obtained for feed composition, feed moisture content and barrel temperature were 42.38%,22.89% and 120^{0}C respectively. The corresponding optimum values of expansion ratio and bulk density were 1.512 and 0.678 g/cm^3 respectively.

CONCLUSION

Designed experiments were conducted following Response Surface Methodology (RSM) for the extrusion of Sorghum, African yam bean and Moringa leaf powder using a single screw extruder. The RSMwas found to be effective technique to investigate the physical properties (expansion ratio and bulk density) of the extruded snack. From the result it shows that the three extrusion variables were found to influence the extrudate properties either independently or interactively. Feed moisture content was found to be the most significant factor that affected the expansion ratio and

the bulk density. The high correlation coefficient of multiple determinations at 95%confidence level and the model equation developed can be used for predicting expansion ratio and bulk density of the extrudate. Using RSM, the combined effect of three variables on extrudate response can be predicted which is difficult to achieve with conventional methods. The understanding of the effect of the process variables on quality parameters of the extrudates such as expansion ratio and bulk density is important to facilitate industrial adoption of this technology.

REFERENCES

Alonso, R., Orue, E., Zabalza, M.J., Grant, G., Marzo, F. (2000). Effect of extrusion cooking
on structure and functional properties of pea and kidney bean proteins. Journal of the
Science of Food & Agriculture, 80(3), 397 – 403.

Anuonye, J.C., Badifu, G.I.O., Inyang, C.U. and Akpapunam, M.A.(2009). Effects of extrusion
process variables on amylose and pasting characteristics of acha/soybean extrudates using response surface analysis. American Journal of Food Technology, 5:354-365.

Akpapunam, M.A. and Darbe, J.W.(1994). Chemical Composition and Functional Properties of
Blends of Maize and Bambara Groundnut Flours for Cookies Production. Plant
Foods for Hum. Nutri.46:147-155.

Apata,D.F. and Ologhobo,A.D (1990). Some aspects of biochemistry and nutritive value of
AYB seed (Sphenostylisstenocarpa). Food chem. 36: 271-280.

Asgar, M.A., Fazilah, A., Nurul, H., Rajeev, B. and Karim, A.A.(2010). Non-meat protein
alternatives as meat extenders and meat analogues. Comprehensive Reviews in Food Science and Food Safety, 9(5):513-529.

Chen, J., Serafin, F.L., Pandya, R.N., Daun, H. (1991). Effect of extrusion conditions onsensory
properties of corn meal extrudates. Journal of Food Science, 56(1), 84.

Enwere, N.J. (1998). Foods of plant origin. Afro-orbis Publishers Ltd., Nigeria. P.24.

Lazou, A., Krokida, M. (2010). Functional properties of corn and corn – lentil extrudates.
Food Research International, 43, 609 – 616.

Martin, F.W., Ruberte,R.M and Meitzner, L.S. (1998). Edible Leaves of the Tropics,3rd ed.
Educational Concerns for Hunger Organisation , Inc., N.ft.Meyers, Fl.194pp.

Murty, D.S. and House, L.R. (1980). Sorghum food quality. Its assessment and improvement 5th
Joint meetings of the UNDP-CIMMYT policy. Advisory committee. P 14.

Neelam, S., Kumbhar, B.K., and Manoj, K.(2006) Modeling of extrusion process using response surface methodology and artificial neural networks. Journal of Engineering science and Technology, 1(1), 31-34.

Nkama, I., Hamakar, B.C., Angarawai, I., Shellong, A.B., Diarra, M. and Bababe, B.(2009). In vitro carbohydrate digestibility of some pearl millet hybrids and couscous from them. In food processing in the semi-arid region: challenges and opportunities. Proceedings of the 33rd Annual Conference of the Nigerian Institute of Food Science & Technology Government House, Yola, October 12-16, pp.111.

Obatolu, V.A. (2002). Nutrient and sensory qualities of extruded malted or unmalted
millet/soybean mixture. Food Chemistry, 76, 129-133.

Pansawat, Jangchud, K., Jangchud, A., Wuttijumnong, P., Saalia, F.K., Eitenmiller, R.R.,Philips,
R.D.(2008). Effects of extrusion conditions on secondary extrusion variablesand
physical properties of fish, rice – based snacks. LWT, 41, 632 – 641.

Pelembe, L.A.M., Erasmus, C., Taylor, J.R.N. (2002). Development of a Protein – rich
Composite Sorghum – Cowpea Instant Porridge by Extrusion Cooking Process.
Lebensm – Wiss. U. – Technol., 35, 120 – 127.

Varnalis, A.I., Brennan, J.G., Macdougall, D.B., Gilmour, S.G. (2004). Optimization of high
temperature puffing of potato cubes using response surface methodology. Journal of
Food Engineering, 61, 153 – 163.

Zasypkin, D.V., Tung- Ching, L. (1998). Extrusion of Soybean and wheat flour as affected by
moisture content. J. Food Sci., 63(6), 1058-1061.

EFFECT OF SOIL SAMPLING DEPTH ON HEAVY METAL CONCENTRATION AND SOME PHYSIOCHEMICAL PROPERTIES OF SOIL AT TWO AUTOMOBILE MECHANIC VILLAGES IN OWERRI, IMO STATE

[1]OKORO, A.C.,

[2]AGU, R.S., [3]NWACHUKWU, C.P.,
[4]UGWU, E.I.
&
[5]NZEKWE, C.A

[1,2,5]Department of Agric Technology, Enugu State Polytechnic,Iwollo.
[3]Department of Agric and Bioresources Engineering, Nnamdi Azikiwe University, Awka [4]Department of Agric and Bioresources Engineering, University of Nigeria, Nsukka.

Abstract
Studies on the effect of soil sampling depth on heavy metal concentration and some physiochemical properties of soil was conducted at two automobile mechanic villages. Soil samples were collected at 0-20cm, 20-40cm and 40-60cm depths respectively from the two auto-mechanic villages and a control site. The values of Copper(Cu) and Lead(Pb) ranged between 191.00-590.00 and 693.33-2197.33mg/kg respectively and they decreased with an increase in depth at the two auto-mechanic villages. When compared to the allowable limits of heavy metals in the soil, the values in this study were far higher. The soil pH was slightly acidic and alkaline ranging from 5.14-7.27. The recommendation is that strict adherence to proper disposal of auto-mechanic wastes should be ensured. The suggested phyto-remediation measures of soil should also as a matter of urgency started at these locations.
Keywords;Soil, Contamination,Heavymetals, Soil Physiochemical Properties and Auto-MechanicVillage.

INTRODUCTION

Heavy metals are consideredas serious pollutants because of toxicity, persistence and their non-degradable conditions in the environment, thereby constituting threat to human beings and other forms of biological life (Tam and Wong, 2000; Yaun et al., 2004; Nwuche and Ugoji., 2008; Aina et al., 2009; and Mohiuddin., 2010).Liu et al., (2007) observed that heavy metal concentrations in the soil are usually highest close to the source declining both in distance and depth. Novak and Walks (2004) found that metal hydroxide and water increases the sorption capacity of soil, which implies that spilling used acid on the ground in the mechanic village will increase soil acidity and the sorption capacity.

Iwegbue (2007) studied metal speciation in soil profiles at motor mechanic waste dumps around Port Harcourt, Nigeria and observed that the metals present were relatively mobile, but more in the surface soil than in the subsurface soil. Ipeaiyeda&Dawodu (2008) also studied heavy metals contamination of topsoil and their disperse-on in the vicinities of reclaimed auto vehicle repair workshops.

All these have deleterious effects on agriculture, and ultimately human beings. Short-term and long-term effects of pollution differ depending on metal and soil characteristics (Kádár,1995; Németh and Kádár, 2005). In the after-effect of heavy metal pollutions, the role of pollutant bounding or leaching increases, which determine their bioavailability and toxicity. Bioavailability of all four of the metallic micronutrients is significantly affected by soil pH, decreasing with increasing pH. Solubility of Fe decreases a thousand fold for each unit increase in soil pH in the range of 4 to 9 (Lindsay and Norvell,1979), and consequently, most Fe deficiencies occur on calcareous soils. This decrease in solubility is much greater for Fe than for Mn, Cu or Zn. The activity (and consequently bioavailability) of Mn, Cu and Zn decreases 100-fold for each unit increase in soil pH.There is Poor information on the relationship between heavy metal and some physiochemical properties of soil with respect to depth.

This work is therefore aimed at determining the effect of soil sampling depth on heavy metal concentration and some physiochemical properties of soil at two auto-mechanic villages in Imo State

MATERIALS AND METHODS

Study Area Description

The study area is Imo State of Nigeria as shown in themaps (Figure 1). The mechanic villages were sited at Nekede and Orji, Owerri west and north local government areas of Imo State respectively with 550,362m^2 and 408,725m^2 of land which provides a dramatic example of environmental impact due to their anthropogenic activities. These automobile mechanic villages were set up in 1983 and 1987 for Nekede and Orji respectively (table 1), with fewer shops then than the present status. Mostly the activities carried out there are basically repairing and maintaining automobile vehicles. The villages are sited around agricultural communities approximately one-kilometer distance from Owerri, the major state capital city of Imo State (Angela, 2011). Nekede mechanic village fall under the geographical coordinates of longitude 7.04-7.06^{0}W and latitude 5.24-5.27^{0}N and lies on an area of flat agricultural land converted to mechanic workshops, shops and homes, where some of the mechanics and families live.

At Nekede, the topography is relatively a level ground but towards the Otammiri River side that borders it to the west. Its landscape has been sculpted by erosion forming deep gullies with elevation ranging between 71.5 and 44.1 meters in the North-West and central sector and to about 65 meters on the east and south. Climate and vegetation fall under the rain-forest belt (Angela, 2011). The geology of the area consists of plain soil which is about 0.05-2.0mm in size. This type of soil has good drainage causing its fast drying (Onweremadu and Duruigbo, 2007). Orji is a village part of the ancient kingdom of Uratta in SouthEast Nigeria and is located within the coordinates 5^{0}31^{I}39^{II}N and 7^{0}3^{I}50^{II}E in the Owerri North Local Government Area of Imo State. Orji covers a land area of 408,725$m^2$the town occupies the western periphery of the mother-clan, Uratta, Orji is bounded on the west by Umuodagu and Umunjam villages and in the East by Owaelu and Okwu; on the North by Obazu and on the South by Owerri town (Umunnakwe et al.,



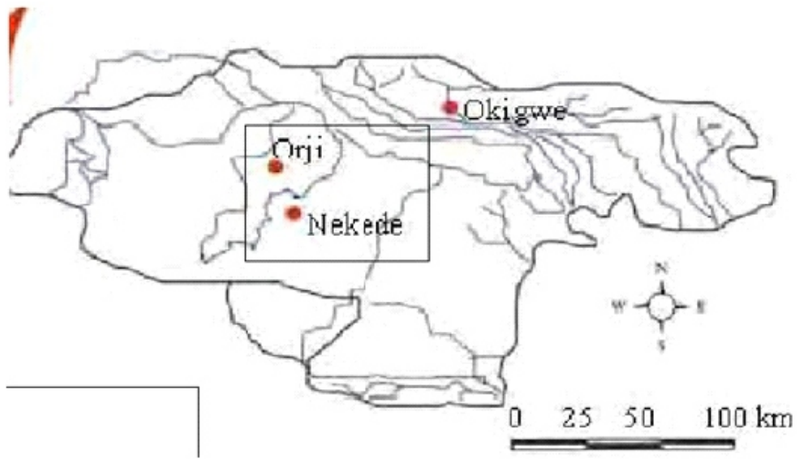


Figure 1: Map of Nigeria showing Imo State and the study area.(Nwachukwu, 2012)

Table 1: General Information on the mechanic villages studied

S/N	SITE	AREA	LOCATION(L.G.A)	YEAR OF ESTABLISHED	AGE OF SITE
1	A	NEKEDE	OWERRI WEST	1983	30
2	B	ORJI	OWERRI NORTH	1987	16

L.G.A = Local Government Area

Data Collection

Three locations within the mechanic villages were the point of interest. Threesamples were collected each atNekede and Orji at three different depths (0-20, 20-40and 40-60cm). A green uncontaminated site at the Ministry of Agriculture was used as acontrol. These samples were collected using a soil auger. Each sample was immediately placed in a fresh plastic bag and tightly sealed. All samples were transported to the laboratory where analytical procedure commenced instantly. The samples were collected by October 2012.

Data Analysis

The soil was spread on a clean plastic sheet and air dried in open air in thelaboratory under room temperature of within 23-27^{0}C for 24 hours. Afterwards the soilwas sieved on a 2mm sieve and 5gram of sample was taken from the sieved soil andput in a beaker 10ml of nitric /perchloric acid 2:1 was added to the samples. These samples were digested at 105^{o}C. Next, HCl and distilled water of the ratio 1:1 wasadded to the digested samples and the mixture transferred to the digester again for30minutes.

The digestate was then removed from the digester and allowed to cool to roomtemperature of 25^{o}C. The cool digestate was washed into a standard volumetric flaskand was made up to the mark with distilled water. Heavy metal concentration wasdetermined in the standard way using Atomic Adsorption Spectrophotometer (AASModel 210 VGP).The pH was determined by an electronic Jenway glass electrode pH meter (Model 3510). Particle size was determinedby the hydrometer method using sodium hexametaphosphate as the dispersant (Bouyoucous, 1962). Bulk density and particle densities were determined using the coresample method, from where Soil porosity was calculated.

Statistical Analysis

The results were analyzed using the GenStat statistical package. Multivariateanalysis (ANOVA) was used to determine differences between treatment means andwere separated using the Duncans new multiple range test (DNMRT) at 5% level ofsignificance ($P < 0.05$).

RESULTS AND DISCUSSION

Results

The results of soil analysis for extractable Copper and Lead at A (Nekede), B (Orji) and control (Ministry of Agriculture) were as presented in Table 2. Lead(Pb) had the highest soil concentration values while Copper(Cu) had the least in the two mechanic villages. Their order of abundance is Pb>Cu

Table 2:Effect of Depth on Heavy Metals and other Physiochemical Properties of Soil in two Auto-mechanic Villages in Imo State

MECHANIC SITE	DEPTH (CM)	SOIL TEXTURE(%) SAND	SILT	CLAY	SOIL pH	POROSITY (%)	HEAVY METALS Cu	Pb
A	0-20	82.00^a	5.00^b	13.00	7.27^a	14.63	498.00^a	2917.33^a
	20-40	78.00^a	5.00^b	17.00	5.14^b	34.62	378.33^{ab}	1719.30^{ab}
	40-60	62.33^a	20.67^a	17.67	5.31^b	41.61	285.00^{ab}	1134.00^b
	SEM	3.15	2.64	1.30	0.40	3.10	40.71	336.28
B	0-20	74.67	6.33	19.00	6.20	25.70^b	590.00^a	2332.70^a
	20-40	68.67	5.00	26.00	6.50	79.46^a	405.00^{ab}	1340.70^b
	40-60	63.33	9.33	26.33	6.42	38.70^b	191.00^b	693.33^b
	SEM	2.62	0.92	2.44	0.25	8.33	70.30	271.50
C	0-20	81.33^a	5.67	13.00	8.27^a	33.89^a	40.00	0.24
	20-40	71.33^b	7.33	15.33	8.70^a	42.22^a	15.00	8.18
	40-60	75.67^b	7.00	17.33	7.27^b	2.56^b	13.00	8.05
	SEM	1.10	0.58	1.28	0.23	6.42	5.06	1.04

a, b – means at the same row with different superscripts are significantly different at $p<0.05$;
A- Nekede; B- Orji; Cu- Copper; Pb- Lead

Effect of Soil Depth on Heavy Metals in two Automobile mechanic Villages in Imo State

Effect of soil depthon Copper concentration

Table 2 showed a significant difference at p < 0.05 for Cu values at A and Bwith an exception to the control withrespect to depth. While, figure 2 showed thatheavy metal concentration decreased with an increasing depth atNekede and Orji respectively.

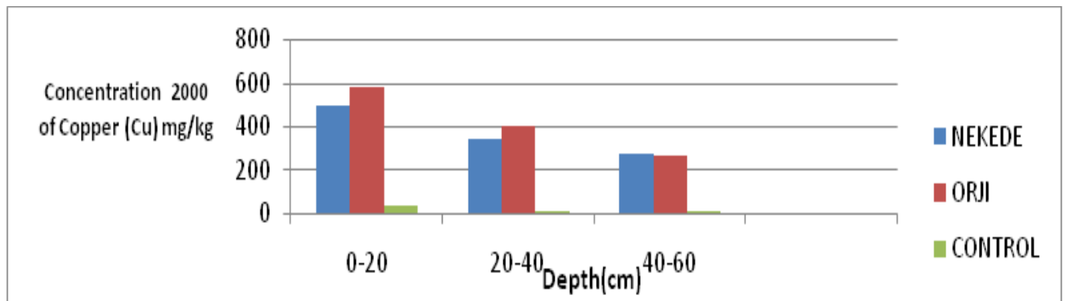


Figure 2: Effect of depth on Copper (Cu) concentration at two Mechanic Villages in Imo State

Effect of soil depth on Lead (Pb) concentration

Table 2 showed a significant difference at p < 0.05 for the values of Pb at Aand B with an exception to the control across the depth. Concentration of lead(Pb) two mechanic villages were represented in Figure 3, which showed that Pbconcentrationdecreased with an increasing depth.

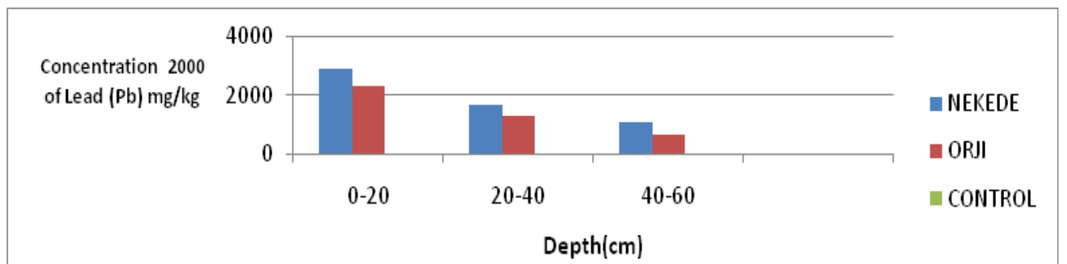


Figure 3:Effect of depth on Lead (Pb) concentration at two Mechanic Villages in Imo State

Effects of depth on the soil physiochemical properties at two auto-mechanic villages in Imo State

Effect depth of soil pH

From table 2, soil pH had a significant difference at P < 0.05 for locations A andcontrol whereas B had no significant difference. Soil pH decreases with an increasingdepth at location A and control on the grounds of their significance. But as representedin Figure 4, it increased with an increase in depth and latter decreased in Orji andControl.

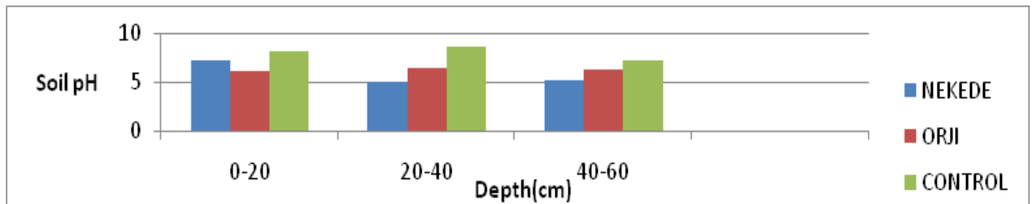


Figure 4: Effect of depth on soil pH at two Mechanic Villages in Imo State

Effect of depth on the composition of sand

From Table 2, locations A and control were significantlydifferent at p < 0.05while B was not significant across depth. Generally, with respect to the three locations,sand decreased with an increase in depth at all locations as presented in (Figure 5).

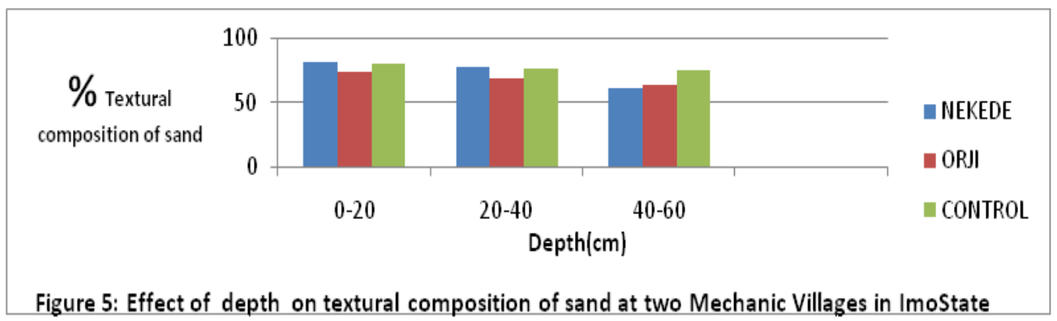


Figure 5: Effect of depth on textural composition of sand at two Mechanic Villages in ImoState

Effect of depth on the composition of silt.

From table 2, locations B and control were not significant while A wassignificant at p < 0.05 across the depths. At location A, silt increased with an increasingdepth while at B it decreased and latter increased with an increase in depth (Figure 6).

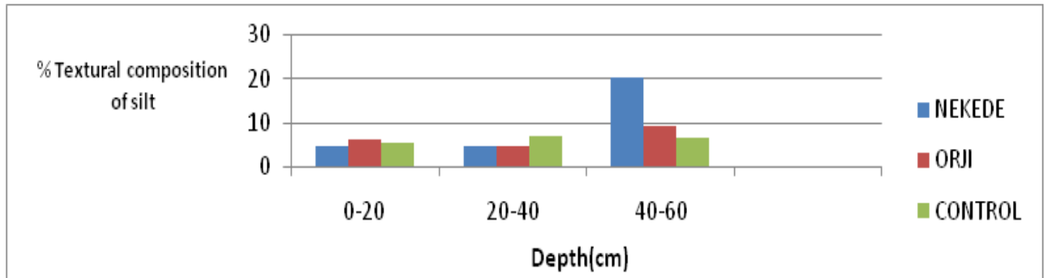


Figure 6: Effect of depth on textural composition of silt at two Mechanic Villages in Imo State

Effect of depth on the composition of clay.

Table 2 showed that clay values were not significantly different for all thelocations across depth. It generally increased with an increasing depth for all thelocations (Figure 7).

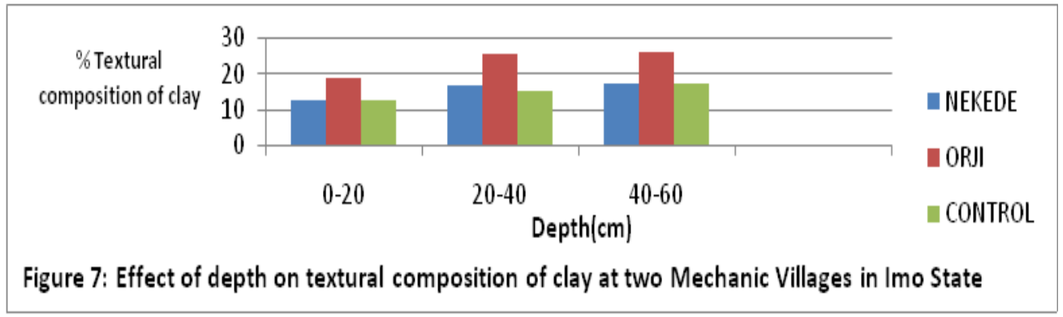


Figure 7: Effect of depth on textural composition of clay at two Mechanic Villages in Imo State

Effect of depth on soil porosity

From Table 2 effects of depth on soil porosity had a significant difference at P <0.05 for locations B and control whereas A had no significant difference. Soil porosityincreased and latter decreases with an increasing depth at locations B and control onthe grounds of their significance. But as represented in Figure 8, it increased with anincrease in depth and latter decreased in Orji and Control.

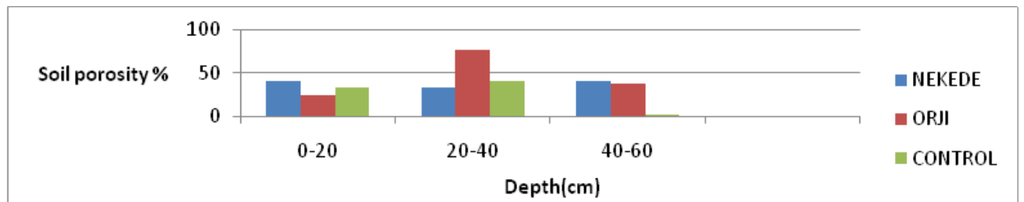


Figure 8: Effect of depth on soil porosity at two Mechanic Villages in Imo State

DISCUSSION

Copper (Cu) concentration in the soil

The highest values of Cu measured at locations A and B(table 2) are severaltimes higher than the target and intervention values in a standard soil (Table 3)(see appendix), the allowable limits in all the countries (table 4) and thetoxic limit of 250mg.kg^{-1} set by USEPA (1986) for agricultural soils.Elevated levels of copper on these auto-mechanic locations are traceable tothe high use of copper conductors and wires, tubes, solders and myriads of othermaintenance items made from copper. According to Alloway (1990) and Lenntech(2009) when copper ends up in soils, it strongly attaches to organic matter andminerals. As a result, it does not travel very far after release. Perhaps this explains whythe highest values of copper recorded in most of the locations were in the 0 to 20 cm depth (Figure 2). As a result of this limited mobility, applied copper tends toaccumulate in soil (Slooff et al., 1989). On copper rich soils, only a limited number ofplants have a chance of survival. In surface water, copper can travel great distances,either suspended on dust particles or as free ions. Soil types have finite holdingcapacities for copper ions, and leaching can occur when the copper levels applied exceed this capacity (Adriano, 1986).

Lead (Pb) concentration in the soil

Lead (Pb) was greatly significant at p < 0.05 for A and B when compared to the different depths (Table 2). Higher concentrations were recorded in the 0 to 20cm depth for A and B while the least was recorded in the 40 to 60cm depth for control (table 2). This observation of higher retention of Pb in the top layers of the soil corroborates the finding of Davies (1995) which stated that lead is especially prone to accumulation in surface horizons of soil because its low water solubility results in verylow mobility. Adelekan and Abegunde (2011) reported higher soil retention of lead(15,000Mg.kg^{-1}) at 30 to 45cm depth compared to that recorded at the top layer. Adieand Osibanjo (2009) found a range of 243 to 126,000 mg.kg^{-1} in soils from the premisesof a battery manufacturing plant. Nwoko and Egunjobi (2002) found Pb concentrationswhich were described as being highly elevated in soil and vegetation in an abandonedbattery factory site. In that case, local miners, unknown to them, for a long time werebringing Pb associated gold ores sourced from surrounding mines for processing in thevillage and putting the villagers at serious risk. When the values of lead (Pb) (table 3.1)were compared to values for the allowable, target and intervention limits of heavymetals concentrations of soils in other countries (tables 3 and 4), it showed a clearincrease in heavy metal contamination of soils. These values were above the range (30-300mg/kg^{-1}) set by USEPA(1986) described as toxic to agricultural soils.

Metal	Target Value(mg/kg)	Intervention Value(mg/kg)
Ni	140.00	720.00
Cu	0.3	10
Zn	-	-
Cd	100	380
Pb	35	210
As	200	625
Cr	20	240
Hg	85	530

Table 3: Target and intervention values for some metals for a standard soil (DPR-EGASPIN, 2002)

Heavy metal	Australia	Germany	France	Luxembourg	Netherland	Sweden	Unitedkingdom
Cu	1-2	1	2	1-3	0.5	0.4	3
Cr	100	60	150	100-200	30	60	400
Cu	60-100	40	100	50-100	40	40	135
Ni	50-70	50	50	30-75	15	30	75
Pb	100	100	100	50-300	40	40	300

Table 4: Allowable limits of heavy metal concentration in soils (Mg/Kg) (ECDGE, 2010)

Physiochemical properties of the soil.
Soil pH

The soil pH differed significantly among the two auto-mechanic villages (Table2). The pH across the two auto-mechanic villages ranged from 5.14 to 7.27. Thesevalues were expected as most soils in the tropics have their ranges from acidic toslightly neutral (Alloway and Aryes, 1997). The pH values of these study sites for thecontrol site had the highest when compared to the two mechanic villages across thedepths (Figure 4) while the effect of depth on heavy metal showed that pH increasedwith an increase in depth and latter decreased in Orji and Control. Thisagrees with the result obtain by Owusu-Donkor, (2011). The values of pH for the seconddepth were seen lower than the first and third except in fewer cases. Generally, the pHwas not high for the two auto-mechanic village, as such, it is expected that heavy metalconcentration will be high. Hence, this increases the risk of heavy metals plant uptake.Previous studies have shown a decrease in metal availability with increasing pH (Itana,1998; Bhattacharya et al., 2002) and that reduction in pH may allow the release of toxicmetals that would otherwise be adsorbed in the soil or sediment (Mouvet and Borg,1983).

Soil texture

Sand and clay were higher at Orji when compared to silt. While sand was decreasingwith an increasing depth (Figure 3.4), clay was increasing with an increasing depth(Figure 3.5). For soil particle size, the distribution of sandfraction was highest followedby clay and then silt (Figures 3.4, 3.5 and 3.6). Similar observation of sand size fractiondominance had been reported (Ano et al., 2007.,Onweremadu and Duruibgo, 2007).

Soil porosity

The porosity obtained at the three sites was inconsistent (Table 2). Itincreased with an increasing depth and latter decreased for locations A and B except inthe control were it decreased and latter increased with an increasing depth. This is incorroboration with the result of Nwachukwu et al., (2010).This implies that porosity was high atthe top soil. The inconsistency in the percent porosity may be due to the irregularity inthe sloppiness of the mechanic villages.

CONCLUSION AND RECOMMENDATIONS

Lead and copper were found to be affected by depth in the two auto-mechanic villages. The physiochemical properties of the soil such as pH and porosity increased with increasing depth. Sand decreased with an increasing depth while clay was increasingwith an increasing depth. The values of Cu and Pbobtained from this study were above thepermissible level for soils, in several countries. This raises significant environmental concern on the level of soil contamination by heavy metals at Nekedeand Orji mechanic villages. This can extend to nearby farmlands if measures to control the activities that increase the concentration of heavy metals at these sites are not implemented.

RECOMMENDATIONS

The recommendations are as follows:

(i) Strict adherence to proper disposal of auto-mechanic wastes should be ensured.

(ii) Strict compliance to regulatory limits in sludge to be released from these villages into the environment is recommended.

(iii) The suggested phyto-remediation measures of soil should also as a matter of urgency started at these locations.

REFERENCES

Adie, G.U. and Osibanjo,O. (2009). Assessment of soil polution by slag from anautomobile battery manufacturing plant in Nigeria. African Journal ofEnvironmental Science. 3(9):239-250.

Adelekan, B.A. and Abegunde,K.D.(2011)."Heavy metals contamination of soil and groundwater at automobile mechanic village in Ibadan, Nigeria. InternationalJournal of the physical Science. 6(5):1045-1058.

Adriano, D.C. (1986). Trace elements in the terrestrial environment. SpringerVerlag, New York.

Aina, m., Matejka, G., Mama, D., Yao, B. and Moudachirou, M. (2009). Characterizationofstablized waste: evaluation of polution risk. Int. J. Environ. Sci. Techno,6(1):159-165.

Alloway, B.J. (1990). Soil processes and the behaviour of metals. In: Heavymetals in soils, B.J. Alloway, ed. Blackie and Son Ltd. Glasgow.

Alloway, B.J, and Ayres, D.C. (1997). Chemical Principles of Environmentalpollution, Blackie Academic and Professional. 53-359.

Angela, C.U., Chidiogo, G.O., Ifeanyi, C.O., Hariet, C.N. and Patrick,T.E. (2011).Assessment of the volume and disposal methods of spent engine oilgenerated fromNekede Mechanic Village, Owerri, Nigeria. Report andOpinion, 3(2):31-36.

Ano, A.O., S.A. Odomelam, and P.O. Ekwueme. (2007). "Lead and CadmiumLevels in Soils and Cassava (Manihot esculenta grantz) along. Enugu-Port Harcourt Express Way in Nigeria". Electronic Journal of Environmental Agricultural and Food Chemistry. 6(5): 2024-2031.

Bhattacharya, P., Mukherejee, A.B., Jack, J. and Nordquist, S. (2002). ''MetalContamination Experimental Studies on Remediation''. Science of TotalEnvironment. (290):165-180.

Bouyoucous, G. J. (1962). Hydrometer method improved for making particle size analysis of soil, Agro. (54) :464.

Davies, B.E., Bowman,C., Davies, T.C. and Sellinus, O. (2005). Medical Geologyperspectives and prospects. Med. Geology perspectives and prospects,Essent. Med. Geol, Elsevier inc.1-14.

ECDGE, (2010). Heavy metals and Organic Compounds from Wastes used as OrganicFertilizers. Final Rep, July. WPA Consulting Engineers Inc. Ref. Nr.Tend/AML/2001/107/20. 73-74.

Ipeaiyeda,A.R., and Dawodu,M. (2008). Heavy metal contamination of top soil anddispersion in the vicinities of reclaimed auto-repair workshops in Iwo Nigeria.Bull Chem. Soc Ethiopia. 22(3):339-348.

Itana, F. (1998): "Comparative Study on Soil Pollution with Toxic Substances onFarmlands close to old and new Industrial Sites in Ethiopia". Bulletin of Chemical Society of Ethiope12(2):105-112.

Iwegbue,C.M.(2007). Metal fractionation in

soil profiles at automobile mechanic wastedumps around Port-Harcourt wastemanage, res. 25(6):585-593.
Kádár I (1995). Effect of Heavy Metal Load on Soil and Crop. Acta Agron. Hung.,43: 3-9.
Lenntech, W. (2009). Chemical Properties, Health and Environmental Effects ofCopper. Lenntech Water Treatment and Purification Holding B.V.www.lenntech.com/periodic/elements/cu.htm.
Lindsay, W.L. and Norvell, W.A., (1979). Development of a DPTA soil test for Zn, Fe,Mn and Cu. Soil Science Society of America Journal. (42):421-448.
Liu,C., Zhang,Y., Zhang,F., Zhang,S., Yin,M., Ye,H., Hou,H., Dong,H., Zhang,M.,Jiang,J. and Pei,L. (2007). Assessing pollutions of soil and plant by municipalwaste dump. Preview by Journal of Environmental Geology. 52(4):641-651.
Mohiuddin,K.M., Zakir,H.M.,Otomo,k., Sharmin,S. and Shikazono.(2010). GeochemicalDistribution of trace metal pollutions in water and sediments of downstream ofan Urban River. International Journal of Environmental Science andTechnology. 7(1):17-28.
Mouvet, C. and Borg, A.C.M. (1983). "Speciation (including adsorbing species) ofCopper, Lead, Nickel and Zinc on the Meuse River". Water Research.(6):641-649.
Németh, T and Kádár, I. (2005). Leaching of Microelement Contaminants: A LongtermField Study. Z Naturforschung, 60: 260-264.
Novak,J.M. and Watts,D.W. (2004). Increasing the Phosphorus sorption Capacity ofSouth-Eastern Coastal Plain soils using Water Treatment Residuals; soilscience. 169(3):206-214.
Nwachukwu,M.A., Huan,F. and Kennedy,A. (2010). Integrated study for automobilewastes management and environmentally friendly mechanic villages in the ImoRiver, Basin, Nigeria. African Journal of Environ sci. 4(4):234-249.
Nwoko,C.O. and Egunobi,J.K(2002). Land contamination of soil and vegetation in anabandoned battery factory site in Ibadan, Nigerian Journal of SustainnableAgricultural Environment. 4(1):91-96.
Nwuche,C.O. and Ugoji,E.O.(2008). Effects of Heavy Metals Pollution on the SoilMicrobial Activity. Int.J.Environssci.Tech. 5(3):409-414.
Onweremadu,E.U. and Duruigbo,C.T. (2007). Assessment of Cd Concentration ofCrude Oil Polluted Arable Soil. Int.J.Environssci.Tech., 4(3):409-412.
OWUSU-DONKOR Y. J. (2011). Heavy metal contents of soil and citrus grownin selected districts of ashanti region, ghana. A thesis submitted to thedepartment of crops and soil sciences, faculty of agriculture, college ofagriculture and natural resources management, kwameNkrumah university of science and technology. kumasi.27.
Slooff, W. Clevan, R.F., Janus, J.A. and Ros, J.P.M. (1989). Integrated CriteriaDocumen Copper. Report No.758474009. National Institute of PublicHealth and Environmental Protection, Bilthoven,Netherlands.
Tam,N.F.Y. and Wong,S.Y. (2000). Spatial Variation in Heavy Metals in surfacesediments of Hong Kong Mangroove Swamps Environs, Pollut., 100(2):195-205.
Umunnakwe.J, Aharanwa B.C, Njoku R(2020). Impact of used motor oil on the soil qualities of Orji mechanic village, Owerri, Nigeria. International Journal of Engineering Technologies and Management Research. 7(3)
USEPA,(1986). Test methods of evaluation of solid waste visser,WJF (993),contaminated land policies in some Industrial Countries. TCB reportR02.UK.38-41.
Yaun,C.J., Shi,B., He,J., Liu,J. and Jiang,G.(2004). Speciation in heavy metals in marine sediments from the East China Sea by ICP-MS with Sequential ExtractionEnvirons. Int. 30(6):769-783.

EFFECT OF TECHNOLOGICAL INNOVATION ON FEDERAL TAX REVENUE, IMPLICATION FOR POST COVID-19 REVENUE MOBILIZATION: FROM VALUE ADDED TAX PERSPECTIVE

OKORO, T. C.
chidinmaekele@gmail.com
&
OBI B. C. (Ph.D)
bridgetchika4real@gmail.com
Department of Accountancy,
Alvan Ikoku Federal College of Education Owerri

Abstract
The study investigated on effect of technological innovation on Federal Tax revenue from Value Added Tax (VAT) perspective. The existing technologies innovated by Federal Inland Revenue Service (FIRS) include: Unique Tax Identification Number (TIN) which was launched in 2012, Electronic Tax (e tax) system platform which was implemented in 2015 and Value Added Tax Automated platform implemented in 2020. The study was informed by Value Added tax low compliance rate despite the digital technologies implemented. The study therefor was set to evaluate the extent Value Added Tax administration has boasted the federal non-oil tax revenue over the period of adoption of the existing technologies. Data for the study was secondary data sourced from FIRS online published quarterly tax revenue statistics from FIRS website from 2012 to 2020. Analysis was carried out with ordinary least square regression model. Finding showed that VAT significantly increased non-oil tax over the period of use of the existing technologies. This posits that the existing technologies are significant for efficient tax revenue collections in post Covid-19 era. The study recommends that commitment of stakeholders in use of the existing technologies is vital for tax revenue mobilization.
Keywords: ***VAT, FIRS, TIN, Technology***

INTRODUCTION.

The ability to generate sustainable revenue remain a challenge to the Nigerian government. The most important index that measures performance of service is revenue collection. Federal Inland Revenue Service (FIRS) is the agency responsible for assessing, collecting and accounting for Value Added Tax (VAT) and other taxes accruing to the federal government of Nigeria. VAT is a tax levied on the supply of taxable goods and services. One key reason behind the establishment of any tax authority is to generate revenue internally for country's development. Tax revenue strengthen a nation's economy and also helps government to fund essential public services which include roads, hospitals, schools and security.

Introduction of digital tax system in Nigerian tax administration demonstrates FIRS commitment to leverage technology to improve its administration. It recently introduced VAT automation collection system. The platform identified as e-VAT (electronic VAT) enables seamless collection and remittance of VAT on relevant transactions covering branded shops, super stores, general supermarkets, standard restaurants and eateries. The platform also enables direct audit/reconciliation of all VAT transactions to enhance tax compliance. The automated system became effective from 1st April 2020 as the approved channel for all VAT returns, filing and payment processing for the affected businesses.

Tax Identification Number (TIN) digital technology was introduced in 2008 but became effective in 2012 when it was published in National Tax Policy document launched by former president Goodluck Ebene Jonathan. TIN number is a ten digit unique number issued and allocated to individuals or companies to identify them as registered taxpayers in Nigeria. It is an automated tax system that enhances tracking of tax position and challenges in the Nigerian tax system. As soon as business registration with the Corporate Affairs Commission (CAS) is completed the entity has the right to be given taxpayer identification number (TIN) free of charge. Thereafter the registered company is required to update its records with the tax authority (FIRS Planner 2018). In Nigeria, every citizen working with government, private sector or owns a business or with an intent to start up one is expected to obtain TIN. TIN must be furnished on returns, statement, and other tax related documents.

Use of technology brought about ease of tax payment through e-tax. FIRS fully implemented online platform of paying taxes in 2015. Taxpayers now pay their taxes online from their bank accounts. The application which was developed in collaboration with the Nigeria inter-bank settlement system (NIBBS) is hosted on the respective commercial banks internet-banking platform. It enables tax payers to pay taxes through the electronic platform, print payment receipt, verify the authenticity of the receipt, and also verify if the deducted withholding tax or VAT payment have been remitted to the government online.

The explosion of the Coronavirus, Covid-19 pandemic has sent unprecedented shock to the global economy, and the need to contain it comes at a significant economic cost. The national response to the pandemic evolves daily as nothing is certain except the reality of an inevitable global revenue shortfall. Like many other countries, Nigeria is navigating through unchartered economic territory and has to adjust its budget to meet new economic realities. Remarkably, the revised benchmark price of $30 per barrel is still much higher than the current price.(Okwara 2020). The scenario posit that broad-based and comprehensive technical innovation in tax administration is vital to generate sustainable revenue growth more especially in the present period when Covid-19 crises has harshly affected the Nigerian economy.

STATEMENT OF THE PROBLEM

Nigerian tax system is generally characterized with low compliance rate which accounts for very low collectible rate of VAT. The informal sector comprises a greater percentage Value Added Tax payer. However, taxing the informal sector is a complex activity, incomes generated by the operators in the sector in many cases are not fully captured in the tax net of the states or federal government despite the digital technologies. VAT payers forms a greater percentage of tax defaulters, increasing cases of tax evasions. Low level of in frastructural development accounts for low implementation of digital technologies in the Nigerian tax administration.

Objective of the study

The general objective of the study is to investigate on effect of technological innovation on Federal Tax Revenue from Value Added Tax Perspective. Specifically, the

study will evaluate whether Value Added Tax revenue has significantly affected federal non-oil tax revenue over the period of implementation of innovative digital tax technologies.

Research Question.

What is the effect of Value Added Tax revenue on federal non -oil tax revenue over the period of implementation of innovative digital technologies?

Research Hypothesis

Value Added Tax revenue has not significantly affected the federal non-oil tax revenue over the period of implementation of innovative digital tax technologies.

LITERATURE REVIEW

Value Added Tax administration in Nigeria.

Federal Inland Revenue Service (FIRS) is the agency responsible for assessing, collecting and accounting for Value Added Tax (VAT) and other taxes accruing to the federal government of Nigeria. VAT is a tax levied on the supply of taxable goods and services. One key reason behind the establishment of any tax authority is to generate revenue internally for country's development. Tax revenue strengthen anation's economy and also helps government to fund essential public services. On the 13th of January, 2020, President Muhammadu Buhari signed the Finance Bill (now Finance Act 2019 (the "Finance Act")) into law. The Finance Act was gazette on 14th January, 2020 with a commencement date of 13th January, 2020. The Finance Act increases the VAT rate by 50% from 5% to 7.5%. While this will increase the amount of revenue generated from VAT by the government, it will also increase the prices of taxable goods and services (Lolade, ,Mojisola, Joseph, Udo & Belo 2020) Regarding implementation, from the 1st February, 2020, entities that are registered for VAT (excluding small companies – i.e., companies with less than NGN25 million annual turnover) must include VAT at the rate of 7.5% on invoices for the supply of taxable goods and/or services

Value Added Tax (VAT) is a tax levied on supply of taxable goods and services.It is an indirect tax, the tax burden passes to the final consumers and it is collectible by FIRS. Section 2 of the Value Added Tax Act, Cap V1, LFN 2004 (as amended) defines "goods and services" as follows: "(2) For the purpose of this Act, goods and services shall be deemed to be supplied in Nigeria if -(a) in respect of goods -(i) the goods are physically present in Nigeria at the time of supply, imported into Nigeria for use by a person, assembled in Nigeria, or installed in Nigeria, or (ii) the beneficial owner of the rights in or over the goods is a taxable person in Nigeria and the goods or right thereof is situated, registered or exercisable in Nigeria;" These provision clarifies that VAT is chargeable on:

a) Goods which include property (tangible or intangible) such as articles of trade, rights in goods or property (e.g., rights in mineral resources, copyrights, trademarks), assets, motor vehicles, oil wells, rigs, aircrafts, ships, buildings, roads, jetties, or any other type of property.

b) Services, **where**:

i.) the services are rendered in Nigeria by a person physically present in Nigeria at the time of providing the service, or

ii.) the services are provided to a person in Nigeria, regardless of whether the services are rendered within or outside Nigeria.

This provision indicates that:

Ø Services performed in Nigeria to persons in Nigeria is liable to VAT irrespective of the residence status of the service provider.

Ø Services provided to persons while in Nigeria, regardless of the medium of delivery of the service, is liable to VAT in Nigeria.

Ø Services rendered remotely, online or by other virtual means to Nigerian residents or persons in Nigeria are liable to VAT in Nigeria. (Value Added Tax Act 2019.)

Zero (0%) rate applies to goods and services including: non-oil exports; commercial aircraft and spare part imports; certain humanitarian initiatives; machinery and equipment used in the solid minerals sector; exports; agricultural equipment; commercial vehicles; basic foodstuffs; postal; residential rents; medical and pharmaceutical supplies; education and related materials; a limited range of financial services; books and newspapers (Value Added Tax Act 2019.) The Federal Government in its Medium Term Expenditure Framework 2020 – 2022 has projected an increase in VAT revenue collection efficiency from the present average of 21% to at least 35% by 2022. This highlights the Federal Government's increased focus on VAT and the potential that VAT presents in increasing the revenue profile of the government.

Innovative Digital Technologies implemented in the Nigerian Tax Administration.

Unique Tax Identification Number (TIN)

Taxpayer identification number (TIN) is a unique number issued to a business or individual for tax purposes. After a new business registers with the Corporate Affairs Commission, the regulatory authority will generate TIN on the portal. A taxpayer can also verify TIN details and print a TIN certificate from the TIN Verification Portal. TIN is now compulsory for all businesses. The Federal Inland Revenue Service (FIRS) public notice also highlights the mandatory use of taxpayer identification number (TIN). Going forward, every company must display its TIN on all business transactions with other businesses and individuals as well as on all documents and correspondence with revenue authorities. Companies must also provide their TIN on all correspondence with ministries and government agencies. Banks or other financial institutions

in Nigeria must collect the TIN from all companies that want to open or continue to operate a corporate bank account (Okwara 2020). It is a unique sequential number of predetermined digits, which is electronically generated and assigned to all corporate and individual taxpayers as part of the tax registration process and is used for the purpose of identifying a taxpayer . The TIN must be quoted in all relevant transactions by the taxpayer, especially when paying taxes. As a testament to the success of this initiative, the FIRS currently has over 800,000 registered taxpayers and counting." Part of the success of the TIN concept is that it has helped the Service achieve the following:

- ü Have a single view of all tax payments made.
- ü Track payments made by taxpayers from a single window irrespective of tax type being paid and mode of payment.
- ü Have a consolidated view of tax payments.
- ü Generate automated real-time reports, and
- ü Remove the burden and complexity associated with manual reconciliations. (Ifueko 2011).

Electronic Tax System (e-tax)

Use of technology brought about ease of tax payment through e-tax. The Nigerian interbank settlement system (NIBSS) and system Specs Nigeria limited have partnered with the Federal Inland Revenue Service (FIRS) to provide electronic payment of taxes

in Nigeria (Abdulrazao 2015). E- Tax Payment is an electronic self-service that gives taxpayers the choice to pay their taxes through approved FIRS online payment channels. An electronic system for filing and paying taxes, if implemented well and used by most taxpayers, benefits both tax authorities and taxpayers. For tax authorities, electronic filing lightens the workload and reduces operational costs – such as the costs of processing, storing and handling tax returns (Taiwo 2013). Manual processes are being replaced with electronic services. For example, as part of the relentless digitization efforts of the tax authorities, the Federal Inland Revenue Service in 2017, announced the introduction of six (6) new electronic tax services (e-services) for the convenience of taxpayers in Nigeria. These include:

- ü e-Registration: for the registration of new taxpayers with FIRS
- ü e-Stamp Duty: for the payment of stamp duties on qualifying documents
- ü e-Tax Pay: presenting more modern payment solutions for all federal government taxes and levies through any of the following platforms – Nigeria Inter-Bank Settlement System (NIBSS), Remita and Interswitch.
- ü e-Receipt: for receiving and verifying e-receipts generated after taxes are paid through the e-Tax Pay
- ü e-Filing: for taxpayers to file their tax returns online via the website: https://efiling.firs.gov.ng
- ü e-TCC: a platform intended to replace the physical application, issuance and verification of a company's Tax Clearance Certificate (TCC).

The unreliable nature of online tax portals is a major reason why many taxpayers, including non-resident companies, are forced to use the traditional paper filing, despite the inconveniences. In order to enhance taxpayer experience, Nigerian tax authorities would need to upgrade their servers, to accommodate the volume of traffic anticipated from users of the portals. This will reduce the frequency of downtime experienced on the portals and attract more taxpayers to the convenience offered by the digitalization of the processes(Okwara 2020).

Automation of VAT

FIRS has recently introduced a VAT automation collection system. The platform, identified as VATrac, will enable seamless collection and remittance of VAT on relevant transactions covering branded shops, super stores, general supermarkets, standard restaurants and eateries. The platform will also enable direct audit/reconciliation of all VAT transactions to enhance tax compliance. The automated system became effective from 1 April 2020 as the approved channel for all VAT returns filing and payment processing for the affected businesses.

However, the implementation seems to have been delayed, following the effects of the national lockdown. Nonetheless, the VATrac is a welcome development, equally underscored by FIRS' assurance to taxpayers that the system will improve ease of doing business without disrupting the affected business' operations.

Security of taxpayers' data is a challenge posing on the digital tax technologies: Taking advantage of modern cyber security methods to address security challenges on the online platforms is vital. This is imperative in building taxpayers' confidence in digital tax technologies. Portal's use of strong passwords to log into taxpayer's account online, multifactor authentications (requiring more than just a username and password) for a taxpayer to access his account is an advantage.

Methodology

The research adopted the ex-post

factor research design to examine how independent variable VAT revenue affected the dependent variable Non-Oil Tax Revenue over the period of implementation of technological innovation on Federal Tax, 2012 to 2020. Relevant secondary data were sourced from FIRS online published quarterly tax revenue from 2012 to 2020.

Model Specification: A linear relationship is established between VAT revenueand Federal Non-oilTax Revenue over the period of the existing technologies. The model is specified thus: NONOILTAX= f {VAT}. Where: NONOILTAX = Federal Non-Oil Tax Revenue and VAT = Value Added Tax

Method of Data Analysis: Data for analysis were first segregated in four quarters of each of the respective years for analysis. Ordinary least square regression model was used to express relationship between the dependent variable and the explanatory variable. Data were analyzed with E-View 10, an econometric statistical tool.

Decision Rule: To reject the null hypothesis the probability value of the T- statistics must be less than 0.05 alpha level of significance otherwise we accept the null hypotheses.

Presentation of Data, Results and Analysis.

Table 1 VAT, NON-OIL TAX REVENUE FOR 2012-2020

Year	VAT (In billions of Naira)	NONOILTAX (In billions of Naira
2012	710.55	1792.1
2013	802.68	2139.2
2014	802.96	2260.57
2015	635.352	2448.56
2016	828.19	2149.63
2017	972.34	2507.42
2018	297	2853.3
2019	1188.56	3151.65
2020	1531.1709	3435.2311

Source: FIRS Website 2020

The table above shows array of variables, comprising of Value Added Tax revenue and Non oil tax revenue for the period 2012 to 2020 in billions of naira

Descriptive Properties of the Variables.

Table 2 below shows the descriptive statistics of the variables in the estimated model. The standard deviation, the Skewness properties and Jarque-Berastatistics of the two variablesNon-Oil Tax (NONOILTAX) and Value added Tax (VAT) are observed from table two.

Table 2 Descriptive Statistics Presentation of Data, Results and Analysis.

Statistics	NONOILTAX	VAT
Mean	615.8581	228.8873
Median	635.9439	216.8829
Maximum	972.0214	327.1954
Minimum	315.3061	64.99220
Std. Dev.	175.0325	56.11525
Skewness	0.129757	-0.251326
Kurtosis	1.988959	3.469640
Jarque-Bera	1.543532	0.670396
Probability	0.462196	0.715196
Sum	20939.18	7782.167
Sum Sq. Dev.	1011001.	103914.4
Observations	34	34

Source: E-View 10

Table 1 above shows the descriptive statistics of the variables in the estimated model. The standard deviation properties of the two variablesNon-Oil Tax(NONOILTAX) and Value added Tax (VAT) are observed. Analysis shows that the NONOILTAX revenue has a standard deviation of 175.0325 from a mean of 615.8581 whileVAT revenuehas a standard deviation of 56.11525 from a mean of 228.8873. The Skewness properties of the two variables were further analyzed, results shows that NONOILTAX is positively Skewed while VAT is negatively Skewed. The reported probability values of Jarque-Bera statistics of each of the variable in the descriptive statistics wereNONOILTAX 0.462196 and VAT 0.715196. Analysis shows that the probability values of each of the variables are higher than 5% level of significance. The implication of the finding is that the two variables of the study are normally distributed.

Unit Root Test

The unit root test was carried out with Augmented Dickey Fuller Unit Root Test statistic and the summary of the results are displayed in table 3 below.

Table 3 Unit Root Test Result

Variables	ADF Statistics	ADF critical level at 5%,	P-value		Order of Integration	Remark
VAT	-5.011300	-2.948404	0.0000		1(0)	Stationary
NONOILTAX	-3.882891	-2.948404	0.0053		1(0)	Stationary

Source: Extracted from E-view 10

The summary of Augmented Dickey Fuller unit root results of the model displayed in table 3 reveal the two variables are stationary at level. This is considering the fact that their respective ADF statistics in absolute values are greater than the reported critical values. The order of integration necessitated the model for Ordinary Least Square Regression analysis.

Ordinary least Square Regression Analysis

Table 4

Dependent Variable: NONOILTAX
Method: Least Squares
Date: 09/01/21 Time: 05:13
Sample: 2012Q1 2020Q4
Included observations: 36

Variable	Coefficient	Std. Error	t-Statistic	Prob.
VAT	0.001054	0.000417	2.525337	0.0164
C	619.3208	29.56133	20.95037	0.0000

R-squared	0.157943	Mean dependent var	632.0039
Adjusted R-squared	0.133177	S.D. dependent var	187.7370
S.E. of regression	174.7894	Akaike info criterion	13.21899
Sum squared resid	1038746.	Schwarz criterion	13.30697
Log likelihood	-235.9419	Hannan-Quinn criter.	13.24970
F-statistic	6.377329	Durbin-Watson stat	1.374995
Prob(F-statistic)	0.016388		

NONOILTAX = 619.320821782 + 0.00105378777996*VAT. Source: E-View 10

Results of the Ordinary Least Square Regression model presented in table 4 revealed the model relationship of Non-Oil Tax revenue and Value added Tax. Result showed that the F-statistics value of 6.377329 is significant with a Probabilityvalue of 0.016388 (<0.05). This affirms that Value Added Tax revenue is a strong predictor of Non-Oil Tax revenue over the of innovative technologies in the Nigerian tax administration. The research furtherestimated the significance of VAT revenue in relation to Non-Oil Tax revenue. The test of significance was carried out with respect to T- test statistics. Analysis showed that VAT is significantly affected Non-Oil Tax revenue over the period of investigation. This is considering the fact that the probability value of T-statistics of VAT revenue is0.0164 and is less than 0.05. The finding is in line with Onaolapo, Aworemi and Ajala (2013) who evaluated the effect of Value Added Tax on revenue generation in Nigeria and in their findings revealed that VAT had significantly affected revenue generation in Nigeria. Findings of this study attested that VAT revenue significantly increased Federal Non-Oil Tax revenue within the period of invention of the innovative technologies in the Nigerian tax administration. Results lead to rejection of the stated null hypothesis.

CONCLUSION AND RECOMMENDATIONS.

The ability to generate sustainable revenue remains a huge challenge for the Nigerian government, especially due to the decline and instability in oil prices which has affected revenue generation from the Nigerian oil and gas industry (Ezomike&Ango 2019). One viable option to boast revenue is through tax. Use of technology brought about ease of tax payment, introduction of digital tax system in Nigerian tax administration demonstrates FIRS commitment to leverage technology to improve its administration. Electronic tax payment (e-tax), Unique Tax Identification Number (TIN), Value Added Tax Automation (e-tax) platforms are welcome innovativedigital technologies required to boast Nigerian tax revenue. VAT revenue significantly increased Federal Tax Revenue over the period of invention of the digital technologies. FIRS had introduced tax system which is imperative for VAT tax revenue (and other taxes) mobilization, curbing tax evasion and avoidance and effecting tax compliance to boast its revenue. This posit that the existing innovative technologies are element of technological innovation required for efficient Value Added tax revenue collections

in post Covid-19 era. The FIRS shouldtherefore put in place effective measures to ensure that the transition to digital tax technology is seamless, and all technical glitches associated with implementation of the new system are promptly resolved. Nationwide sensitization, integration of relevant taxpayers and tax education are instrumental for the welcome development.

REFERENCE

Abdulrazo, A. O. (2015) Overview of FIRS e-tax filing and online payment. http//www.inkedin.com/pulse/firselectronictaxfilingonline.

Chinedu, E. and Michael A. (2019) How Important Is The Value Added Tax To The Nigeria Economy? Andersen Tax LP

Okwara, D. (2020) Key Considerations for Improving e-Tax Administration in Nigeria. 3 July 2020 Home › Media › Press releases ›

Federal Inland Revenue Service, (FIRS 2011) Living the gains of the reforms. Gauge 2 a Quarterly Publication of the Federal Inland Revenue Service October - December , 2011

Federal Inland Revenue Service (FIRS 2018) Tax year planner . www.firs.gov.ng

Ifueko, O. O. (FIRS, 2011) Living the Gains of the Reforms. Gauge a quarterly publication of the Federal Inland Revenue Service October - December , 2011

Lolade, O., Mojisola, J. Joseph, E. Udo U. & Belo O (2020). The New Face Of VAT In Nigeria: https://www.mondaq.com/nigeria/sales-taxes-vat-gst/902618/uubo-tax-

Onaolapo, A. A., Aworemi, R. J. &Ajala, O. A. (2013). Assessment of Value Added Tax and its effects on revenue generation in Nigeria, International Journal f Business and Social Science, 4(1),

Taiwo O. (2013) The making of a good e-tax system. www.pwc.com/com

VAT Act (2019) Clarification on the implementation of the Value Added Tax provisions Finance act 2019. No. 2020/02 www.firs.gov

Wola, O. (2020) FIRS automates Value Added Tax filing and collection... ng-fmtaxenquiries@ng.kpmg.com

ELEMENTAL CONCENTRATION OF SOME NIGERIAN COAL SAMPLES BY INSTRUMENTAL NEUTRON ACTIVATION ANALYSIS

OMEJE, Cornelius U.*
Department of General Studies and Entrepreneurship,
Enugu State Polytechnic, Iwollo, Enugu State, Nigeria.
omejecu@gmail.com

AGU, Romanus S.
Department of Agricultural Technology,
Enugu State Polytechnic, Iwollo, Enugu State, Nigeria.
aguromanus72@gmail.com

OKORO, Alex C.
Department of Agricultural Technology,
Enugu State Polytechnic, Iwollo, Enugu State, Nigeria.
merciescds@yahoo.com

AGU, Valentine O.,
Department of General Studies and Entrepreneurship,
Enugu State Polytechnic, Iwollo, Enugu State, Nigeria.
aguval704@yahoo.com

IGWILO,Ibezim J.
Department of Animal Health and Production Technology,
Enugu State Polytechnic, Iwollo, Enugu State, Nigeria.

Abstract
The inconsistent power supply, the call for the diversification of power supply and the unharnessed large deposits of coal in Nigeria which can be a source of remedy, prompted the use of Instrumental Neutron activation analysis to determine the elemental concentration of some Nigerian coal samples sourced from the South-Eastern part. Nigerian Nuclear Research Reactor – 1 was used to irradiate the samples to determine the concentration of the elements. 0.15 g – 0.20 g of the samples were fed into the reactor by means of pneumatic transfer with the aid of rabbit capsule. The investigation revealed seven elements (Mg, Al, Ca, Ti, V, Mn and Dy) in various concentrations. It also showed that these coal samples generally have very low trace elements (Ti, V, Mn and Dy) in ppm which implies that the large scale use of these coal samples will not cause serious environmental pollution.

Keywords: *Coal samples, Irradiation, INAA, Elemental concentration, Environmental pollution*

INTRODUCTION

Coal is essentially made up of coal matter, mineral matter and moisture. Coal matter consists of carbon, hydrogen, oxygen and nitrogen while the mineral include aluminum and other silicates, iron sulphide and oxide of several metals of varying compositions. Thus, when coal is subjected to combustion for extracting heat energy the byproduct is the oxidized incombustible residue in form of ash having concentration that is closely correlated with the mineral matter content (Omeje, C. U. et al., 2011 a and b).Prior to the discovery of petroleum in Nigeria in the 1950s, coal was the country's main mineral export and major source of revenue. Today coal, which is still abundant in Nigeria has practically an unlimited domestic supply for any purpose, even to meet the energy demand of this country.

In 1905, an ordinance establishing the Nigeria coal corporation was enacted and solely charged with the responsibility of developing the coal resources of Nigeria (Godwin, 2008). The coal resources discovered so far in Nigeria occur within geological units known as the coal measures which are concentrated within the Anambra basin, but coal measure occur in other rocks within Nigeria, such as Lafia-Obi in Nasarawa State, Lamja Gombe in Gombe State and Afikpo in Ebonyi State to mention but a few.

Since coal is low cost and reliable source of energy, it is used for the generation of thermal electricity. Presently, Nigeria's most exploited coal mine located at Enugu State is no longer in operation leading to the loss of electricity generation from the Oji thermal power plant for decades now. Coal contains many major and minor trace elements and hence its combustion either for industrial or domestic purposes can be a potential sources of environmental pollution. It is therefore important to ascertain the concentration of such elements in Nigeria coal samples, in order to asses any hazard it's use or uses could cause to the environment. Hence, coal mining operations are sometimes associated with the distribution of various hazardous substances particularly in connection with surface water contamination. Various analytical techniques such as x-ray fluorescence, atomic absorption spectrometry and instrumental neutron activation analysis (INAA) have been applied by some researchers for the determination of various elements in coal and other samples. This work applied INAA due to its efficacy, to measure the elemental concentrations in six coal samples from five south-eastern states in Nigeria and bring to the bare the human/health and ecological effects (if any) in using large scale coal with high toxic or trace elemental contents.

METHODOLOGY

Instrumentation

The Nigeria Research Reactor - 1 (NIRR-1) is a miniature neutron source Reactor and has in pool structural configuration with a nominal thermal power rating of 31kw. NIRR-1 was acquired for an extensive soil fertility-mapping project of the different arable land in Nigeria and is specifically designed for neutron activation analysis (NAA). Therefore, the capabilities for the analysis of trace, minor and major elements in different sample matrices have been enhanced greatly (Jonah et al., 2006). The samples used in this project work were irradiated using NIRR-1.

Theory of NAA Measurement

In Neutron Activation Analysis a source of neutron is required and in this work, NIRR-1 was used to provide the source of neutrons. The sample is exposed to a flux of activaost analytically significant of the activation process. The radiation intensity from the radionuclide produced by activation is proportional to the amount of the corresponding element present in the sample. Irradiation of the sample will produce a heart variety of radionuclide which needs to be separated so that the amount of the individual element originally present can be calculated. Since the radioactive emissions and radioactive decay paths for each element are well known, using this information it is possible to study spectra of the emissions of the radioactive sample and determine the concentration of the elements within it (Kogo et al., 2009).

The instrumentation used to measure the gamma rays from the radioactive sample generally consist of a semiconductor (Hyper pure germanium detector (HPGe) and a computer based, multi-channel analyzer (MCA).In Neutron Activation Analysis, samples could be short, intermediately or long-irradiated depending on the element of interest. However, in this work only short irradiation were employed due to time and other constraints.

Short Lived Irradiation

In short-lived irradiation, each of the samples was parceled. Sealed in 7cm^3 rabbit capsules and sent for irradiation one after the other in one of the outer irradiation channels of NIRR-1. The neutron spectrum in the outer channel is soft having a flux of 2.5x10ncm^{-2}s^{-1} and irradiation period of 600s. the outer irradiation channels was chosen so as to eradicate corrections, which arise from nuclear interference caused by threshold reactions notably Mg in the presence of Al; Al in the presence of Sl; and Na in the presence of P. all these are as a result of the closeness of the inner channels of the MNS reactors to the core leading to the relatively higher ratio of fast to thermal neutrons. The short irradiation is only capable of identifying the elements of interest with short half-life (Jonah et al., 2006).

SAMPLE COLLECTION AND PREPARATION

Sample collection

The samples used in this work were collected from Nigerian coal cooperation Enugu, these includes coal samples from: Ogwashi/Azagba in Delta State, Owukpa in Benue State, Inyi in Enugu State, Okpara in Anambra State, Ogboyoga and Okaba both in Kogi State.

Sample preparation

This consists primarily of weighing and packaging. The sample aliquots of the standard approximately 0.15g - 0.20g were weighed and wrapped in polyethylene films. The polyethylene films and rabbit capsule (vial) were cleaned by soaking in 1:1 KNO_3 (nitric acid) for 2 days and washed with de-ionized water. The polyethylene film containing the sample is then heat sealed and put into vial, the vial is then covered with cotton wool and sealed, then stored prior to sample irradiation.

Sample Analysis

After the short irradiation there is a waiting time of 2 to 15 minutes, followed by the first bit of counting which was carried out for ten minutes. The samples were placed on a plexi - glass sample holder designated, H_2 which refers to the source detector geometry of 5cm which is depicted as S_1. The second lap of counting was also carried out for 10 minutes after irradiation and depicted as S_2. The waiting period in this case is as long as 3 - 4 hours. Samples are counted on plexi - glass sample holder denoted, H_1 which refers to source detector geometry of 1cm.

After the irradiation for the long-lived, the first lap of counting was carried out after a waiting period of 4-5 days for duration of 30 minutes. This long irradiation is termed L_1 and is carried out using the H_1 holder. The second lap of counting is carried out after a cooling period of 10-15 days for duration of 60 minutes. This is termed as L_2 and samples counted using plexi-glass holder H_1. With the aid of gamma ray spectrum software known as WINSPAN 2004, the gamma ray of sample radionuclides can be identified by their energies as well as quantitative analysis of their concentrations are obtained as reported by Jonah et al., (2006). However, only short irradiation was considered for the six coal samples used in this work as pointed out earlier.

RESULT AND DISCUSSION

Results

The analytical result of INAA of six (6) coal samples are presented in the Table 1 below. Seven elements were found from the coal samples presented. These include Mg, Al, Ca, Ti, V, Mn and Dy, which was obtained by short-lived irradiation.

Table 1: Concentration of Element for Six (6) Coal Samples Analyzed

	Ogwashi	Ogboyoga	Inyi	Owukpa	Okpara	Okaba	feedcoal(*)	coal ash (*)
Mg (%)	BDL	BDL	BDL	0.04≤0.01	BDL	BDL	0.05≤0.00	2.70≤0.01
Al (%)	0.20≤0.01	0.60≤0.02	0.30≤0.01	0.40≤0.01	0.75≤0.02	0.05≤0.02	1.45≤0.01	9.85≤0.49
Ca (%)	0.03≤0.01	BDL	BDL	BDL	BDL	0.04≤0.01	-	-
Ti (%)	BDL	0.10≤0.01	0.03≤0.01	0.03≤0.01	0.10≤0.01	0.11≤0.01	0.09≤0.00	0.95≤0.04
V (ppm)	7.5≤0.3	6.1≤0.6	3.80≤0.01	5.3≤0.05	10.3≤0.6	11.5≤0.8	92.76≤0.40	127.67≤0.01
Mn (ppm)	1.62≤0.06	2.0 ≤ 0.1	2.6≤0.1	17.0≤0.3	2.4≤0.1	45≤1	2.77≤0.57	232.24≤0.01
Dy (ppm)	1.6≤0.1	0.33≤ 0.04	0.11≤0.03	0.35≤0.04	2.26≤0.04	0.42≤0.05	6.41≤0.05	8.37≤0.41

Key BDL: Below Detection Limit (*): Ewa et. al., (1996)

Other trace elements of interest were not determined because of fact that the samples were not exposed to long-lived irradiation. However, comparing this work to Ewa et al., (1996) some significant relationship exists for some of the trace elements and other elemental concentrations obtained for feed coal and coal ash as presented in columns 8 and 9 respectively.

DISCUSSIONS

Seven elements were obtained from the short-lived irradiation for all six (6) coal samples that were analyzed. From table 1, it can be observed that Ogwashi coal has five elements with two below detection limit (BDL). Element such as V, Mn and Dy constitutes elements with higher concentrations while, Ti was found to be BDL.

The Ogboyoga coal is also enriched in V and Mn, with higher concentrations compared to other elements found, while Al, Dy and Ti have low elemental concentrations, with Mg and Ca being below detection limit.

The Inyi coal, has V and Mn as its major elements with higher concentrations while Al, Dy and Ti are minor elements with lower concentrations. Mg and Ca were below detection limit.

The result also showed that six elements are present in Owukpa coal and one element below detection limit. Ma and V having higher concentrations than Al, Dy, Mg and Ti, with Ca to be below detection limit. The Okpara coal has V and Mn also as its major element with higher concentrations as compared to others. Al, Dy and Ti are minor element with lower concentrations while Mg and Ca are found to be below detection limit.

The Okaba coal is enriched in V and Mn with higher concentrations compared to other elements found while Al, Dy, Ti and Ca have lower elemental concentrations with Mg found to be below detection limit.

However, element such as Mn and V are present in high concentration in all the coal samples analyzed and as such constitute the major elements present, other element such as Al, Ca, Mg, Ti and Dy are presented as minor element or are found to be below detection limit in some samples. The fact that element such as Al, Ca, Mg, Ti and Dy are present in the sample shows an even distribution of the element in the coal samples analyzed.It was observed from the Table 1 that the quantity of Mn in the sample is greatest in Okaba and Owukpa coals compared to other coal samples, indicating that the coal in those regions might have negative effect on its users and miners. It was also observed that the concentration of Mg is strongly below detection limit for six coal samples except for Owukpa coal which is present at moderate concentration level. However, the result obtained was compared with that of Ewa et al., (1996) and it was observed that element such as Mg and Ti are found to be below trace concentration level and Mn was noted to be above trace concentration level. Mn having the greatest hazard potential had concentration of about (45 ± 1) in Okaba and (17.9 ± 0.3) at Owukpa.

SUMMARY

Generally, the results of this work show low level of trace elements in the samples analyzed and therefore, may not pose big environmental issues or pollution when used in large scale for power generation and other purposes.

CONCLUSION

The instrumental neutron activation analysis is an effective method of analyzing elemental concentration in coal samples. More importantly, it is useful for the purpose of monitoring trace element level around Nigerian Coal mines and Nigeria coal plants by the Environmental protection Agency. However, most elements identified were also found to be in moderate quantities, which shows that most coals found in Nigeria have low trace element concentration level. Based on the findings of this work, it is recommended that detailed study on elemental concentration level in coal samples using INAA and other techniques be investigated in order to ascertain properly the environmental impact of coal, and samples exposed to long irradiation in order to identify other elements.

REFERENCES

Ewa I. O. B, Adetunji J., Elegba S.B (1996). Determination of Trace Element in Nigeria Coal Ash
By Instrumental Neutron Activation Analysis, Journal Environmental Science and Health, A31 (5), 1089-1100.

Godwin C. N. (2008). The Nigeria coal Cooperation: An Evaluation of Production Performance
(1960-2000) Retrieved 2008/04/12

Jonah S. A., Umar I.M., Oladipo M.O.A., Balogun G.I. and Adeyemo D. J. (2006). Standardization
of NIRR-1 Irradiation and Counting Facilities-For Instrumental Neutron Activation Analysis, Applied Radiation and Isotopes (64) 818-822.

Kogo, B.E., Gagere E.N, Ogunmola J.K. and Ogbole J. O. (2009). Neutron Activation Analysis of
Soil Samples from Different part of Abuja metropolis, Middle East Journal of Scientific Research 4 (4): 254-262.

Omeje C. U., I. O. Okunade and S.A Jonah (2011) a. Determination of Ash Content of Nigerian
Coals by Single Energy Gamma Transmission Technique. International Journal of Physics. 3(1). 36-40.

Omeje C.U., I.O. Okunade and S. A. Jonah (2011) b. Determination of Ash Content of Nigeria
Coals Using Dual Energy Gamma - RayTransmission Measurement. Nigerian Journal of Scientific Research, a Publication of the Ahmadu Bello University, Zaria, Nigeria, Supported by the TETFUND. Vol. 9 & 10. Pp. 171 - 175.

EMERGING TECHNOLOGIES IN EFFECTIVE LIBRARY SERVICES: OPEN-SOURCE TECHNOLOGIES AND LIBRARY SOFTWARE

KALU, Chidi, Onuoha (CLN)
National Institute of Construction Technology
and Management (NICTM),
Uromi, Edo State, Nigeria
chidiokalu@yahoo.com
Corresponding Author

NWORIE, Josiah Chukwuma Ph.D (CLN)
Alvan Ikoku Federal College of Education,
Owerri, Imo State, Nigeria
chimanworie@gmail.com
&
SABA, Fatima Muhammad (CLN)
Baze University, FCT, Abuja
princesstasallah@gmail.com

Abstract:
Technology is gradually taking over every aspect of human endeavour and many organizations or institutions are following the trend in their services or operations. Therefore, library which is seen as the gateway of knowledge should not be left out. There is no doubt that open-source technology is now an emerging technological trend that drives success today and will do so in the future. This paper aims at discussing the emerging technologies in effective library service, in respect to open-source technologies and library software. This paper discusses the concept of open-source technology or software, library software, and mentions some of the benefits of open-source technology, which includes its flexibility, reliability, quality of use and support options. There are emerging open-source technologies, which includes open source in machine learning, the R programming language, blockchains and bitcoin, open source and the Internet of Things (IoT), open source and big data analytics, and open source and cloud computing. The paper also discusses the usefulness of open-source technology in library services and its examples.

Keywords: *Library, Library software, Open source, Technology, Library services*

THE SCALE: MAIDEN EDITION VOL 1 NO 1 DECEMBER 2021

INTRODUCTION

Technology no doubt is gradually taking over every aspect of civilization, in so much so that every sector in human endeavour is moving digitally. Therefore, in near future the world will be digitalized, and those that are not conversant with the use of electronic resources in their daily work routine will find it difficult to communicate with the rest of the world. As the global events are transforming technologically, in the same vein, library operations should not be left out. The issue of open source technologies and library software come to mind as the result of technological advancement.

In library services, library software and library automation works together in achieving digitalization of library operations. Library software cannot be discussed without brief explanation of software, which can be seen as an instruction given to the computer which tells the computer how to work. While library software is software designed to meet the requirement of a library in a digital manner.

On the other hand, open source technology is an emerging technological trend that drives success today and will do so in the future (Nayyar, 2018). Open source technology or software as the case may be is a growing trend in Global Information System (GIS). It is software in which the source code is used to create the program freely, and it is available for the public to view, edit and redistribute (Purohit, 2018). Njoku & Ravichandran (2017) noted that the need for open source technology in library activities such as acquisition, cataloguing, circulation, serials and reports management all over the world is gaining grounds as libraries are moving from traditional practice to electronic system. The web-based information access of all kinds available free has made open source technology an indispensable research and learning environment. The aim of this chapter is to examine the issues on library software, automation and open source technology.

OBJECTIVE OF THE PAPER

The general objective of this paper is to examine the emerging technologies in effective library services, narrowing the discussion to open source technologies and library software. The paper discusses the following specific objectives:

I. To examine the concept of library software and open source technologies.

ii. To discuss the two categories of library software and importance of library management software

iii. To examine the emerging technologies in library services and use of some emerging technologies

LITERATURE REVIEW

Concepts of Library Software

Library software can be defined as the use of computers and associated technologies to do exactly what has been done in the library with the justification of reducing cost or increased performance. In other words, it is the use of computers to perform library operations most especially services that are routine and repetitive. According to Dhanavandan (2012), library software is the application of automatic and semi-automatic data processing machines to perform functions such as acquisition, circulation, cataloguing, reference service and serial control. In his own view, Thomas (2012) asserted that library software are computer programs that are written individually, which operate in a specific way or in a tailor made procedures and systems such as library housekeeping, words processing, database management, text retrieval, and expert systems.

Library Software, no doubt offers information managers many opportunities to improve library services to their client. It makes information resources easier to be located and retrieved. In addition, it enables

library staff to serve library patrons better by facilitating execution of multitude operational tasks such as cataloguing, acquisition, circulation, OPAC, management of e-resources and reference services among others with less stress (Ayodele, 2015). Library automation software provides centralized management and process automation for public, private and school libraries, and offers features such as circulation, circulation history, administration, cataloging, reporting and patron records. Library software is categorized into two, which are Proprietary software and Open source software.

i Proprietary Software:

According to Techopedia (2017), proprietary software can be defined as s any software that is copyrighted and bears limits against use, distribution and modification that are imposed by its publisher, vendor or developer. Proprietary software is seen as the software that remains the property of its owner/creator and is used by end-users/organizations under predefined conditions. Proprietary software may also be called closed-source software or commercial software. Proprietary software is primarily commercial software that can be bought, leased or licensed from its vendor/developer. In general, proprietary software doesn't provide end users or subscribers with access to its source code.

ii **Open-source Technology:**

Open Source Software (OSS) is computer software with its source code made available and licensed in which the copyright as the holder provides the right to study, change and distribute the software to anyone and for any purpose. An open source software movement accelerated the development of compatible open source library software, partly to provide an alternative to the sometimes highly prohibitive cost of the proprietary software (Ayodele, 2015). Open source technology is discussed in details at the end of this chapter.

Importance of Library Management System Software

According to Techware (2021), the library management system software for library management is used to find books and access journals easily. The library automation system automates the typical procedures of libraries and reduces the workload for library staffs. The importance of a library management system to library services is toenhance the efficiency of both the librarians and library users. It also enables librarians to easily catalog books and keep proper records of books issued, reissued, and those not returned, to reduce the library management cost, to save precious time for both the librarians and users, to increase the productivity of library workers, amongst others.

Open-source Technology (Software)

Open source is a term that originally referred to open-source software (OSS). Open-source software is a code that is designed to be publicly accessible, which anyone can see, modify and distribute the code as they see it. Open-source technology or software as the case may be is a growing trend in Global Information System (GIS). It is software in which the source code is used to create the program freely and it is available for the public to view, edit and redistribute.

Open-source technologies have numerous benefits to its user. Thebiggest benefit of open-source technology is that it offers great flexibility to use the platform according to someone's needs. Open-source technology is reliable, which means it is always under continuous review, which leads to more reliability of the platform. It is qualitative because it is being developed by countless users, as many new and innovative features get added, the product gets enhanced. Open-source technology has support options as it is usually available for free and it has a huge community group to support the piece of software (Kalu, Nzeh and Chidozie, 2021).

Emerging Open-Source Technologies

Nayyar (2018) enunciated some emerging open-source technologies that drive success nowadays, which range from how the entire tech industry is getting reshaped by digital transformation. According to the author, some of the areas in which groundbreaking open-source technologies are set to revolutionize the world are as follows:

· **Open Source in Machine Learning (ML): This** is the study of algorithms that use large data sets to learn, generalize and predict. With more data, the algorithm improves its predicting power, and the machine language acts as a strong base for self-driving cars, speech recognition, home automation products and much more. It is closely related to computational statistics and also focuses on making predictions via computers.

· **The R Programming Language:**

This is a free and open source ML language, which supports statistical computing and the graphics language on a wide range of operating systems. It also provides diverse statistical functionalities like linear and non-linear modelling, classical statistical tests, time-series analysis, classification, clustering and advanced graphical techniques.

· **Open Source and the Internet of Things (IoT): Another emerging technology is the**

Internet of Things (IoT), which is highly fragmented and changing continuously. Open source is playing a crucial role in creating IoT platforms as well as ready-made prototypes in terms of development boards for research and development (R&D) and automation. IoT standards, together with Artificial Intelligence (AI), are controlling and interpreting a wide range of activities in a smart manner.

· **Open Source and Big Data analytics:**

Nowadays, most organizations tends to understand the value of capturing all the data streaming inside the business and hence employ open source Big Data analytics to gain crucial advantage from it.Open-source software and Big Data go hand in hand these days since today's applications can handle diverse data in an effective manner, as it grows exponentially in variety, volume, velocity and veracity.

· **Progressive Web Apps (PWAs):** Progressive Web Apps (PWAs) bring a mobile-app like experience to end users without any app installation requirements. Designed by Google, these apps were promoted in the Google I/O 2017 conference. PWAs take advantage of the much larger Web ecosystem, plugins, community and the relative ease of deploying and maintaining a website when compared to a native application in the respective app stores.

·**Open Source and Cloud Computing:**

Cloud computing is one of the most significant technologies to have emerged in the last couple of years and perhaps, even the next couple of years, resulting in billions of dollars in investments. The cloud computing industry is expected to touch US$ 241 billion by 2020. Common open-source cloud applications are CloudStack, OpenNebula or OpenERP servers.

The Usefulnessof Open-Source Technology in Effective Library Services:

The open-source integrated library services have become more popular in recent years, with a number of major

systems and several companies offering support, and open-source software (OSS) is designed to meet the needs of library patrons (Ukachi, 2012; Breeding, 2011). As a result of the above, some academic libraries in Nigeria has introduce open source integrated systems and in-house services such as acquisition, cataloguing, circulation, and serials services and reports management. Nowadays, digital libraries provide an integrated set of services for capturing, cataloguing, storing, searching, protecting, and retrieving information, which provide a coherent organization and convenient access to typically large amounts of digital information (Wei, 2011).

According to Reddy and Kumar (2013), the open-source software (OSS) initiative is one such development that is changing the access to information system. It is many things from openness, flexibility, adaptability, speed, support and standards, and offers many opportunities for libraries and educational institutions to embrace automation as the facilities provided go far beyond the acts of traditional libraries (Wong and Sayo, 2010). Academic libraries that key into the movement of OSS and implement them appropriately stand to gain comparative advantage, while those that fail to take advantage of this opportunity may find their ICT development behind that of other libraries. Open-source software (OSS) has become an international phenomenon that allows researchers around the world to share knowledge and skills on daily basics without barriers (Kalu, Nzeh and Chidozie, 2021).

Rossi, Russo & Succi (2007) described the characteristics of open-source library management software including licensing, requirements and functionality as a mile stone in information dissemination. Ukachi (2012) maintained that the OSS is designed to meet the needs of library patrons. The open-source integrated library services have become more popular in recent years, with a number of major systems and several companies offering support. This has compelled some academic libraries in Nigeria to introduce open-source integrated systems and in services such as acquisition, cataloguing, circulation, and serials services and reports management. Gireesh, Kumar &Jayapradeep (2015) asserted that many libraries are yet to realize the advantages of using an OSS for library management. It is an opportunity for library and information science professionals to introduce newer and customized services, cost efficiently. They maintained to in order to achieve these; the professionals are to upgrade their proficiencies and competencies in free open access software.

Examples of Open Source Software for Library Services

Njoku & Ravichandran (2017) noted that library and information centers are using various open-source software for integrated library system. Below are examples of open-source software for library automation and management systems software:

Open-source library automation software: ·

Koha - is the world's first free and open-source Integrated Library System (ILS). It has features suitable for library management system of various types and sizes. Koha is a browser-based using an Online public access catalogue interface. There is no cost for the license; and users have the freedom to modify the product to adapt it to your library needs. Development is sponsored by libraries of varying types and sizes, volunteers, and support companies from around the world. The strength of Koha lies with its strong community of users, libraries and businesses that contribute to its development. Koha runs on Linux, Web and Server.

Evergreen- is an open-source integrated library system (ILS) software, freely licensed under the GNU GPL that helps library users locate library materials and manages, catalog, and circulate those materials despite the size or type of the library. It runs on Linux, Windows and Mac

· **NewGenlib (NGL)** - is an integrated library management system that provides a comprehensive support for many standards related library and information science. The Interface of is designed in such a way that even library managers without a library science background can use the system with little or no training. It provides many basic ILS functions as well as having several social media functions built in.

·**OpenBiblio** - is an easy to use, open source, automated library system containing OPAC, circulation, cataloging, and staff administration functionality. The purpose of this project is to provide a cost-effective library automation solution for private collections and schools.

·**Opals**- Cooperatively developed, Cloud &Web-based, open-source access to information databases and library collections.

Open-source Digital library/Institutional repository software: ·

Dspace - is an open-source repository software package typically used for creating open access repositories for scholarly and/or published digital content. It is the software of choice for academic, non-profit, and commercial organizations building open digital repositories. DSpace preserves and enables easy and open access to all types of digital content including text, images, moving images, jpegs and data sets.

·**Greenstone** - is open software suitable for building and distributing digital library collections. It provides a new way of organizing information and publishing it on the Internet or on CD-ROM. It is open-source, multilingual software, issued under the terms of the GNU General Public License. It runs on Linux, Windows and Mac.

·**Fedora** - open-source software gives organizations a flexible service-oriented architecture for managing and delivering their digital content. It is a powerful digital object model that supports multiple views of each digital object and the relationships among digital objects ·

Eprints - an open-source platform for creating self-configuring repositories for libraries and the publishing industry

Open-source learning management system software:

·**Moodle (Modular Object-Oriented Dynamic Learning Environment)**

- is a free open-source learning management system or e-Learning platform that serves educators and learners across the world. Moodle is a learning tool designed to provide educators, administrators and learners with an integrated system to create personalized learning environments.

· **OLAT (Online Learning and Training)** - is an open-source learning management system designed to the needs of academic institutions. It is a web application learning management system that supports any kind of online learning, teaching, and tutoring with few educational restrictions.

Open-source electronics resource management system software:

·**Calibre** is a free and open-source e-book library management application developed by users of e-books for users of e-books

Open-source content management software:

·**Drupal**-is a free and open-source content management system that provides back-end for websites. It runs on linux. ·

Joomla - is an open-source platform on which Web sites and applications can be created. It is a content management system (CMS) which connects your site to a MySQLi, MySQL, or PostgreSQL database in order to make content management and delivery easier on both the site manager and visitor. Joomla's versatility, including its ease-of-use and extensibility has made it the most popular Web site software available because it is extremely customizable for different purpose. ·

Wordpress - is an online, open-source website creation tool written in PHP and MySQL. It has easy and probably the most powerful blogging and website content management system (or CMS) in existence today. WordPress is a free and open-source content management system (CMS) based on PHP and MySQL and is installed on a web server.

CONCLUSION

Global events are transforming technologically, library services are also expected to follow suit. Libraries are to key into the use of emerging technologies for effective library services, such as open-source technologies and library software. Libraries as information centers are being established to satisfy the information needs of the users and they need to follow the information technology trends that is invoke in order to efficiently and effectively satisfy the needs of its users. Without these technologies libraries will be lagging behind in providing effective services to its clientele.

RECOMMENDATIONS

This paper recommends as follow:

1. That librarians should endeavour to abreast themselves with the emerging technologies for effective library services.

2. That management of various libraries should fully support their libraries in the use of these emerging technologies for effective library services.

3. Library professionals are to upgrade their proficiencies and competencies in free open access software.

REFERENCES

Ayodele, R. (2015). Assessment of library application software packages for library operations and services in federal university libraries in North Western states of Nigeria. **A thesis submitted to the school of postgraduate studies Ahmadu Bello University, Zaria in partial fulfillment of the requirements for the award of degree of master of Information Science Department of Library and Information Science, Faculty of Education, Ahmadu Bello University, Zaria.**

Breeding, M. (2011). Perceptions 2010: An international survey of library automation. Library Technology Guides. http://www.librarytechnology.org/perceptions2010.pl.

Dhanavandan, S. (2012). An evaluative study of automation software application and database management systems in academic libraries. Journal of Emerging trends in Computing and Information Sciences, 3(5), 677-679.

Gireesh Kumar, T. K. &Jayapradeep, M. (2015). Perceptions of LIS professionals on open source integrated system and adaptability of Koha over Libsys in India. International Journal of Information Dissemination and Technology, 5(2), 100-105.

Nayyar, A. (2018). Top Emerging Open Source Technologies. Retrieved from: https://www.opensourceforu.com/2018/03/ten-emerging-open-source-technologies/

Kalu, C. O., Nzeh, C. O. & Chidozie, O. (2021). The use of open source technologies in effective library services: An overview. Gloryland Journal of Library and Information Science, 1(4), 216 – 244.

Njoku, I. S. & Ravichandran, R. (2017). Use of open source technology for effective academic library services in Nigeria. Library Philosophy and Practice (e-journal). 1686. https://digitalcommons.unl.edu/libphilprac/1686.

Reddy, T. R. & Kumar, K. (2013). Open source software's and their impact on library and information centre: An overview. International Journal of Library and Information Science, 5(4), 90-96.

Rossi, B., Russo, G. & Succi, G. (2007). Open source software and open data standards as a form technological adoption : A case study. In Feller, J. B, Fitzgerald, W., Scacchi, A &Sillitti, A. (Eds.) IFIP International Federation for Education Processing, 234, 325-330.

Techopedia (2017). Propriety software: What does proprietary software means? https://www.techopedia.com/definition/4333/proprietary-software

Ukachi, N. B. (2012). Awareness, availability and utilization of open sources software in Nigerian libraries: the way forward. International Research Journal of Library Information and Archival Studies, 2 (1), 1- 9.

Wei, Z. (2011). Research on the application of open source software in digital library. Advanced in Control Engineering and Information Science. Procedia Engineering, 15, 1662 – 1667.

Wong, K. &Sayo, P. (2004). Free open source software: A general introduction. Kuala Lumpur: United Nations Development Programme.

EMPLOYEE PARTICIPATION IN DECISION MAKING AND ACHIEVEMENT OF ORGANIZATIONAL GOALS: A STUDY OF ABIA STATE COLLEGE OF HEALTH SCIENCES AND MANAGEMENT TECHNOLOGYABA ,2018-2019.

[1]UBANI,Goodluck Eguzoikpe
&
[2]NWAKODO, Udochukwu, Precious
[1,2]department Of Public Administration
Abia State Polytechnic, Aba.

Abstract
The study examines the effect of employee participation in decision making on the achievement of organizational goals in Abia State College of Health Sciences and Management Technology, Aba. The immediate justification of the study was the observed tranquility that exists among the workforce. The work therefore was interested in finding out the effect of employee participation in decision making on the achievement of organizational goals of Abia State College of Health Sciences and Management Technology, Aba. The survey method was adopted in carrying out the study. Survey data were collected from 220 respondents drawn from departments of Pharmacy, Science Laboratory Technology, Medical Laboratory Technology, Community Health Technology, Statistics, Public Health, Environmental Health Technology, Public Administration, Business Administration, Computer Science, Public Health Nursing, Health Information Management, and Dispensing. Three research questions were raised and answered using the mean score. The result of the analysis revealed that industrial harmony occurs when workers opinions and suggestions reflect in the decision-making output of the organization. Also, we deduced that leadership approach, effective communication etc, were other factors positively affecting employee participation in decision making in Abia State College of Health Sciences and Management Technology, Aba. It was therefore recommended that the management of Abia State College of Health Sciences and Management Technology, Aba should encourage employee participation in decision making through direct participation to have firsthand information from the employees. Also, it was recommended that union executives should endeavor to carry along every staff especially the higher cadre employees who feel they are not often consulted before making decisions.

Keywords:*Participation, Decision Making,*

INTRODUCTION

The desire of every organization is to excel and achieve its aims and objectives which is the main essence for their existence. The achievements of the organizational goals are dependent on the quality and the objectivity of the decisions made by the decision makers of such an organization. Most often the decision makers could be the management who would make decisions and expect the workers to execute or implement the task that is required of them. This approach of decision making was most appropriate in Taylor s mechanistic working environment where decisions were made by the management and strictly implemented by the workers as instructed. However, with the advent of the human relations theory, the trend has changed in that management expects more from its workers than doing simply what is put before them. The trend has also changed in that workers also expect that more output can be gotten from them by giving them a sense of belonging. The quest to incorporate the workers in decision making has given rise to Participatory Decision Making (PDM). It remains a central theme in business, public policy, administration, management etc.

According to Stanheider, et al (2006), participation in management has been used interchangeably to mean shared leadership, employee empowerment, employee involvement, participatory decision-making, dispersed leadership, open-book management, or industrial democracy. These coinages have come about as a result of the long quest to enhance employee contribution to management decisions so as to achieve organizational objectives and enhance productivity. However, this has become a major challenge of management in recent times. Organizations that focus on their employees tend to increase to employee satisfaction, commitment and organizational success Gannon, (2004). Through participatory decision making, productivity is expected to increase since commitment by employees towards implementation of decisions to achieve enhanced productivity and overall organizational goals will be high and help reduce agitations, misconceptions and lack of commitment on the part of the employees.

Bevandan (2000), posits that opportunity, adequate authority and leadership are among a myriad of factors that influence employee satisfaction and commitment. Employee participation in decision making is the extents to which employers allow or encourage employees to share or participate in organizational decision-making. The participation could be formal or informal in addition, the degree of participation could range from zero to 100% in participative management stages. Employee participation is a creative process that gives ownership of decisions to the whole group, thus favouring individual input in the management of the organization.

Decision making in many organizations are done by top management teams without considering the input of the employee at the other managerial levels. In these organizations, the decisions taken by top management is however implemented by the lower level of employees because they do not take part in the decision making, it sometimes becomes difficult for some of the decisions taken by top management to be implemented especially when the decisions seem not to be favourable to the (lower) workers. Somech (2002), argues that flatter management and decentralization authority structures carry the potential for achieving outcomes unattainable by the traditional top bottom/down bureaucratic structures.

Despite the importance of employee participation in decision making, some researchers are of the opinion that involving employees in decision making is a risk on the organization. To some with ideas coming from many people, it will be time consuming, inefficient, indecisiveness and incompetence (DeBerin, 2007). Despite these assumptions, evidence shows that when employees are involved in decision making, staff absenteeism is reduced; there is greater organizational commitment, improved performance, reduced turnover and greater job satisfaction (Luthans, 2005). Employees feel fulfilled as being part of the organization and this raise their degree of worth and importance within the organization.

In tracing the background of employee participation in decision-making, one can argue it to be a household name in

many countries of the world. Japan's success in the business world is attributed to employee participation. Decision making is shared at all levels of management. It is observed that decision making in Japanese firms are focused on defining questions or issue rather than on finding solutions. Thus, all levels of the organization are involved in the process of decisions making. In the United States of America, the concept is known as industrial democracy. Employees are encouraged to buy shares in companies thereby enabling them to have a say in the management of their organization; in Britain it is known as joint consultation, while in Germany it is known as co-determination. In Nigeria, participatory management has come to stay. The indigenization decree of the Nigerian Military Government in 1977 demonstrated industrial ownership in Nigeria where it states that 10 percent total equity share(s) of any enterprise on schedule 2 and 3 should be reserved for workers . This in a nutshell inculcates a sense of belonging to the workers.

Due to the importance of participative management in organizational growth, both public and private organizations have adopted it. For instance, United African Company UAC, John Holt, United Trading Company UTC, etc., refer to it as consultation committee, where ideas, opinion, and interest are aggregated to arrive at a consensus in taking decisions for the good of all in the organization. Despite the above scenario of the existence of participative management in Nigeria and other countries many are of the opinion that absolute participatory management does not and can not exist due to underdevelopment, inexperience in democratic process, economic and political instability due to constant change of government and policies, and above all poor attitude of some workers towards the organizations where they work most often are not encouraging towards participative decision making between the management and the workers.

STATEMENT OF THE PROBLEM

The effect of employee participation in decision making on the achievement of organizational goals cannot be overemphasize. Scholars are of the opinion that employee participation in decision making of their organizations will go a long way to create a sense of belonging to the workers which in turn will engender organizational growth, cordial working relationship between the management and the staff, mutual trust, conducive working environment that supports sincerity and tranquil atmosphere for policy initiation and implementation for the general good among the members.

It is pertinent to say that despite the numerous benefits of employee participation in decision-making, the objectives have not been fully adopted in most organization both public and private and hence hinders the achievement of organizational goals in most work places as a result of lack of effective communication between management and their staff; inability of management to encourage and achieve team work. Inability of the management to involve workers in some cadre of decision making have in one way or the other hinder the achievement of some organizational goals. It is obvious and almost impossible for the organization to reach every Dick, Tom and Harry on every decision of the organization, however, this could be achieved through the engagement of the workers representatives, the union members. Most often their involvement led to industrial

harmony, economic emancipation and boom while their relegation and abandonment could lead to sabotage and economic loss, mistrust, absenteeism, strike, low productivity and job lost.

The above charged environment is not good for the management, the workers and the entire society at large. It is therefore the purpose of this work to examine the impact of employee participation in decision making on the achievement of organizational goals in Abia State College of Health Sciences and Management Technology, Aba.

Objectives of the Study

The objectives of the study include:

1. To examine the extent employees participate in decision making in Abia State College of health Sciences and Management Technology, Aba.
2. To determine the effect of employee participation in decision making on the achievement of organizational goals on Abia State College of health Sciences and Management Technology, Aba.
3. To examine the factors affecting employee participation in decision making in Abia State College of health Sciences and Management Technology, Aba.

Research Questions

The researcher seek answers to the following corresponding research questions:

1. To what extent does employees participate in decision making in Abia State College of health Sciences and Management Technology, Aba?
2. What are the effects of employee participation in decision making in Abia State School of health Sciences and Management Technology, Aba?
3. What are the factors affecting workers participation in decision making in Abia State College of health and Management Sciences, Aba?

Significance of the Study

The significance of the study specifies the benefit of the research hence the study has direct implication for today s organizations. The study will be beneficial to Abia State College of health Sciences and Management Technology, as the staff participate in decision making to achieve organizational goal. The work will guide management and administrators of corporate business organization in implementing an effective employee participative programme to encourage employees participate in decision making. Also the findings of this research work will serve as a reference for academic research for students for future research. In all, the research work will be useful to the general public both public and private sectors who want to improve their organization through employee participation in decision making.

Theoretical Framework

The theory adopted for this study is participative leadership theory. The theory was propounded by Lewin, Kurt, Lippit. R and Whit, R. K. in 1939. However, the theory is popularly known as Lewin's participative leadership theory. According to the theory participative leaders offer guidance to group members, but they also participate in the group and allow input from other group members.

Participative or democratic leaders encourage group members to participate in the decision-making process. Here, group members/employees feel engaged in the process and are more motivated and creative. Democratic leaders tend to make followers feel relevant part of the team, which helps foster commitment to the goals of the group.

The theory is most suitable because it laid emphasis on leadership which according to Wikipedia is a process of social influence in which one person can enlist the aid and support of others in the accomplishment of a common task. The theory definitely will be of great impact on

Abia State College of Health Sciences and Management Technology, Aba whereby the management will adopt participative leadership as it will encourage employees to participate and contribute to decision-making in the organization and it is believed this in turn will engender commitment, self-worth and sense of belonging to the organization.

CONCEPTUAL CLARIFICATIONS AND REVIEW OF RELATED LITERATURE

Decision Making.

Decision making is central to the organization predetermined goals and objectives. This is to say that the performance of management functions are carried out through decision making. Decision is often the basis of organizational analysis and seen as the central concept in the descriptive and explanation of behaviour in organization. Organization grows, prospers or fails as a result of decisions made by its managers (Danny and Richard, 2003).

Similarly, they argue that good decision is a vital part of good management, because decision determines how the organization solves its problem, allocates its resources, and accomplishes its goals. According to Emmanuel (2015), decision making is central to organizational effective performance.

Decision making is a vital concept in organizational development both public and private and hence has generated a lot of interest from scholars and researchers a like.
Eminue (2009:78), is of the view that a decision is a choice made among competing alternative options in response to certain needs or problem-solving situations .
To Sharma, et al (2013:794), A decision is the selection of a course of action. It is the choice from among a set of alternatives . A decision represents a judgment, a final resolution of a conflict of needs, means or goals and a commitment to action.

Roa and Roa (1996), define decision making as the process by which individuals select a course of action from among alternatives to produce a desired result. According to Nwachukwu (1992), decision making is the selection of alternative course of action from available alternatives in order to achieve a given objective. A decision is therefore a choice from among alternative course of action mainly to solving a societal or organizational challenges.

Participation

Participation is the active involvement of subordinates or followers in the making of decisions that directly affect them in the work place. Participation in decision making is generally regarded as a sign of enlightened and democratic management hence, employee participation is the process of involving workers in the decision-making process. Participation is defined as a special way of delegation in which the subordinates gains greater control, greater freedom of choice with respect to his or her responsibility. It could also be defined as the act of one partaking in something that affects him or her directly.

Participation is the act of taking part in an activity or event. It is also a style of managing in which the supervisors give the direction but decisions are made by consensus (Eke, 2008). Participation as a management style was adopted in 1961, by Renis Likert of the University of Michigan. (grossarchive.com).

The benefits of employee participation towards the achievement of organizational goals can not be overemphasized. Researchers have shown Helms (2006), Newstom (1997), Reddy (2016), Jayne (2019), all agree that for organizations to excel they must utilize their staff effectively in decision making. They enumerate that employee's participation in decision making is the foundation of any successful company. Employees represent a source of knowledge hence, involving them in decision making process not only empowers them to contribute to the success of an organization, but also saves the company time and money, increased productivity and reduced outsourcing. Participation in the decision making process gives each employee the opportunity to voice their opinions, and to share their knowledge with others. While this improves the relationship between manager and employee, it also encourages a strong sense of team-work among workers.
When employees are involved in decision making, they gain a professional and personal stake in the organization and its overall success. This commitment leads to increased productivity as employees are actively participating in various aspects of the company and wish to see their efforts succeed overall.

According to Casey (2019), actively engaging workers in the decision making process increases overall company morale. Many companies have a distinct separation of power between management and workers; however, the active employee involvement lowers that gap, opening the lines of communication between supervisors and employees.

Employees Participate in Decision Making Through the Following Ways:

1.**Participation through Collective Bargaining:**

This also refers to as joint consultation. It is the participation of workers through collective agreements and by deciding and following certain rule and regulations. It is a process whereby employee representatives meet to dialogue and agree on matters affecting employees at work. Most often, negotiations are mainly on salaries and wages including other condition of service such as medical care, gratuity, leave allowance, housing benefits, transport etc., this is considered as an ideal way to ensure employee participation in managerial processes.

2. **Participation through Ownership:**

Another way of ensuring workers participation in organizational decision making is by making them shareholders of the company. Inducing them to buy equity shares, advancing loans, giving financial assistance to enable them become partners in progress who will make and implement good decisions that will make the organization progressive and successful.

3. **Participation at the Board Level:**

Representation of employees at the board level is known as industrial democracy. This can play an important role in protecting the interest of employees. The employee representative present the problems and other challenging issue of the employees in front of management and guide the board to make decisions that are favorable to the desires of the workers.

4.**Participation through Quality Circles:**

A quality circle is a group of five to ten people who are experts in a particular work area. They meet regularly to identity, analyze and solve the problems arising in their area of operation. Anyone from the organization, who is an expert of that particular field can become quality circle member. This is an ideal way to identify the problem areas and work upon them to improve working conditions of the organization.

5.**Participation through Job Enrichment or Expanding:**

This is a process of expanding the job

content and adding additional motivators and rewards to the existing job profile. Job enrichment offers freedom to employees to exploit their wisdom and use their judgment while handling day-to-day business problems.

Apart from the aforementioned, employees can also participate in decision making through
complete control or system of self-management, suggestion schemes, briefing groups, etc.

Models of Decision Making

A number of models, theories, approaches, concepts and analytical frameworks have been suggested for studying policy formulation and decision making processes.

Heywood, has succinctly identify the following models:

1.**The Rational-Comprehensive Model:**

This is perhaps the best known and also the most widely accepted model of policy formulation and decision making. The model was developed by Herbert Alexandra Simon in his renowned work Administrative Behaviour: A study of Decision Making process in Administrative Organizations published in 1947. It is a model or theory of rational choice. The rational- comprehensive model is comprehensive because it compels the policy maker to take all actors into consideration before formulating a policy; it is rational because it compels the policy makers to exclude all non-rational and non-logical influences or factors in the process of formulating a policy and because it most effectively achieves a given end.

According to Rosenau (1996:218), a rational model of decision making implies that an individual decision-maker responds to an event or problem on the basis of a cool, clear-headed, means-ends calculation. He uses the best information available and chooses from the universe of possible responses that alternative most likely to maximize his goals .

Obi, et al (2008), identified the following steps involved in the rational comprehensive model as:

a. Clarification of goals and objectives

b. Identification of all alternatives courses of action available in solving the problem at hand or achieving the objectives.

c. An evaluation of the cost and benefits of all the alternatives.

d. A comparison of the cost and benefit consequences of alternatives.

e. Choice of the alternative with the least cost but with the maximum benefit.

2. The Incremental Model (Incrementalism).

The incremental or incrementalism decision making model was developed by Charles E. Lindblom in his work. The Science ofMuddling Through . This model is also known as piecemeal engineering disjointed incrementalism approach to decision making . (Eminue, 2009:249). In incremental decision making model the decision maker prefers to slice their decision making problems into small fragments, each of which is tackled at a time, thus enabling them to make incremental or marginal rather than holistic, far-reaching or profound choices. Policy making is therefore a continuous, exploratory process, lacking overriding goals and clear cut ends, policy-makers tend to operate within an existing pattern or framework adjusting their position in the light of feedback in the form of information about the impact of earlier decisions . The incremental model operates from the premise that the decision maker is not really interested in completely new solutions that are radically different from previous decisions instead his interest lies in improvements of previous decisions. All decisions are therefore modifications of existing ones (Obi, et al, 2008), because decision making is a continuous exercise, nobody should be bordered about making comprehensively rational decision.

3. Bureaucratic Organization Model

. The model was championed by Graham Allison in 1971.The model is of the view that the bureaucratic structure or the political organization of political system have a positive influence on the policy making processes. It is believed that the large political and other organizations have their own values, ideas and long cherished and well-guarded inclination. All these create definite impact upon the decision making process. Hence, while decision in being made, the organizational process cannot be neglected. In all political systems bureaucrats play a crucial role in the various stages of the formulation of decision. The bureaucrats and related agencies have their own outlook, values and assessment about incidents and when policy making process starts the top government officers and allied agencies release their efforts to guide the formulation of policies in the light they cherish.

The state as state exist and it guides, but it is not the final voice on any national and international issue, organizational structure and bureaucracy are deciding factors. The exponents of the model believe that though the ministers have a positive role in the policy making process, the actual function is performed by bureaucrats.

Belief System Model: Generally there is a belief system which can be termed as ideology or deep rooted belief. Some scholars are of the opinion that in the area of decision-making beliefs or ideologies have a very important influence.

The Mixed Scanning: The mixed scanning model was developed by Amitai Etzioni as an attempt to synthesize the main approaches to decision making. It therefore tries to maximize the advantages of both the rational and incremental models while minimizing their disadvantages. Etzioni argues that both the incremental and rational models do not offer satisfactory explanations for the two main types of decision-making (Obi, et al, 2008).

RESEARCH METHODOLOGY

Research Design

The design used in this study is descriptive survey design. Descriptive survey design was used to get information on the employee participation in decision making on the achievement of organizational goals. The researcher used descriptive survey design because the study is examining an existing condition and how it affects the population of the study. Descriptive survey design was used because it is valuable in providing useful information and in making predictions.

Population of the Study

The population of this study consists of the entire employees of Abia State College of Health Sciences and Management Technology, Aba, which is 246. There are 13 departments in the Institution which are as follows:- Pharmacy, Science Lab Tech, Medical Laboratory Technology, Community Health Technology, Statistics, Public Health, Environmental Health Technology, Public Administration, Business Administration and Management, Computer Science, Public Health Nursing, Health Information Management, Dispensing Optician.

Sample / Sampling Technique

The total number of employees in

Abia State College of Health Sciences and Management Technology, Aba, which is 246 were used for the study which formed the sample size. This is because the population is not too large and could be covered by the researcher within the time frame of the research. However, 220 questionnaires were correctly filled and returned.

Sample Table:

SN	DEPARTMENT	MALE	%	FEMALE	%	TOTAL
1	Pharmacy	8	16	15	7.7	23
2	Science Lab Tech	5	10	3	1.5	8
3	Med. Lab. Tech	6	12	10	5.1	16
4	Comm. Health Tech	2	4	28	14.3	30
5	Statistics	7	14	8	4.1	15
6	Public Health	4	8	20	10.2	24
7	Environmental Health tech	3	6	25	12.8	28
8	Public Administration	5	10	12	6.1	17
9	Business Administration	2	4	10	5.1	12
10	Computer Science	3	6	13	6.6	16
11	Pub. Health Nursing	1	2	20	10.2	21
12	Health Info. Management	2	4	17	8.7	19
13	Dispensing	2	4	15	7.7	17
	Total	**50**	**100**	**196**	**100**	**246**

Source: Field Survey, 2021

Sources of Data

Data for the study came from both primary and secondary sources:

a. Primary Sources:

i. Questionnaire: The data used in this study were sourced with questionnaire. The questionnaire took the structure of restricted or close ended questions which enabled the researcher to ask questions that helped him elicit vital information from the respondents. The questionnaire was designed with the four point rating scale of (a) Strongly Agree (SA), (b) Agree (A) (c) Strongly Disagree (SD) (d) Disagree (D)

The following are the various values assigned to the scales or options

Option	Value
Strongly Agreed (SA)	4
Agreed (A)	3
Disagreed (D)	2
Strongly Disagreed (SD)	1

Instrument for Data Analysis

Mean score was used to analyze data collected with the questionnaire. A mean score of a set of data is equal to the sum of all the values in the data set divided by the total number of values. Determination for cut-off point for each questionnaire item was done by finding the mean of the numerical values assigned to the option using the formula

$$= \frac{x}{N} = \frac{4+3+2+1}{4} = \frac{10}{4} = 2.5$$

Where $\bar{X}$ = Mean

Σ = Summation

X = Normal value of the option

N = Number of items

Decision Rule:

The decision rule was any item mean that attains 2.5 or above will be accepted while any item mean below 2.5 will be rejected.

Data Presentation and Analysis

Research Questions 1

What are the impacts of employee participation in decision making in Abia State College of Health Sciences and Management Technology, Aba

Research Question 2

To what extent do employees participate in decision making in Abia State College of Health Sciences and Management Technology?

Research Question 3

What are the factors affecting workers participation in decision making in Abia State College of Health Sciences and Management Technology, Aba?

DISCUSSION OF FINDINGS

v In research question on the impacts of employee participation in decision making on Abia State College of Health Sciences and Management Technology, Aba, the mean item variables showed that there is positive impact of employee participation in decision making in Abia State College of Health Sciences and Management Technology, Aba. The responses of the employees clearly showed that when they participate in decision making, their opinions and decisions reflect in decision output, the employees feel motivated, important, sense of belonging, increased output and industrial harmony in the organization. An interviewee in the institution concur to the above findings hence he added that the incorporation of the workers in decision making has actually given them a practical sense of belonging in the institution.

He affirm that they are owned many months of salary arrears, unconducive working environment yet workers keep the organization ticking only because they know their problems and also have the opportunity of collectively solving their problems. This has led to industrial harmony and eliminate strike actions as experienced in other institution in Abia State.

This finding is supported by Tessem (2011) who concluded that participation in decision making is argued to improve not only business, be also worker's job satisfaction . Another dimension as observed by Ezennaya (2011) on employee participation in decision making and its impact on productivity. The study shows a positive relationship between participate management and productivity. The study concluded that participate management results in increased productivity.

Going by the findings of this study, it can be easily inferred that worker's participation in decision making in organizations matters a lot and should be a concern to the management and other policy makers. This is obvious as the industrial harmony and tranquility experienced in Abia State College of Health Sciences and Management Technology, Aba is directly linked to employees participation in decision making in the institution.

v Analysis of data for research question 2 to what extent do employees participate in decision making in Abia State college of Health Sciences and Management Technology, Aba, reveals a positive relationship between these variables. From the table, the mean item score of the variables were accepted which shows that there is high level of employee participation in the institution more especially representation through the union bodies. This has made them to feel fulfilled implementing policies or decisions made thus reducing, conflicts, tensions and unnecessary delay in the organization. An interviewee in the Medical Record Unit (MRU), acknowledges that though certain categories of decisions are made solely by the management they consult the employees directly or indirectly for one information or the other. According to him this approach has made the employees relevant in the chain of decision making as vital data and information come from the ordinary staff.

This latest finding is supported by a study by Abdulai and Shafiwu (2014) and they concluded that when employees participate in decision making in various forms, decision implementation becomes easy, creates a good working environment, increases commitment and satisfaction on decision taken and also increases employee moral since they feel recognized and as part of the team in the organization and the direct consequences of all these led to improved productivity . From the findings and the supporting studies, we conclude that employee participation in decision making in Abia State College of Health Sciences and Management Technology, Aba is a major strength towards its integration, cooperative policy initiation and implementation.

v On the third question which is on the factors affecting workers participation in decision making in Abia State College of Health Sciences and Management Technology, Aba. The means score for the four mean variables were above 2.5. Therefore the researcher accepted that leadership approach, job security, effective communication and experience are factors that affect employee participation in decision making in Abia State Collage of Health Sciences and Management Technology, Aba.

An interviewee in the rectory department gave credence to the quality of leadership and access information approach adopted by the rector and his management have positively affected the quality and sincerity in decision making of the institution. Finally a group of interviewed staff were of the opinion that qualification, job experience and years of service should not be a major criteria affecting participation in decision making. Their line of argument is that some staff who may have not stayed long or without higher qualifications but are highly endowed with natural wisdom can make useful contributions.

We align with their argument because human beings have different levels of intelligent quotient which have nothing to do with qualification or years of service. Finally we deduced that leadership approach, experience, qualifications and years of service; job security and effective communication are factors positively affecting worker s participation in decision making in Abia State College of Health Sciences and Management Technology, Aba.

Summary

The topic of this research is Employees Participation in Decision Making on the Achievement of Organizational Goals. The objective of the study is to determine the impact of employee participation in decision making on the achievement of organizational goals in Abia State College of Health Sciences and Management Technology, Aba; to examine the extent employees participate in decision making in Abia State College of Health Sciences and Management Technology, Aba and to examine the factors that enhance employee participation in Abia State College of Health Sciences. To this effect, three research questions were developed which are, what are the impacts of employee participation in decision making in Abia State College of Health Sciences and Management Technology, Aba; To what extent does employees participate in decision making in Abia State College of Health Sciences and Management Technology, Aba; and what are the factors affecting workers participation in decision making in Abia State College of Health

Sciences and Management Technology, Aba. The population of study consists of the entire employees in the institution which is 246. The sample size is 246. Questionnaire was used to get information from the 246 respondents. Mean score was used to analyze the data collected with questionnaire. It was observed that when employees participate in decision making their opinions and suggestions reflect in decision output it make them to feel motivated, important and have a sense of belonging which has led to industrial harmony. It was discovered that most often than not, employees are represented in decision making through their union bodies who consult them before taking decision with management. This has reduced tension and conflict in the organization and make employees feel more fulfilled in implementation of decisions made by management.

It was discovered and confirmed that leadership approach, qualifications, experience and years of service, job security and effective communication are other factors positively affecting decision making in Abia State College of Health Sciences and Management Technology Aba.

Conclusion

The findings of this research revealed that industrial harmony occurs when workers opinions and suggestions reflect in the decision output through adequate participation of workers in decision making. By this, workers will be motivated, feel important and have sense of belonging in the organization. Again, a reliable and an active union body which seeks for workers opinion and suggestions before taking decisions with management will make workers feel more fulfilled, reduce conflicts and tension and mitigate unnecessary delay in decision implementation.

Finally, leadership approach, qualification, experience and years of service, job security and effective communication are factors positively affecting workers participation in decision making in Abia State College of Health Sciences and Management Technology, Aba.

Recommendations

Based on the findings of this research, the following recommendations were made.

1. Worker's participation in decision making should also be encouraged through direct participation and not only through representative participation. By direct participation, workers should interact with management where they will discuss their challenges as it affects them and their job.

This will give them more sense of belonging and make them feel as partners or stakeholders in the organization which will increase their loyalty, output, etc.

2. Criteria for workers participation in decision making should not be based mainly on possession of higher qualifications and years of service. This is because most workers who may not have acquired higher qualifications or stayed long in the organization may be blessed with natural wisdom, higher level of intelligent, useful ideas and experience which will help the organization meet up with its desired goals.

3. Union executives should endeavour to carry everybody along especially the higher cadre employees who feel they are not properly consulted before making decisions. This will reduce industrial conflict and promote unity and peaceful atmosphere in the organization.

REFERENCES

Abdulai, I.A, Shafiwu, A.B. (2014). Participatory Decision Making and Employee Productivity. A case Study of Community Banks in the Upper East Region of Ghana. Business and Economy Journal 35:99.doi:10-4172/2151-6219.100099,

Abdul, H. and Aamer, W. (2011), Employee Development and its Affect on Employee Performance: A conceptual Framework. International Journal of Business and Social Science vol.2 No 13

Bevandam, J. (2000). Managing Job Satisfaction. Special Report, 6,.1-2

Danny, S. and Richard L. D. (2003). Management. Australia: Nelson Australia Pty Limited.

DeBrin .S, and Marshall. V (2004). Participation in decision making. http://academies/research/participative_decion-making.htrin.

Drucker, P. (1954). The Practice of Management. New York: Harper and Row.

Ezennaya, N. (2011). Employee Participation in decision making and its Impact on Productivity: An Appraisal of Government Printing Press and Two other Private Publishing Firms in Enugu Retrieved September,2019, from www.unn.edu.ng

Eminue, Okon. (2009). Public Policy Analysis and Decision-Making: Lagos: Concept Publications.

Emmanuel, C. N. (2015). Decision Making in an Organization. In Emmanuel N. I (Ed), Organizational Behaviour and Contemporary Issues in Administration. (Ed.) (PP. 184-195) Owerri: Career Publishers.

Gannon, B, and Sterling J. (2004). Company Culture Provides edge for Sargento Foods. Stratlead, 32:31-35.

Helms, M. M. (2006). Theory X and Theory Y. Encyclopedia of Management Education: htt://www.enotes.com/management.

Hameed, A and Aamer, W. (2011). Employee Development and its Affect on Employee Performance: A Conceptual Framework. International Journal of Business and Social Science. Vol.2 No13.

Lindblom, C. (1959). The Science of Muddling Through Public Administration Review 19(4).

Luthans, F. (2005). Organizational Behaviour. 10th Ed., New York: McGraw-Hill Irwin Books.

Nwachukwu, C. C. (1992). Management Theory and Practice. Onisha: African Fed Publishers.

Obi, E. A, Nwachukwu, C. L. and Obiora, A. C. (2008). Public PolicyAnalysis and Decision making. Onisha: Book Point Educational Ltd.

Rathnakar G. (2012). A Study of Workers Participation in Management Decision Making at Bhel, Hyderabad: International Journal of Marketing, Financial Services and Management Research. Vol. 1 Issue 9, September, 2012, ISSN 2277.3622. Retrieve October, 2019.

Sharma M. P, Sadana, B. L and Harpreet Kaur. (2013). PublicAdministration in Theory and Practice. Allahabad: Kitab Mahal Printing Division.

Singh, S. K. (2009). A study on employee participation in Decision Making. Unitary E-Journal, 5(1): 20-38.

Somech, (2002). Explicating the Complexity of Participative Management: An Investigation of Multiple dimensions; EduAdm Quart 11:341-371.

Sterinheider, B and Wuestewald. (2006). Participatory Decision Making. (Online Decision Making. htm).

Tessem (2011). Decision making, participation and empowerment in Norwegian Software Development organization

ENHANCING PRODUCTIVITY IN AN ORGANIZATIONTHROUGH PERSONNEL TRAINING AND DEVELOPMENT: A CASE STUDY OF MTN NIGERIA, PLC. PORT HARCOURT BRANCH

GIDEON,Mudiem Titus.
Department of General Studies
Bayelsa State College of Health Technology. Ogbia-Town
gimotitus@gmail.com.

Abstract
The study highlights the impact of personnel training and development in enhancing employee productivity. Employee productivity is a function of ability, efficiency and situational factors. An organization may have employees of special ability and determination, with appropriate equipment and managerial support, yet productively falls below expected standards. The missing factor in many cases is the lack of adequate skills and knowledge which are required through training and development. However, the researcher gathered information pertaining to the subject under study. Data for the study was collected through questionnaires which were distributed to 100 respondents using simple random sampling techniques. Hypotheses were tested using Cochran Q-Test. The findings indicated that; Training and development is a major factor in enhancing productivity in an organisation. The result further indicated that, Effective employee training and development is the basis for increase productivity on the job. The researcher recommends that training and development programmes should be carried out in an organization routinely, both in the public and private sectors in other to enhance employee productivity.

Keywords: *Productivity, organization, personnel, training, development.*

INTRODUCTION

Trainingasaconceptisexclusivetodefine. As a result of this controversy, several definitions have arisen.According to Michel Armstrong, "Training is systematic development of the knowledge, skills and attitudesrequired by an individual to perform adequately a given task or job". According to Edwin B Flippo (1984), "Training is the act of increasingknowledge and skills of an employee for doing a particular job." The term 'training' indicates the process involved in improvingthe aptitudes, skillsand abilities of theemployees to perform specific jobs. Training helps in updating old talents and developing new ones. 'Successful candidates placed on the jobs need training to perform their duties effectively'. Aswathappa (2000).The principal objective of training is to make sure,the availability of a skilled and willing workforce to the organization. In addition to the principal objective: it also prepares the employees, both new and old to meet the present, as well as the changing requirements of the job and the organization. To prevent obsolescence. To impart the basic knowledge and skill in the new entrants that they need for an intelligent performance of a definite job. To prepare the employees for higher level tasks. To assist the employees to function more effectively in their present positions by exposing them to the latest concepts,

information and techniques and developing the skills they will need in their particular fields. To build up a second line of competent officers and prepare them to occupy more responsible positions.To ensure smooth and efficient working of the departments.To ensure Economical output of required quality.According to the Chandranshu (2012), there are twelve important factors of quality of work life. These working factors are important for the development of organization most valuable assets (employees). These factors are also useful for gainingcompetitive advantage in the market. These factors are communication, career development and growth, organizational commitment, emotional supervisory support, flexible work arrangements,family response culture, employee motivation, organizational climate, organizationalsupport,job satisfaction, rewards and benefitsand compensation. Likewise different authors have suggested different suggestions for the improvement of quality of work life. Chen& Fan (2003) also focuses on the Working environment of the organization, Salary and bonus, Welfare, Promotion for the employees. It also involves the Work nature, Training and development, Leadership style of the boss, Cooperation among colleagues, Enterprise image, Communication, Organizational regulations, Organization climate and culture, Working time and workload of the employees. Saraji&Dargahi (2006) Fair Pay and Autonomy, Job security, Reward systems, Training and career advancements opportunities, participation in decision making,

Development is a course of action designed to enable the individual to realize his/her potential goals for growth in the organization. Development relates to the future rather than the current. Flippo(1982) Says that "after an employee have been recruited, selected and inducted, he or she must be developed to better fit the job and the organization. No one is perfectly fit at the time of hiring, some training must take place; they must be involve in some session of training and development. Newly hired employees usually need some training before they can take up their work while older employees requires training both to keep tern alert to the demand of their present job and fit them for transfer and promotion. Ubeko (1975), Training should not be undertaken for the sake of it. It must be geared towards the job objectives of a particular company. This is important because organizations differ in culture and in order to work out training needs, each organization has to be assessed. However, there are many employees in this country that still do not believe in the philosophy of training, the sole proprietorship, small contracting and small shop keepers feel that training is unnecessary and wastage of money. It is in sharp reaction to this sort of attitude that the government sees the development of human resources not as a sole monopoly of the nation's educational institutions capable of performing training functions. Oxford advanced learner's dictionary (2008) defined training as the process of learning the skills that you need to do the job. Training is regarded as sending a person on a course, just the same as one could consider sending a car engine to a garage for recondition.

The role of training and development is to enhance organization to be more productive and effective, through this, it can be seen that money spent on training and development is money well spent. Therefore organization who acknowledges the importance of training and development of employee's skills and knowledge's on their respective job and tasks such organization is heading towards success. Cole (1993) In his contribution to staff development defined it as "systematic and planned effort to change through exposure to select learning process and experience, the behaviour, institutional conception, orientation on and global

perception and work attitude of workers" Training is often thought of as something which occurs in a classroom or in on-the-job encounter between someone who is teaching and someone who is being taught. It implies that something is being done or transferred by one person to another. In terms of modem learning theory, this view is greatly over simplified as well as inaccurate. Training is more appropriately thought of as something which occurs as part of learning process. Learning itself cannot be observed but be inferred from behaviour. Thus, learning is a behavioural change, the change that results from experience. Training is the adopting or moulding of a person to increase his fitness for specific activities. Hackman (1980) says development is "a course of action designed to enable individuals realize their potentials and contribute to the growth of an organization. Wondell (1975), defined "training and development as an attempt to improve currently employees' future. Ability to perform, usually by changing the employees' attitudes or increasing his or her skills and knowledge". The process of training and development is a continuous one. Money spent on training and development of an employee is money well invested. Employees who have not received adequate training lack the necessary confidence with which to carry-out the job. An employee should be helped to grow by systematictraininganddevelopmentItisonlythenheorshewill feel confident to carry out the responsibility that his or her job demands. Because by knowing what is expected ofhim on the job and the ability to do it, his or her elusion on the job will definitely increase. Training is short term educational process utilizing a systematic and organized procedure by which non-managerial personnel learn technical knowledge and skills for a definite purpose. Low echelon employees are taught technical skills as how to operate mechanical equipment i.e. technical and mechanical operations/skills. Armstrong (2006) still maintain that, there are enormous benefits in training, these include –Achannel for communication, job satisfaction, achievement, recognition and motivation. Training also enable people to exercise greater responsibility, education and training are essential ingredient in change management program.

Development is the label given to a long term educational process or procedure that is systematic and organized by which management personnel learn conceptual, philosophical and theoretical knowledge for general purpose. The training and development of employees is at the heart of employee's utilization, productivity, commitment, motivation and growth in any organizations. Many employees have performed low in their organizations because their need for training was not identified and not been given proper attention as an aspect of management functions in the organization. Development on the other hand is broader scope of improvement, growth in abilities, attitudes and personality traits. Bill 0' Reilly (1979) defined "training as a development of a person's knowledge, skills and attitudes for vocational purpose". Organizations are fast growing in Nigeria and the world at large. With the complexity of the work environment, the rapid change in organization and advancement in technology, among other things, it is necessary that people must be needed to work in these organizations which makes the need for training and development for those people vital, in other to enhance efficiency and productivity. The need for improved productivity has become universally accepted and that it depends on efficient and effective training and development is not less apparent. It has further become necessary in view of advancement in modern improvement is productivity is the means by which the society raises the standard of living.

Productivity is mainly defined as the measure of how well resources are brought together in an organization and utilized for accomplishing a set of results productivity is reaching the apex level of performance with the least expenditure of resources. Also productivity is defined to mean a ratio of input it is not production, though the two are often confused. Production refers to output by itself, such that three thousand payroll cheques processed. Productivity relates that output to some unit of input, processed in three hours. Productivity is about the effective and efficient use of all resources. Productivity is a measure of efficiency; probably the most familiar productivity measures are possible on numerous dimensions. For instance the total number of patient recovered after being operated upon, the rate of turn over by sale agent etc. the most familiar productivity measure for the economy is that of labour productivity. Efficiency of every organization depends directly on how well its members are trained one major challenge which Nigeria faces today in an effort to achieve a rapid economic development and industrial modernization is more of non-availability of the desired human resources than other resources.

In Nigeria manpower problems in the process of industrialization have been largely caused by the fact that training skilled personnel was prevented by the economic and industrial under-development and backwardness, the limited spread of education, the badly structured educational system and the absence at appropriate vocational training. Directed at the expense of skilled manpower. It will be inappropriate for a person to carry out a research of this magnitude without analyzing and accepting guidelines from this area to comprehend the previous thoughts and perceptions of other researchers. The experience of world economic development especially Japan's case, clearly shows that the cause and prospects of industrialization are largely determined by the quality of a country' s workforce, the availability of trained managers, technicians and other categories of skilled personnel possessing vocational and technical knowledge to undertake efficient production and administrative activity.

STATEMENT OF THE PROBLEM

The quality of training and development given to the various types of staff and at the various levels is mostly inadequate leading to the cases of inefficiency and ineffectiveness which has resulted into wastage of manpower. In the name of training and development of employee millions of cash have been wasted in many organizations each year in the hands of managers who do not know even the elementary principles of management. There is the need for experience and qualified workers in an organization. The quality of the labour forces and the speed of development taking place in organization have given rise to the need of training of employees so as to ensure increasing performances in the organization. It is very vital for all levels of management to appreciate training as a means of making the organization forward and helping the organization achieve its purpose for existence.

Research question

1.Towhatextendistrainingand developmentamajorfactorinenhancingemployee'sproductivityinanorganisation?

2.Howwillyouconfirmthateffectiveemployeetraininganddevelopmentisthebasisforincreaseproductivityonthejob?

Statement ofHypotheses.

This research work is premised on the following hypotheses

1. Ho: Training and development is not a major factor in enhancing productivity in an organization.

2.Ho: Effective employee training and development is not the bases for increased productivity on the job.

Method

The analysis of various presentations was done using simple percentages and statistical instruments of Cochran Q-test. The instruments for data collection: - Questionnaire, Interview&Documentary evidence

Research design is the specification of method and procedure for Acquiring information necessary to structure a problem. This is used for the purpose of obtaining data toenable the researcher to test the hypothesis. It also ensures that information obtained is relevant to the research problem. The researcher chooses to use survey research method in this study. This is considered appropriate because survey design generally can be used to effectively investigate problem in realistic setting. The method will also allow the researcher to examine several variables and use multi-variant statistic to analyze data.

The instrument used for data collection is the questionnaire Titled 'Enhancing Productivity in an Organization through Personnel Training and Development' The 20 item questionnaire with (Yes, No and Nil) answers was administered to respondents in other to gather a pool of information for the purpose of this research. The questionnaire is complemented by the face to face interview.

The sampling for this research work was drawn from a population of 1,000. The method use for selecting is the sample percentage and subsequently, a sample of 100 respondents was drawn, that is 10% of 1,000.

The area of coverage within which this research is conducted is the staff of MTN Nigeria Limited Port Harcourt Branch with strength of 500. Since it is basically difficult to study all the population due to certain constrains, the researcher decided to draw a sample of the total population for the purpose of this study.

Data analysis and research presentation.

Data was analyzed using simple percentage method and Cochran Q - Test.
The formula for the percentage method is denoted by:
PM - Percentage Method
S - Fraction of the Sample
N - Sample size
PM =S x 100
Number 1
Percentages were calculated based on how respondents reacted to the "yes or no" questions on the instrument.

Table 1. Enhancement of employee productivity

Option	Frequency of Respondent	Percentage (%)of frequency
Yes	70	70
No	25	25
Total	100	100

source: field survey 2015
Table 2. Organisational Productivity

Option	Frequencyof Respondent	Percentage (%)of frequency
Yes	85	85
No	15	15
Total	100	100

source: field survey 2015

Table 3Employee productivity

	Option	Frequency ofRespondent	Percentage (%)of frequency
	Yes	75	75
	No	15	15
	Response	10	10
	Total	100	100

source: field survey 2015
The formula for the Cochran Q-test given thus

$$Q = (K-1)\,[K\,(\sum s_1^2 + \sum s_2^2 + \ldots \sum s^2 k) - (\sum L)^2]$$

$K\sum L - \sum L^2$

Where:
K = Number of sample, Sk=Sum of positive (favourable) response
$\sum L$ = Sum of all favourable response

1. **H_o:**Training and development is not a major factor in enhancing productivity in an organisation?

Summary to response table

Table 4.

	Option	Junior officer	Senior officer	Top management	Total
	Yes	35	25	15	75
	No	5	5	-	15
	No Response	-	5	5	10

D.O.F = (k-1)

K = 3, SK = ?, L = 75

$\sum L^2$ = $35^2 + 25^2 + 15^2 = 1225 + 625 + 225 = 2,075$

$$Q = \frac{(K-1)\,[K(\sum S_1^2 + \sum S_2^2 + \ldots..\sum S^2k) - (\sum L)^2]}{K\sum L - \sum L^2}$$

$$Q = \frac{(3-1)[3(35^2 + 25^2 + 15^2) - (75)^2]}{3(75) - 2075}$$

$$Q = \frac{(2)\,[3(2075) - (5625)]}{225 - 2075}$$

$$Q = \frac{(2)[6225 - 5625]}{225 - 2075}$$

$$Q = \frac{(2)\,[600]}{-1850}$$

$$Q = \frac{1,200}{}$$

Option	Junioroffice	Senioroffice	Top management	Total
Yes	45	20	20	85
No	5	5	5	15

D.O.F = (k - 1) = 3-1 = 2, K =3, SK = ?, L = 85

$\sum L^2$ = $45^2 + 20^2 + 20^2 = 2025 + 400 + 400 = 2,825$

$$Q = \frac{(K-1)[K(\sum s_1{}^2 \sum s_2{}^2 + \ldots..\sum s^2k) - (\sum L)^2]}{K\sum L - \sum L^2}$$

$$Q = \frac{(3-1)[3(45^2 + 20^2 + 20^2) - (85)^2]}{3(85) - 2825}$$

$$Q = \frac{(2)\,[3\,(2825) - (7225)]}{255 - 2825}$$

$$Q = \frac{(2)\,[8475 - 7225]}{255 - 2825}$$

$$Q = \frac{(2)\,[1250]}{-2600}$$

$$Q = \frac{2500}{-1850}$$

Q = 0.0961

Q computed = 0.0961, Critical = 4.61

Accept H_1 which says training and development is a major factor in enhancing productivity on the job.

Discussion of Finding

The analysis carried out so far revealed that:

1. The researchers work brought to limelight the importanceof training and development on the priority in MTN Nigeria Limited

2. That training and development in MTN Nigeria limited is alwaystailored to achieve the objectives of the organization

3. That training and development helps in enhancing organizational effectiveness

4. The training is being conducted because there is inefficiency in the employees. The deficiency creates a gap between the expected and actual performance standardthus, training and development is used to close the gap.

5. It has been established that MTN Nigeria considers training needs before embarking on training and development programmes. The fact that training has good effect in individual's ability and organizational effectiveness is a phenomenon that was also proven by this study

6. Training increased efficiency in both individual and in the organization in general

8. The analysis has shown that training has impacted positive on the level of employee performance.

9. From the analysis of this hypothesis. The resultsshows that the calculated value of 6.484 is greater than the critical value of 5.99. This means that H, hypothesis is accepted and the alternative hypothesis is rejected. Hence training and development is necessary for employee performance.

CONCLUSION AND RECOMMENDATION

The human resourceelements of any organization are its greatest asset. A company's (public and private) future, its prosperity and success depends not only upon providing a product which is competitive in price and quality, not for simply increasing their range of products produced. One of the most vital aspects is the company's investment in its employees or staff.If a company has employees of vision, energy and experience to direct the labour force and facilities, such utility staff can only come by, principally through development and training. It is an ongoing process, as new employees are trained, so also are long serving employees transferred to other jobs or when new equipment are required. It is the realization of this fact that employers all over especially in the private sector of the economy put up a large sum of their fortunes annually on the training and re-training of employees just to ensure a committedworkforce that can be relied upon for the attainment of their goals and objectives. Huge as this may sound; it is still not nearly enough, that most of these funds are spent by big organizations in training well educatedmanagers and professionals, organisation need to train workers mostly non-professionals who will need technical trainings to perform their current job at peak efficiency. Life time learning is the role in today's fast-paced global economy. Unfortunately, this trend seems to be lacking in our public sector in Nigeria. This apparent lack of training and development of public sector employees is what has really generated the interest of this researcher to embark on this study. A comprehensive insight into the impact of personnel training and development inMTN Nigeria Port Harcourt branch was presented by this study. Based on the responses derived from the questionnaire administered, the researcher was able to obtain the feelings, desires, expectations and frustrations of employees in respect of the issues bothering on the area of training and development. However from the findings of the administered and retrieved questionnaires, it is pretty clear that the adoption of training and development programme is an antidote for organizational effectiveness where as the lack of it will create negative reactions from employee as well as they will not be interested to show adequate commitment to their jobs. This is capable of having negative effect on the organization. Never the less,From the responses obtained from the respondents through the administered questionnaire, the researcher was able to establish that there is significant relationship between the training of employees and improved performance, this was proven by way of hypothesis testing, which compelled the research to accept the alternative hypothesis:

RECOMMENDATIONS

Given the fact that no organization, public or private can function effectively without human element. Organization should pay adequate attention and be committed to the issue of employee training and development in order to achieve organizational effectiveness, productivity and efficiency.In order to improve the training programme and enhance productivity inMTN Nigeria, the following recommendations are made:

1. MTN Nigeria training program (particularly for junior workers) should be properly designed.

2. Courses on training and development should be opened to every category ofstaff to enhance their knowledge and to increase their productivity.

3. Nomination of staff for training courses should follow appropriate and approvedpolicy guidelines of the organization.

4. There is need for redeployment of trained employees to new departments wherethey can exhibit new skills instead of being left on old schedule of duties

that are no longer challenging.

5. There should be provision for adequate and consistent budgetaryallocation for training and development purposes.

6. The organization should ensure that training programmes are extended to all cadres of workers so that skills and talents could be developed and potentials fully utilized.

7. Employees should be encouraged, motivated to embark on self development programmes.

8. Training and development programmes should be well planned andappropriate to the type of work to be performed.

REFERENCES

Armstrong M. (2006). A Handbook of Human Resource Management Practice, Kogan Page, 10th Ed.

Aswathappa, K. (2000) Human resource and Personnel Management, New Delhi: Tata Mcgraw-Hillpublishingcompany ltd.

Bill 0' Reilly (1979) work group demography, social integration and turnover.

ChandranshuSinha (2012), Factors affecting quality of work life. Journal of business and management research. Vol. 1 no11.

CHEN Jia-sheng and FAN Jingli (2003). International journal of management and humanity.. Vol 3 (2016).

Cole G. A. (1993) management theory and practice. 4th ed. Up publication Ltd London.

Edwin B Flippo (1984) The principal of Personnel Management, McGraw Hill; 6th Edition, New York

NaslSaraji G and Dargahi H (2006). International journal of management and humanity.. Vol 3 (2016).

Hackman J .R. (1980) Work redesign reading. Addison Wesley, mass

Mitchell Armstrong (2001) A Handbook of Human Resource Management Practice, Kogan Page, 8th Ed,

Oxford advanced learner's dictionary (2008)

Ubeku A.K. (1975), Personnel management in Nigeria, Ethiopia publishing cooperation Benin city

Wondell, L (1975) The personnel management process, Houghton Mifflin company

ENVIRONMENT AND IMPLEMENTATION OF LEGAL REQUIREMENTS IN CAPITAL PROJECTS

QS ONYEKWENA, Tobechukwu
Quantity Surveying Department
Federal Polytechnic Nekede Owerri
tobechukwuonyekwena@gmail.com

Abstract
This paper studies what forms ones environments, assesses Nigerian environment studies the legal aspects of capital projects, analyzes people's behavior towards implementation of the legal issues and finally suggests ways that could help us mature and develop enough in ennobling the environment and achieving desired goal; realization of strong, reliable and cost effective project, and also peace and progress.

Keywords: *Environment, Implementation, Legal requirements, Capital Project.*

INTRODUCTION

The environment of an area, be it country, state, local government, town, community, kindred or social group affects culturally and socially the behavior pattern of that circle towards achieving its desired goal.Environment has been defined as conditions, circumstances etc affecting a person's life (Oxford Advanced Learners Dictionary). It can also be defined as the natural conditions in which people, etc live (Oxford Advanced Learners Dictionary).

In the Nigerian environment, the laws separated people into tribes and in these tribes lies dialects and groups of various nature. Each experiencing in accordance with its maturity and development. The difficulty in the implementation of issues of uniform concern lies in the differences of the maturity and development. Implementation of legal issues in various endeavour is not uniform and causes disharmony. People do things as they like and very easily get free from them. All capita; projects have suffered severely from this, especially in construction activities generally and building construction in particular. There are laws, act (both parliamentary and statutory), regulations, bye-laws, etc governing construction activities, yet no one pays serious regards to them. Even in circles where these should really be taken serious and implemented fully, conflicts abound as to who should do what and its consequent violation of legal issues and encroachment into fields one is not particularly trained.

METHODOLOGY

The procedure for this work is unique. The motivation issue had to be necessarily articulated and cognate literature reviewed in the context of the environmental and legal aspect of capital project. Thus, an attempt was made to give the work a strong theoretical footing in the light of cognate works and finally buttressed empirically through analysis of 68 returned questionnaire distributed randomly selected staff in ministries, parastatal, institutions, construction firms, consulting firms, professional bodies and individuals in the capital territory and major state capital, one each in the South East, South West,

North West, North Capital and South South of Nigeria eg. Ikeja, Yola, Kaduna, Jos and Calabar respectively.
The questions were based on our attitude to award of contracts, execution of contracts, respect of law and order and professionalism. The result arrived at were striking and formed the bases for item 6, conclusion and recommendation of this work.

THE NIGERIAN ENVIRONMENT

Natural Laws (Laws of creation) separate people into their kind, form their experiences and determine their progress or retrogression both spiritually and materially. The laws even determine the tribe, town, community, kindred and the family into which people are born. The Nigerian populace is no exception. The laws separate it into tribes, dialects and various social groups each contributing its part towards the nation's development and progress.People are brought together in accordance with their qualities, virtues and vices, and by experiencing in them the people either mature and progress or immature and deteriorate.

Every person in Nigeria is experiencing individually and collectively the qualities, virtues or vices prominent in the area the separation brought him and in the collective responsibility arising from them that affect the entire nation. Thus, religion, politics, commerce, trade union and social organization are affected. The law are hardly obeyed. The way we find ourselves in them, either liking them or disliking them, enjoying theon or becoming sad in them show how light or heavy we are and how progressive or retrogressive we are. To me, all is tending to sadness, heaviness and rapid retrogression. A radical change, materially and spiritually, need to take place. Our environment affects how the legal requirements in capital projects are implemented.

LEGAL ASPECT OF CAPITAL PROJECT

A capital project to be one which the owner intends to execute as an increase in his fixed asset and for which special funds have been a period in a year (Latinwo, 1996).Such project could be building, road, water, electricity, manufacturing plants and other industries. Capital project require an annual recurrent expenditure for its maintenance and a depreciation of [part or a whole of the project. Capital project are usually on contract basis, that is, awarded to contractors. This necessitates the consideration of the legal requirement. The requirement are considered under the following heading.

a. Pre-contract legal requirement

b. Legal requirement from the award of contract.

c. Post completion legal responsibilities.

d. Parties legally entitled to be involved in the execution of capital project.

e. Types of contract.

a. Pre-contract Legal Requirements
The Pre-contract legal requirement can be divided in:

i. Perfection of little

ii. Bidding

I. Perfection of Title:

The land use act of 1978 vested all land in state governors with whose express consent, all grants or rights and interest may be assigned, mortgaged, transferred, sublet, or otherwise alienated without the consent of the State Governor. This has far reaching implications on our land tenure system throughout the federation and provides us with a uniformity and unity in policies as far as land matters are concerned. Therefore, any contractor or builder given instruction to develop a landed project must hope and pray that the property which is about to develop will not be subject to any litigation and/or demolition or that he will not be subjected to harassment, or penalty in the form of payment of fund. It is therefore in the interest of all parties to the project that the tile of the property in issue is perfect or perfected.

ii. Bidding

: in bidding for capital projects, may require certain fixed payments prior to collection of bids and for world bank projects a second payment upon being nominated for award of contract. The intention of this requirement is to obtain the total commitment of the contractor's interest in the project. Contractor not complying at either of the two steps maybe disqualified without recourse to compensation. Also tender documents invariably specify that the contractor shall seal his bid. Submission without indication of his company name and failure to complying will lead to disqualification. More importantly, the date and time for submission of bids as usually fixed must be strictly complied with. The lowest tender is no guarantee that a bidder will be awarded the contract (tender documents usually spell this out, even where they do not, contractor should be wary of it).

b. Legal Requirement from the Award of Contract:

Contracts are administered afterward with the documents called "Form of contract" the form of contract used determines the legal rights of every part to the contract. In Nigeria, JCT from 1963 and 1980 edition and also RIBA are still operative. These are foreign conditions. Federal Ministry of Works and Housing fashions its own after the JCT. Nigeria has not yet produced a form of contract peculiar to its problems. The legal requirement from the award of contract can be considered under the following categories

a. Obligation of the computer

b. Obligation of the employer

a. Obligation of computer: the contractor has the following obligations.

i. Care and diligence in the discharge of the services agreed upon Safety of his workers including insurance cover of his workers including insurance cover of his workers.

ii. Safety of his workers including insurance cover of his workers including insurance cover of his workers.

iii. Security of his equipment and materials on site and insurance cover for same

iv. Diligence in the environment of equipment so as not to disturb other fixed properties of the employer and any other contractor engaged by the employer and any other contractor or sub-contractor engaged by the employer on other projects near the site.

v. Ensuring that the site is cleared and all debris removed from the site .

vi. Adhering as far as practicable to the implementation of programme of the project

vii. Advising the client as to the needs of the client where additional services are required.

b. Obligation of the Employer:
The employer has the following obligations.

I. Prompt payment for services and free movement of contractor's personnel within a fenced up area in the event of a built up environment belonging to the employer.

ii. **Employment of supervising experts:**

these could be architects, builders, engineers, quantity surveyors in the case of building industry. Each of these experts would be engaged in areas recognized by law for their practice. These represent him in issues to the contract.

iii. **Arbitration and termination:**

there are two steps in this obligations; either the two parties nominate an arbitrator that is agreeable to both of them or the two parties applying to the high court of Nigeria especially if the arbitrator they jointly nominated failed to resolve the dispute. Very often, the employer threatens a termination based on a certain presumed default of the contractor and the contractor will contest the ground and seeks for arbitration. Controversially, a contractor may threaten a withdrawal from the works on the ground that the employer is failing to meet its legal obligations under the contract. The procedure for arbitration would follow. When delays occur, the cause must be ascertained and remedies made in accordance with the condition of contract. Delays may lead top claims or extension of time.

iv. Insurance:

insurance must be taken out with a company approved by the employer and the condition will normally include a period terminating at the end of the construction and in some cases at the post contract defect liability period. Generally, employers prefer the latter care should be taken by the contractor to obtain the agreement of the employer to the draft text of the insurance bond prior to committing himself to the insurance company. This is because in many cases insurance company normally would want to shorten the life bond either due to ignorance or deliberately. If after presentation the client has to require an extension of the bonds expiry date, he may find himself liable to pay additional money to the insurance company.

v. **Bond:**
this also is the obligation of client in capital projects. There are two types of bond.

i. Mobilization bond or down payment bond.

ii. Performance bond

i. Mobilization bond or down payment:

Mobilization bond has a value not exceeding the amount of the down payment made by the employer at the commencement of the project. This bond does not cover the rest of construction period which is government by payment certificate.

ii. Performance bond:

bond covers from mobilization to the end of the post-contract defect liability period. Under this arrangement, mobilization bond but in large high rise building contracts, the performance bond usually applies because the owner observes to ensure adequate cover both for the proper completion of the project as well as for the legal means whereby he can protect himself in the event of default leading to termination and employment of others to complete the project

c. Post completion legal Requirement (Responsibilities):

defect liability period is a period allowed (usually 6 to 9 months from partial completion as the cause may be) within which if a defect arises in the works, the contractor would make amend without extra cost to the client. Percentage of the contract sum(called retention fund) is set aside from every payment certificate and reserved for any defect that may arise within the period. The period is usually controversial period during which the ball can be passed from the contractor to the employer, and the employer to the contractor for the cause of the defect generally, the consultant representative of the client has a responsibility for deciding where the liability lies. However, if proper provisions had been made in the contract that the employer personnel shall use the completed work with diligence, then upon failure of a damage to materials and fixtures, the contractor is not liable.

c. Parties legally to be involved in the execution of a capital project: the following parties are legally entitled to be involved in the execution of capital projects.

i. The employer (building owner) who requires construction to be down for him. For capital projects, he usually engages consultants to design and administer the works for him. An employer could be corporate body, a partnership, a statutory body or an individual his rights are spelt out in the conditions of contract.

ii. The contractor who undertakes to carry out the works for the employer in accordance with the specification. He is the only signatory to the contract with the client. He could engage consultants to assist him or employ professional or professionally registrable personnel. He could be corporate body partnership or individual. His obligations and responsibilities are spelt out in the conditions of contract.

iii. The subcontractors and suppliers who agree to carry out or provide part or the whole of the works or materials in the contract. He can be nominated as a specialist in a specialize work or domestic if just to assist or ease of the main contractor's load.

iv. The Architect who is one recognized by law to conceive, design and supervise as to the compliance to the form and function in the design. His activities start from inception and lasts to completion. (Law of Federal Republic of Nigeria, 1990).

v. The Builder who is one recognized by law for buildability assessment, construction planning, management of quality of work, workmanship and material. His activity should start from scheme design stage and lasts till completion but most often it starts from award of contract to completion in response to present conditions of contract yet to be adapted to Nigeria circumstances (Law of Federal Republic of Nigeria 1990).

vi. The Quantity Surveyor who is one recognized by law for cost planning and cost control. His activity starts from outline proposal stage to completion (Law of Federal Republic of Nigeria 1990).

vii. The Engineers those recognized by law for design o frames and mixes, and for design of mechanical and electrical services. Depending on the nature of the services, their activity could start from outline proposal or detail design (Law of Federal Republic of Nigeria 1990).

viii. Resident Supervisors, those usually engaged where fairly close attention to day to day construction is required. They are clerk of work (an architect) a builder, an engineer, a quantity surveyor engaged by respective consultants in their relevant areas. The present condition of contract spelt out role for supervision officer without attaching profession to it. The extent these parties should be engaged in capital project is still a big problem Nigeria. In non –capital projects, no regard is paid to practice what.

a. Types of Contract:
from the type contract entered into, the parties are assured of an exchange of promise by an employer to pay for work done and the contractor to carry out the work as described within the contract documents. The various classification of contract includes:

I. A lump sum contract:

this is contract where there is a fixed price for the work. The work is sufficiently identified

or described within the contract documents. In this type, it is envisaged that the whole of the work is done before the fixed price is paid. The lump sum contract can be such that the increase in cost of materials and labour after the award of contractor's risk. This is called fixed price. It could also be such that the increases in cost of labour and materials and labour after the awards of contract are the contractor's risk. This is called fixed price. It could also be such that the increases in cost of labour and materials during the progress of work are paid for by the employer and added to the contract sum. This is called Fluctuating Contract.

ii. A Scheduled Contract:

this is a contract where there is a schedule or specification of the work to be done and schedule or specification of work to be done and a schedule of prices and rates which the tendering contractor set out in the contract document. This is called contract with quantities. Most substantial contract would involve the employment of bondsman who underwrites in part the performance of the contractor. He is usually a finance house, insurance company or bank if not distressed. The bond is to be a value of a part of the contract sum. This is to provide the employer with a limited amount of cover against the contractor's default. Parties to construction contracts very often do not execute the contract document for some considerable time after the works have actually began. This is sometimes due to the fact that the contract documents often take a long time to prepare and once a tender is accepted, the parties are anxious for the work to proceed. Contracts must make provision for change (variation) in the work originally specified. This could be alteration, substitution omission or addition of any work. The employer of his professional representatives has express power in the condition of contract to vary the work. A contract that fellow all legal procedures for award and execution usually provide for the issue of payment certificates by the professional representatives of the client to the contractor to pay him within specified periods. Payment certificate are issued in agreed stages and called interim certificate of making good defect are issued at the end of defect liability period. The certificate provides advance of money to the contractor during the progress of work. The issue of such certificates is usually a condition, a condition precedence to payment on account during the progress of the work.

NIGERIANS' BEHAVIOUR TOWARDS THE LEGAL REQUIREMENTS From the results of the research carried out and the analyst of same, the following were deduced as Nigerian behaviour towards the legal requirements:

a. Hatred, selfishness, envy and jealousy majorly formed our environments

b. Capital projects even though bided for, are actually awarded to mostly those not qualified but have the connections either as relatives or using cash or both. The experience, quality and qualification of the contractor and his management and technical staff are not considered, even the equipment he has or how he would procure them are not considered .

c.Most considerations are given to benefits that are derivable from the contractor of the percentage of the contract sum he would allow and willingness to give it up font.

d. Litigations and/or demolitions and harassments abound because of cheats in the perfection of the title of most properties in which projects are being executed or are about to commence.

e. Legal requirements in respect to perfection of buildings, executions, completions, acts, regulations, bye-laws, and statutory requirements seem to be merely window dressings.

f. Parties to most contracts do not respond sincerely to their obligations and responsibilities as spelt out in the contract documents. This very often results to abandonment, termination, arbitration and litigation.

g. Many capital projects are executed without adequate insurance and bond arrangements

h. Strict professionalism, specialization, and professional ethics are not observed. Professionals argue on who must do what just for what they think they would loose if it goes to another, even if it is clear that the law specifies that it is the duty of the other. It is like the winner takes all.

i. Most large projects are executed with very little documentation and administration. Legal procedures are not followed. Shoddy jobs abound all over the country.

CONCLUSION

From all evidences, our attitudes which shape our environments have inflicted deep wounds in the way projects are executed and the implementation of legal requirements in this regard. Building regulations, urban planning laws, local government bye –laws and statutory bodies requirements are minimally obeyed. Selfishness and greed hinder people from reasoning together so as to forge ahead desired goals.

RECOMMENDATIONS

Having recognized that our problems are from ourselves and resolve to be reasonable in all we do in order to achieve harmony and get good result on this parlance, I recommend the following:

1. The federal Government should specify the individuals roles of our profession and strictly implement them

2. The Federal Government should ensure that such roles are implemented uniformly, in all states and local governments.

3. There is need to change the present foreign forms of contract and produce one that will be relevant to our circumstances.

4. As a matter of urgency, the Federal Government should release the code practice prepared jointly by all the professional bodies and the ministry to save the problem of who does what.

5. Every regulatory council/board for various professionalism must strictly regulate the practices of those involved in those professions.

6. Finally, every Nigerian must put God first, recognize and do his will, making it his way of life which will manifest outwardly.

REFERENCES

Bamisile A. (2004): Building production Management Foresight Press Limited, Lagos.

Hornby A. S. (1995): Oxford Advanced Learner's Dictionary of Current English Oxford University Press.

Latinwo B. (1996): The Legal Aspect of Capital Projects. Text of invited lecture delivered at the 26th Annual Conference of the Nigerian Institute of Building.

Law of the Federal Republic of Nigeria (1990). Act Caps. 20, 40, 111, 234 Decree 27 of 1992.

Joint Contract Tribunal (JCT) Form of Contract 1963 Edition.Land Use Act of 1978.

EVALUATION OF BACTERIOLOGICAL QUALITY OF SOYBEAN MILK BEVERAGE SOLD IN EKWULOBIA AND OKO METROPOLIS

NDIFE, Rachael Chinaza
&
CHUKWUMBAH, Emmanuel Chukwuemeka .
Department of Science Laboratory Technology,
Federal Polytechnic Oko
ndiferachael@gmail.com

Abstract
This work was aimed at evaluating the bacteriological quality of soybean milk beverage sold in Ekwulobiaand Okometropolis.Twenty-one(21) Soymilk samples were bought from different sellers atEkwulobia andOkometropolis. They were aseptically taken to the microbiological laboratory for analysis. The analysis was carried out using standard bacteriological, and biochemical methods. The total viable count of the Soymilk sampled rangedfrom (1.0 X 10^4 cfu/ml to 8.9 X 10^4cfu/ml.), and the coliform count ranged between (4 X 10^3cfu/mlto 6.6 X 10^4cfu/ml) after the analysis,the bacteriagenera isolatedwereStaphylococus aureus, Bacillus spp., Escherichia coli, Klebsiella spp., Salmonella spp., Pseudomonas spp,. These organisms isolated have been known to be pathogenic bacteria which are responsible for gastrointestinal diseases such as dysentery, diarrhea, cholera and typhoid fever etc.The results indicatedthat precautions were not taken by the processors and handlers of Soymilk drink as the contamination may be as a result of bad processing practice, unhygienic practice and poor sanitation of equipment and unhygienic environment. It is therefore concluded and recommended that good processing and hygienic practices should be introduced during processing and packaging of Soymilk product.

***Keyword**: Soymilk, Soybean, Bacteriological, Contamination, and hygiene*

INTRODUCTION

Soymilk or soybean milk is a typical extract gotten from Soyabean seed botanically called (Glycine max).Soymilk, also called soya bean milk, soy juice and sometimes referred to as soy drink is a beverage made from soy beans, a leguminous seed nicknamed "golden crop" or the "miracle seed" (Nzelu, 2009). Soy-based foods are rich in high quality proteins, essential amino acids, minerals, vitamins (especially A and B) and vegetable oil etc. (Edet and Peter, 2017). Soy bean milk are often sourced due to their high protein profile as an alternative to animal milk and protein and as such, highly recommendable for vegetarians.A generalized method of processing soy milk include cleaning, soaking, boiling, cooling, dehulling, wet milling, sieving, reconstitution, pasteurization, packaging, cooling and refrigeration (Umeoduaguet al., 2016).It is milky-whitish in color, often sometimes reconstituted with water and sweetened with sugar before sales.

The local producers of soymilk do not undergo detailed processes and still produce and sell under unhygienic environment thereby exposing the soymilk

to high levels of contamination by pathogenic and other spoilage organisms" (Nzelu, 2009). In addition to poor handling and unhygienic practices of local producers of soymilk products, the nutrient composition of soymilk makes it an excellent bacteriological medium (Michael, 1986). The usage of untreated water for production and frequent use of un-sanitized cans for packaging of this soy milk beverage contribute immensely on the bacteria load of these beverages. Which often, the sellers don't even know about the implication of the bad manufacturing practice.

Control of microbial growth and spoilage of product is achieved by restricting and controlling microorganisms from contaminating the product through good manufacturing and handling practices (Ofoefule, 2002).Pathogenic microorganisms are microorganisms capable of causing disease, although they represent only a small part in the total microbial world; they receive much attention because they represent a threat to the human or animal health and to agriculture (Onuorahet al 2007).

Pathogenic microorganisms can cause disease of plague dimensions with serious economic and environmental consequences (Twizeyimanaet al., 2009). The bacterial species commonly found in Soybean milk drink include Pseudomonas, Bacillus and Klebsiella species (Edet and Peter, 2017). Liamngeeet al., (2013) reported that some samples of soymilk drink were contaminated with members of the enterobacteriaceae, including E. coli, Klebsiella spp, Salmonella typhi, Streptococcus faecalis, and Staphylococcus aureus. These have been implicated in the occurrence and prevalence rate of diseases such as typhoid fever and dysentery among soymilk consumers (Alangaet al., 1975; Addo et al., 1977).

This work is aimedat investigating the bacteriological quality of Soybean milk beverage sold in Ekwulobia and Oko metropolis.

MATERIALS AND METHODS

Study Area

The study area is Ekwulobia and Okometropolis, in the Orumba North local government area of Anambra state Nigeria.

Source of Sample

The samples were sourced from seven different areas in Ekwulobia andOkometropolis. These sites include Ekwulobia round-about, Ekwulobiamotor park, St John Anglican church Ekwulobia, Eke Ekwulobia Market, Ekwulobia timber shed road, Federal polytechnic Okomain gate, and close to Union bank Oko.These sites were chosen because they are highly patronized by consumers.

Sample Collection

Twenty-one (21) soymilk samples which were already packaged in plastic bottles were purchased from women, men and children that hawk the product around the locations mentioned above and transferred immediately to the Microbiology Laboratory for bacteriological analysis.

Media Used

The media used for the isolation was Nutrient agar (NA), MacConkey agar, Salmonella Shigella Agar, Mannitol Salt Agar, Centrimide agar and Eosin Methylene Blue Agar. The media was prepared according to the manufacturer's instruction.

Microbiological Analysis of Sample

Ten-fold serial dilution of the samples was carried out by pipetting 1ml of each sample into 9ml of the distilled water (diluent). After performing the serial dilution, 1ml of 10^2 dilution of the solution was pipette into an empty petri dish. The prepared culture media was allowed to cool and about 20ml of Nutrient agar, MacConkey agar, EMB agar, Centrimide agar and

Salmonella Shigella Agar were poured into a well labelled petri dish containing 1ml of the aliquot of each sample. The plates were swirled to mix them thoroughly and left to solidify. The plates were incubated at 37°C for 24 hours. The cultures that developed were counted and subcultured to obtain pure cultures which were stored on agar slants (Chessbrough, 2005).

Identification of Bacteriological Isolates

Each of the bacterial colonies on the agar plates was sub-cultured and the pure culture obtained. Isolates were identified by cultural, morphological and biochemical tests (Chessbrough, 2005)

Biochemical Analysis

Biochemical test carried out wereGram staining reaction, Catalase test, Coagulase test, Indole test, Oxidase test, Citrate utilization test, motility, sugar fermentation test (Glucose, Sucrose, Lactose).

RESULTS

Table 1: Total Viable Bacteria counts of Soy milk
Total Viable count in cfu/ml

Sample	Total aerobic count	Coliform count	Feacal coliform count	*SalmonellaShigella* Count	*Staphylococcus* Count
A	1.0×10^4	5×10^3	Absent	Absent	3×10^3
B	3.8×10^4	4×10^3	Absent	Absent	9×10^3
C	2.0 X 10	1.0×10^4	5×10^3	1×10^3	3×10^3
D	8.9×10^4	6.6×10^4	1.1×10^4	1×10^3	2×10^3
E	6.0×10^4	2.3×10^4	1.0×10^4	1.0×10^4	1.0×10^4
F	4.0×10^4	3.0×10^4	Absent	Absent	1.0×10^3
G	3.0×10^4	1.0×10^4	Absent	Absent	1.1×10^4
H	3.5×10^4	2.0×10^4	Absent	Absent	1.0×10^4
I	2.5×10^4	1.9×10^4	Absent	Absent	5×10^4
J	3.0×10^4	1.0×10^4	Absent	Absent	Absent
K	4.9×10^4	7×10^3	Absent	Absent	1.1×10^4
L	4.7×10^4	1.9×10^4	Absent	Absent	1.1×10^4
M	2.5×10^4	5×10^3	1.0×10^4	1×10^3	9×10^3
N	6.6×10^4	1.6×10^4	Absent	1×10^3	1.0×10^4
O	4.0×10^4	1.0×10^4	Absent	Absent	Absent
P	3.9×10^4	1.0×10^4	Absent	Absent	1.5×10^4
Q	4.0×10^4	1.0×10^4	Absent	Absent	1.0×10^4
R	3.2×10^4	1.8×10^4	Absent	Absent	1.0×10^4
S	1.0×10^4	1.0×10^4	Absent	Absent	1×10^3
T	1.5×10^4	Absent	Absent	Absent	Absent
U	1.0×10^4	4×10^3	Absent	Absent	Absent

KEY. TAC = Total aerobic Count , SS = Salmonella Shigella count, Absent= no growth, *Staphylococcus*spp count

TABLE 2 Cultural characteristics and Biochemical reaction of isolate

Iso	Cultural characteristic	GR	Ca	Ci	Co	Ox	In	Mo	Gl	La	Su	Probable org.
1	Greenish Metallic sheen on EMB	Rod -	+	-	-	-	+	+	+	+	+	*Escherichia Coli*
2	Shiny pink colony on MacConkey	Rod -	+	+	-	-	-	-	+	+	+	*Klebsiella spp*
3	Shiny light green colony on CET	Rod -	+	+	-	+	-	+	+	-	-	*Pseudomonas spp*
4	Black colonies on SSA	Rod -	+	-	-	-	-	+	+	-	-	*Salmonella spp*
5	Very large whitish colonies on NA	Rod +	+	+	-	-	-	+	+	-	-	*Bacillus spp*
6	Yellow colonies within yellowZone on Mannitol salt Agar	Cocci +	+	+	+	-	-	-	+	+	+	*Staphyloccocus aureus*

KEY: Iso: Isolate, GR: Gram Reactions, Ca: Catalase, Ci: Citrate, Co: Coagulase, Ox: Oxidase, In: Indole, Mo: Motility, , Gl: Glucose, La: Lactose, Su: Sucrose, Probable Org.: Staphylococcus aureus, Pseudo spp.: Pseudomonas spp, E. coli: Escherichia coli and Bacillusspp +: Positive, -: Negative, EMB: Eosin methelene blue agar, CET: Centrimide Agar, SSA: Salmonella Shigella count, NA: Nutrient Agar, and Mannitol salt Agar

DISCUSSIONS

The bacterial species isolated from the soymilk samples were Escherichia coli, Klebsiella spp, Pseudomonas spp, Salmonella spp, Bacillus Spp, and Staphylococcus aureus.The result obtained from the bacteriological assessment revealed that the microbial count and most probable number of coliform obtained exceeded the acceptable limit for both milk,

milk products and non-alcoholic beverages (< 10^4cfu/ml) (Ezeigboet al., 2014: (PHLS, 1993).

Feacal coliform were seen in sample C, D, E and M as other samples recorded no growth of feacal coliform. The presence of coliform bacteria in soymilk generally provides an index of the hygienic standard of the milk and its keeping quality (Sara & Hilda, 1990).Salmonellasppwere seen in sample C,D,E, M and N. Staphylococcus aureus was the major occurring pathogen as only sample J, O, T. and U recorded no growth forStaphylococcus aureus.

The high bacteriological quality recorded in these soymilk samples may be due to poor manufacturing practice which include use of contaminated water in the grating, poor personal hygiene during production and non-pasteurization of the product, use of contaminated plastics in packaging of these drinks. The total Aerobic count obtained for every sample of soymilk analyzed exceeded the acceptable limit for both pasteurized and ultrahigh temperature treated milk (3 x 10^4cfu/ml and less than 10 coliforms) (Ezeigboet al., 2014: (PHLS,1993). The Total Aerobic count obtained from this research agrees with the findings of Akeem et al. (2011) were they reported high bacterial count for Soy bean milk analyzed.Liu &Keshun, (1997) and Leinear, (2001) stated that Soymilk can be contaminated by high coliform counts which usually indicate neglect from the following: contaminated equipment, improper pasteurization of finished products, poor quality of ingredients used during production and infected soya bean varieties.

The presence of Escherichia coli isolated indicates the presence of feacal coliform which may be due to use of contaminated water during the processing of soymilk. Staphylococcusspp indicate poor processing technique where bare hands were often used in the mixing of the slurry without glove. Other bacterial genera isolated which include klebsiellaspp,pseudomonas spp and Salmonella spp are indication of cross contamination from the production personnel or during the production process.

This result agrees with the findings of Ezeigboet al., (2014) as they isolated andidentified Bacillusspp, Staphylococcus spp, Lactobacillus spp, Enterobacter sppand Escherichia coli. from soy milk beverage sold in Aba, Abia state in Nigeria. Umeoduagu et al. (2016) isolatedsimilar bacteria whichare Staphylococus aureus, Bacillus spp., Escherichia coli, Klebsiella spp., Salmonella spp., Pseudomonas spp. and Vibrio spp.,from Soy milk beverage.

The above result was in conformity with the report of Adeleke et al., (2000), Prescott et al., (2005) and Odu&Egbo, (2012) which stated that the bacteriathat have been associated with soymilk contamination include: coliform bacteria such as Escherichia coli, Klebsiella spp, Pseudomonas spp, Enterobacter spp, Salmonella spp, Staphylococcus spp and other faecal coliform bacteria.Akeen, (2011)also isolatedStaphylococcus spp., Shigella spp. and Salmonella spp fromsoy bean milk products consumed in Nigeria. Most strains of these isolate are pathogenic and have been the cause of various diseases such as dysentery, diarrhea, typhoid fever, and other forms of gastrointestinal diseases.Odds et al., (2001) reported the ubiquity in the hawking of locally produced soybean milk, packaged in different forms was considered a public health concern.

CONCLUSION

The result reveals that the samples of soymilk drink sold within Ekwulobiaand Okometropolis were directly or indirectly contaminated with high level of pathogenic bacteria. Hence, the presence of these bacteria could be reduced by following Good manufacturing practice and employing the use of treated water in production of soymilk beverage.It is important that food borne illness or disease couldbe controlled in Nigeria, if these products are being monitored by NAFDAC.Hence, health and environmental education should be taught at grass root level by the government as these will go a long way to improve public health.

REFERENCES

Adeleke, O. E., Adeniyi, B. A., andAkinrinmisi, A. A. (2000). Microbiological quality of local soymilk: A public health appraisal. Afri J. Biomed Res., 3; 89-92

Akeem A. Agboke, Uduma E. Osonwa, Christian C. Opurum and Emmanuel C. Ibezim, (2012). Evaluation of Microbiology Quality of Some Soybean Milk Products Consumed in Nigeria. Pharmacologia, 3: 513-518.

Akeen, A., Agboke, E., Osonwa, C.C. and Ibezim C.C. (2011). Microbiological quality of some soy bean milk products consumed in NigAkeen, A., Agboke, E., OsonwaC.C.andIbezim, C.C. (2011). Microbiological quality of some soy bean Milk products consumed in Nigeria.Prime Journal, 1(2): 25-30eria.Prime Journal 1(2): 25-30

Alanga, T. V., Beaver, P. C., & Goldman, F. A. (1975). Standardization faecal smears for estimating egg production and worm burden. Journal of parasitology, 36: 451-453

Chessbrough, M. (2005). District laboratory practice in tropical countries. Cambridge University press, 38: 178-306.

EdetAsuquo, Nkoyo and Peter Antai, Slyvester (2017) Microbiological and Biochemical Analysis of Soymilk Produced and Sold within Calabar Metropolis. Microbiology Research Journal International 21(2): 1-8, 2017

Ezeigbo, O. R., Ekaiko, M. U., Kalu T. and Nwodu, J. A. (2014). Quality Assessment of Soymilk Sold in Aba, Southeastern Nigeria.International Journal of Epidemiology & Infection 2(4):88-91

Leinear, I. E. (2001). Factors affecting the nutritional quality of soya product. Am. Oil Chemist. Soc., 406-415.

Liamngee K ., Terna T.P., Bem A.A., Orpin J.B., Mzungu I., Obaje M. and Anum, T. (2013). Microbial Analysis of Soyabean Milk Sold In Makurdi Metropolis.IOSR Journal Of Environmental Science, Toxicology And Food Technology Volume 3, Issue 3 PP 97-104

Liu, P. Y., andKeshun, K. O. (1997). Soybeans: Chemistry, Technology and Utilization. 3rd ed. Chapman hall new York, 112-113

Michael, P. O. (1986). Use of soyabeans in treatment of protein malnutrition in infants. Journal of Tropical and Agricultural Research, 8:7-8

Nzelu, I. C., (2009). Identification, compositionand Utilization of Tropical Food commodities 2nd edition. Fergu Nwankwo printing service Enugu. pp: 87-112

Odds, F. C., Rinaldi, M.G, Sheehan, D. J., and Warnock, D. W. (2001). Antifungal susceptibility testing: practical aspects and current challenges. Clin. Microbiol. 14: 643-58

Odu, N. N., andEgbo, N. N. (2012). Assessment of the effect of different preservatives on the keeping quality of soymilk stored at different temperatures. Nature and Science, 10 (9): 1-9

Ofoefule, S. I. (2002). A text book of Pharmaceutical Technology and Industrial Pharmacy, Samakun Nigeria, enterprise p. 120-12

Onuorah, C. E, Adejare, A. O. and Uhiara, N. S. (2007) Comparative physicochemical evaluation of soymilk and soya cake produced by three different methods. Nig. Food J. 25: 2-5

Prescott, L. M., Harley, J. P., and Kelvin, A. D. (2005). Microbiology, 6th ed. McGraw Hill, New York, pp 633-638

Public Health Laboratory Services (PHLS) (1993). Public health laboratory

services standing advisory committee on laboratory safety. Safety precaution: Note for Guidance

Sara, F., and Hilda, N. (1990). Fate of pathogenic and non-pathogenic Escherichia coli strain in two fermented milk products. J. Appl. Bacterial., 69 (6), 814-821

Twizeyimana, M, Ojiambo, P. S., Sonder, K., Ikotun, T., Hartman, G. L., and Bandyopadhyay, R (2009). Pathogenic Variation of Phakopsorapachyrhizi Infecting Soybean in Nigeria, 99: 353-61.

Umeoduagu, N. D., Dimejesi, S. A., Nworie, O., Orji Jerry O. and Oti-Wilberforce R.O., (2016). Microbiology Assessment of Soymilk Sold in Onitsha Metropolis African Journal of Basic & Applied Sciences 8 (2): 87-89,

THE EVALUATION OF DIFFERENT CONCRETE MIX USING PARTICULATE PALM KERNEL SHELL

Engr. AZIEGBEMHIN, Ehiabhi Paul
MechanicalEngineeringDepartment,
Edo State Polytechnic, Usen, Edo State, Nigeria
ehipaul@yahoo.co.uk

Abstract
Palm kernel shell (PKS) is an agricultural waste and is quite environmentally friendly. The use ofpalmkernelshellforconcreteproductiontendtoincreasethestrengthanddurabilityofconcrete . Its use in concrete production will alleviate the increasing challenges of scarcity and high cost of cement. Thus, this paper evaluates different concrete mix using particular palm kernel shell. A prescribed mix of 1:2:4 (Cement: sand: coarse/fine aggregate) by volume was used in making all 11 concrete samples. Some samples were made with gravel, stone dust, kalokalo, coarse palm kernel shell, and fine palm kernel shell. Some were made with a combination of stone dust and coarse palm kernel shell, kalokalo and coarse palm kernel shell, stone dust and fine palm kernel shell, gravel and coarse palm kernel shell, gravel and fine palm kernel shell, and kalokalo and fine palm kernel shell. Compressive strength tests were carried out on the samples after 7 days of casting. The study analysis showed that gravel concrete is stronger than all other aggregates when it is partially replaced with palm kernel shell and gravel concrete that is partially replaced with fine palm kernel shell is stronger than gravel concrete that is partially replaced with coarse palm kernel shell. Also, the result shows that when using stone dust partially replace with coarse palm kernel shell, *the concrete tends to have a higher compressive value than the normal stone dust concrete and stone dust partially replace with fine palm kernel shell.*

Keywords: PalmKernelShell,Concrete,CompressiveStrength.

Background

Concrete is a construction material manufactured by mixing fine aggregate (e.g. sand), coarse aggregate (e.g. gravel, crushed stone), cement and water either in a designed or prescribed proportion. In its simplest form, concrete is a mixture of paste and aggregates, or rocks. The paste, composed of cement and water, coats the surface of the fine (small) and coarse larger aggregates. Throughachemicalreactioncalledhydration,thepastestrengthensandgainsstrengthto form therock-likemass known as concrete. Concrete is a quite strong and durable construction materials because of gravel and other coarse aggregates that is added to the mixture used in producing concrete. Concrete has a low water-to-cement ratio and is a thinner consistency than mortar (, which is a workable paste used to bind building blocks such as stones, bricks, and concrete masonry units together, fill and seal their regular gaps between them, and sometimes add decorative colors or patterns

in masonry walls.)Concrete is strong in compression; it has very good fire resisting properties and it is quite ideal for providing structural support of a building, for setting posts such as fence posts, basketballposts,mailboxposts,deckposts,etc. accountforitswidespreaduseincivilengineering structuresuchas buildings, dams and so on. Furthermore, concrete being the widely used construction material is facing problem due to unavailability of construction materials (such as sand, cement and coarse aggregate) and the high and rising cost of construction materials.

However, as a result of the daily increase in the cost of concrete material most especially cement, coarse aggregate and fines and. It becomes vital to introduce and develop available local material. Recycling is one of the most important actions currently available to reduce these impacts and represents one of the most dynamic areas in the construction industry today. Local materials such as later Ite and clay; naturally occurring aggregates (gravel,s and, pumice); shells, mining and particulate of palm kernel shell can be mixed with pulverized poly ethylene bags to form composite and such a composite have the potential to be used as a partial replacement for cement and aggregate, leading to reduction in the cost of construction, and a convenient means of waste disposal, resource preservation.

Furthermore, popular materials such as cement, crushed stone aggregate used for the production of concrete are quite expensive as a result of high cost of production or importation. The high cost of these materials for the production of concrete has resulted in the development and use of other materials available locally. Some of the locally available materials that can be used for concrete production include natural soil, e.g. laterite and clay; naturally occurring aggregates(gravel, sand, pumice); shells, mining, industrial and agro wastes; timber; bamboo and natural fibers and palm kernel shell. Particular interest to this study is the palm kernel shell.

Palm kernel shells (or PKS) are the shell fractions left after the nut has been removed after crushing in the Palm Oil mill. Palm kernel shells are a fibrous material and can be easily handled in bulk directly from the product line to the end use. In fact, the use of palm kernel shell for concrete production tend to increase the strength and durability of concrete. Its use in concrete production will alleviate the increasing challenges of scarcity and high cost of cement. It is on this basis that this paper evaluates different concrete mix using particular palm kernels hell.

Statement of the Problem

To a very large extent, the production of concrete depends on the availability of cement, sand and coarse aggregates such as granite. Overtime, the cost of these aforementioned materials for concrete production has risen. Despite the rising cost of these materials, the demand for concrete is increasing. The rising cost of concrete production has also necessitated research into the use of alternative materials, especially locally available ones which can replace conventional ones used in concrete production. Apart from reducing the cost of concrete construction, the use of such replacement materials help to reduces tress on the environment. Furthermore, the locally available building materials that could be used for concrete construction such as laterite and clay; naturally occurring aggregates (gravel, sand, pumice); shells, mining, industrial and a gro wastes; timber; bamboo and natural fibers and palm kernel shell, palm kernels hells appear least investigated hence the need for this research to evaluates different concrete mix using particular palm kernel shell.

Materials and Methods Sample Collection and Preparation

Palm kernel shells, acquired from wastes of small scale palm oil milling centre's were washed, dried and evaluated for suitability as coarse aggregate for production of the different concrete mixes. Sand samples were also collected from a burrow pit in Benin City, Edo State and were air dried and thoroughly mixed to ensure homogeneity. Other materials used for the study include: gravel ,water, stone dust ,kalokalo, rods, quarter roads and binding wires.

Testing and Evaluation of Samples Testing of Palm Kernel Shell

Sieve analysis was carried out on samples of palm kernel shells to ascertain their grading. The palm kernel shells samples were shaken through a set of sieves of successively smaller openings and the mass of sample retained by each sieve was recorded. Thereafter, samples of palm kernelshellsweredriedinanovenfor24hoursat1000°Candthemasseweredetermined.Themassofwateroccupyingavolumeequaltothatofthesolidincludingimpermeableporeswasdetermined for each sample by using a vessel, which could be accurately filled with water to a specified volume.

The apparent specific gravity

$$= {}^{D} \quad (1)$$

– + Where:

Are presents the mass of vessel with sample and top ped up with water ;B =Mass of vessel full of water;

D=Massof ovendried sample;

B-A+D=Themass of water occupying the same volume as solid.

To determine the moisture content of each sample of palm kernel shells, an empty sample can was weighed. Then the weight of the can plus sample was determined. The can plus the sample was then oven dried and weighed.

ThemoisturecontentM C ,wasdeterminedbyequation2:

$$= - \times 100 \quad (2)$$

_

Where:

A =Weight of empty can;

B=Weight of can plus sample;

C=Weight of can plus dry sample.

Determination of Compressive Strengths of Concrete Cubes

A prescribed mix of 1:2:4 (Cement: sand: coarse/fine aggregate) by volume was used in making all concrete samples. This prescribed mix was employed because it is the most commonly used for construction purposes in Nigeria. The prescribed mix constituents do not include the volume of water, it is therefore necessary to determine the water- cement ratio so as to estimate the quantity of water to be used such that the requirements of quality, work ability, and economy could be balanced. 28 liters of water to 1 bag of cement was used, resulting in a water-cementrationof0.56.Aftertheconcretemixture,mouldsofsteelmeasuring150mmx150mmwereused in casting the samples for compressive strength tests. The concrete casting, compaction and testing were done in line with British Standard 1881.Some samples were made with gravel, stone dust, kalokalo, coarse palm kernel shell, and fine palm kernel shell. Some were made with a combination of stone dust and coarse palm kernel shell, kalokalo and coarse palm kernel shell, stone dust and fine palm kernel shell, gravel and coarse palm kernel shell, gravel and fine palm kernel shell, and kalokalo and fine palm kernel shell.After24hourssincecasting,themouldswerestrippedandtheconcretesampleswere takentothe curing stands. The various samples were cured by wetting them.

Compressive strength tests were carried out on the samples after 7 days of casting. In all, a totalnumberof11cubeswere produced and batched, cured and tested for compressive strength.

Composition of Each Concrete

1.NormalGravelConcrete

Aggregate	Quantities	Weight
Gravel	6	17.5BS(8.1KG)
Sand	5	14.4BS(6.12KG)
Cement	3	7BS(3.4KG)
Water	4	6.2BS(2.16KG)

2.Normal Stone Dust Concrete

Aggregate	Quantities	Weight
Stonedust	6	15.5BS(6.4KG)
Sand	5	14.4BS(6.12KG)
Cement	3	7BS(3.4KG)
Water	4	6.2BS(2.16KG)

3.Normal KaloKalo

Aggregate	Quantities	Weight
KaloKalo	6	15.4BS(7.1KG)
Sand	5	14.4BS(6.12KG)
Cement	3	7BS(3.4KG)
Water	4	6.2BS(2.16KG)

4.Gravel partially replace with Coarse Palm KernelShell

Aggregate	Quantities	Weight
Gravel	3	9.1BS(4.3KG)
CoarseP. K. S.	3	5BS(2.5KG)
Sand	5	14.4BS(6.12KG)
Cement	3	7BS(3.4KG)
Water	4	6.2BS(2.16KG)

Stone Dustre place with Coarse Palm KernelShell

Aggregate	Quantities	Weight
StoneDust	3	8.1BS(3.2KG)
CoarseP.K.S.	3	5BS(2.5KG)
Sand	5	14.4BS(6.12KG)
Cement	3	7BS(3.4KG)
Water	4	6.2BS(2.16KG)

7 Normal Palm KernelShell Concrete(Coarse)

Aggregate	Quantities	Weight
CoarseP.K.S.	6	10BS(2.5KG)
Sand	5	14.4BS(6.12KG)
Cement	3	7BS(3.4KG)
Water	4	6.2BS(2.16KG)

7GravelpartiallyreplacedwithfinePalmKernelShell

Aggregate	Quantities	Weight
Gravel	3	9.1BS(4.3KG)
FineP.K.S.	3	5BS(2.5KG)
Sand	5	14.4BS(6.12KG)
Cement	3	7BS(3.4KG)
Water	4	6.2BS(2.16KG)

9 Stone Dust partially replaced with fine Palm KernelShell

Aggregate	Quantities	Weight
StoneDust	3	8.1BS(3.2KG)
FineP.K.S.	3	5BS(2.5KG)
Sand	5	14.4BS(6.12KG)
Cement	3	7BS(3.4KG)
Water	4	6.2BS(2.16KG)

10 KaloKalo partially replaced with fine Palm Kernel Shell

Aggregate	Quantities	Weight
KaloKalo	3	7.4BS(3.8KG)
FineP.K.S.	3	5BS(2.5KG)
Sand	5	14.4BS(6.12KG)
Cement	3	7BS(3.4KG)
Water	6	10.1BS(2.16KG)

11. Normal Palm Kernel Shell Concreate (Fine)

Result Analysis

Compressive Strength Test Result

S/N	ConcreteCubes	Rebound Hammer Valuen/mm²	CompressiveValue
1.	Normalgravelconcrete	35,32,34,31	36
2.	Gravelconcretepartiallyreplaced withcoarseP.K.S.	25,25,28,25	25.7
3.	Gravel concrete partiallyreplace withfineP.K.S.	23,24,23,25	23
4.	NormalStoneDustConcrete	19,20,22,19	20
5.	Stone dust concrete partially replacedwithcoarseP.K.S.	25,22,24,24	23.25
6.	Stone dust concrete partially replacedwithfineP.K.S	22	22
7.	NormalKaloKaloconcrete	24	24
8.	Kalo Kalo concrete partially replacedwithcoarseP.K.S.	15,19,19,16	17.25
9.	KaloKaloconcretepartiallyreplace withfineP.K.S.	14	14
10.	CoarseP.K.S.concrete	22,22,23,25	15
11.	FineP.K.S.concrete	20	20

From the above result, it can be observed that gravel concrete is stronger than when it is partially replaced with palm kernel shell and gravel concrete that is partially replaced with fine palmkernel shell is stronger than gravel concrete that is partially replaced with coarse palm kernelshell.

Also, the result shows that when using stone dust partially replace with coarse palm kernel shell, the concrete tends to have a higher compressive value than the normal stone dust concrete and stone dust partially replace with fine palm kernelshell.Finally,italsoshowsthatkaloka loconcretehasahighandstrongcompressi vevaluethanthatofwhich is partially replaced with either fine or coarse palm

kernel shell.

CONCLUSION

From the result and analysis of each concrete samples, normal gravel is the best for construction because it is stronger than all other aggregate. For stone dust, it is better to replace it partially with coarse palm kernel shell because stone dust partially replaced with coarse palm kernel shell is stronger than that of a normal stone dust concrete .In the case of kalokalo, normal kalokalo concrete is stronger than a kalokalo concrete partially replaced either with coarse or fine palm kernel shell.

RECOMMENDATIONS

Based on the study findings, the following recommendations are made:

Those using gravel for construction project, should make use of only gravel aggregate in a concrete mixture and those using stone dust should partially replace it with coarse palm kernelshell to have good and strong construction. For those having access to kalokalo, it is better to use only kalokalo in the concrete mixture. And finally, when using palm kernel, it is better to use coarse grinded palm kernel shell for concrete mixture.

REFERENCES

F. Incolano, B. Liguori, D. Caputo, F. Colangelo, R. Cioffi, Recycled plastic aggregates inmortarscomposition:Effectonphysicalandmechanicalproperties.MaterialsandDesign,52(1), 16. (2013)

S. Vanitha,V. Natarajan, M. Praba, Utilisation of waste plastics as a partial replacement ofcoarse aggregate in concrete blocks. Indian Journal of Science and Technology, 8(12),1-6.(2015)

M. M. Sadiq, M. R. Khattak, Literature review on different plastic waste materials use inconcrete.JournalofEmergingTechnologiesandInnovativeResearch,2(6),1-4.(2015)

EXAMINING THE EFFECTIVENESS OF BLENDED LEARNING AS A NEW NORMAL FOR SCHOOLS SURVIVAL IN POST-COVID-19 NIGERIA

ANHO, Erere Joy (Ph.D)
Department of Mass Communication
Delta State Polytechnic
Ogwashi-Uku
erere2k7@yahoo.com

Abstract

Following the reopening of schools which were initially closed to curb the spread of the COVID-19 pandemic in Nigeria, various efforts were made by all major education stakeholders to promote continued learning and bridge all potential learning gaps. Blended learning, which involves a combination of the regular face-to-face classroom with the virtual mode, became the new normal for schools' survival in post COVID-19 Nigeria. While this initiative is considered great, many Nigerians believe that the country is ill-equipped for it to be effective. It is against this backdrop that this paper examined the effectiveness of blended learning in Nigeria. The study is qualitative in nature and it was anchored on the critical mass and the diffusion of innovation theories.The analysis, revealedthatblended learning has experienced significant growth in recent time with possible expansion still anticipated but that there are many challenges that beset its effectiveness in Nigeria. The study therefore concludedthatif the wealth of a nation is in its people, access to quality education which blended learning offers must be given attention by all stakeholders to ensure national development. Consequently, it was recommended that government should prioritize education and knowledge by properly funding the education sector.

***Keywords**: Blended Learning, New Normal, Post COVID-19*

INTRODUCTION

Education is a crucial sector in any nation because it is basic to national development. It is a known fact that the standard and quality of the educational system and the capacity to innovate determine the level of growth and development of a nation. Jonathan (2011) cited in Ugwu (2015) corroborated this view when he said that: "Education is the heart of national development and the source of quality human capital development that will propel Nigeria to be among the top 20 economies in the world.

However, this all-important sector was negatively impacted by the outbreak of Corona Virus Disease-2019 (COVID-19) pandemic. It has been reported that due to measures to contain the pandemic, about 1.3 billion learners were out of school and 73.8 percent of the world's school population were affected by school closure (UNESCO, 2020a). This has necessitated the reshaping of education delivery across the globe. In Nigeria, the government at all levels and other relevant stakeholders developed quick solutions through the use of the conventionalmedia of mass

communication (radio, television, newspaper and magazine) and online learning platforms to minimize the impact of the pandemic on the sector. Indeed, rapid development in information and communication technologies has made a significant impact on education.

Following the reopening of schools, the online learning platforms have been combined with the face-to-face classroom mode as a new normal for schools' survival. This is also known as Blended Learning (BL). Some scholars refer to it as the "new traditional model" (Ross and Gage 2006, p. 167) or the "new normal" in course delivery (Norberg et al. 2011, p. 207). However, with the increasing adoption of blended learning in post-COVID-19 Nigeria, there is limited evidence of its effectiveness; instead, most research outcomes have focused on the advantages of blended learning. It is therefore important to interrogate if and how the various online learning platforms are working; knowing full well that they were mostly adopted as immediate response to the crises caused by the pandemic. In the light of the foregoing, this study examined:

1) The innovations that aided learning in Nigeria during schools closure.

2) The effectiveness of these innovations in schools' survival.

3) The major challenges affecting these learning innovations in the post-COVID-19 era.

Conceptual clarification and review of related literature

Before delving into the review of related literature, there are certain concepts like new normal and blended learning which need clarification.

New Normal: The American Dictionary defines new normal as "a previously unfamiliar or atypical situation that has become standard, usual or expected." With the COVID-19 pandemic, the new normal means a new way of living and going about life, work, school and interactions with other people. It is important to note that wearing of face mask, washing of hands, covering of mouth with the elbow when coughing and nose when sneezing, physical distancing and relying on technology for transactions between people are some of the things that have become normal in the post-COVID-19 era.

For schools, the new normal demands remaining and reshaping schooling practices to prevent a possible anticipated second outbreak. This period requires teachers to unlearn old habits and acquire new skills of online learning engagement. In this regard, blended learning has become the new normal for schools survival because its rotation models can be a way to maintain social distancing in schools.

Blended Learning: Horn and Staker (2011, p.3) define blended learning as "any time a student learns at least in part at a supervised brick-and-mortar location away from home and at least in part through online delivery with some element of student control over time, place, path, and/or pace." According the ELM learning (2020) "Blended learning combines the best of two training environments – traditional face-to-face classroom training and high-tech learning." Blended learning serves both those who learn better in a structured environment that includes face-to-face interaction with an instructor, and independent types who learn better with semi-autonomous computer-based training. Brew (2008) further describes blended learning as "integrating online and face-to-face formats to create a more effective learning experience than either medium can produce alone."

While the classroom offers an opportunity for role-playing with immediate face-to-face feedback, online learning provide personalized, self-paced learning with learning components that lend themselves to interactive media in the Learning Management Systems (LMS) and accessible from the learner's Smartphone or tablet.

In today's world, Webinars have become easy route to blended learning. Some webinar tools used during the lockdown and are still being used in the post-COVID 19 era include: Zoom, Google Hangout, Cisco WebEx and Go to Webinar. These tools usually integrate with the Learning Management Systems to synchronize set up, registration, and attendance reporting.

As a matter of fact, blended learning has experienced significant rates of growth in recent time and further expansion is anticipated (Horn & Straker, 2011; Shea & Swan, 2012). Various studies have found that blended learning results in improvement in students' success and satisfaction, (Dziuban & Moskal, 2011; Means et al, 2013), as well as an improvement in students' sense of community (Rovai& Jordan, 2004) when compared with face-to-face courses.

Jaggar (2012) conducted a qualitative study on student's preferences related to enrollment in online courses and found that students preferred "difficult" courses, such as math, to be delivered in face-to-face formats, preferring courses perceived to be "easy" in online formats. Lab science and foreign language were among the subjects rated as poorly suited to online context. Furthermore, Xu and Jaggars (2013) conducted a large-scale analysis of online courses enrollment across community college system in Washington and noticed that humanities, social sciences, education, computer sciences, applied professions, English, mass communication and natural sciences comprised the bulk of students' online enrollment.

Regarding utilization of virtual learning tools, Christie and Jurado (2009) found that some tools are not used. Rather than worry about underutilization, the researchers encouraged teachers to let their pedagogical needs dictate which tools they use.

Theoretical framework

To best understand the thematic preoccupation of this study, the concept of critical mass theory as it applies to the adoption of a new communication technology and the diffusion of innovation theory were used. The **critical mass theory** takes its root in physics, where critical mass refers to the maximum amount of material needed to trigger and sustain a radio-active chain reaction. According to Kaye and Medoff (2001) the term has been loosely applied to communication and refers to the minimum number of people needed as adopters before a new communication technology can have a permanent place in society. Williams, Strover& Grant (1994) reveal that the interesting aspect of the critical mass perspective is that widespread use appears to have a snowball effect. Once a perceived critical mass is using the technology, those without it are strongly motivated to adopt it not minding the draw backs.

Similarly, the **diffusion of innovations theory** developed by Everett Rogers in 1962, originated in communication to explain how, over time, an idea or product gains momentum and spreads through a specific population or social system. Two important factors that influence how quietly diffusion occurs are the way in which innovations are communicated to different parts of society and the subjective opinions associated with the innovations.

The theory recognized that adoption of innovation does not happen simultaneously in a social system; rather it is a process whereby some people are more apt to adopt the innovation than others. Basically, there are five established adopter categories namely;

Ø Innovators: These are people who are

open to risks and the first to try new ideas.

Ø Early adopters: These are people who are interested in trying new technologies and establishing their utility in society.

Ø Early majority: This category encompasses all those who pave the way for use of an innovation within mainstream society and are part of the general population

Ø Late majority: This is also part of the general population and refers to the set of people who follow the early majority into adopting an in novation aspart of their daily life.

Ø Laggards: This category is the hardest to appeal to. It is made up of those who are very conservative and the last to make the changeover to new ideas. They resent change and may continue to rely on traditional products or services until they are no longer available. However, the sweep of an innovation through mainstream society makes it impossible for them to conduct their daily life without it; thereby forcing them to adopt an innovation.

The above theories are relevant to this study because information communication technologies are helping to popularize blended learning and it is believed that more and more institutions will be engaging in this innovation in order to remain relevant in the post-COVID-19 era.

Methodology

This paper is qualitative in nature as such it relied on information from the internet, books, journals and newspapers to draw inferences.

Teaching and learning during COVID-19 pandemic in Nigeria

In a bid to curb the spread of COVID-19 pandemic in Nigeria, the Federal Ministry of Education on 19th March, 2020 approved the closure of all learning institutions in the country (Nlebem, 2020). This abrupt closure led to significant disruption in the education system causing relevant stakeholders to adapt quickly and put various measures in place to ensure that students continue to learn despite the closure.

Among the interventions to ensure continuous learning was the setting up of the Nigeria Education Sector COVID-19 Response Strategy by the Federal Ministry of Education and the Universal Basic Education Commission (FMoE, 2020). The Federal Ministry of Education, through the Learn at Home programme and in partnership with educational technology companies, launched virtual learning platforms and provided links to e-learning resources. These virtual learning platforms include School Gate, Mobil Classroom, WAEC E-learning toolkit and unity schools virtual learning platforms among others.

The Education Partnership Centre (2020) report says the School Gate virtual platform gives school children free access to instructional materials while the Unity Schools virtual learning platform was set up for students enrolled in the federal government owned unity secondary schools and those from other schools. To access the platform, students join a telegram group where codes for JSS 1 to SSS 3 classes were provided. The WAEC E-learning toolkit on the other hand, provided students with resources needed to effectively prepare for the West African Senior Secondary School CertificateExamination (WASSCE). The website gave students access to detailed answers to past WASSCE questions.

Again, the Federal government in partnership with 9mobile telecommunications provided data-free access to Khan Academy, SchoolGate, Seesaw, Mobile Classroom and Centre for Entrepreneurship and General Studies for 9Mobile data users. It is worthy tonote that lessons centered on content of core primary and secondary school subjects were transmitted on radio, television and other online platforms. It is disheartening to note that the tertiary institutions were not considered by the federal government in its effort to promote learning during the period under review. Tertiary institutions that had the needed facilities had to make their own arrangements by utilizing the learning management systems platforms and Video conferencing for their virtual learning.

On a general note, the education sector in Nigeria made use of the following learning platforms within the period: traditional media (radio and television), mobile (WhatsApp and Telegram), social media (YouTube, Facebook), virtual conferencing (Zoom, Cisco Webex), Learning Management Systems (School website, moodle, Google classroom) and home schooling.While it was relatively easy for private institutions and schools in urban areas to adapt quickly to the virtual learning model by adopting some of these learning platforms, the situation was not so easy for the public schools because "the delivery of education in Nigeria has mainly been through in-person learning taking place in classrooms with very little embrace of digital options by schools" (Kazeem, 2020). Besides, much awareness was not created on the availability of the government initiatives to necessitate quick adoption.

Most parents struggled to access the common online platforms because they are not familiar with the technology. The situation was even worse for learners in the rural areas due to electricity and non-availability of internet access. While internet access or cost are not likely to prove a barrier among high-class and middle-class households that can afford private schools or sign-up with Ed-tech startups, the quality of access remains in question because the Nigeria broadband speed is slow.

For the low-income households however, virtual learning is out of reach due to the high cost of data and internet-enabled devices. This explains why most state governments adopted the traditional mass media option for remote learning. But this platform lacks the interactivity that internet enabled platforms provide.

Furthermore, students/teachers' unwillingness to change is yet another challenge that beset virtual learning in Nigeria during the lockdown. Although most institutions have learning management systems that enable virtual learning, such platforms are only used for students' registration and computer-based examinations. Teachers/students do not often use the platform to teach or learn either because they are not familiar with the platforms' interface or they are generally not ICT-compliant. To cover up for their short comings, they will rather stick to teaching and learning in person in a face-to-face traditional mode.

Blended learning, the new normal in post-COVID-19 Nigerian

Following all those teachers and learners have gone through during the shutdown of schools in Nigeria, blended learning has become the new normal in the post-COVID-19 era. Nevertheless, many Nigerians are concerned about its effectiveness considering how ill-equipped the country is in terms of infrastructure. Experience has shown that changing the medium of instruction requires more than just new technology; but also new attitudes and skill sets (Kassner, 2013). To this end, teachers' fear of technologyis gradually giving way to an emerging sense of obligation to master technology and explore ways to integrate it into their pedagogy as professionals. However, Adetola (2020) has

advanced four major challenges facing the establishment and by extension the effectiveness of blended learning in Nigeria. They are:

1)Finding the right blend: One significant challenge faced by those developing and delivering blended learning in Nigeria is identifying the instructional strategies that match well with the conditions that are present in the face-to-face learning environment and the virtual learning environment. The desire to achieve the right blend, both from a learning and cost effective point of view makes this challenge more complex.

2) Increased demand on time: Prior to the shutdown of schools in Nigeria, teachers were generally comfortable with creating and presenting instructional materials either in a face-to-face learning environment or in a remote learning environment, but not for both. When the same teacher decides to utilize both learning environments to teach a single course as demanded by blended learning, the time demands of the teacher increases because instructional materials must be developed to suit each of the environments.

3) Overcoming barriers of institutional culture: In Nigeria, there are cultural barriers for both teachers and learners that must be overcome in order to use blended learning effectively. A general component of blended learning requires a large amount of self-discipline on the part of the learners because learning in that setting is largely independent.

4) Inadequate infrastructure: Limited availability of infrastructure such as telecommunication networks and services, which require development and expansion, continues to elude the Nigerian educational system. Where they are available, they are often not accessible to all teachers and learners. For blended learning to be effective, internet services must be available and affordable to all.

Apart from these challenges, there are still several others such as insufficient allocation of fund to education, poor electricityandnon implementation of educational initiatives and policies among others which are working against the effectiveness of the new normal in education.

CONCLUSION AND RECOMMENDATIONS

If the wealth of a nation is in its people, access to quality education which blended learning offers must be given attention by all stakeholders to ensure national development. Various studies as reviewed in this paper have shown that blended learning has great benefits. But there are numerous challengesthat are besetting its effectiveness in Nigeria. In the light of the above, the following recommendations are therefore given:

1) Educational institutions should equip teachers and schools with necessary skills and learning tools to make blended learning effective. Organizing seminars for teachers and students on how to use the learning platforms adopted by various institutions will be a good way to start.

2) Internet providers should partner with Ed-tech companies to ensure that students who are plagued by the digital divide due to poverty have free access to the internet by limiting this access to the education platforms only. Alternatively, the government at all levels should encourage students to continue their online learning by making available to them smart phones free of data charges.

3) Government should prioritize education and knowledge by properly funding the education sector. With proper funding, schools will be well equipped and staffed to compete with international standards.

4) The traditional mass media of communication should also take it as a duty to create awareness on the various learning platforms and how to use them. The broadcast media should also produce and transmit instructional programmes that would promote on-line teaching.

REFERENCES

Adetola, A. (2020). Establishing blended learning in the Nigerian educational sector. https://www.skillsoutsideschool.com

Brew, L. (2008). The role of student feedback in evaluating and revising a blended learning course. Internet and Higher Education, 11, 98 – 105.

Christie, M. & Jurado, R. (2009). Barriers to innovation in online pedagogy. European Journal of Engineering Education, 34(3), 273 – 279.

Dziuban, C. &Moskal, P. (2011). A course is a course: factor invariance in student evaluation of online, blended and face-to-face learning environments. The Internet and Higher Education, 14(4), 236 -241.

Education Partnership Centre (2020). Learning in a pandemic: Nigeria's response to teaching and learning during the COVID-19 pandemic. https://education.gov.ng

ELM Learning (2020). What is blended learning? A guide to everything you need to know. http://elmlearning.com

Horn, M. &Staker, H. (2011). The rise of K-12 blended learning. Report. Innosight Institute. Retrieved from http://www.innosightinstitute.org/innosight/wp-content/uploads/2011/01/The -Rise-of-k-12-Blended-Learning.pdf

Kazeem, Y. (2020). Nigerian schools are being forced to rethink their digital limits and education models in a pandemic. https://www.google.com

Means, B., Toyama, Y., Murphy, R., &Baki, M. (2013). The effectiveness of online and blended learning: A meta-analysis of the empirical literature. Teachers College Record, 115(3), pp. 1 -11

Nlebem, A. (2020 March 19). FG orders closure of all schools in Nigeria as corona virus spreads. Business Day. https:/businessday.ng/coronavirus/article/fg-ordersclosure-of-all-schools-in-nigeria-ascoronavirus-spreads/

Norberg, A. Dziuban, C. D. &Moskal, P. D. (2011). A time-based blended learning model. On the Horizon, 19(3), 207 – 216.

Rose, B. & Gage, K. (2006). Global perspectives on blended learning. In C. J. Bonk & C. R. Graham (eds.) The handbook of blended learning – Global perspectives, local designs.CA: Pfeiffer – An imprint of Wiley

Rovai, A. P. & Jordan, H. M. (2004). Blended learning and sense of community: a comparative analysis with traditional and fully online graduate courses. International Review of Research in Open and Distant Learning, 5(2), pp1 – 13.

Ugwu, S. C. (2015). Education and national development: Nigeria Experience. Knowledge review, 32(1) https://www.globalacademicgroup.com

Xu, D. & Jaggars, S. (2013). Adaptability to online learning: differences across types of students and academic subject areas. https://ccrc.tc.columbia.edu/publications/adaptability-to-online-learning.html

FARMERS-HERDERS CRISES AND FOOD INFLATION IN NIGERIA: EVIDENCE FROM DELTA STATE

OGANA Michael
Department of Human Resource Management,
Delta State Polytechnic, Ogwashi-Uku, Delta State
Michaelogana4u@gmail.com

MORDI Kenneth Ejime
Department of Production & Operations Management,
Delta State Polytechnic,Ogwashi-Uku, Delta State
mordikenneth11@gmail.com

OGALA Sunday Christian
Department of Arts and Humanities,
Delta State Polytechnic,Ogwashi-Uku, Delta State
ogalasundaysoc@mmail.com

Abstract
Food and human insecurity are the major problem facing Nigeria. This paper examined farmers/herders crises as it affects food security in Nigeria with evidence from Delta State. The study is anchored on frustration aggression theory. The study adopted both qualitative and quantitative method as well as descriptive survey research design, making use of both primary and secondary data. The secondary data were sourced from journals, online daily newspapers and other online publications while the primary data were sourced with structure questionnaire. 40 farmers were selected from two communities in each senatorial district of Delta State. The choice of community was determined by the occupation of the people and incessant activities of herdsmen. The study adopted simple percentage to analyze the raised issue. The study finds out that there has been reduction in output and income of crop farmers as a result of destruction of crops by cattle and indiscriminate bush burning. A lot of farmers lost part or the whole of their crops. This spelt reduced yield which translated into low supply of food, low income on the part of the farmers who take farming as major occupation and general food inflation in the state. The study therefore recommends the development of modern livestock management system, grazing reserves to target pastoralists with large stocks where skills for pasture production, large milk production, etc can be promoted.

Key words: Farmers, Herdsmen, Food Security

THE SCALE: MAIDEN EDITION VOL 1 NO 1 DECEMBER 2021

INTRODUCTION

Farmers-Herders conflict is as old as the existence of man. It started from the children (Cain and Abel) of the first man (Adam). Abel was a shepherd and Cain was a farmer according to Bible's account, however, Cain killed Abel in the field out of jealousy. This conflict is believed to have existed since the beginning of agriculture and either increased or decreased in intensity or frequency depending on economic, environmental and other factors. Okoro (2018) averred that herdsmen-farmer or harder-farmer conflicts are conflicts occurring between peasant farmers and nomadic livestock keepers. He further stated that conflict occurs whenever disagreements exist in a social situation over issues of substance or whenever emotional antagonisms create frictions between individuals or groups. The issues of substance may include resources such as land, water, trees, crops, crude oil, diamond, gold, reserves and rights – grazing rights, farming rights and hunting rights. However, most conflicts emanating from the above itemized issues are called resource conflicts. Blench (2016) asserted that resource conflicts can be classified into two, namely point resources including mines, farms and reserves and eco-zonal conflicts including water, grazing and hunting rights.

Farmer-herder crises in Nigeria occur as a result of resource scarcity; there exists a growing scarcity of arable land and water sources that are equally essential to sustain crop cultivation and cattle herds. Farmers encroach on grazing routes, and have expropriated land designated to grazing reserves, while herders often destroy crops, pollute water sources and trespass on farms to feed their cattle. This is further exacerbated by the growing population of farmers, herders and their herds, increasing scarcity of arable land due to droughts, impending desertification of the sahel-savannah, land degradation, and cultural differences among ethnic groups that predominantly farm or graze cattle (Fayinka, F. A. (2004).

As Okoro, (2018) put it the struggle for survival and protection of economic livelihood such as farmlands, crops and cattle appears to precipitate conflict between herdsmen and farmers across many communities in Nigeria. And most times the attacks and counter attacks between these vulnerable groups in the rural areas are precipitated by government inaction. The people take law into their hands because they feel they are abandoned by the governments, and some of them even migrate to the urban areas abandoning their farmlands, just to secure lives.

In Delta State of Nigeria, there has been hue and cry by many people in various communities of the incessant herdsmen/farmers conflicts in the recent past. The conflicts have taken dangerous dimensions, to the extent that clashes have become frequent and culminating into killings, maiming, arson and invasion of communities. Communities with cases in recent times include Obiaruku, IsseleAzagba, Agadama, Abraka, Ohoror, Kwale, Isoko, Umutu, Afor and Ogume etc. This situation has created debilitating security challenges including high incidence of crime, food shortages, poor farm produce, because farmers were forced to abandon their farm land due to security challenges and other economic problems this conflict pose to Delta State and the country in general. In the light of the foregoing, this paper examines the Herdsmen and farmers crisis and its effects on food challenges; in Delta state

STATEMENT OF PROBLEM

Resource conflict is not unusual and perhaps not unnatural in human ecosystems. Conflict per se, is not bad: it is perhaps a necessity in the evolution and development of human organizations. But when conflicts degenerate to violent and

destructive clashes, they become not only unhealthy but also counter-productive and progress-threatening.

Sylvester (2017) submits that the violence between herdsmen and farmers has displaced more than 100,000 people in Nigeria and left them under the care of relatives or in make shift Internally Displaced Persons (IDPs) camps while many are still struggling to rebuild their lives. The Global Terrorism Index (GTI) recently placed the Nigeria's Fulani herdsmen as the world's fourth deadliest militant group for having accounted for about 1,229 deaths in 2014. Amnesty International (as published on New Telegraph) on January 29th 2018 asserted that "the Nigerian authorities' response to communal violence is totally inadequate, too slow and ineffective, and in some cases unlawful. Clashes between herdsmen and farmers in Adamawa, Benue, Taraba, Ondo and Kaduna have resulted in 168 deaths in January 2018 alone. Hundreds of people lost their lives in 2017, and the government is still not doing enough to protect communities from these violent clashes. For instance, 549 deaths were recorded across 14 states while thousands were displaced in 2017 (Oli, Ibekwe, & Nwankwo, 2018)

There has been a gap in the literature to show the relationship between farmers/herders' crises and food priceinflation and price volatility in Nigeria. Food inflation in Nigeria has witnessed dramatic changes in recent years. Beginning from February 2016 food inflation as well as overall inflation has remained high at double digits. Food inflation rose to 22.95% in March 2021, caused by wide-ranging price increases across items such as cereals, yam, meat, fish and fruits. It is on this note that this paper examined the nexus between farmers-herders' crises and food inflation in Nigeria: evidence from Delta State.

Conceptual Frame Work

The agricultural sector has been the mainstay of the economy since independence and despite several bottlenecks; it remains a resilient sustainer of the populace. In the 1960s, Nigeria was the world largest exporter of groundnut, the second largest exporter of Cocoa and Palm Oil and an important exporter of Rubber and Cotton (Olaniyi&Opara 2018). Recently, agriculture employs about two-thirds of Nigeria labor force, contributes significantly to the GDP and provides a large proportion of non-oil earnings (Olokor, 2018). Thus, farmers/herdsmen contributions to the development of the Nigerian economy cannot be overemphasized. Studies have shown that livestock production contributed to about 6% of the Nigeria's Gross Domestics Products (GDP). Explicitly, livestock breeders are one of the primary sources of the food in Nigeria particularly for the urban areas of the country. To the extent Fulani pastoralists and herdsmen have been relevant to dietary existence wellbeing of Nigerians (Idowu, A.O. 2017). It is disheartening to discover that farmers and livestock breeders who are the major source of raw materials are in conflicts which have affected food production in the country.

Cases of Farmers and Herders conflicts in Delta State

Herdsmen and farmers violence in Nigeria is difficult to come by due to the lack of a dedicated database; therefore, most of the evidence comes from newspaper reports of various incidents involving the herdsmen and farmers in settled communities. Some sources claimed that since 2001 over 60000 persons had died in Nigeria. The table 1.0 shows cases of herders and farmers conflict in Delta State.

Table 1.0: Cases of Herders and Farmers conflict in Delta State

S/N	Date	Location	Casualties/ Degree of Destruction	*Source*
1	September30 2013	Isoko North local government council, Delta State.	Fulani herdsman was accused of murdering the Director of personnel management	(Oli et al., 2018)
2	April 19 2014	Onitsha Ukwuani in Ndokwa West Local Government area of Delta State	killing of 23 people by the nomadic herdsmen	Editor O, (2016)
3	September 2015	Illah community in Oshimili North Local Government Area of Delta State	left about three persons dead	(Oli et al., 2018)
4	December 7, 2015,	Ofagbe community, Isoko North, Delta State	herdsmen reportedly killed a man	Ochuko A. 2015)
5	December 7, 2015	in Obiaruku community, Ukwani local government area, Delta State	The killings continued as herdsmen unleashed terror	Ochuko A. 2015)
6	March 2, 2016	Ossissa, Ndokwa, Delta State	4 persons killed, some wounded, and residents forced to flee their homes as houses were destroyed.	(Oli et al., 2018)
7	April 27, 2016	Issele- Asagba community in Delta State	The Herdsmen reportedly harassed farmers and held eight of them hostage for several hours.	Editor O, (2016)
8	May 14, 2016	Illah community in Oshimili North Local Government Area of Delta State	Fulani nomads tried rapping the woman and was later beheaded as she resisted Fulani nomads beheaded a woman and left two others with sever machete wounds.	(Oli et al., 2018)
9	June 19, 2016	Ossissa community, Ndokwa East Local Government Area, Delta State	A lawyer and others abducted. 1 person was killed	(Oli et al., 2018)
10	December 30, 2017	Okpanam community near Asaba.	No fewer than three persons were feared killed by Fulani herdsmen	(Oli et al., 2018)
11	January 9, 2017	Abraka and Obiaruku, both in Ethiope East and Ukwuani LGAs, Delta State	No fewer than 5 persons were killed.	(Oli et al., 2018)
12	March 6, 2017	Omumu community,	Omumu community, Ika South LGA,	(Oli et al., 2018)

Author's compilation from reportages of various online mass media and the work of Oli, Ibekwe, & Nwankwo, (2018)

THEORETICAL FRAMEWORK

Frustration-Aggression Theory

Frustration-aggression theory as espoused by John Dollard and expanded by Miller cited in Osisioma, (2004) is used to explain farmers-herdsmen clashes. This theory contends that the reason for the display of aggression by people is the feeling of not being able to completely get what they actually deserve. In other words, when what people get is lower than their expectations, they result to conflict. He further posits that where expectation does not meet attainment, there is a high likelihood for the aggrieved party to confront anybody they feel is responsible for their inability to attain their desires. Frustration-aggression theory conceives conflict as the outcome of frustration of an individual or group from being unable to attain their legitimate desire. This theory has some major propositions which when explored are capable of explaining farmers-herdsmen conflicts in Nigeria.

Frustration-aggression theory explains the farmers-herdsmen conflict in the sense that, they both feel they are legitimately entitled to pasture land and water due to the nature of their occupation, The farmers feel that, by virtue of being the indigenous owners of the land, there should be no further reduction on the limited available land which is not commensurately owned with their given demographic explosion. They feel that Fulani's encroachment on their land is a hindrance to attaining their full farming potential, since they have large families that cultivate large expanse of land. The Fulani on the other hand feel that the farmers are problems to them in accessing pasture land and water, thereby mal-nourishing their cattle and reducing their market value by making them less attractive. The Fulani's major preoccupation is to have a large herd of cattle, and any hindrance to achieving such a goal is confronted with very strong aggression and attack.

Empirical Review

Ofuoku and Isife (2010) conducted a study in Delta state to investigate the farmers-nomadic herders' conflict that is very common in many parts of Nigeria. Using simple random and positive sampling techniques, 80 farmers and 20 nomadic cattle herders were selected respectively from 8 randomly selected communities. Data were collected using structured interview schedule. The study found out that the causes of the conflict include destruction of crops, contamination of streams by cattle, zero grazing of land, disregard for local traditional authorities, female harassment, harassment of nomads by host communities youths, indiscriminate bush burning, defecation of cattle on roads, cattle theft, and straying of cattle.

Rahim M. A, (2011) conducted a study on the herdsmen and farmers conflicts in North-Eastern Nigeria examining its causes, repercussions and resolutions. The study was conducted in Yobe State, Nigeria. Four-stage cluster random sampling procedure was used to select respondents for the research. Relevant data were collected with the aid structured questionnaire. The author averred that the necessity to provide food crops and animal origin, as well as raw materials for industry and export in order to meet ever-growing demands, has led to extensive use of land. Also, he argued that conflicts have demonstrated high potential to exacerbate the insecurity and food crisis particularly in rural communities where most of the conflicts are localized, with repercussions nationwide

Sylvester (2017) conducted a study on anti-grazing policy and conflict resolution between Fulani herdsmen and farmers in Ekiti state. Primary and secondary data sources were used to generate data for the study. Purposive sample was used to draw the 22 interview respondents. Both data from interview and secondary sources were analyzed qualitatively. The study revealed that the Ekiti State Government passed into Law Anti Grazing Bill 2016 to resolve various conflicts between Fulani herdsmen and Farmers in Ekiti State. It also revealed that the Government set up Ekiti Anti-Grazing Enforcement Marshal who implements the Law. The State government partner with the 16 Local Governments in allocation of land to herdsmen for cattle's grazing. It was established that the government also collaborates with the herdsmen association in Ekiti to maintain peaceful implementation of the law. It recommended the creation of grazing zone; private ownership of ranch; border should be secured; training of Ekiti State Grazing Marshal and proper monitoring of their operations. Although this study by Sylvester claimed that the anti-grazing policy has succeeded in resolving the conflict between herdsmen and farmers in Ekiti state, news reports have proven otherwise.

Chinwokwu (2017) conducted a study on glamorization of Fulani herdsmen's criminality and its implications on national security in Nigeria. Using secondary method as the source of data collection, the study revealed that government inaction to caution, arrest, prosecute or punish the criminal activities of the Fulani herdsmen is evidence that government is behind their activities. It also viewed government silence as shrouded in inert motive which is not far from expansionist ideology. Therefore, the study suggested that efforts of government must ensure that the activities of Fulani herdsmen are checked to ensure peace and security across the country.

Oli and Ibekwe (2018) examined the prevalence of herdsmen and farmers conflict in Nigeria. The study is anchored on the frustration-aggression and conflict theories. Data were extracted and used from secondary sources like journals, textbooks, newspapers and online organizational publications. Findings from the study showed that some of the factors that usually led to clashes were limited or unavailability of sufficient resources like grazing fields, farm lands, destruction or grazing on crops, long-standing disagreements, lack of access to farm or grazing fields and scarcity of fresh water. Consequently, loss of human and animal lives, destruction of crops and properties, displacement of persons and animals, distrust between herdsmen and farmers, rising anti-Fulani sentiment and breakdown of peaceful relationship with many communities in some parts of the country were amongst the gross effects of the conflict

METHODOLOGY

The study employs descriptive survey research design, making use of both primary and secondary data. The structured questionnaire was in two sections (A and B). Section A comprised of four items and was used to obtain general background information of the respondents while the section B contains twenty (20) items used to elicit information on the activities of herdsmen and farmers in Delta State.

The study sample was made up of 120 farmersin six randomly selected communities from Delta Central, Delta South and Delta North senatorial District of Delta State. In Delta North, Isele-Azagba and Ossissawhile in Delta Central, Abraka and Uwheru. In Delta South, OfagbeandUzere were selected. The choice is determined by the occupation of the people and incessant activities of herdsmen.

SECTION A

Table 2.0: Personal characteristics of Respondents

Authors construction from field survey 2021

SECTION B

Table 3.0: The Causes of the Herdsmen/farmers crisis in Delta state

S/N	Causes of the Herdsmen- farmers crisis	SA	A	D	SD	Total
1	Destruction of crops/bush burning by herdsmen	42 35%	52 43.3%	10 8.3%	16 13.3%	120 (100%)
2	Contamination of stream by cattle	28 23.35%	38 31.7%	34 28.3%	20 16.7%	120 (100%)
3	Zero grazing of fallow land	42 35%	28 23.3%	33 27.5%	17 14.2%	120 (100%)
4	Disregard for traditional authority	67 55.8%	12 10%	23 19.2%	18 15%	120 (100%)
5	Sexual harassment of women by Herdsmen	59 49.2%	23 19.2%	26 21.7%	12 10%	120 (100%)

Authors construction from field survey 2021

Table 4.0: The socio-economic effects of the conflicts

	The socio-economic effects of the conflicts	SA	A	D	SD	Total
6	Creates ethno-religious suspicion	75 62.5%	15 12.5%	18 15%	12 10%	120 100%
7	Leads to arms proliferation/arms running	82 68.35%	20 16.7%	10 8.33%	8 6.7%	120 100%
8	Heightens tension in the state	45 37.5%	28 23.33%	27 22.5%	20 16.7%	120 100%
9	Leads to development of militancy	80 66.7%	12 10%	15 12.5%	13 10.8%	120 100%
10	Dissertation of community due to fear	65 54.2%	34 28.33%	11 9.2%	10 8.33%	120 100%
11	Smell and bad odour/health hazard	75 62.5%	15 12.5%	18 15%	12 10%	120 100%
12	Loss of house and properties	82 68.35%	20 16.7%	10 8.33%	8 6.7%	102 100%
13	Loss of lives	65 54.2%	34 28.33%	11 9.2%	10 8.33%	120 100%

Table 5.0: Implications of the Herdsmen- Farmers crisis to food production in Delta state

	Implications of the Herdsmen- farmers crisis food security in Delta state	SA	A	D	SD	Total
4	Displacement of farmers	95 79.2%	15 12.5%	7 5.8%	3 2.5%	120 100%
5	Fear of sending children to farm	82 68.35%	20 16.7%	10 8.33%	8 6.7%	102 100%
6	Loss of produce in storage	45 37.5%	28 23.33%	27 22.5%	20 16.7%	102 100%
7	Reduction in output and income of farmers/ Herdsmen	80 66.7%	12 10%	15 12.5%	13 10.8%	102 100%
8	Increase in the price of beef due to scarcity	65 54.2%	34 28.33%	11 9.2%	10 8.33%	102 100%
9	Scarcity of farm produce	80 66.7%	12 10%	15 12.5%	13 10.8%	120 100%
0	Increase in the price of farm produce	95 79.2%	15 12.5%	7 5.8%	3 2.5%	120 100%

DISCUSSION OF RESULTS

This study will be discussed based on the main objective that guided the study.

Table 3.0 shows that destruction of crops/bush burning, disregard for traditional authority, Sexual harassment of women by Herdsmen are the major causes of farmers/herders conflict. This is congruent with Ofuoku (2010) who stated that the most frequent cause of such conflict is the destruction of crops by cattle. These cattle enter the farm to feed on the foliage of crop even in the presence of the herdsmen who pretend not to notice such destruction. Rape, a major cause of conflict is a taboo to every society in the world and in Africa in particular, it is not taken lightly.

Also, table 5.0 revealed that reduction in output and income of crop farmers as a result of destruction of crops by cattle and indiscriminate bush burning. A lot of farmers lost part or the whole of their crops. This spelt reduced yield which translated into low supply of food, low income on the part of the farmers who take farming as major occupation. This is in line with Baumann (2016) studies who revealed that food insecurity is a major cause of food price inflation in Pakistan.

CONCLUSION

This paper focuses on farmers/herders crises as it affects food security in Nigeria with evidence from Delta State. Farmers/herders crises have disrupted farming activities and cause panic to the host communities. This crisis has resulted to shortage of food supply as most farmers are forced to abandon their farm land. This tends to negatively affect their savings, credit repayment ability, food security and economic welfare of both rural and urban dwellers that depend on these farmers for food supply.

Beginning from February 2016 food

inflation as well as overall inflation has remained high at double digits in Nigeria as a result of food scarcity. Food inflation rose to 22.95% in March 2021(CBN 2021) caused by wide-ranging price increases across items such as cereals, yam, meat, fish and fruits. This can be traced to worsening crises faced by farmers and herders who are the major players in the Agricultural sectors.

RECOMMENDATIONS

The study recommends the following for proper crises resolutions between the Fulani herdsmen and farmers.

1) Use of and development of grazing reserves to target pastoralists with large stocks where skills for pasture production, large milk production, etc can be promoted.

2) Semi-intensive systems of animal husbandry should be pursued accompanied with requisite investment in infrastructure, training, extension, marketing and animal health service delivery in conjuncture with the private sector.

3) Government should be firm and fair in its resolution and implementation of decisions. Traditional and local leaders should be well involved in finding solutions to herdsmen-farmer crises. The committees proposed above must have representatives of the local leadership.

REFERENCES

Akenzua, O. (2017, December 30). Three feared killed in fresh Delta herdsmen attacks. Retrieved February 3, 2019, from The Guardian: https://guardian.ng/news/three-feared-killed-in-freshdelta-herdsmen-attacks/

Amnesty International. (2018). Harvest of Death: Three Years of Bloody Clashes Between Farmers and Herders. Nigeria.

Baumann, K, (2016) Land Use Conflict between Farmers and Herdsmen – Implications for Agricultural and Rural Development. Ilorin: Department of Agricultural Extension and Rural Development, University of Ilorin.

Blench, O. (2016) No Retreat No Surrender Conflict for Survival between Fulani pastoralists and Farmers in Nothern Nigeria. European Scientific. 8(1).

Chido Okafor, Warri and Sony Neme, (February 16, 2020) The Guardian

Chinwokwu (2017) Non-aggressive reactions to frustration. Psychological Review, 48(4), 343–346. Sunday, N. (2017, April 19). Kwara to commence herdsmen registration. Retrieved February 5, 2019, from Vanguard: https://www.vanguardngr.com/2017/04/kwara-commence-herdsmenregistration/

Euwema, M., (2015). The National Security Implications Of Herdsmen/Farmers Conflicts In Kogi State. Scientific Research Journal. VII.

Editor O, (2016 April 26) Killings carried out by suspected herdsmen between 2012 and 2016 according to the media reports. The Guardina newspaper. Retrieved from https://guardian.ng/features/killings-carried-out-by-suspected-herdsmen-between-2012-and-2016-according-to-the-media-reports/

Hagmann (2017), 4 die in Kwara farmers, herdsmen clash. Retrieved 02 03, 2017, from Vanguard: https://www.vanguardngr.com/2017/03/4-die-kwara-farmers-herdsmenclash/

Idowu, A.O. 2017). The Political Ecology of Herdsmen/Farmers Conlict in Nassarawa State, Nigeria. American International Journal of Contemporary Research, 2(5).

Mathew O, (2020) Issele-Azagba:Delta Community in the grip of Bandits. The Punch Newspaper. https://punchng.com/issele-azagba-delta-community-in-the-grip-of-bandits/

Ofuoku, A. &Isife, B. (2010). Causes, Effects and Resolution of Farmers-Nomadic Cattle Herders Conflict in Delta State, Nigeria. International Journal of Sociology and Anthropology Vol.1(2:) 47-54.

Ochuko A. (December 7, 2015) Vanguad

Oli, I. &Nwankwo ,G. (2018) Conflicct between Fulani Herders and Farmers in Central and Southern Nigeria. An International Journal of Arts and Humanities, 3(1).

Okoro, S. (2018) Cattle management of pastoralist and conflict resolution strategies in the tropical humid rain forest zone of southern Nigeria. Journal of International Scientific Publications: Agricultue and Food.

Olaniyi , S., &Opara , G. (2018). Fulani herdsmen kill 32 in Kogi State attack. Abuja and Lokoja: Guardian Newspaper.

Rahim M. A, (2011) Managing conflict in organizations. New Jersey: Transaction Publishers. Lagos, Nigeria

Sylvester, O. (2017). Anti-Grazing Policy and Conflict Resolution between Fulani Herdsmen and Farmers in Ekiti State. Asian Research Journal of Arts & Social Sciences, 4(1), 1-13.

Williams, A. (2018). Herdsmen and Farmers Conflict in Nigeria: Another Dimension of Insecurity. Journal of Public Administration and Social Welfare Research, 3(1), 2504-3597.

FEASIBILITY STUDY OF ANDROID APPLICATION IN NBTE-ACCREDITED CURRICULUM OF ARCHITECTURAL TECHNOLOGY EDUCATION

[1]ONWUKWE, Chukwuemeka S.O., [2]ONYEKWENA, Tobechukwu&[1]OGBUOKIRI, Obinna A.C.
[1]Department of Architecture, Federal Polytechnic Nekede-Owerri, Owerri, Imo State
sonwukwe@fpno.edu.ng
[2]Department of Quantity Surveying, Federal Polytechnic Nekede-Owerri, Owerri, Imo State
tobechukwuonyekwena@gmail.com
[1]Department of Architecture, Federal Polytechnic Nekede-Owerri, Owerri, Imo State
clinhausarchitects@gmail.com

Abstract

*The recently reviewed curricula for Architectural Technology Education by the NBTE released as at October, 2020 is still recommending Windows XP and Windows Vista operating systems and applications as learning resources for all courses at both the HND and ND levels of Architectural Technology. These operating systems are more than a decade old, rigid and obsolete. To this end, this study is premised on investigating the practicability of adopting android operating systems and their applications as learning resources in teaching and learning course modules in Architectural Technology Education. Cross-sectional survey research methodology was adopted to elicit responses from participants sampled from NBTE-accredited polytechnics domiciled in the six geopolitical regions of the country. Slovin's formula (**$n = N / (1 + Ne^2)$ **as shown in section** vend **employing** confidence level of 95 % with an alpha level of 0.05 was used to generate sample size for each polytechnic. Respondents were composed of technologists/instructors, lecturers and HND/ND incoming students. A total of six (6) polytechnics, one from each geopolitical zone, and three hundred and fifty-three (353) respondents provided data for this study. Data collated and analyzed provided results which indicated that android operating systems and their widgets provided visualized, user-friendly, affordable and interactive capabilities for architecture students and teachers. This will ensure overall above par performance ofstudents in General Studies/Education, Foundation and Professional Courses thus providing a high-tech driven crop of middle manpower in Architectural Technology.*

***Keywords*:** Alpha level, Android, Architectural Technology, Operating System, Widgets.

THE SCALE: MAIDEN EDITION VOL 1 NO 1 DECEMBER 2021

INTRODUCTION

Android is one of the most useful and powerful operating systems because of its supporting feature. In several aspects, smartphones are considered as important tools of innovation. Android technology is also a remarkable tool for distributing new knowledge and proffering viable solutions. Due to technological inventions, the android operating system has undergone great changes and it is running on countless models of smartphones, personal computers, tablets, as well as many other devices **(Odeh & Nwampkpa 2018)** With the availability ofsmartphone devices and advancement in mobile technology, developers are designing interactive and effective android applications which can be used for learning and teaching architecture through single platform **Philip 2016** Careful investigation of the recently reviewed curricula of the NBTE for Architectural Technology shows new addition of courses both at the ND and HND level. The courses, including computer courses, have specified learning resources which only revolve around operating systems (OS) like Windows XP and Vista. It's even worrisome to note that both operating systems are no longer in use today as they have been replaced by far more intelligent and robust operating systems. While Windows XP was released in October 25, 2001**(Microsoft 2021)** Windows Vista debuted in January 30, 2007 **Fisher 2021**. Invariably, operating systems listed as learning resources in a 2020 document are more than a decade old. The curricula never listed android as a learning resource.

To this end, this study is aimed at finding out the practicability of adopting android applications in teaching and learning course modules domiciled in Architectural Technology Education in NBTE-accredited polytechnics. This is ensured by the following specific objectives:

a. To initiate an innovative pedagogy of Architectural Technology by incorporating in the curricula learning resources and operating systems with improved interface design, interaction, visualization capabilities and system functionalities;

b. To groom a technically innovative crop of manpower that can transform their knowledge to actual practice through the use, efficiency, output index and visualization techniques of android applications;

c. To improve on the capacity of preferring architectural solutionsof both students and instructors/technologists by providing affordable and cost-effective platforms powered by android operating systems and applications;

d. To build a new order of middle manpower that know their onions as concerns security of data, legal/copyright fireworks and privacy clauses;

e. To build an output-driven middle manpower based on operational parameters in order to promote problem-solving, encourage literacy development and creative thinking skills through android applications.

Android applications are gradually displacing traditional architectural design and learning technologies thus becoming more advanced in the education sector due to its innovative and efficient technologies like virtual Reality (VR) and Augmented Reality (AR). In Architectural education for visualization of three-dimensional (3D) model, students require this technology on mobile devices to compare their 3D models with real worldobjects. Image architecture, virtual scene and digital simulation, among other applications, are examples of digital technologies that have been involved in the education process of architectural education to replace traditional education tools which was mainly based on two dimensional (2D) sketches on physical 3D models. Integration of complete digital teachinglike computer aided drafting (CAD), modeling and enumerating has

become the main subject in Architectural education. Over the past decades, mobile technologies are providing more effective educational methods for classrooms and outdoor learning. The rest of the paper is further structured as follows:

I. Section Improvises an overview of android;

ii. Section IIpresents the basic components of android application;

iii. Section III outlines the use of android application in the education sector;

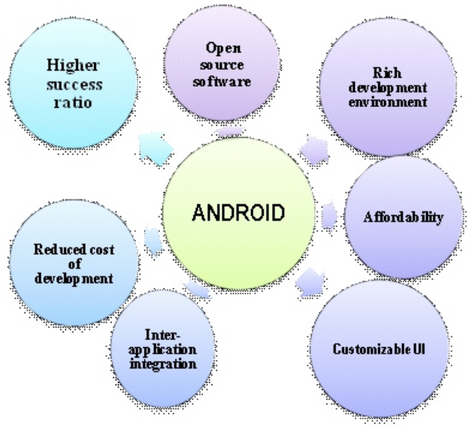
iv. Section IV describes Architectural Technology Education;

v. Section V highlights the sample size calculations adopting the Slovin's Formula, collation and analysis of data gathered in the course of the study;

vi.Section VI discusses the interpretation of results generated from the study;

vii.Section VII put forward recommendations as informed by the study while

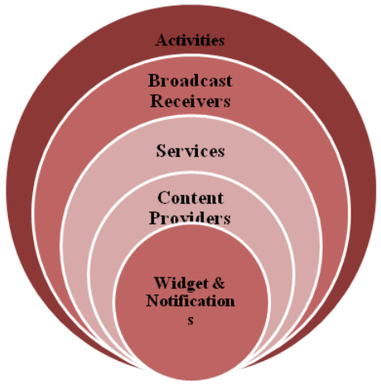
viii.Section VIII offers final conclusive notes.



Note. From *Learning Android* (1st ed., p. 1-2), by Marko Gargenta, 2011, O'Reilly Media Inc., 1005, Gravenstein Highway North, Sebastopol, CA 95472.

Overview of Android

Android is a popular, comprehensive open-source platform and Linux based operating system for mobile devices. Its operating system (OS) which was developed by the Open Handset Alliance (OHA), led by Google, was primarily designed for touch screen mobile devices such as tablet computers and smartphones. These days, android is one of the most sought-after and widely used mobile operating system because of its features such as interactive user interface (UI), connectivity, multi-touch, multitasking storage, media support, web browser, messaging, multi-language, GCM, resizable widgets, android beam and wi-fi direct. Android OS has been released in a number of versions. They include Android Astro (1.0), Bender (1.1), Cupcake (1.5), Donut (1.6), Eclair (2.0), Froyo (2.2.x), Gingerbread (2.3.x), Honeycomb (3.0), Ice Cream Sandwich (4.0.x), Jelly Bean (4.x), KitKat (4.4), Lolipop (5.0), Marshmellow (6.0), Nogut (7.0), Oreo (8.0), Pie (9) and Q (10) which is the latest released version of android (**J.R, 2021.)** Figure 1 shows the acceptability index of android and seven main reasons why android is so popular. Nowadays, a good number of architectural applications are available on android thus helping architectural students to work smarter instead of harder **(Ukoh & Nwamggbe 2019)**



Note. From *Android Application Development with Kotlin* (p. 57), by Hardik Trivedi, 2020, *BPB Publications*, 245, Jurgen, Cincinnati, USA.

Basic Components of Android Application

In recent years, wireless communication techniques and android devices have evolved significantly in daily life style of individuals. This has led to a high demand for developing and roid applications that run on android devices. This section outlines necessary basic components of an android application as can be seen in figure 2. The figure shows essential building blocks of an android application. Activity is a class that is considered as an entry point for users that represents a single screen. A messenger application might have an activity that shows a new notification, another activity which reads messages and another which composes a new message.

Each activity is independent of one another. **For example,** camera application can be started in an email application to compose an email that shares an image. Broadcast Receiver is a component that responds to broadcast messages from another application or the same system. It can also deliver broadcasts to applications that are not running. **A good example is when users get "battery-low" notifications**. Android developers can use broadcast messages in the application or outside the normal flow. Service is a component that runs in the background while acting as an invisible worker in the application. It keeps updating data sources and activities. It also **broadcasts intents** and performs tasks when applications are not active. An example of service is when we can surf the internet or use any other application while listening to music. Content Provider is a component that allows applications to share data among multiple applications. It hides the details of the database and can be used to read and write private data of the application which is not shared. Widgets are variations of Broadcast Receivers and essential aspects of **home screen customization**. They display data and allow users to perform actions on them. There are various types of widgets as refers:

I. **Information widget:** These widgets display crucial information and track how the information changes over time.

ii. **Collection widget:** As the name depicts, collection widgets are a collection of information of the same type. Its use is for browsing information and opening any one of the elements to view details.

iii. **Control widget:** These widgets display functionalities and by using them, the user can trigger from home screen without opening the application.

iv. **Hybrid widget:** These widgets combine features of all the other three widgets. Example – music player widget is a control widget but it also informs the user about which track is playing currently, which means it is a combination of control and information thus it is termed as hybrid widget.

Notifications alert users when the application is not visible or is inactive. This alert flashes on the screen and then disappears. An example is notification of new incoming message which briefly pops up on the screen for few seconds **Simon 2021.**



Note. From *Android Application Development for the Intel Platform* by Ryan Cohen and Tao Wang, 2014, Apress Open, Intel Software College, Shanghai, China.

Android Applicationin Education Sector:

In the education sector, the rapid evolution and advancement of wireless portable technology, such as mobile devices, has led to radical development. A wide variety of android applications are available these days for learning and teaching. Applications are designed these days to be effective, engaging and interactive. Over the last few years, mobile learning has brought tremendous success with the possibility of learning anywhere, anytime by using android-based learning application **(Handoyono & Rabiman, 2020)**. Nowadays, android apps are more convenient and user-friendly for students while bringing different approaches in educational instructions such as 'knowledge objects' and 'learning objects. Android applications have enriched and enhanced the current educational system to provide permanent, effective and productive learning outcomes in academic institutions **(Ryan & Tao, 2014).** In the education sector, interactive android applications motivate learners, educators and instructors to adopt mobile learning as teaching and learning tools **(Luis Francisco Mendes Gabrirel Pedro, 2018) .** Educational android applications provide various benefits of learning in education sector such as flexible, self-regulated, interactive, collaborative and experimental learning. Android applications have increased students learning experience and become meaningful, systematic, organized and socially interactive **(Adesti, 2019)** as shown in figure 3.

Android applications facilitate various feasible educational benefits for learners and educators such as sharing information, exchanging information and ideas with associates through digital method, discuss information with groups through centralized system, organize and select correct information, scan or capture needed information, access dictionary, check spelling and translate text from one language to another language and vice versa. Others include social interaction technologies for students and instructors (i.e., WhatsApp, Blog, Facebook, Twitter, Email), multiple representation of information such as audio and video session for participants, share findings and discussion. These benefits allow users to quickly and broadly get knowledge in digital manner, facilitate game-based learning and encourage 3D learning method with multiple interaction forms **(Rahman 2000).**

ArchitecturalTechnology Education

Architecture is an amalgam of science and art and it is also considered as social engineering and practical art. Technology refers to methods, systems, and devices which are the result of scientific knowledge being used for practical purposes. Education means transfer of systematic and necessary information directly or indirectly from one generation to other generation with proper teaching techniques for more informed learning outcomes. It is categorized into sub-sections such as educational environment, educational tools, educational techniques and educational psychology. Architectural Technology Education can then be said to be the educational plan laid out to groom scholars both in the academic and professional genre of the architectural discipline through the deployment of technology **(Malecha, 2017).**

Architectural Technology Education (ATE) is guided by curricula which maintains the combination of professional training and academic scholarship. This includes not just knowledge of drafting, constructional elements, sketching, building materials, but also includes history, geometry, philosophy/sociology, etc. There are two types of educational techniques in architectural technology education. They are traditional techniques (i.e., problem-solving, question and answer, pair and group works, discussion, case study, narrating lectures, etc.) and digital techniques (i.e.,e-learning, Virtual Reality (VR), Artificial Intelligence (AI), 3D-modelling, etc.). Architecture is a completely developed discipline and it consists mainly of collaborative and synthetic profession **(The University of Nottingham 2020)**. In ATE programme, students have to learn architectural theory and history, problem-solving, building design on computer aided design and drafting, analyzing and communication, structures, physical science, building construction methods and professional practice (National Board for Technical Education 2020).

ATE is based on teacher-oriented and student-oriented programmes in which theoretical lectures are managed in teacher-oriented manner and design studio, which is managed in both teacher and student-oriented manners. In ATE, it is necessary for students to be involved in building construction, modeling, planning and designing. It is expected that architectural students should have creative aptitude, software skills and technical knowledge to become a professional **architect (Architects Registration Council of Nigeria 2020).**

Sample Size, Collationand Analysis of Data

Cross-sectional survey research methodology was adopted to elicit responses from participating institutions and respondents sampled from NBTE-accredited polytechnics domiciled in the six geopolitical regions of the country. These surveys elicited responses from alpha variables which are coalesced from the primary objectives. Data was sourced from six (6) NBTE-accredited polytechnics across the country, one from each geopolitical zone. For the purposes of integrity and unbiased reportage, this study intentionally avoided adopting data from the researchers' domiciled institution. They include:

I. Akanu Ibiam Federal Polytechnic Unwana - representing the south-east geopolitical zone;

ii. Akwa Ibom State Polytechnic, Ikot Osurua, Ikot Ekpene, Akwa Ibom State- representing the south-south geopolitical zone;

iii. The Federal Polytechnic, Ado-Ekiti – representing the south-west geopolitical zone;

iv. The Benue State Polytechnic, Ugbokolo – representing the north-central geopolitical zone;

v. Hussaini Adamu Federal Polytechnic, Kazaure – representing the north-east geopolitical zone and

vi. Jigawa State Polytechnic, Dutse – representing the north-west geopolitical zone.

It is pertinent to note that The Benue State Polytechnic, Ugbokolo, Hussaini Adamu Federal Polytechnic, Kazaure and Jigawa State Polytechnic, Dutse had significant low population size due to the fact that their programmes in Architectural Technology terminates at the National Diploma level. Population size is made up of teachers (instructors, technologists and lecturers) and incoming ND I and HND I students only as these crop of students have higher contact hours to both academic staff and course modules. At the HND level, total contact hours at HND I level is 58 while contact hours at HND II level stands at 51 **(National Board for Technical Education, 2020)** At the ND level, total contact hours at ND I level is 56 while contact hours at the ND II levels stands at 53 **(National Board for Technical Education, 2020)** It must be noted also that all NBTE-accredited polytechnics must not exceed the statutory carrying capacity of intake in any academic session. However, polytechnics may have two streams of a particular class if and only if such polytechnics have the infrastructure and staff to support and carry the spill-over

intakes (Ekwerike 2018) .Population size and computation of sample size is as shown in table 2 while interpretation adopted is as shown in table 1 below:

Table
Interpretation of ratings

S/n	Rating range	Interpretation
1	1 – 3	Completely unfeasible
2	4 – 5	Undecided; identification of research gap
3	6 – 10	Feasible; adoption advised

Note. Source from researchers' fieldwork conducted on the 28th May, 2021

Table
Sample size

GenerationofSample Size						
Parameters of the Slovin's Formula	**Institution 1:** Akanu Ibiam Federal Polytechnic Unwana (academic staff + incoming students)	**Institution 2:** Akwa Ibom State Polytechnic, Ikot Osurua(academic staff + incoming students)	**Institution 3:** The Federal Polytechnic, Ado-Ekiti (academic staff + terminal students)	**Institution 4:** The Benue State Polytechnic(academic staff + incoming students)	**Institution 5:** Hussaini Adamu Federal Polytechnic, Kazaure(academic staff + incoming students)	**Institution 6:** Jigawa State Polytechnic, Dutse(academic staff + incoming students)
Population size	81	97	101	47	48	45
Confidence Level	95%	95%	95%	95%	95%	95%
Margin of Error	5%	5%	5%	5%	5%	5%
Respondents/Sample size deducted from *Slovin's formula (n = N / (1 + Ne²)*	??? + ???????	??? + ???????	??? + ???????	??? + ???????	??? + ???????	??? + ???????
	= 68	**= 78**	**= 81**	**= 42**	**= 43**	**= 41**

Note. Source from researchers' fieldwork conducted on the 28th May, 2021

The study was designed around a pent a grammatic perspective which allowed respondents to make objective assertions based on inquiries surrounding each alpha. The pentagram, in this study, are five alpha variables that enabled the apt analysis of the feasibility study. These alphas are derived to specifically address the objectives of this study. They include:

1. Technology & System Feasibility – responses surrounding the interfacedesign, interaction capabilities, visualization capabilities, user-friendliness and system functionalities of android applicationsare elicited from participants and appropriately rated.

2. Human-Factor/Time Feasibility - responses surrounding ease of use, efficiency, and output index of android applications are elicited from participants and appropriately rated.

3. Financial Feasibility – responses surrounding cost, maintenance and overall solution cost of android applications are elicited from participants and appropriately rated.

4. Legal Feasibility – responses surrounding privacy of data, security and legal concerns of android applications are elicited from participants and appropriately rated.

5.Operational/Resource Feasibility – responses surrounding how android applications solve problems and satisfies the requirement of users by using some operational parameter such as reliability, dis possibility, maintainability, sustain ability, support ability and producibility are elicited from participants and appropriately rated.

Table 2 shows responses of participants and their ratings. Ratings adopted for this survey employed the descriptive rating scale as each answer option under each alpha variable is elaborately explained for the respondents. Each participant responds to four (4) questions under each alpha. The average response for each alpha is calculated. Invariably each participant is expected to have five (5) average responses from five (5) alpha variables. This is repeated for total number of respondents in each institution. The final feasibility rating of each alpha from each institution is deduced from the average of all respondents of a particular alpha.

Table
Cumulative Rating Scores from participating institutions and final feasibility rating of Android Applications

	Alpha Variables	Rating score average from 68 respondents of Institution 1	Rating score average from 78 respondents ofInstitution 2	Rating score average from 81 respondents ofInstitution 3	Rating score average from 42 respondents ofInstitution 4	Rating score average from 43 respondents ofInstitution 5	Rating score average from 41 respondents ofInstitution 6	**Final Feasibility Rating (FFR) of Android Applications**
1	Technology & System Feasibility	7.8	7.5	8.2	8.1	7.9	8.1	**7.933333**
2	Human-Factor/Time Feasibility	8.2	8.3	8.3	8.1	7.9	8.4	**8.2**
3	Financial Feasibility	6.3	6.1	5.9	7.1	6.8	6.6	**6.466667**
4	Legal Feasibility	5.2	4.8	4.2	4.3	4.6	5.1	**4.7**
5	Operational/Resource Feasibility	7.6	7.5	7.9	6.9	8.1	7.7	**7.616667**

Note. Source from researchers' fieldwork conducted on the 1st June, 2021

INTERPRETATION OF RESULTS

This section proffers the interpretation of results deduced from of this study:

1. Technology & System capabilities: With an FFR of 7.9, the feasibility of adopting android operating system and applications in teaching and learning Architectural Technology course modules in NBTE-accredited polytechnics is assured.

2. Human-Factor/Time Feasibility: With an FFR of 8.2, the feasibility of adopting android operating system and applications in teaching and learning Architectural Technology course modules in NBTE-accredited polytechnics is assured.

3. Financial Feasibility: With an FFR of 6.5, the feasibility of adopting android operating system and applications in teaching and learning Architectural Technology course modules in NBTE-accredited polytechnics is assured.

4. Legal Feasibility: With an FFR of 4.7, the feasibility of adopting android operating system and applications in teaching and learning Architectural Technology course modules in NBTE-accredited polytechnics needs to be re-visited and reviewed. Response from participants clearly showed a research gap.

5. Operational/Resource Feasibility: With an FFR of 7.6, the feasibility of adopting android operating system and applications in teaching and learning Architectural Technology course modules in NBTE-accredited polytechnics is assured.

CONCLUSION

This study mainly focuses on feasibility of android application-based learning and teaching method as compared to traditional method in education sector in architectural Technology Education. This study clearly shows that adoption of android in the general pedagogy of Architectural Technology is practicable and feasible, though with some slight concerns. These bother on legal issues which can be resolved through enlightenment campaigns as they may even bother on sheer 'Ignorantia juris'. We simply cannot make any headway if, till now, our curricula are still guided by obsolete learning resources. The age of Covid-19, and AI is here and efforts must be made to be in sync with the demands of such times as failure to do so will definitely affect the quality of technologically-based middle manpower we produce in the Built Environment.

RECOMMENDATIONS

This study has identified some recommendations which must be addressed by the NBTE with respect to adopting and incorporating android operating system and its applications in teaching and learning course modules in Architectural Technology. This study recommends the adoption of android operating system for improved output especially in both foundation courses and professional courses. The widgets make learning quite interactive and easy to operate by teachers. Large classes can also be handled efficiently as most students are equipped with affordable and cheap android devices. Assessments and evaluations are made less cumbersome while deficiency in course modules can be easily and quickly re-assessed. However, it is pertinent to note that legal feasibility of android applications must be fully explored and researched to make for an encompassing acceptance. This is necessary to bring to fruition the developmental, technological and sustainable strides being made by the Nigerian Government in these insecure times of the pandemic era.

REFERENCES

Adesti, S. N. (2019). Android-Based Mobile Learning : Its Effect on Students' Learning Achievement. International Conference on Progressive Education (ICOPE 2019) (pp. 100-103). Indonesia: Atlantis Press.

Architects Registration Council of Nigeria. (2020, November 11). Becoming a professional architect. Abuja, Abuja, Nigeria.

Diadon. A. W. (2014). Architectural Revolution, Stturtgart: Kremlin .

Ekwerike. J. C. (2018). Compilation of Accreditation Reports of Polytechnics from 2012 - 2017. InternationalJournal of Education Issues and Development, 334-346.

Fisher. T. (2021, July 29). Microsoft Windows Vista. Retrieved from Lifewire: https://www.lifewire.com/windows-vista-2626311

Greg. D. (2018). Financial feasibility of andriod applications. Washimton: Oak press.

Handoyono, N. A., & Rabiman. (2020). Development of android-based learning application in EFI materials for vocational schools. Journal of Physics: Conference Series , 1-9.

Hardik . T. (2Q2Q). Android Application Development with Kotlin. Jurgen: Cincinnati, USA.

Harkiran, T. (2021, March 4). Top Programming Languages for Android App Development. Retrieved from Geeks for Geeks: https://www.geeksforgeeks.org/top-programming-1 angu ages -for-android-app-deve!opment/#>:text=While%20Java%20is%20the%20official,used%20for%20Android%20App%20Development.

J.R. R. (2021, July 12). Android versions: A living history from 1.0 to 12. Retrieved from Computer World: The voice of business technology:https://www.computerworld.com/article/3235946/android-versions-a-living-history-from-1 -0-to-today.html

Luis Francisco Mendes Gabriel Pedro, C. M. (2018). A critical review of mobile learning integration in formal educational contexts. International Journal of Educational Technology in Higher Education, 23-28.

Malecha. M. J. (2017). Architectural Education. Athens: Athens Technological Organization.

Marko . G. (2011). Learning Android. California: O'Reilly Media, Inc.

Microsoft. (2017, November 12). Modern Teaching and Learning. Switzerland, Sweden.

Microsoft Wiki. (2021, July 12). Whistler 2000-2001. Retrieved from Windows XP : https://microsoft.fandom.com/wiki/Windows_XP

National Board for Technical Education. (2020, July 14). Curriculum for ND and HND Architectural Education Technology. Abuja, Abuja, Nigeria.

Odeh. A. F.. & Nwamkpa, A. C. (2018). Transforming Architectural Education. The Andriod Technology and Transformation in Education (pp. 34-38). Enugu: The Architects Registration Council of Nigeria.

Olsen, F. S. (2015). Computer-aided Design and Architecture. Bath: Elsiever.

Philip. O. (2016). Digitalizing instructions in

Architectural Education. Enugu: Cromwell Publishers.

Rahman, A. (2000, November 1). Development of an Integrated Traditional and Scientific Knowledge Base: A Mechanism for Accessing, BenefitSharing and Documenting Traditional Knowledge for Sustainable Socio-Economic Development and Poverty Alleviation. UNCTAD Expert Meeting on Systems and National Experiences for Protecting Traditional Knowledge, Innovations and Practices, pp. 1-15.

Ryan, C.. & Tao, W. (2014). Android Application Development for the Intel Platform. Shanghai: Apress Open.

Simon. E. J. (2021, July 15). Android Application Components with Implementation & Examples. Retrieved from Data Flair: https://data-flair.training/blogs/android-application-components/

The University of Nottingham. (2020, May 11). Architecture with Collaborative Practice. Nottingham, Nottingham, United Kingdom.

Ukoh, A. D., & Nwamgbe, D. S. (2019). Android Architecture: The Smart Output. Los Angeles: Springfield.

FIRE PROTECTION AND SAFETY ON BUILDING SITE

Qs ONYEKWENA, Tobechukwu
Quantity Surveying Department
Federal Polytechnic Nekede Owerri
tobechukwuonyekwena@gmail.com
&
ONWUKWE,Chukwuemeka Ozioma Stanislaus
Architecture Department
Federal Polytechnic Nekede Owerri
sonwukwe@fpno.edu.ng

Abstract
The principal source of fire in buildings/building sites is their content. Obviously, the combustibility of the content of buildings varies considerably. This paper considers the effects of fire on the structure and finishes building sites, and highlights methods and equipment used for protecting the building and its occupants from the effect of fire. It also highlights measures that are necessary to ensure the safety of men and materials on a building site. The paper concludes that the purpose of fire protection is to ensure the protection of life, materials, goods and activities within a building or on a building internally and in relation to adjacent buildings internally and in relation to adjacent buildings, and satisfactory planning and construction of means of escape, and installation of protective service for firefighting in the building and the site. In addition, schedule 5 of Health and Safety at Work etc Act 1974 and the Building Regulations make it mandatory for any contractor or client on a building site to provide first aid boxes, shelter and accommodation for clothing and for taking meals on every site, protective clothing, fencing and provision of security guard etc to ensure their safety. That way will be able to achieve optimum fire protection in building sites.
Keywords: *Fire, Protection, Safety, Building site.*

INTRODUCTION

Fire protection is every measures for the prevention, detection and extinction of fire, as well as the reduction or prevention of fire damage or loss of life and the design of building to resist fire (i.e. structural protection) it also the protection of the occupants, contents and structure of building/site from the risks associated with fire. The subject is of vital importance and is so linked with the design and construction of building that is essential to understand the factors which influence the nature and form of the protection and of the principles which are the basis of the various building regulations covering fire protection of building and sites.

Section I of part E of Building Regulation is concerned with structural fire precautions and Section II with means of escape, since the regulations are made in the interest of public health and safety, they do not attempt to achieve non-combustible buildings, but rather to ensure the safety of the building/sites, it occupants and the public. Building must therefore be constructed so that, in the event of fire;

a.They will resist collapse for a sufficient period of time to allow evacuation of the occupants and

b. The occupants are able to reach a place of safety and

c.The spread of fire within and between buildings is kept to minimum the first requirement is met by setting reasonable standard of fire resistance for the structural elements of a building the floors, roofs, load bearing walls and frames. The second is met by providing an adequate number of exists and protected escape routes. The third is met by dividing a large building into compartments and requiring higher standards of fire resistance of the walls and floors bounding a compartment, setting standards of non –combustibility and fire resistance for external walls and floors bounding a compartment, setting standards of resistance to fire penetration and flame spread for roof covering , ideally, there should be no opening in any compartment or floor, but this is impractical. Opening are therefore permitted, provided they are suitably protected by self closing fire resistance doors or shutters for walls, and stairwells or lift shafts within a fire resisting structure termed a protected shaft for floors. Any opening in a structure enclosing a protected by fire resisting doors or shutters.

EFFECT OF FIRE ON STRUCTURE AND FINISHES OF BUILDINGS.

The principal source of fires in building sites is their contents. Obviously, the combustibility of the contents of buildings varies considerably. In this section the effects of fire on the structure and finishes of building are considered under the headings of combustibility, spread of flame and external fire exposure.

Combustibility: materials used in structure and finishes of a building are classified as non-combustible or combustible little to fire in buildings, and those that are combustible will make some contribution to fires. Therefore for adequate fire protection and safely on building sites the designers need to choose those materials that contribute less to fire in the construction of building.

Spread Of Flame: combustible materials used in walls and ceiling lining may encourage flame to spread all over their surface and so accelerate the spread of fires in buildings. These materials are divided into four classes:

Class 1: Surface of very low flame spread e.g. plaster board

Class 2: surface of low flame spread e.g. fabric sheets.

Class 4: surface of rapid flame spread e.g. fiber hardboard.

Again the designer needs to ideally choose from classes 1 and 2 for our building projects in order to achieve fire protection and safety on our building sites.

A state above, the protective measures against fire include means for limiting the spread of fire together with the provision of structural elements capable of fulfilling their functions during a fire without the risk of collapse. The first to some extent (as other factors in limiting the spread of fire are the use of non-combustible lining and planning considerations) and the second entirely, depend o the use of elements of the structure (floor, beam, column, load bearing wall or member) of an appropriated degree of fire resistance.

The term "Fire resistance" used in connection with fire protection has the precise meaning defined in BS476: part 1, 1953: fires tests on building material and structures-a relative term used to designate that property by virtue of which an element of structure as a whole functions satisfactory for a specified period whilst subjected to prescribed heart influence and load' it is applied to element of structure, not to a material. Fire resistance depends on the way in which materials are used in an element and not solely on whether they are combustible or not. This standard lays down tests for establishing the fire resistance of various elements of structure by means of which different forms of construction may be graded according to the length of time during which they will function satisfactory under the action of the standard test fire and so designers can select those that can prevent fire spread until extinguishers are used to put off the fire.

MATERIALS IN RELATION TO FIRES

We have two types of materials used in building site: non-combustible material and combustible material.

Non-Combustible Materials

These are materials which if decomposed by heat will do so endothermically that is with the absorption of heat or if they oxidize, do so with negligible evolution of heat. Also included are those materials which require a temperature beyond the range of most fires before they react in any way.

Non-combustible materials do not contribute to the growth of a fire but are damaged when the temperature is reached where decomposition, fusion or significant loss of strength occurs. However before that occurs the fire must have been put out by fire protection services such as fire extinguishers etc. when incorporated in the structure, the loss of strength by non-combustible materials may be such that they no longer maintain the integrity of the structure. Examples of non-combustible material are metal, stone, glass, concrete clay products, gypsum products and asbestos product. They are suitable for building constructions to minimize fire incidents.

Combustible Materials

There are materials which, within the temperature range associated with fire, will combine exothermically with oxygen that is to say, in their reaction with oxygen considerable heat is evolved in the flame or glow. Such materials whether forming part of the structure or the contents of the building, are responsible for the growth of a fire and its ultimate severity. Examples of such materials are wood, wood product, vegetable products, animal products, manufactured products such as fiber broad and straw board. Within this classification are flammable materials which ignite readily and react vigorously, producing rapid fire spread. Examples of these materials are volatile liquids (petroleum distillates) certain plastic and certain paints base on nitro-cellulose products. Where these have to be in building site, we must have adequate firefighting equipment to put out the fire as soon as it starts in order to avoid rapid spread of fire.

Fire Resistance Grading

This is the use of fire resistance to BS476 which are graded for their fire resistance or endurance. Fire resistance is usually measured by the time for which the member continues to satisfy three criteria viz: collapse, flame penetration and excessive temperature rise on the "cool" face. If it satisfies all three criteria for four hours, it is described as having four hours fire resistance thirty minutes is often adequate for small houses. While six hours could be needed for a large warehouse with a fire density of 400MJ/M^2. The fire resistance needed by buildings and their elements are laid down in buildings regulations 1979.

It must be understood that the grading is applied to the structural element as a whole and to a precise specification of that element. What may appear to be minor changes in the details of construction of an element may result in a great change in its fire resistance. Therefore, there is great need for people supervision at the building site to ensure that the quality of material used and standard of workmanship are as in the specifications so that the fire resistance grading according to BS476 are maintained for the different materials as in the design.

The term "fire grading" is the classification or grading of the elements of

structure building in terms of their degree of resistance to fire. This grading of building is considered from two points of view, firstly in terms of damage and exposure hazard, for which the protection is mainly provided by structural precautions, and secondly in terms of personal hazards, for which the protection is provided primarily by easy means of escape. The first is considered here.

The severity of a fire depends largely upon the amount, nature and distribution of combustible material in the building. This is determining the requisite degree of fire protection it is necessary to take into account, the use and size of a given building and by this means to assess the probable amount and types of combustible material which would contribute to a fire.

Fire Load

The assessment of the severity of a fire due to the combustible materials in the building is made by reference to what is known as the "fire load" which is the amount of heat, expressed in KJ, which would be generated per square meter floor area of a compartment of the building by the complete combustion of its contents and any combustible parts of the building.

The fire load is determined by multiplying the weight of all the combustible material by their caloric values and dividing by the area of the floor. It is based on the assumption that the materials are uniformly distributed over the whole area of the floor.

The caloric value is the property of a material which indicates the amount of heat which will be generated by a particular quantity of that material which indicates the amount of heat which will be generated by a particular quantity of that material and it governs the ultimate severity of a fire. Thus the maximum heat is evolved from materials have the highest caloric values, e.g.

Bitumen	35,355KJ/kg
Petrol	46,520KJ/kg
Rubber	39,452KJ/kg
Wood	18,508KJ/kg

The fire load is used as a means of grading occupancies. The general trend will be to avoid high fire materials in buildings site.

Openings

Ideally, there should be no openings in any compartment wall or floor to avoid the spread of fire, but this impracticable. Openings are therefore permitted, provided they are suitably protected. Openings in compartment walls must be fitted with a self closing fire resistance door shelter which is generally metal plated door designed to slide shut when a fusible link melts so that it holds backs a fire for an hour or more.

Compartment floors may be pierced by stairwells or lift shafts passing from one storey to another, and these could result in vertical spread of fire. This is prevented by enclosing stairwells or lift shaft within a fire-resisting structure termed a protective shaft should be protected by fire resisting doors or shutters.

Means of Escape in Case of Fire.

Schedule 5 of health and safety at work etc Act 1974 requires the installation of means of escape from a building in case of fire. It is also considered in fire precaution Act 1971.The object in providing means of escape is to permit unobstructed egress from within a building by way of definite escape routes (exit ways, corridors and stairs) to a street or an open space or to an adjoining building or roof from which access to the street may be obtained.

The primary danger to occupants is that staircases and corridors leading to them from rooms or compartments may be filled with hot gases and smoke, trapping the occupants and causing panic. It is, therefore, important that such escape routes should be

enclosed with adequate fire resisting enclosures. In addition they should be separated by fire resisting doors planned in strategic positions to prevent the spread of smoke and fire from storey to storey via lift shafts and staircase, and to keep the latter free from smoke when used as an escape route.

Smoke removal from staircases is normally by open able windows at each story or landing level. Where this is not practicable, the code of practice CP3 recommends a permanent vent at the tope of the staircase of at lease five per cent of the area of the enclosure. Another system which been shown to work effectively is the "Automatic air flow control" system for escape route smoke movement in multi-storey flats.

The requirements of building regulations in respect of means of escape vary with size construction, used and height of the building in question, the critical heights of the floors being 6m and 12.6m in the former case it is dangerous to jump from building; in the latter case the standard 15.2m wheeled escaped ladder, available in most area, is at maximum extension.

GENERAL CONSIDERATION

The protection of buildings, their contents and the occupants in the case of fire not only depends upon the design of the buildings and the facilities providing but upon the management of the building when it is in use. The designer must provide adequate means of escape, the requisite fire resistance of the various parts of the structure, means of compartmentation where necessary and also suitable fire protection and treatment systems. When the designer has carried out his duties adequately it is up to the building manager to ensure that the facilities are adequately maintained. Escape stairs and corridors must not be obstructed by storage of materials. Smoke stop doors must be working efficiently and not wedged. Values of service pipes should be in easily accessible positions and where they are designed to operate on the occurrence of a fire, they should be tested at regular intervals. Safety officers should be appointed to ensure that the occupants of buildings and sites know what to do in the event of fire. Also, from time-to-time fire practice should be carried out portable fire appliances should be inspected at regular intervals and the contents renewed are necessary.

This fire hazard of a building indicates the chances of a fire occurring together with an assessment of the intensity of fire likely to result and the difficulty of extinguishing it. It does not indicate the chances of loss of life nor indicate the value of the damage to contents likely to result in the event of a fire. For example a museum is regarded as an extra light fire hazard, though the value of the contents may be very high. A hospital is also an extra light fire hazard, though there may be great difficulty in evacuating patients and the potential loss of life is high. Building storing bottles or can of alcohol may be regarded as an extra high fire hazard, though the number of people employed may be quite low and the total value compared with the museum is fairly low.

However, the purpose groups in building regulations part E are not directly related to fire hazard but take into account loss of life as well.

Fire Protection Systems.

Fire protection systems which are designed and installed to put out any fire that occurs on a building or building site in order of complexity are:

1. Portable equipment, e.g. buckets, blankets, extinguishers etc.
2. Other firs aid equipment
3. Fire and smoke detectors
4. Fire alarms
5. Sprinklers, drenchers and deluge systems.
6. Fixed gaseous extinguishing system.

1. Fixed equipment for fire service including wet and dry risers and fire

hydrants.

These protection systems are in addition to parts of the building structure (e.g. compartment walls and some doors) already mentioned which also play an important part in fire protection of buildings and building sites. Fire protection may be required by statute, but in most cases the details are not stated and depends upon the opinion of the fire authority at an early stage in the design of the building. As the fire protection may have a considerable effect on the ability to insure a building and the cost of the premiums, it is also prudent to approach the insurance companies as soon as practicable.

All fire protection system must be properly maintained an inspection at regular intervals is essential in systems subject to pressure, safety values and pressure alarm systems may be required.

Safety in Building Sites

Many building sites injuries and illness are caused by lack of attention to safety in the site. Proper and adequate health and welfare facilities are to be provided on all building projects and sites in accordance with the requirements of the construction (Health and Welfare) Regulations 1966, schedule 5 of health and safety at work etc. Act 1974 and the building regulations of 1979.

The following provision are simple interpretation of the requirements of the various regulations which is mandatory for any contractor or client on a building site.

Safety which should always be observed, both in the interest of workers on site and for the sake of those around them. They are:

Provisions of first aid boxes: where any contractor has more than five operatives working on a site, he must provide and mountain a first aid box, accessible during working hours to all positions on the site. First-aid equipment only must be kept in the box, accessible during working hours to all positions on the site. First aid equipment only must be kept in the box which must contain first aid leaflet (from 1008(, finger dressing, medium and large dressings, adhesive dressings, (assorted sizes), adhesive plaster rolls, cotton wool, eye ointment etc with qualified personnel to administer treatment.

Ambulance: the regulations say that if a contractor has more twenty-five operatives on a building site, he must make arrangement for a hospital ambulance service to be available for emergency situations.

Shelter and Accommodation: On every site the contractor has more than twenty-five operatives on a building site, he must make arrangement for a hospital ambulance service to be available for emergency situations.

Washing facilities: Any site where anyone is employed for more than four hours must have washing facilities.

Sanitary convenience: every building site must have convenience for every twenty operatives.

Protective Clothing: Protective clothing must be provided for operatives who must continue to work in the rain and for special operations such as welding, iron bending etc. protective clothing acts as one line of defense against building site danger as it cannot guarantee absolute safety e.g overall, leather gloves or quantlets to protect hands and forearms from burns, eye damage, therefore protection in form of goggles are necessary during iron work.
However, any irritating object enters the eye, it should be flushed out with clean water or recommended commercial product. As soon as possible the victim should see an eye specialist similarly, the bright light produced during welding processes necessitates face shield to avoid damage to the eye.

Site Layout: the layout of a building site must be such as provide for safety as well as convenient gangway and working area. There must be provided to all shelters, statutory conveniences etc. which are required by the regulations. The site layout must ensure that any fire outbreak on one point of the site is put off before it transfers to another part. All the facilities must be maintained in the good order.

Lifting and Handling: the construction (lifting operations) regulations 1961 states that object may be lifted manually or by mechanical means in a building site. All methods of lifting must be carried out safely to avoid accident and injuries when lifting objects manually, effects should be made to take strain with the legs by placing the feet together, bending the knees and keeping the back straight. The firm grip with the hands is essential and these should be protected by gloves when listing sharps components.
Mechanically lifting is carried out by trucks, forks lifts or cranes and strings. Each of these should be tested periodically to establish its safe working load (SWL) and this must not be exceeded.

Whatever means of lifting is used, vision should not be obstructed by the load and a clear route should be determined before lifting is started under any circumstance, should any one stand beneath loads suspended by cranes.

Standing scaffold: all standing scaffold must be erected according to the regulations and reinforced to avoid accidental falls from them by operatives working at heights.

Fencing and provisions of security guards: the contractor is expected to make the building site by fencing it with only one gate, the provision of security guards in order to exclude trespassers and also prevent the theft of materials and the site.

CONCLUSION

It is the purpose of fire protection to protect life, goods and activities within a building or building site. These aims are achieved by inhibiting the combustion of materials from which the building is constructed and by preventing the spread of fire within the building and between buildings. In addition, by ensuring that the elements of construction fulfill their functions for a sufficient length of time during a fire, the occupants are able to escape to safety and the fire brigade is given time to deal effectively with the outbreak and thus limit during a fire, the occupants are able to escape to safety and the fire brigade is given time to deal effectively with the outbreak and thus limit the total damage. Protective measures involved suitable form of construction, suitable planning of the building internally and in relation to adjacent buildings, and satisfactory planning construction of means of escape, and installation of protective service for fire fighting in the building site. That way buildings and building sites together with their contents, occupiers and operatives will be protected from fire ravage and we can also reduce the fire insurance premium for construction projects.

In addition, proper and adequate health and welfare facilities should be provided on all building projects and sites in accordance with the requirements of the construction (Health Welfare) Regulations 1966 schedule 5 of health at work etc. Act 1974 and the building regulation of 1979 which made it mandatory for any contractor or client on a building site to provide first aid boxes, shelter and accommodation for clothing where necessary fencing and provision of security guards, safe standing scaffold etc for operatives working on his site to ensure their safety. That way we will achieve optimum fire protection and safety on buildings and building sites, also there is need for experienced security personnel and post-contract supervision as the origin of a fire is usually the result of negligence ranging from direct acts such as lighted cigarettes left building to more indirect

causes such as poor installation and maintenance of electrical wiring and ineffective control of vermin.

Finally, there is need for the client to engage the service of qualified and experienced professional advisers, who will ensure that the buildings are designed with materials to meet fire protection standards ands structural stability and supervised to conform to specifications and avoid collapse and resultant injury to persons and goods.

REFERENCES

Barry, R.(1996): 'The Construction of Buildings, Vol. 3, 2nd Ed. Crosby Lockwood Staples, London.

Bruberry, P. (1986): 'Environmental and Services', BT Bertfold Limited, London

CIBS Glude (1996): 'Fire Protection System', London.

Foster J.S. et al (2007): "Structure and Fabric Part II'' Belford Ltd. London.

Scott, J.S. (2001): Penguin Dictionary of Building, London.

Whyte W.S. (1979): "The Building Regulations Explained an illustrated" 5th Edition, Can

I.C.T AND EDUCATION MANAGEMENT IN PANDEMIC SITUATIONS IN NIGERIA: PROBLEMS AND PROSPECTS.

IMUETINYAN, Sophia Osayomwanbor
Edo State Polytechnic, Usen.
sophiaimuetinyan@gmail.com

Abstract
Information and Communication Technology in educational management is necessitated especially in the difficult period of pandemic outbreak (Covid,19). The pandemic has shown the deficiencies in incorporating I.C.T in the education sector especially in Nigeria. This study examines information and communication technology in education management in pandemic outbreak focusing specifically on theoretical review of the problems and prospects in Nigeria. It used combination of library and descriptive type of research. Secondary source of information was employed and these were obtained from text books, journal articles, seminars and conference papers. The study found that ICT in educational management in terms of problems entail issues like inadequate funding, poor infrastructure facilities etc. It also revealed prospects of ICT in educational management to include fostering distant teaching and learning, internet usage, computer and software application usage etc. It concluded that ICT plays crucial role in educational management especially in pandemic outbreaks with a lot of prospects despite its associated problems. The study recommended that government should adequately fund ICT and infrastructural facilities, training and development of teachers, Strategies using ICT in education management implemented by different international educational communities should be replicated in Nigeria in these periods of corona virus (Covid, 19) pandemic.
Keywords: *Education, I.C.T, Management.*

INTRODUCTION

In recent time, Information and Communication Technology (I.C.T)has attracted considerable attention by academic researchers and practice. The need for ICT in education management is necessitated following the difficult period of pandemic outbreak (Covid,19)such that all businesses and schools closed. The most encouraging projections forecast for a possible return to normality, in no less than eight months to a year, producing an economic, environmental and social impact that affects all countries (Yanez, 2020). Educational processes at all levels of education have been affected, causing a reorientation regarding the strategy of transmitting knowledge to students, where the use of ICT has an essential role to play **(Basilaia &Kvavadze, 2020; Moreno -Correa, 2020).**

The incorporation of ICT tools in educational system, without a doubt, has generated changes in the educational field. This has not only been noticed in the methodologies used in the teaching and learning process, but also in the possibilities of innovation and skill development for

adaptation to the changes that educational institutions have had to undergo from the current pandemic (Moreno, Rodriguez, Gomez, Ramos, 2020). New technologies have crucial prospect in educational management such have greatly helped to fulfil substantive functions in higher education, under exceptional conditions arising from the impact of pandemic (like COVID-19), with its virtual applications greatly improving education reaching university students in most developed countries (Mendoza, Rodriguez & San Andres, 2020). The modality of e-learningis chosen in difficult times of a pandemic and brings with it modifications in teaching-learning strategies, logically based on the use of ICT tools (Torrecillas, 2020). It also leads to educational innovations (Falco, 2017) and the search for information to find out what other national and international educational institutions have done in this new stage of education to offer a quality teaching process to students based on the construction of a new paradigm (Hernandezet al., 2018).

ICT plays a significant role in teacher education to effectively surmount the enormous task of capacity and nation building. Adako (2006) opines that if Nigeria must catch up with other developing countries at a very reasonable pace, the nation builders (teachers) must be abreast of all new educational development around the world more so that the world is now seen as a global village.Hence this study investigates the role of ICT in educational management in pandemic out break with emphasis on the problems and prospects in Nigeria.

STATEMENT OF THE PROBLEM

The worldwide health emergency situation has caused the confinement of people and with it, the closure of schools and the transfer of face-to-face education to online education in developed countries. Faced with these facts, teachers have had to adapt at a dizzying pace not only to new methodological approaches, but also to their own confinement, presenting high levels of stress using ICT in learning. Deficiency in ICT in the nation educational management encouraged closure of schools at all levels when there is out-breaks of pandemic.

Educational managementin Nigeria is bedeviled with a lot of challenges in the modern day technology of imparting knowledge in the teaching learning process(Gbadegesin, Alabi& Omodun, 2018) especially in this time of serious pandemic outbreak. Information and Communication Technology (ICT) is relatively a very new development in Nigerian educational management. The usage of ICT in facilitating teacher education is still a myriad in Nigeria as many of the teachers are not ICT literate and those under training in Colleges of Education, Institutes of Education and Faculties of Education in Nigerian universities are not fully exposed to the use of ICT in the acquisition of skills and practical teaching (Owolabi, Babatope&Oke, 2013).Meanwhile, most Nigerian primary schools in rural areas lack electricity, while some use sheds of trees as classrooms. In areas where electricity is available, the school managers are faced with the challenge of lack of internet access or low-speed internet access which is a requirement for updating software and integrating ICT into teaching and learning situations. Even though the government set out to implement rural electrification as a way to empower rural populations mainly in education and health, it was faced with challenges of vandalism of power line, high connection fees and inadequate funds (Ayieko, 2011).

However, relatedstudies on ICT and educational management in term of problems and prospects with link to pandemic out breaks were mostly from developed countries. Closely related studies from Nigeria for instance, **Kasimu (2015)** study **was on assessment of the impact of information and communications technology (ICT) on educational development;**

Owolabi, Babatope and Oke, (2013) examined teacher education, information and communication technology: Prospects and challenges of e-teaching profession in Nigeria; while, Daramola (2006)study was on information communication technology (ICT) and educational development in Nigeria. To the best of the researcher's knowledge, prior studies have not addressed the issues of problems and prospects with the role of ICT in educational management in pandemic outbreak. This is the gap in knowledge this study desires to fill by way of theoretical review ofproblems and prospects of ICT in educational management in Nigeria. The remaining parts of this study are structured in literature review, methodology, discussion of findings, conclusion and recommendations.

LITERATURE REVIEW

Educational Management

The term Educational Management is mentioned in the scientific field referring to the basic administrative functions of educational institutions and learning organizations (Athanasoula - Reppa, 2008). Falco(2017) believes that management can be utilized in multiple educational fields and support that: There are general rules in management which can be utilized in every corporation. Educational management may even be considered a (logy) by itself when it comes to the management of educational organizations (Bush, 2003). In essence, educational management is all about factual application of management principles in education fields. Educational management is an applied field of management. Ibrahim and Mazin (2017) defined educational management as the application of theory and practice of management to the field of education or educational Institutions. The process of educational management consists of five basic functions; a manager uses these functions to achieve educational organization goals and objectives. Most of the authors agreed on the following five functions of the educational management: Planning, organization, directing, coordination, controlling, and evaluation. Ibrahim and Mazin (2017) further noted that educational management has three major field study area which consisted of Human resource, through the student, the educational personnel, and the stakeholder and community as an education service user.

Proper educational management will bring about educational development which is concerned withgrowing of vibrant field for helping colleges and universities function effectively as teaching and learning communities (Felten, Kalish, Pingree & Plank, 2007).Education management is about facilitating positive change in teaching and learning in post-secondary institutions at the individual, programme/department and institutional levels. It is viewed as actions aimed at enhancing teaching(Amundsen & Wilson, 2012; Stefani, 2003). Educational development is defined as a key lever for ensuring institutional quality and supporting institutional change (Sorcinelli, Austin, Eddy & Beach, 2005).

Cruz (2018) noted that I.C.T as an aid for teaching and learning, provides an explicitly symbolic function and central significance of teaching and learning to the university community, even in the midst of a "garbage can" of constituents, agendas, and challenges. Educational management is intended to provide safe havens for the exploration of teaching and learning practice; to emphasize teaching and learning as ongoing—and very much intellectual—processes; and to recognize and reward multiple pathways of development(Lee, DeZure, Debowski, Ho, & Li, 2013). In effect, educational management is aimed towards creating new knowledge, organize a field, mobilize

momentum, build trust and to understand teaching and learning in order to achieve the school or educational goals.

Information and Communication Technology

ICT stands for "Information and communication technology". The term ICT is an extension of the term Information Technology (IT) that emphasizes the role and integration of communication to aid users' access, storage, transmission and manipulation of information (Mwadulo & Odoyo, 2020). ICT is defined as all technological gadgets which include but not limited to computers and the internet used to communicate, create, manage, store and disseminate information (Tonui, Kerich, & Koross, 2016). Fisseha (2011) defined Information Communication Technologies (ICT) as computer and internet connections used to handle and communicate information for learning purpose. It refers to technologies that provide access to information through telecommunication (Ratheeswari, 2018). It is similar to Information Technology (IT) but focuses primarily on communication technologies. This includes the internet, wireless networks, cell phones and other communication mediums(Ratheeswari,2018).

The Federal Government of Nigeria, in the National Policy on Education (Federal Republic of Nigeria, 2010), recognizes the prominent role of ICTs in the modern world, and has integrated ICTs into education in Nigeria. To actualize this goal, the document states that government will provide basic infrastructure and training at the primary school. At the basic school, computer education has been made a pre-vocational elective, and is a vocational infrastructure and training for the integration of ICTs in the school system. Nigeria started implementing its ICT policy in April 2001 after the Federal Executive Council approved it by establishing the National Information Technology Development Agency (NITDA), the implementing body. The policy empowers NITDA to enter into strategic alliances and joint ventures and to collaborate with the private sector to realise the specifics of the country's vision of making Nigeria an IT capable country in Africa and a key player in the information society by the year 2005 through using

Damkor, Irinyang and Haruna(2015) outlined below some of the objectives of Nigeria's ICT policy:

(I) To ensure that ICT resources are readily available to promote efficient national development;

(ii) To guarantee that the country benefits maximally, and contributes meaningfully, by providing the global solutions to the challenges of the Information Age;

(iii) To empower Nigerians to participate in software and ICT development;

(iv) To encourage local production and manufacture of ICT components in a competitive manner;

(v) To establish and develop ICT infrastructure and maximise its use nationwide;

(vi) To empower the youth with ICT skills and prepare them for global competitiveness;

(vii) To integrate ICT into the mainstream of education and training;

(viii) To create ICT awareness and ensure universal access in promoting ICT diffusion in all sectors of national life; and,

(ix) To create an enabling environment and facilitate private sector (national and multinational) investment in the ICT sector.

Problems of ICT in Educational Management

Effective implementation of ICT requires the availability of equipment, supplies of computers and their proper maintenance including accessories [Clement, 2012]. Some of the equipment includes hardware, software and telecommunication in form of computers, scanners, digital cameras, phones, faxes, modems, CD and DVD players and recorders, digitized video, radio, and TV programs [Lang, 2015]. Problems of ICT in educational management vary from developed and developing countries. The developed countries, which are mostly generally perceived as high-tech countries and have good technological management, but many developing countries, may also experience some difficulties in implementing ICT in schools. Those difficulties may range from teachers' readiness, school supports, and finance. Teachers play a vital role in successful implementation of ICT in class. As mentioned by Lim and Khine (2006) how teachers perceive ICT can determine how well and effective the integration of ICT in class.

Becta (2004) also identifies some other difficulties in implementing ICT in schools of some developed countries. Those are insufficient access to technological resources (including insufficient hardware, bad management of resources, unsuitable software, low quality of hardware), the teachers' overload work, some technical problems, and some attitude and belief barriers (including unsupportive belief and negative assumption about the presence of ICT in classroom) (Becta, 2004). Australia also has specific difficulties due to the implementation of ICT in schools. Fleer (1989) conducted a research to see how six Western Australian Schools perceive the implementation of microcomputers in their schools. She found some difficulties in implementing microcomputers in those schools.

As mentioned by Albirini (2006) the school community will reject the proposed technology if there is a mismatch between the introduced technology with the school value. Many schools' ITcoordinators do not aware of this difficulty since frequently they think that the technology which should be implemented in their schools is the most up-to-date, the latest, or the most modern technology. Steele (1986) finds that one of some barriers in implementing technology is relating to the issue of finance. Maintaining the up-date-ness of technology needs a lot of finance. Some institutions have high finance to support the implementation of ICT,

However, in Nigeria and some developing countries, as mentioned by Owolabi, etal., (2013) and Haruna (2005), initiation of ICT service in Nigeria is militated against by certain human and materials factors which are highlighted as follows: (i) ICT facilities are expensive and unaffordable to many individuals, private and some government establishments; (ii) Necessary infrastructures such as electricity and telephone for the operation of ICT components are lacking or grossly operated at epileptic level; (iii)Lack of adequate trained manpower for the development, maintenance and operation of ICT facilities to service the increase demand of Information Technology service in Nigeria; (iv) Poor remuneration for the inadequate personnel in ICT which consequently keep them away from labour markets in Nigeria; (v) Lack of total commitment on the part of government towards the development of ICT sector; (vi) Inadequate funding of internet connectivity because it is capital intensive. (vii) Lack of adequate knowledge among the educational planners, administrators as well as the society on the importance of ICT in educational system; (vii) Lukewarm attitude of many teachers especially at the primary and secondary school levels to be computer literate. The capacity building of teachers in ICT is very low and this must be urgently addressed by educational policy makers and school administrators.

However, Lang (2015) noted that one of the most prominent barriers is the lack of political goodwill of the rulers of a country. In most developing countries allocating sufficient funds for the education sector and ICT does not seem to be a priority or is not attractive enough to the leaders of the country. This is evident in the way developing countries prefer a big budgetary allocation for defense forces than the education sector. Kirya (2019) posited that corruption in the educational management of schools threatens the well-being of a society because it erodes social trust and worsens inequality. Corruption is also evident in the allocation of resources to the education budget, leaving the sector under-resourced.

Prospects of ICT in Educational Management

ICT can provide considerable benefits in supporting educational development. Huffaker (2003)noted that using technology learning students can be active learners and that an active learning allows the students to decide when they require a particular information and whether they have already understood that information or not. By having access to internet in their school the students will not totally depend on the teachers or lecturers. Self-managed learning allows the students to be self-motivated and self-directed learners who will be able to readily, efficiently, and quickly respond to the quick change of information.

As noted by Uhomoibhi (2006) e-learning allows the students to get information faster from everywhere and anytime. ICT also can provide a way for dynamic and collaborative learning. Students can access internet anytime and anywhere.Technology also enables us to cross the demography limits. Rural students can access information from urban areas, get information and share knowledge with other students or teachers in the same area or even different countries. Moodiel (2000) stated that by working together we can do what we cannot do individually. The most important learning aspect in collaborative learning that we want to achieve using ICT is interactivity and communication. Rodrigues (2002) pointed out that effective learning happens when students are interactively engaged in a learning task. Learning using ICT is more than learning through memorization. It allows the learners to experience their learning processes, being interactive, enjoy and have fun with technology. As stated by Rodrigues (2002) by using technology to support collaborative learning, there will be not only human-machine interaction but also human-human interaction. Web-basedlearning context, for instance, allows the students to interact with teachers or other students mediated by machine. ICT can lead us to meta-cognitive learning. As noted by Monteith (2002) by using ICT in our learning we can learn how to learn rather than learn a particular skill. By this we can be realize that learning new technology and new knowledge is not more difficult than learning old knowledge/skills.

As mentioned by Adonis (2006) the effective use of ICT can upgrade the students' literacy and numeracy. Thus, ICT plays an important role in scaffolding process to improve children's literacy. The use of ICT not only can support the cognitive development of the students but also increase their motivation to learn and their interaction in learning.

METHODOLOGY

This section shows procedure and method employed to carry out this conceptual paper. It is a library type of research. It conceptually reviews related relevant literature by sourcing information from textbooks, journal articles, seminars and conference papers. In this case, no research instrument was developed since the study has no population and sample size to collect data as the discussion of this study is based on the existing situation as relates to ICT in educational management with emphasis on the problems and prospects with particular reference to Nigeria. It is based on the various reviews carefully carried out from related literature sources that discussion of findings, conclusion and recommendations are put forward.

DISCUSSION OF FINDINGS

The findings of this conceptual study based on the extant studies reviewed showed that very few studies were conducted in ICT in educational development, but none of these studies from Nigeria linked it to during pandemic outbreaks. This implied that much is still needed to be done.

First, the study revealed that ICT is faced with series of problems which affect educational management in Nigeria. These supported the views of Gbadegesin, et al., (2018) Garba (2014) Adedeji (2011) who revealed that low level of usage of ICT gadgets and non-availability of some ICT equipment with sluggish use and integration of ICT in education system. Also, Owolabi, etal., (2013) and Haruna (2005) indicated that ICT facilities are expensive and unaffordable, poor infrastructures such as electricity and telephone for the operation of ICT components, lack of adequate trained lecturers and teachers in usage of ICT, poor maintenance culture of ICT facilities; inadequate funding of internet connectivity because it is capital intensive, lack of adequate knowledge among the educational planners, administrators as well as the society on the importance of ICT in educational system in Nigeria.

Second, it is deduced that ICT in educational management could foster significant prospects in schools. This corroborated with Aristovnik (2012) who found that ICT improves educational outputs and outcomes in schools. Similarly, Ezugwu, et al., (2016) showed that ICT plays a vital role in promoting efficiency in the teaching process. Also,Huffaker, (2003) revealed that ICT make student to be active and not much dependent on the teacher such that students can be self-managed, self-motivated and self-directed and quickly respond to the quick change of information. Furthermore, Adonis (2006) noted that use of ICT can upgrade the students' literacy and numeracy like skills in use of computer and internet services in schools.

CONCLUSION

The thrust of this study is on role of ICT in educational management in pandemic outbreaks in Nigeria with emphasis on problems and prospects.Use of ICT in the educational management of schools is a relatively new research area that requires before school managers adopt it, they are expected to have an in-depth understanding of its benefits, challenges accompanied by its adoptions and the effect it may pose on school processes. The relevance role of ICT in educational management towards improving the quality of teaching and learning in schools cannot be over-emphasized. These can be fully achieved through full integration of the nation into the global highway which is ICT oriented. Implementing ICT in schools/education has many benefits and difficulties during any pandemic outbreak.

To successfully implement ICT in schools need to consider many aspects. It will waste a lot of time, energy, and money if before implementing it, we do not consider those aspects as regards to management. Theoretical framework by way of the theory of planned behaviour has showed that intention to adopt innovation like ICT in educational management is essential in achievement of uninterrupted learning despite the circumstances. Outcomes of prior related empirical studies did not show much divergence about problems and prospects of ICT in educational management. It is therefore concluded that

ICT plays crucial role in educational management in pandemic outbreaks with a lot of prospects despite its associated problems.

REFERENCES

Adako, L.B. (2006). E- teaching profession: Prospects, problems and remedies. Journal of Research in Vocational and Technical Education, 3(1),12- 16.

Adedeji, T. (2011).Availability and use of ICT in South-Western Nigeria colleges of education.International Multidisciplinary Journal, Ethiopia, 5(5), 315 331.

Adi S. (2020). ICT in education: its benefits, difficulties, and organizational development issues. JurnalSosialHumaniora, 3(1), 106-123.

Ajegbelen, A.J. (2016). The use of ICT to enhance university education in Nigeria. International Journal of Education, Learning and Development, 4(5), 1-11.

Akpan, C. P (2008).Lecturers' perception of the role of ICT in the management of university education for sustainable development in Nigeria. Nigerian Journal of Education Administration and Planning (NAEAP),8(1),114-127.

Aristovnik, A. (2012). The impact of ICT on educational performance and its efficiency in selected EU and OECD countries: A non-parametric analysis. The Turkish Online Journal of Educational Technology, 11(3), 144-152.

Atiqah, N., Na, S., Kim, Y., & Oh, C. (2020).An analysis of the horizontal and vertical consistency of ict skill standards in selected countries and regions. International Journal of Innovation, Creativity and Change, 11(11), 132-146.

Basilaia, G., &Kvavadze, D. (2020).Transition to online education in schools during a SARS-CoV-2 Coronavirus (COVID-19) Pandemic in Georgia. Pedagogical Research, 5(4), 123-135.

Clement, C. K. (2012). Barriers to the introduction of I.C.T into education in developing countries: The Example of Bangladesh. Int. J. Instr., 5(2), 61–80.

Cruz, L. (2018). The Idea of Educational Development: An Historical Perspective. First published: 27 February 2018 https://doi.org/10.1002/tia2.20069

Damkor, M., Irinyang, D.J., &Haruna, M. (2015).The role of information communication technology in Nigeria educational system.International Journal of Research in Humanities and Social Studies, 2(2), 64-68.

Daramola, A. (2006). Information communication technology (ICT) and educational development in Nigeria. A lead paper presented at the 2ndNational Conference of the School of Education, College of Education Ikere- Ekiti, Nigeria.

Davies, C., & Birmingham, P. (2002).Using ICT to enhance the learning experience in the classroom.Education Libraries Journal, 45 (1), 17-19.

Ezugwu, A. E., Ofem, P. O., Rathod, P., Agushaka, J .O., &Haruna, S. (2016). An empirical evaluation of the role of information and communication technology in advancement of teaching and learning.Procedia Computer Science 92,568 – 577

Falco, M. (2017).Reconsidering educational practices: ICTs in the teaching-learning process. Pedagogical trends.

Federal Government of Nigeria (2004).National policy on education.Revised Edition.Federal Ministry of Education, Abuja, Nigeria.

Garba, S. A. (2014). Towards the effective integration of ICT in educational practices: A review of the situation in Nigeria. American Journal of Science and Technology, 1(3), 116-121.

Gbadegesin, T.F., Alabi, O., &Omodun, K. (2018). Children education in ICT age in Nigeria: A tripartite socio-cultural phenomena. Journal of Educational andSocial Research, 8(3),51-62.

Ibrahim, A. A. & Mazin S. A. (2017). Educational management, educational administration and educational leadership: Definitions and General concepts. SAS Journal of Medicine (SASJM),3(12), 326-329**.**

Kasimu, S.I (2015) Assessment of the impact of information and communications technology (ict) on educational development: a study of selected senior secondary schools in Kaduna state, Nigeria. A thesis submitted to the school of postgraduate studies, Ahmadu Bello University, Zaria, in partial fulfillment of the requirements for the award of a master of science degree in public administration.

Lang, A. C. (2015). Barriers Hindering Implementation, Innovation, and Adoption of ICT in Primary Schools in Kenya. Int. J. Innov. Res. Dev., 4(2), 1–11.

Lim, C., P. &Khine, M., S. (2006). Managing teachers' barriers to ICT integration in Singapore schools.Journal of Technology and Teacher, 14 (1), 97-125.

Marshall, S. & Taylor, W. (2005).Facilitating the use of ICT for community development through collaborative partnerships between universities, governments, and communities.International Journal of Education and Development Using Information and Communication Technology, 1 (1), 5- 12

Monteith, M. (ed.) (2002).ICT: Teaching primary literacy with ICT. Buckingham: Open University Press.

Olowoyeye, G.B. (2016). The role of information and communication technology (ICT) toward teachers' education in south west Nigeria: impediments and the way forward. European Journal of Computer Science and Information Technology, 4(1), 56-62.

Owolabi, T.O., Babatope, K. O &Oke, J.O. (2013). Teacher education, information and communication technology: Prospects and challenges of e-teaching profession in Nigeria. American Journal of Humanities and Social Sciences, 1(2), 87-91

Seele, J. (1986). Edtech and the review of efficiency and effectiveness in higher education.Australian Journal of Educational Technology, 2 (2), 129-138.

Torrecillas, C. (2020). The challenge of online teaching for Spanish public universities in the face of the COVID-19 pandemic.ICEI.

Veleza, M.G.B , Marcos, A. Y. R., &Gamezc,M.R (2010). Use of ICT in the Teaching-Learning Process during the COVID-19 Emergency Lockdown: An Analysis of International Cases. International Journal of Innovation, Creativity and Change, 14(1), 1268-1281.

THE SCALE: MAIDEN EDITION VOL 1 NO 1 DECEMBER 2021

IMPACT OF MULTIMEDIA CONTENTS IN BROADCASTING

OHWO, Stephen O.
Delta state polytechnic Ogwashi-uku Delta State.
Department of Computer Science
steveohwo@yahoo.com
&
ERIRHI, Jonathan O. (Ph.D)
Delta state polytechnic Ogwashi-uku Delta State.
Department of Computer Science
erihri@yahoo.com

Abstract
Broadcasting is the distribution of audio or video content to a dispersed audience via any electronic mass communications medium, but typically one using the electromagnetic spectrum (radio waves), in a one-to-many model. Multimedia aredifferent forms of media used to collect digital contents and deliver such contents through information processingby the use of Radio Broadcasting, Cable Network involving Television Broadcasting, Video, Smart Phone, Camera, Newspaper Magazine, etc. Most of the information been delivered are short of quality due to ineffective dissemination of the information contentsand lack of proper managing of the multimedia content.The objective of this research is to examine the impact of multimedia contents in broadcasting particularly in television and to enlighten broadcaster the importance of quality multimedia contents in broadcasting.The research gives an insight of how multimedia content delivering by television stations impact the viewer mental perception. The researcher reviews related works of the role's multimedia contents like; texts, graphics and audios play in broadcasting. Research Questions and Hypothesis were formulated to ascertain the impact of these contents in information dissemination. Data generated from the survey instrument were analyzed with simple percentages, sum and mean. Chi-square to test the formulated hypotheses. The result showed that quality multimedia contents improve quality broadcasting. Conclusively, the researcher highlights the positive impact of proper managing of multimedia content and the enormous roles they play with respect to television broadcasting.

Keywords: Multimedia content, Broadcasting, Multimedia content delivering, Television broadcasting

INTRODUCTION

Multimedia is a field in computer science and engineering concerned with the computer controlled integration of text, graphics, drawings, still and moving images (Video), animation, audio, and any other media where every type of information can be signified, stored, communicated and handled digitally. While Broadcasting is the distribution of audio or video content to a dispersed audience via any electronic mass communications medium, but typically one using the electromagnetic spectrum (radio waves), in a one-to-many model. Multimedia can be recorded and played, displayed, interacted with or accessed by information satisfied processing devices, such as high-tech and automated devices, but can also be part of a live presentation. Multimedia devices are electronic media strategies used to store and involvement multimedia content. Multimedia is notable from diverse media in fine art; for model, by containing audio it has a broader scope. In the early years of multimedia, the term "rich media" was identical with collaborating multimedia, and "hypermedia" was an application of multimedia. In this paper we discussed about the different elements of multimedia along with its applications, features, advantages and disadvantages so on.

Multimedia has developed an unavoidable fragment of any performance. It has originated a diversity of presentations right from entertaining to education. The development of internet has also enlarged the request for multimedia content. Multimedia is the media that uses numerous forms of information content and information processing (e.g. text, audio, graphics, animation, and video interactivity) to inform or entertain the user. Multimedia is alike to traditional varied media in fine art, but with a broader opportunity. The term “rich media” is equal for interactive multimedia. Multimedia elements includes; Text, Graphics, Audio, Video and Animations. Interactivity multimedia may be generally separated into linear and nonlinear groups. Direct active content developments without any navigation control for the watcher such as a cinema presentation. Non-linear content suggestions user interactivity to control progress as used with a computer game or used in self-paced computer created exercise. Non-linear content is also known as hypermedia content. Multimedia presentations can be live or noted. A recorded presentation may permit interactivity via a steering system. A live multimedia presentation may allow interactivity via interaction with the presenter or performer. Multimedia enhanced simple, text-only computer interface and production acquisition and holding of attention and interest in measurable benefits. In short, is to improve multimedia information retention. When it's properly constructed, can be profound and useful multimedia entertainment. Multimedia can be use in many way are business, school, home, public places and virtual reality.

Broadcasting is the distribution of audio or video content to a dispersed audience via any electronic mass communications medium, but typically one using the electromagnetic spectrum (radio waves), in a one-to-many model (Peters,1999). Broadcasting began with AM radio, which came into popular use around 1920 with the spread of vacuum tube radio transmitters and receivers. Before this, all forms of electronic communication (early radio, telephone, and telegraph) were one-to-one, with the message intended for a single recipient. The term broadcasting evolved from its use as the agricultural method of sowing seeds in a field by casting them broadly about. It was later adopted for describing the widespread distribution of information by printed materialsor by telegraph (Douglas, 1987). Over the air broadcasting is usually associated with radio and television, though more recently, both radio and television transmissions have begun to be distributed by cable (cable television). The receiving parties may include the general public or a relatively small subset; the point is that anyone with the appropriate receiving technology and equipment (e.g., a radio or television set) can receive the signal. The field of broadcasting includes both government-managed services such as public radio, community radio and public television, and private commercial radio and commercial television. The U.S. Code of Federal Regulations, title 47, part 97 defines "broadcasting" as "transmissions intended for reception by the general public, either direct or relayed". (Saint Louis Medical and

Surgical Journal ,1886).Private or two-way telecommunications transmissions do not qualify under this definition. For example, amateur ("ham") and citizens band (CB) radio operators are not allowed to broadcast. As defined, "transmitting" and "broadcasting" are not the same.

Transmission of radio and television programs from a radio or television station to home receivers by radio waves is referred to as "over the air" (OTA) or terrestrial broadcasting and in most countries requires a broadcasting license. Transmissions using a wire or cable, like cable television (which also retransmits OTA stations with their consent), are also considered broadcasts but do not necessarily require a license (though in some countries, a license is required). In the 2000s, transmissions of television and radio programs via streaming digital technology have increasingly been referred to as broadcasting as well.

It is generally recognized that the first radio transmission was made from a temporary station set up by Guglielmo Marconi in 1895 on the isle of weight. This followed by pioneering work in the field by number of people including Alcssandro Volta, Andre Marie Ampire, Geory ohm and James Clerk Maxwell. The radio broadcasting of music and talk intended to reach a dispersed audience started experimentally around 1905. VHF (very high frequency) stations started 30-35 years later. In the early days, radio stations broadcast on the long wave, medium wave, and shortwave band, and later on VHF (very high frequency) and UHF(ultrahigh frequency). However, in the United Kingdom Hungary, France and some other places, from as early as 1890 there already a system where by news, music, live theater, music halls fiction readings religious broadcast e.t.c were available in private homes and other places via the conventional telephone line, with subscribers being supplied a number of special, personalized headsets. In Britain this system was known as electrophone, and was available as early as 1895 or 1899 (sources vary) and up till 1926. In Hungry, it was called telefonHimondo (1893-1920s), and in France, theatrophone (1890-1932).

By the 1950s, virtually every country had broadcasting system, typically one owned and operated by government. Alternative modes included commercial radio, as in the United States, or a due system with both state sponsored and commercial stations, introduced in Australia as early as 1924, with Canada following in 1932. Today, most countries have evolved into a dual system, including the UK. By 1955, practically every family in North America and Western Europe, as well as Japan, had a radio. A dramatic change came in 1960s with the introduction of small inexpensive portable transistor radios which greatly expanded ownership and usage. Access became practically universal around the world.

Argentine was a world pioneer in the broadcasting, being the third country in the world to makes it first regular broadcasts in 1920, having been the first Spanish speaking country in Latin America to offer daily radio broadcasts. The main stations were in Buenos Aires and Cordoba. Among the historical facts related to Argentine radio, it can be mentioned that the first broadcast was made with live broadcast of Richard Wegner's opera Parsifal from the Teatro Coliseo in Buenos Aires, on August 27, 1920 in charge of the radio Argentine society of Enrique Susini, Cesar Guerrico, Miguel Mugica Luis Romero and Ignacio Gomez, who installed a transmitting device on the roof of the building, for which they are remembered as “the crazy people on the roof”.

Multimedia Contents

Text: Whether or not they have used a computer, most people are familiar with text. Text is the foundation for word processing programs and is still the fundamental information used in many multimedia programs. In fact, many multimedia applications are based on the conversion of a book to a computerized form. This change gives the user instant access to the text and lets him or her display pop-up windows, which give meanings of certain words.

Audio Sound: The combination of audio sound into a multimedia application can offer the user with information not likely finished any other technique of announcement. Some types of information can't be taken efficiently without using sound. Audio sound can also strengthen the users considerate of information obtainable in another type of media. For example, a description might define what is being seen in an animation clip. This can enhance the understanding of what the application is all about and lead to better comprehension. Experts in learning have found that presenting information using more than one sense aids in later retaining of the information. Most importantly, it can also make the information more interesting to the user. Audio sound is available in several different formats. Today, maybe the greatest collective type of audio is red book audio. This is the normal prerequisite used to mention to customer audio compacted discs. It is a worldwide standard and is formally recognized as IEC 908. Another audio sound format is the Windows wave file, which can be played only on PCs running the Windows operating environment. A wave file contains the actual digital data used to play back the sound as well as a header that provides supplementary information about the determination and playback rate. Wave files can store any sort of sound that can be verified by a microphone. Musical Instrument Digital Interface or MIDI for short is also another audio format. The MIDI format is actually a specification invented by musical instrument manufacturers. Rather than being a digitized form of the sound, the MIDI specification is actually a set of messages that describes what musical note is being played. The MIDI requirement cannot accumulation whatever but in the form of musical notes. MIDI music can be shaped with a sequencer.

Static Graphics images**:** When you imagine graphics images you believably think of "still" images-that is images such as those in a photograph or drawing. There is no occurrence in this kind of picture. Still graphics images are an all-important portion of multimedia because humans are modality adjusted. Static graphics images have a certain concept of formats and can be created in a number of various ways. Just as you can see a limitless number of photographs or pictures, the types of static graphics images that you can include in a multimedia application are almost unlimited.

Animation: Animation mentions to moving graphics images. The happening of somebody giving CPR makes it much easier to learn internal organ revitalization, rather than just screening a static picture. Just as a static graphics image is an all-powerful form of human action, such is the case with animation. Animation is particularly useful for enlarge concepts that affect movement. Such thought as playing a guitar or hitting a golf ball are hard to exemplify using a single photograph, or even an ordination of photographs, and equal more difficult to explicate using text. Animation forms it easier to portray these characteristic of your multimedia application.

Full-Motion Video: Full-motion video, such as the images depicted in a television, can add even more than to a multimedia application. Although full-motion video may sound similar a perfect way to add a powerful message to a multimedia application, it is nowhere near the quality you would anticipate after watching television. Full-motion video is still in its occurrence stages on PCs, and it is constricted in resolution and size.

Uses and Applications of Multimedia

Multimedia in Education:Multimedia

combining respective media in a one evidently it has more beginning of information. So it is extended used in the field of education and training. Even in conventional method we use audio visual for imparting education, where charts, models and so were used. Now days the classroom demand is not limited to that accepted method instead it needs audio and visual media. The multimedia incorporates all of them in one system. For the use of multimedia as education assistance the PC integrated a high quality display. This all has advance the improvement of a wide scope of computer based training. The software package named computer aided direction is accessible that supply a friendly interactive acting of learning.

Science and Technology: Multimedia had a broad application in the field of science and technology. Whether it is an industry or the case of sciences all are benefited by its use. The multimedia applications are beneficial to science and technology. The multimedia system is competent of transferring audio, and clips in addition to the regular text. It is even capable of sending message and formatted multimedia documents. At the same time the multimedia also helps in live presentation, which is a live interaction through audio messages and this is only possible with the multimedia contents. It is adequate for communication and meetings. At the same time the multimedia is sufficiency useful services based on images.

Multimedia in Business: The business application of multimedia includes, product demos, instant messaging. One the excellent applications are voice and live conferencing. A multimedia can make an audience come live. It is widely used in programs. Such a program can be used by a mechanic and peoples. There are a number of easy to use authoring programs and tools that can even let workers to create their own program. There are a number of applications available that slow to run more smoothly and effectively.

Multimedia in Games: One of the most exciting applications of multimedia is games. Now days the live internet pay to play gaming with multiple players has become popular. Actually the first application of multimedia system was in the field of entertainment and that too in the video game industry. The integrated audio and video effects make various types of games more entertaining. Generally, most of the video games need joystick play.

Creative industries: Creative industries use multimedia for a variety of purposes ranging from fine arts, to entertainment, to commercial art, to journalism, to media and software services provided for any of the industries listed below. An individual multimedia designer may cover the spectrum throughout their career. This might request for their skills range from technical, to analytical, and to creativity.

Research Aim and Objectives

This research generally aims to find out the impact of multimedia content in broadcasting. While the specific objectives are:

1. To examine the impact of multimedia content in broadcasting particularly in television.

2. To enlighten broadcaster, the importance of quality multimedia contents in broadcasting.

Research Questions

The following research questions were raised to guide the study:

1. To what extents does quality multimedia contents impact broadcasting?

2. Which of the media mode does multimedia contents impact most in broadcast?

3. To what extends will multimedia contents in broadcasting educate the viewer?

Research Hypotheses

The following hypotheses were formulated and tested in the course of the study.

1. There is no significant difference in using quality multimedia content in broadcasting and not using multimedia contents.

2. There is no significant difference in the improvement irrespective of the mode of broadcasting

3. There will be no impact of multimedia contents in educating the viewers.

Related works

Masaru et al. (2009) proposed a technique to acquire knowledge for baseball digest video production using an inductive inference approach. They integrated the concept of inductive logic programming (ILP) and baseball game metadata to enable learning of the highlight scene definition from digest video produced by a TV director. ILP is a learning method formed at the intersection of machine learning and logic programming, and ILP processor can acquire the highlight scene definition by inductive learning from scenes that are selected as highlights in sports news. This technique makes it possible to generate a semantic digest automatically, which includes not only score scenes but also attractive scenes reflecting the director's intention.

Xi, and Shiguo (2011). Proposed digital fingerprinting technique for traitor tracing in multimedia content distribution. It embeds unique customer information (e.g., customer ID) into multimedia content and generates different copies for different customers. The unique customer information can be extracted from the illegal copy and used to tell the traitor who re-distributes his copy to other unauthorized customers. Till now, there exist some fingerprint embedding algorithms, such as additive embedding, multiplicative embedding, quantization embedding, etc. However, the ability to resist collusion attacks is not studied. Collusion attack is the biggest threat to fingerprinting algorithms, which combines several copies together to produce a new copy without customer information.

García-Lucas et al. (2019) proposed a fast scheme in order to accelerate the ME in JEM called "pre-analysis algorithm." This algorithm allows reducing the size of the search range and the number of the reference frame. Numerical results prove that the proposed algorithm achieves more than 62% of the execution time with a negligible BD-rate of 0.11%. Moreover, the work in García-Lucas et al. (2020) proposes a Naïve-Bayes model-based fast CU mode prediction in HEVC-JEM transcoding to improve coding efficiency. This technique reduces the computational time by 12.71%

.

Khemiri et al. (2018) suggested an algorithm using the parallel-difference-reduction process to optimize the ME module of HEVC. The proposed scheme achieves on average 56.17% and 30.4% reduction in coding time with a PSNR loss of 0.095 dB and a reduction in Bitrate of 0.64%. Three algorithms are presented to improve the TZ search (test zonal search) algorithm. The computational complexity reaches 75% with 0.12 dB PSNR and a decrease by 0.5% in the Bitrate in RA configuration. Another fast algorithm named "early skip mode decision" for the HEVC. The obtained results reveal that the fast scheme saves on average 58.5% and 54.8% of execution for several video sequences under RA and LDB configurations.

Wang et al. (2017) proposed an effective quad-tree plus binary tree (QTBT) partition method to reach a good

compromise between compression performances. Experimental results provide an average time reduction of 64% with only 1.26% increase in Bitrate. Results show that the proposed method achieves 57% time saving with an increase of 0.43% in the BD-rate.

METHODOLOGY:

Data Collection

This study adopts the survey methodology. Questionnaires were distributed to some broadcasting media organizations staffs and television viewers. The researcher makes use of probability random samplingtechnique. The structure of the questionnaire in this study is close-ended structure of questions. The close-ended questions require a choice between a number of given answers, ranked from a tod. The questionnaire is structured in such that respondents can answer Yes or No. The purpose of the questionnaires is to know the impact of multimedia content in broadcasting in order to make justifiable generalization.The population of the study comprised 370 respondents in broadcasting field and viewers. Three hundred and seventy (370) copies of the questionnaire were administered by the researcher with three research assistants on a face-to-face basis. All instruments administered were returned but nine (9) were not properly filled and were therefore discarded leaving 351 for data analysis.. This exercise took ten (10) days, which at the end 351 copies was retrieved valid for analysis.

Validity/ Reliability of the Instrument

Validity is the extent to which an instrument measures what is designed to measure. The instrument is designed to measure the impact of multimedia contents on the viewers. The criterion and population validity was use, two groups of broadcast were tested in delta broadcasting station Warri delta state based on the impact of the contents on the viewers and test result obtained will be compare with the result that will be obtain from the data analysis.

Method of Data Analysis

The data collected were presented in tables which are in a condensed form. Descriptive statistics using SPSS (Statistical Package for the social sciences) were conducted on the quantitative data. Data generated from the survey instrument were analyzed with simple percentages, sum and Mean. Chi-square was used to test hypotheses.

RESULTS

Table 1: Percentage responses of Journalist, Producers, Presenter and viewers of the extends in which multimedia content impact broadcasting?

s/n	Item	No impact in Broadcasting quality F	%	Impact Broadcasting quality	%
	Journalist, Editors, Producers Presenter, and viewers are aware of the following:				
1	Most broadcasters include only text content in their broadcasting.	127	14.2	217	14.4
2	Broadcasters broadcast using unorganized images	117	13.1	227	15.0
3	Most audios in broadcasting are distorted	104	11.6	240	15.9
4	Presented slides in broadcasting are wrongly time	124	13.8	220	14.6
5	Most children became addictive to TV broadcast due to rich contents	95	10.6	249	16.5
6	Innovative technology will improve multimedia content	143	16.0	201	13.3
7	Electronic device contribute to quality broadcasting	186	20.8	158	10.5
	Total	**896**		**1512**	

Sources: Field survey, 2021

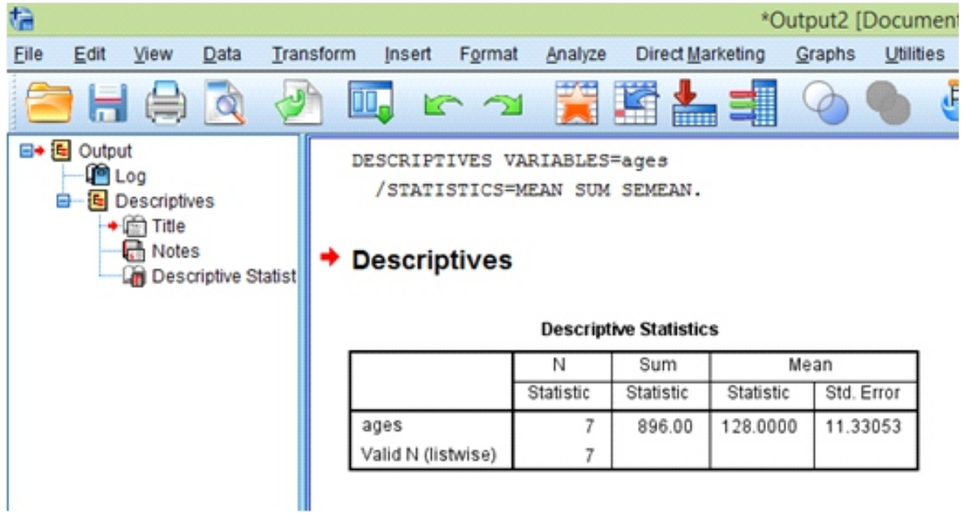


Figure 1: Mean of No Impact in Broadcasting Quality Based on Multimedia Contents

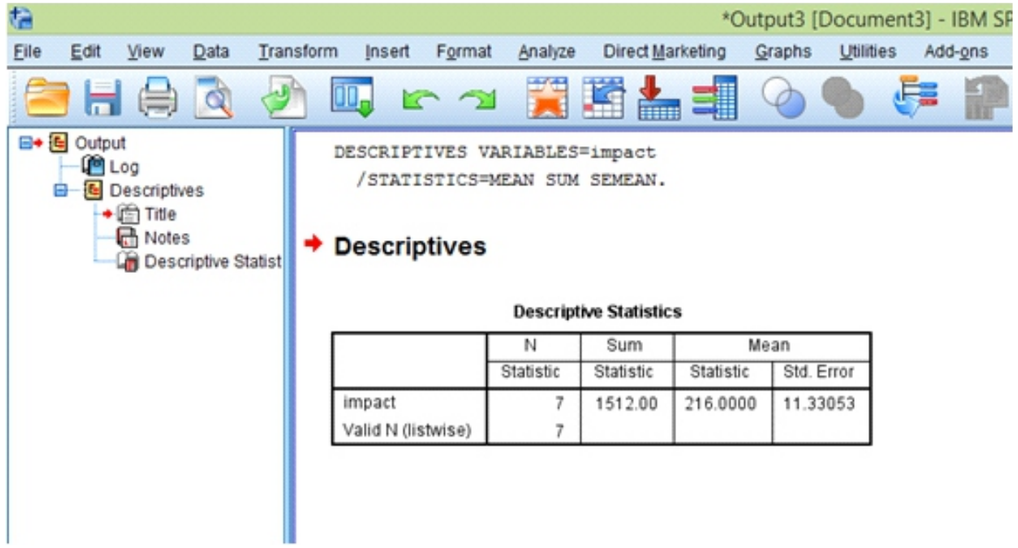


Figure 2: Mean of Multimedia Contents Impaction Broadcasting Quality

The above table shows that quality multimedia content has impact in broadcasting. A total of 896 and a mean of 128 (or 37.2%) does not have impact on broadcasting while a total of 1512and a 216 mean (or 62.8%) have impact on broadcasting.Table 2: Percentage responses of Journalist, Producers, Presenter and viewers to the media mode in which multimedia content improve most in broadcasting.

s/n	Item	Equal impact in mode of Broadcasting F	%	Impact more in TV Broadcasting F	%
	Journalist, Editors, Producers Presenter, and viewers are aware of the following:				
1	Most broadcasters include only text content in their broadcasting.	127	14.2	217	14.4
2	Broadcasters broadcast using unorganized images	117	13.1	227	15.0
3	Most audios in broadcasting are distorted	104	11.6	240	15.9
4	Presented slides in broadcasting are wrongly time	124	13.8	220	14.6
5	Most children became addictive to TV broadcast due to rich contents	95	10.6	249	16.5
6	Innovative technology will improve multimedia content	143	16.0	201	13.3
7	Electronic device contribute to quality broadcasting	186	20.8	158	10.5
	Total	**896**		**1512**	

Table 3: Percentage responses of Journalist, Producers, Presenter and viewers to how far multimedia content in broadcasting educate the viewer?

s/n	Item	Multimedia content don't educate viewer F	%	Multimedia content educate viewer F	%
	Journalist, Editors, Producers Presenter, and viewers are aware of the following:				
1	Most broadcasters include only text content in their broadcasting.	127	14.2	217	14.4
2	Broadcasters broadcast using unorganized images	117	13.1	227	15.0
3	Most audios in broadcasting are distorted	104	11.6	240	15.9
4	Presented slides in broadcasting are wrongly time	124	13.8	220	14.6
5	Most children became addictive to TV broadcast due to rich contents	95	10.6	249	16.5
6	Innovative technology will improve multimedia content	143	16.0	201	13.3
7	Electronic device contribute to quality broadcasting	186	20.8	158	10.5
	Total	**896**		**1512**	

Sources: Field survey, 2021

Test of Hypothesis 1

There is no significant difference in using quality multimedia content in broadcasting and not using multimedia contents.

Table 4: Chi- square test by usage of quality multimedia content as it affects broadcasting.

Usage	Not Affect Broadcasting F	Affect Broadcasting F	Total F	$X_{2\,cal}$	$X_{0.5}$	Df	Decision
Quality multimedia content	61	91	152				
No quality multimedia content	28	60	88				
	89	151	240	1.63	0.46	1	significant

Since X_{2cal} = 1.63 is more than $X_{0.5}$ = 0.46, degree of freedom 1, therefore the null hypothesis is rejected and the conclusion is that there is significant difference in using quality multimedia content in broadcasting and not using multimedia contents.

Hypothesis 2
Table 5:Chi- square test by mode of broadcasting base on improvement.

Mode of Broadcasting	Equal impact on mode of Broadcasting F	Affect TV Broadcasting most F	Total F	$X_{2\ cal}$	$X_{0.5}$	Df	Decision
Multimedia content affect mode of broadcasting equally	61	118	179				
Multimedia content don't affect mode broadcasting equally	63	102	165				
	124	220	240	0.76	0.46	1	significant

Since X_{2cal} = 0.76 is more than $X_{0.5}$ = 0.46, degree of freedom 1, the null hypothesis is rejected and the conclusion is that there is significant difference in television broadcasting and other mode of broadcasting.

Hypothesis 3
Table 6: Chi- square test by viewer education through multimedia content.

Viewer's education	Viewers are not educated through multimedia content F	Viewers are educated through multimedia content F	Total F	$X_{2\ cal}$	$X_{0.5}$	Df	Decision
Media content educate viewers	50	46	96				
Media content don't educate viewers	70	61	131				
Total	120	107	227	0.41	0.46	1	Not significant

Since X_{2cal} = 0.41 is less than $X_{0.5}$ = 0.46, degree of freedom 1, the null hypothesis is accepted and the conclusion is that there is no impact of multimedia contents in educating the viewers.

DISCUSSION

This research work critically examines impact of multimedia content on broadcasting. Three hundred and fifty-one (351) respondents from media organizations, viewers, stakeholders were used. Research question one examined the extent quality multimedia content impact broadcasting with respect to the viewers. Research questions two examine media mode (e.g. television) that multimedia content impact most. Research question three tries to find out the extent multimedia content educate the viewers. The results show that quality multimedia content has impact on broadcasting. Also, there was significant difference between in television broadcasting and other mode of broadcasting. However, there was no significant impact of multimedia content in educating the viewer. Based on these, some recommendations were made. All these point to the fact that without quality multimedia content, quality broadcasting is not made. Likewise, quality multimedia content may not contribute in educating viewer depend on the content of the multimedia and context in discuss.

CONCLUSION

It can be inferred from the results that multimedia content has remarkable impact on broadcasting. Therefore, presenters, producers and professional in broadcasting should embrace quality multimedia contentsin their broadcasting knowing that broadcast without quality multimedia content make the broadcast not achieving what its intend to achieve. From the results, it is clear that with combined efforts of broadcaster, media organization, collaborated body and Government a lot will be achieved in giving quality broadcast in the society.

Finally, both the quantitative and qualitative parts of the survey provide evidence of the critical importance of human, material and financial resources. One respondent sums it up poignantly: "We are constantly challenged to provide quality information despite not having as much resources as other media, but still do well", followed by "If we had more, we could do more". These and similar quotes speak of the enthusiasm, optimism and resilience among broadcasting member organizations.

RECOMMENDATIONS

Based on the findings of this study, the following recommendations are made:

1. Broadcaster, media organization, and collaborated body should have quality multimedia content in their broadcast.

2. Software that can assist in creating, editing and managing multimedia content is encourage to be use.

3. Producers, presenters and alliance professional are encouraged to undergo training periodically to update skills in multimedia management.

4. If possible demo broadcast should be done before public broadcast.

5. Multimedia contents should be tailor in educating viewers in one way or the other to create a better society.

REFERENCES

Douglas, S. J. (1987). Inventing American Broadcasting, 1899–1922.

García-Lucas, D., Cebrián-Márquez, G., Díaz-

Honrubia, A. J and Cuenca, P. (2020). "Accelerating the CU partitioning decision in an HEVC-JEM transcoder," Multimedia Tools and Applications, vol. 79, no. 3-4, pp. 2047–2067.

Khemiri, R., Kibeya, H.,.Sayadi, F., Bahri, N., Atri, M.andMasmoudi, N. (2018) "Optimisation of HEVC motion estimation exploiting SAD and SSD GPU-based implementation," IET Image Processing, vol. 12, no. 2, pp. 243–253.

Lotz, A. (2014). The television will be revolutionized New York,NY:NewYork University press.

Manyozo, L. (2016). Critical reflection on the theory versus practice debate in communication for development. Journal of Media and Communication Research, 32(61), 116–134.

Martin, H. and Priscila, L. (2011). The World's Technological Capacity to Store, Communicate, and Compute Information, 332(6025), 60–65.

Masaru, M , Masahiro, M., Nobuyuki, S Baseball Digest Production System Using Inductive Logic Programming, Journal of Multimedia 5(4):503 – 508.

Pavlik, J. (2008). Media in the digital age, New York, NY: Columbia University Press.

Perse, E. M., and Lambe, J. (2016). Media effects and society (2nd Ed.). New York, NY: Routledge

Peters, J. D. (1999). Speaking into the Air. University of Chicago Press. ISBN 978-0-226-66276-3.

Saint Louis Medical and Surgical Journal (1886). Operations formerly described in the city press alone, are now sent broadcast through the country by multiple telegraph. p. 334.

Wang, Z. , Wang, S., Zhang, J., Wang, S. and Ma, S. (2017) "Effective quad-tree plus binary tree block partition decision for future video coding," in IEEE in Data Compression Conference, pp. 23–32, Snowbird, UT, USA.

Xi, C., Shiguo, L. (2011). On the Collusion-Resistance of the Fingerprinting Algorithm Based on Additive Watermarking, Journal of Multimedia 6(4):369-375

Ziegler, A, Ogurreck, M., Steinke, T., Beckmann, F., Prohaska, S. (2010). Opportunities and challenges for digital morphology. Biol Direct., 5: 45-10.1186/1745-6150-5-45.

IMPERATIVES OF E-GOVERNANCE AND PUBLIC ADMINISTRATION IN NIGERIA

OKAFOR, Okafor Ogbonnaya
&
NWAKODO,UdochukwuPrecious
Public Administration Department
Abia State Polytechnic, Aba,
Abia State
syl4best22@yahoo.com

Abstract
The world as a global village is fastly advancing technologically towards effective public service delivery, electronic governance and administration. This is predicated on the appreciable use of information and communication technology methodsin the administration and governance of the people. However, in Nigeria, there are lots of challenges hindering the effective implementation of e-governance and public administration. In this work,data were sourced and analyzed qualitatively through content analysis. Based on the finding, it was concluded that e-governance remains the best in encouraging transparency and accountability in public administration. The paper therefore recommends that the Nigerian government should develop an e-governance policy and the needed political will to implement the electronic governance.

Keyword*:E-governance, public administration, E-government, E-Administration,Information andcommunication technology.*

INTRODUCTION:
In recent years, the emergence of e-governance has been one ofthe significant developments in public administration. It encompasses all government roles and activities, shaped by informationand communications technologies (ICT's).E-governance has become one of the reform tools geared towards effective public service delivery. E-governance in the public sector and administration is very relevant in the discourse on modern usage of technology in the world of public administration.People's perceptions and mode of doing things have drastically changed as a result of technological advances. Amaechi &Eme(2015) argued that as internet usage grows, and the use of technology in general grows, so too does the use of technology and internet by the government.E-governance is the general term used to describe the government's use of ICT in performing it's multiple responsibilities (Holzer and Schwester, 2011). This work among others analyses how e-governance relates to public

administration and the challenges in the implementation of e-governance in Nigeria.

The impact of e-governance on public administration in Nigeria cannot be over emphasized. Abasilim and Edet (2015) observed that e-governance in Nigeria can be traced to the formulation of the Nigerian National Information Technology (NNIT) policy in the year 2000. The essence of the policy was to make Nigeria an information technology (IT) capable country in Africa and a key player in the information society and also use IT for education, creation of wealth, poverty eradication, job creation, governance, health, agriculture (NITP,2000).

The application of e-governance has become an important mechanism in enhancing citizens participation, monitoring and evaluating of governmentprojects, ensuring government accountability and transparency as well as transferring information from one sector to another (Palvia and Sharma, 2007). Sunday (2014) added that e-governance has become a necessary political mechanism in evaluating government performances in many developed parts of the world. In fact, the use of information and communication technology in government businesses through promoting government's role in delivering services, public administration and promoting active participatory democracy has been gaining an impelling force in the global community (Heeks,2002).

CONCEPTUALIZATION:

E-Governance

E-governance has been broadly defined especially as it relates to the entire range of government roles and activities, shaped by and making use of information and communication technologies (ICT's).It is an activity that takes place by digital process over a computer network, usually the internet, between the government and members of the public and entities in the private sector especially regulated entities. These activities which generally involves the electronic exchange of information to acquire or provide products or services, to place or receive orders, to provide or obtain information, or to complete financial transactions (www.dir.state.tx.us/taskforce).

E-governance encompasses a broad vision of the utilization of information and communication technology in government businesses with the primary aim of encouraging greater participation in the state, as well as enhancing the relationship between the government and the citizens. According to the United Nations E-Government Report (2008),e-governance is of recent origin which emerged at the beginning of the 21st century. In the early days of its development, e-governance was part of e-commerce in the public sector which followed the evolutionary e-business evolving models where the focal point of e-services were easy representation of graphic user interface with no mutual or reciprocal action.

Scholars such as Sunday (2014) added that e-governance has to do with the use of information and communication technology by the various government agencies to enhance accountability, create awareness, and ensure transparency in the management of government business. It is a political strategy through which the activities of the government are made public through the adoption of modern communication.

From the foregoing therefore, it is believed that e-governance has become an accepted methodology involving the use of information technology in improving transparency, providing information speedily to all citizens, improving public services such as transportation, power,health, water, security, and municipal services. Governance has always been dependent upon technology, in the broadest sense of knowledge, skills, techniques and epistemological strategies, as well as devices, hardware, software and power circuits (Amaechi and Eme,2015). As the reach of governance has spread into new areas of the globe as well as new aspects of hitherto personal relationships, it has come to rely upon more complex assemblages of technically stored and disseminated knowledge (Coleman, 2008).

According to Dan Fulani (2013), the scope of e-governance revolves around E-registration, E-participation, E-taxation, E-mobilization, E-education, E-service delivery, E-feedback, E-policing, E-debates and the analysis of public financial statements.Thus, e-government is a network of organizations such as the government, non-profit organizations and private institutions who work together to achieve a common goal. Adeyemo (2013) observed that the primary aim of ensuring the application of e-governance in the affairs of the state is to promote good governance which is characterized by equality, partaking in the democratic process, transparency and accountability in the various sectors of the nations economy.

E-governance evolved on the basis of the revolution in information and communication technology such as personal computers, internet, mobile phones and different electronic applications. The emergence of these devices gradually enabled the easy transfer ofinformation and services between the government and other segments of the society (Danfulani, 2013). In agreement with the above, Amaechi and Eme (2015) noted that e-governance is the public sector's use of information and communication technologies with the aim of improving information and service delivery, encouraging citizen participation in the decision making process and making government more accountable, transparent and effective. E-governance involves new styles of leadership, new ways of listening to citizens and new ways of organizing and delivering information and services.E-governance is generally considered as a wider concept than e-government, since it can bring about a change in the way citizens relate to governments and to each other. E-governance can bring forth new concepts citizenship, both in terms of citizens needs and responsibilities. Its objective is to

engage, enable and empower the citizen (www.unesco.org).

E-governance entails the digitalized coding, processing, storage and distribution of data relating to three keys aspects of governing societies; the representation and regulation of social actors; the delivery of public services; and the generation and circulation of official information(Coleman,2008).

E-Administration,according to Amaechi &Eme (2015), isa part of e-government which handles internal administration within government instead of external users such as citizens and businesses. The European Commission defines E administration as an application using information and communication technology (ICT) to support back office administrative tasks. Heeks (2001) observes that e-administrative coversG2GSrelationtoimproveadministrativeprocessesinhierarchicalorganization.

E-Administration, according to Wikipedia (2021) refers to any of a number of mechanisms which convert what in a traditional office are paper processes into electronic processes, with the goal being to create a paperless office. This is an ICT tool, with the goal being to improve productivity and performance, E-Administration can encompass both intra-office and inter-office communication for any organization. Its objective according to Amaechi and Eme (2015) is to introduce total transparency and accountability leading to better e-governance within any organization. They added that this initiative in Germany is especially targeted at government organizations, where public accountability is of special concern. The main purpose of e-administration is to improve the internal workings of the public sector by cutting process costs, managing process performance, creating strategic connections within government bodies, and creating empowerment.

In a similar vein, Ayo (2014) saw e-governance as the application of ICTs in executing government businesses. From the above, it can be deduced that e-government is simply the use of ICTs in the operations of government administration. Put it another way, it is the shift from the traditional method of carrying out government activities which is mainly hierarchical, linear and one-way to the use of internet which enables the public seek information at their own convenience and not really having to visit the office in person or when government office is open. Heeks, (2001) underscores that the essence of e-governance is to improve government processes (e-administration) connect citizens (e-citizens and e-service), and build external interactions (e-society).

Challenges of E-Governance Implementation in the Nigeria Public Administration

For a successful implementation of e-governance,certain factors are to be considered.According to Godse and Garg(2009), making and implementing

decision, proper leadership, putting in place organizational arrangements, ensuring resources and funding, establishing accountability and measure success, telecommunications network, internal agency system, cross-government systems, service delivery network access points, internet access and skilled staff, better delivery of government services to citizens improved interactions with business and industry, citizens empowerment through access to information and more efficient government management.

When e-governance is implemented, there will be accountability, awareness and transparency in the management of governmental business will be ensured (Sunday,2014). Also, Budhiraja (2003) opined that the implementation will bring about simple, moral, accountable, responsive and transparent (SMART) governance. In addition, it is believed that it will also achieve an efficient, speedy and transparent process of disseminating information to the public and other agencies, enhance the performance of administrative activities both internally and externally and also enhance good governance (UNESCO, 2008). Unfortunately, Abasilim and Edet (2015) observed that this is not the case in Nigeria. According to them, the e-governance practice is bound to meet with strong opposition from the bureaucracy. By this they said, is the over bloated public service whose members will analyze this practice as a deliberate attempt by the government to throw majority of their members out of their jobs. Majority of the public servants are thus; likely to use their positions to frustrate the effective application of e-governance in Nigeria.

Lack of Trained and Qualified Personnel

One of the major challenges of e-governance implementation in the Nigerian public administration is lack of trained and qualified personnel to handle and operate its infrastructures. According to Abdel-Fathah and Galal Edeen (2008), this is due to the high cost associated with the procurement and training of public servants with ICT skills, government sometimes feel reluctant in the actual implementation of e-governance in the public service. In addition is the absence of skilled workers to handle various ICT services and their applications in bringing about the successful implementation of e-governance in the public sector. Ayo and Ekong (2008) noted that for effective and successful implementation of e-governance, experts are required to coordinate and operate the ICT-related infrastructures.

Lack of Infrastructure

Epileptic and irregular power supply, lack of internet connectivity, lack of telecommunication and computer hardware etc are the challenges posed to the implementation of e-governance in Nigeria.Against the current picture of what exit in most of the public service, most government agencies operate on generators and sometimes the generators lack capacity to power adequately the ICT facilities (Abasilim and Edet 2015). Adding his mind Okwueze(2010) noted that

adequate power supply is important element to be considered for the successful implementation of e-governance in the country's public sector.

Digital Divide

This is another challenge of e-governance implementation in Nigeria's public service. This has to do with the gap between those with regular effective access to digital and information technology and those without this access. Keniston (2003)saw digital divide as the level of ICT knowledge between the rich and powerful who he terms as those parts of the information age and the poor, and the powerless who are not. He further noted that digital divide is not only limited to the level of ICT knowledge between the rich and the poor but also that which has to do with linguistic. The implication of this, according to Abasilim&Edet (2015) is that, the challenges of digital divide encompasses the access to technology hardware physically and the required skills and resources needed for the judicious application of its use.

Lack of Basic Ict Infrastructure

This is another crucial challenge to the implementation of e-governance in Nigeria's public service. The Nigeria's public service is still lacking in basic ICT infrastructure. For instance some of the offices still lacks common computer let alone the common skills for its operation. There are still no access to internet network in most public sector offices, no regular powersupply etc. all these pose challenges to the implementation of e-governance in Nigeria's public service (Adeyemo, 2013).

Benefits of E-GovernanceIn Nigeria

The most beneficial prospects of E-governance in countries who are undergoing development processes are: better level of efficiency, government roles in the society will be more transparent, accountability on the part of public office holders, access to government services will be faster and easy, democracy will be people centered, and administrative services will be at a minimal rate.

According to Kama and Ongo'ndo (2007), the proposed benefits can only be achieved if Government should create a conducive atmosphere where the citizens can have an easy access to the government via electronic means of communication. Again, if capable institutions should be established to curb corruption at all levels of government and finally, if bureaucratic bottle-necks should be reduced to a minimal level and there should be inter-departmental exchange of information, while related services should be merged so as to reduce cost, time, space and man power. According to Adeyemo(2013) electronic- governance enables government departments to network and incorporate their services through ICT and consequently improving service delivery which will enhance the relationship between the government and the public. Nigeria's culture, transparency and accountability status can be improved if e-governance is properly implemented.

CONCLUSION AND RECOMMENDATIONS

E-governance has not significant impact on public administration in Nigeria, this could be attributed to the poor implementation strategies. Records show that there are disparities in the implementation process of e-governance in the country.

Report also has it that despite the growth of ICT in Nigeria, there are still certain challenges which have hindered the development of e-governanceimplementation. The major setback which is experienced in the process of implementing e-governance in Nigeria is the fact that the primary objective of making it citizen-centered approach usually becomes a displaced priority. There is the absence of team work among government agencies. Above all,the Nigerian government is still unwilling to share vital information to the public, which has resulted to high level of technology illiteracy and unequal access to internet services and facilities.

It is imperative at this juncture to make the following recommendations:

1. There should be adequate training of qualified ICT personnel in the country to implement the e-governance in our public and private sectors.

2. There should be effective implementation of ICT at all levels of education in both urban and rural areas.

3.There should be regular supply of electricity and internet connectivity, telecommunication facilities, computer hardware in all areas of the country.

4. The government must provide the necessary infrastructure that will aid the successful implementation of e-governance in Nigeria's public service such as robust broadband services etc.

It is worthy to note that e-governance is not only the computerization of a government system, but a belief in the ability of technology to achieve high level of improvement in various areas of government thus transforming the nature of politics and the relations between government. Therefore, the implementation of e-governance has become an imperative mechanism in enhancing citizens participation, monitoring and evaluating government projects, ensuring government accountability and transparency as well as transferring information from one sector to another.

REFERENCES

Abasilim, U.D. and Edet, L.I. (2015). E-governance and its implementationchallenges in the Nigerian public service ACTA UniversitalisDanubius,vol.7,No 1.

Abdel-Fattah, M. and Galal, E. (2008).Toward flexible evaluation for E-government website equality: A multi perspective evaluation framework 8th European Conference on E-Government, July 10-11.

Adeyemo, A.B.(2013). E-government implementation in Nigeria.

Anassessment of Nigeria's global e-government ranking.Journal of Internet and Information System,2(1):119-125.

Amaechi, O.R. and Eme, O.I. (2015).Electronic governance and administrationin Nigeria. Prospects and challenges.Arabian Journal of Business and Management Review, 5(3): 45-57.

Ayo, C.K.(2014).Information and communication technology as a lever forinnovation in leadership. In T.Abioye etal. Leadership andinnovation in Africa's development paradigm, Ota. CovenantUniversity Press.

Ayo C.K and Ekong, W. (2008) E-voting implementation in Nigeria: productsand challenges 8th European conference on e-government,July10-11.

Budhiraja,R. (2003).E-governance a key issue in the 21st centuryadditional director, electronic governance division MIT India. www.mit.gov.in/eg in articles.

Coleman, S. (2008).Foundation of digital government:In Chen, H et al. (eds), digital government e-government research, case study and implementation, New York: Springer Science Business Media.

Dan-fulani,J. (2013). E-governance: A weapon for the fight against corruption in Nigeria.saharareport.com.

David, B. (2015).Electronic government and public administration, London: IIAS, Sage Pub.

Godse, U. and Garge, A. (2009).From e-government to e-governance,New Delhi: Computer Society of India.

Heeks,R. (2001).E-governance in Africa: Promise and Practice, Manchester: Institution for Development Policy and Management. University ofManchester.

Holzer, M. and Schwester, R.W. (2011). Public administration an introduction, New York: M.C. Sharpe, Inc.

Karma, N. and Ongondo, M.(2007).Impact of e-government onmanagement and use of government information in Kenya, worldlibrary and information congress: 73rd IFLA general conferenceand council. South Africa.

Keniston,K.(2003).The four digital divides,New Delhi: Sage Pub.

Okwueze, F.O.(2010).E-governance as a total for public sector development in Nigeria, Nsukka: Society for Research and Academic Excellence,vol.2

Palvia, S.C.J. and Sahara, S.S.(2007). E-governance: definitions/framework and status around the world. Computer Society of India.

Sunday,O.J. (2014). E-governance:An imperative for sustainable grass root development in Nigeria.Journal of Public Administration and Policy Research, 6(4): 89-91.

UNESCO(2008). United Nations e-government report www.unesco

NITP (2000). National Information TechnologyPolicy, http://www.researchictafrica.net/nigeria

IMPLICATION OF MULTIPLE TAXES AND LEVIES ON SMES IN COVID-19 ERA: A THEORETICAL AND EMPIRICAL APPROACH.

TEIDI, Emmanuel
Department of Banking and Finance,
Federal Polytechnic, Ekowe, Bayelsa State.
Correspondingauthor:emmanuelteidi@gmail.com;
&
AGADA, Franklin. A
Department of Banking and Finance, Federal polytechnic Ekowe, Bayelsa State.
franklinagada@yahoo.com;

Abstract
This research examined the implication of multiple taxes and levies on SMES in COVID -19 era. A theoretical and empirical review was made which elucidate the issues of tax and other levies. The problems were identified to include among others, poor performances due to multiple taxes and levies; constant closure of shops to avoid tax official; and passiveness to innovation and business expansion etc. This paper therefore sought to establish the existence of multiple tax, determines whether they are of concerns to business survival. A descriptive statistic was employed using frequency and percentages to analyse the responses from a sample size of 399 SMEs, using simple random sampling technique. The results show that continuous multiple taxes are a great concern to business owners and it causes demotivation to entrepreneurial spirit, business failures, high running cost and high prices. The work concludes that a lot of businesses are optimistic to returning back to their ventures in the post COVID -19era if CBN can roll out support schemes. Finally, the work recommends that tax holiday should be given to newly established businesses at least 3years while existing businesses should be given a form of tax palliatives of about 50% reduction in their payable taxes and levies to ensure survival of SMES in covid-19 era and post COVID -19.

Keywords: Taxes, Levies, SMEs, COVID-19 Era.

OBJECTIVES OF THE STUDY

The general objective of this research work is to find out the implication of multiples taxation and levies on SMEs in Covid-19 era. The specific objectives are to:

1) Obtain facts that multiple taxes and levies truly exist in the state (Bayelsa)

2) Determine whether these taxes and levies are of great concern to SMES.

3) Know the various negative economic impact that these excessive taxes and levies has on SMES.

STATEMENT OF THE PROBLEM

Small and Medium Enterprises, from empirical evidences, have over the years recorded poor performances due to multiple taxes and levies. This has no doubt makes Entrepreneurship difficult for most individual and as an unviable venture to dabble into. Most managers of SMEs who still struggle to survive in the business indulge in late coming, spend most of their time in gossiping, attending to unproductive phone calls, snapping of self-pictures, social media chatting, and taking unnecessary break time and leave to avoid field tax force in the state. These attitudes of most SMEs owner are also problematic as it also contributed to (among other reasons) business failure.

METHODOLOGY

This study makes use of descriptive statistics by using tables, frequency and percentage to analyse and show results of responses from a random sampling of micro, small and medium enterprises (SMES) in the major known streets in Yenagoa Metropolis. A population size of 500 SMES was used, and questionnaires as survey instrument were given out. Finally, 390 responses were returned.

Population of the Study:

The population size for the study is 500 SMEs comprising eateries, supermarkets, printing press, Bakeries, hotels, among others operating within Yenagoa metropolis in Bayelsa state

Sample size:

The sample size of 399 was drawn using random sampling determined from Yaro Yamani Formula. The questionnaire was distributed with the number of the sample size and 390 returned. The analysis and discussion of findings are based on the returned questionnaires.

LITERATURE REVIEW

Taxes and levies are fiscal instrument used by the government to raise revenue for economic, political and social development of any country. Taxes are compulsory payments to the government by individuals and corporation for the purposes of achieving one or more of government objectives. Levies are **extra** amount of money that has to be paid (oxford dictionary 8th edition). According to ogbonna and appah (2011), the political, economic and social development of any country depends on the amount of revenue generated for the provision of infrastructure. However, one means of generating the amount of revenue for providing the needed infrastructure is through **well-structure tax system** (Ihezie U. et al, 2014). Ayanwu (1993), posited that there are three basic objectives of taxation. these are to raise revenue for the government; to regulate the economy; and economic activities and to control income and employment. Also, Nzotta (2007) noted that taxes generally have allocational, distributional and stabilization functions. The allocation function of taxes entails the determination of the pattern of production the goods that should be produced, who produces them, the relationship between private and public sectors and the point of social balance between the two sectors. The distribution function of taxes relates to the manner in which the effective demand over economic goods is divided among individuals in the society (Ihezi et al, 2014).

THEORETICAL FRAMEWORK

Taxation: Bhatia's (2009), (as cited in Iheziet al 2014) posited that a taxation theory may be derived on the assumption that there need not to be any relationship between tax paid and benefits received from the state activities. In this group, there are two theories namely:

- Socio-political theory
- The expediency theory

The other theories are different in that they are based on a link between liability and state activities. This reasoning justifies the imposition of taxes for financing state activities and also providing a basis for apportioning the tax burden between members of the society. This reasoning yields the benefit received theory and cost of service theory. there is also the faculty theory of taxation.

Socio-Political Theory: these state that social and political objectives should be the major factors in selecting taxes. The theory advocated those taxes should not be used to serve individuals, but should be used to cure the ills of the society as a whole.

Expediency Theory: this theory asserts that every tax proposal must pass the test of practicality. It must be the only consideration weighing with the authorities in choosing a tax proposal (Economic and social objectives of the state) and that effects of the tax system should be treated irrelevant (Barthia 2009 in Ihezie, et al., 2014).

Benefit Received Theory: this theory proceeds on the assumption that there is basically an exchange relationship between tax-payers and the state. The state provides certain goods and services to the members of the society and they contribute to the cost of these supplies in proportion to the benefits received.Anyanfo (1996) (cited inIheziet al, 2014) argues that taxes should be allocated on the basis of benefits received from government expenditure.

Cost of Service Theory: this theory is similar to the benefits received theory. It emphasizes the semi-commercial relationship between the state and the citizens to a greater extent. In this theory, the state is being asked to give up basic protective and welfare functions. It is to scrupulously recover the cost of the services and therefore this theory implies a balanced budget policy

Faculty Theory: According to Anyanfo (1996) (cited inIheziet al, 2014) this theory state that one should be taxed according to the ability to pay, it is simply an attempt to maximize an explicit value judgement about the distributive effects of taxes. Barthia argue that a citizen is to pay taxes just because he can, and his relative share in the tax burden is to be determined by his relative paying capacity.

Canon of Taxation: Anyanwu (2014) discussed some general rules, standards or principles by which taxes should be imposed and implement. these include

i. **The Benefit Principle:** this principle suggest that tax imposition should not be generalized rather it should be based or applied to each tax payer in line with his or her evaluation of benefit and demand for the concerned public service since preferences differ

ii. **The Optimality Principle:** This is principle state that issues of welfare among payers such as leisure are expected to be included in the whole tax base.it suggest a mix of taxes put in place for the purpose of minimizing excess burden on the tax payer.

iii. Principle of Equality: a good tax should not be discriminatory either in favour of or against foreigners or anyone for that matter.

iv. **Principle of Neutrality:** a good tax system should also be tailored to have neutral effect, in that such taxes are carried out in such a manner that they do not change private sector behaviour.it has been advocated those taxes should not influence the market decision of either satisfaction motivated customer or of profit motivated business. if such allocation occurs, '' non-neutrality'' is said to exist.

Theoretical Reviews of effects of taxes and rates on business (SMES)

Njoku, et al. (2017) define small businesses to be generally a business which is owned and controlled by one or few persons, with direct owner's influence in decision making and having a relatively small market share and low capital. The federal government industrial policy of 1989 defined a small business as any business that its total investment is

between 10,000 and 2million exclusive of land but including working capital. Maxwell (2012) outlines the undesirable effects of tax on the economy (SMES in this case), which include; a deterrent to work; it inhibits saving and invariably investment; does not encourage risk taking businesses; a source of inflation; diversion of economic resources; and proneness to corrupt practices.

Also, according to William J (2003) taxing more and spending less produces a contractionary fiscal policy that reduces aggregate demand. When aggregate demand (consumer's demand for goods and services) is negatively affected, business increasing level of failure and invariably closure is inevitable. In his economic explanation, David C. Colander (2002) posit that high marginal tax rate discourage people from working and firms from investing. This justifies why a lot of businesses (especially SMES) have liquidated recently in Bayelsa state. Majority of the street's shops have remain perpetually closed

Empirical Review on taxes and levies situations with SMES

There has been a general outcry against the existence of multiple charges of taxes and rates in Nigeria. Adeleke (2011), stated that one of the challenges facing Efficiency and effectiveness of Nigeria's tax system over the years is multiple taxation where there are over 500 different taxes and levies imposed by various tiers of government in Nigeria instead of only those approved by Taxes and Levies (Approved list of Collection) Act. The multiplicity of tax-imposing and tax collecting structures drive up the cost of doing business and destroys investor confidence. In fact, the World Bank Doing Business Report, 2010, ranked

Nigeria 132nd out of 183 countries with regard to the ease of paying taxes.

Multiple taxation partly accounts for this low ranking. Multiple taxes are more common in the Local Government Councils. Adebimpe Balogun in Vanguard newspaper (2015), stated that there are states in Nigeria where business premises receive and entertains about six to seven demand notices for taxes from the state government offices annually. These governors often equip thugs with uniforms, provide them with motorcycles and give them revenue targets on monitoring and seizing broken down vehicles, collecting fines for wrong parking, wrong lane driving and all sorts of unimaginable traffic offences along their often potholes-filled roads. When you are caught, the fines are usually very heavy, from N35,000 for cars to N90, 000 for trucks, but you can negotiate and sort them out with a little amount before they drag you to their wretched officers in their office. The implications for these multiple taxation on businesses in some states are heavy and further impoverish the people. New business start-ups are very slow and few, because of such impediments. In Bayelsa state, a man whose relative sells "Bolle" (i.e roasted plantain) was lamenting how she was given 8000 to pay from one of the task force which they lamented was too outrageous. According to Sahara reporters (2020), in an interview with business owners on revenue generation by one of the Lagos local government council, it was reported that some business premises were given about 100,000 to pay. In their response, a kiosk owner said:

"This money they are asking us to pay is too much for us. we just came back from coronavirus lockdown and we have already paid tax to the state and local government.
"This is very ill-timed as it is coming when federal government just increased electricity and petrol fee.

"We want this our local government chairman to rethink this money they are forcefully asking us to pay".

Another respondent by name Mr Mide also said:
"They came to my shop, carried my generator and said I mustpay before I get it back.
"This forceful taxation should be stopped considering the increase in our economy, there is no money outside and instead of giving us tax palliatives, they are giving us demand notice to get money for the local government". If nothing is done, multiple taxation will endanger, if not kill, the laudable new initiative of the Central Bank of Nigeria to empower and fund SMEs in the states of the Federation. In Bayelsa state for example, from various survey carried out, numerous taxes and levies are being impose on businesses, which include;

i. Environmental tax

ii. Sanitation tax

iii. Council (i.e. local government) tax/dues

iv. Tax to revenue office

v. Impoundment (illegal structure) charge

vi. Education tax

vii. Union dues i.e. trade union that the individual lines of goods belong to.

It is important to note that each of these enumerated taxes above have their task force who are not civil at all in carrying out their enforcement. Quoting from Adebimpe (Vanguard Newspaper 2015), she said;

Most tax officials tend to be poorly educated and lack the basic knowledge and techniques to communicate. Many Tax inspectors tend to be very aggressive, thereby putting the taxpayer on the defensive

According to report from survey carried out, most times, the tax payer's goods or assets are impounded with force without prior warning or allowance for negotiation for days of grace. i.e., time limits.

COVID 19 Era and state of businesses The COVID-19 is an acronym for coronavirus pandemic that began in late 2019 till this present time. The era span through a time of before, during and post covid-19. During this period, a lot of businesses were locked down which cause low or Zero production. Sneader and Singhal (cited in Akinfemi, 2020) said '' the coronavirus plague pandemic is not just a health crisis of monument proportion-but also a business crisis or a nation's economic economic.it portends an imminent restructuring of the global economic order''. He, Akinfemi , also point out four (4) impacts which COVID-19 have on businesses, which include;

1. Demand and Supply-side economic shock: depressed consumers, users, client's patients and suppliers of products and services, multiplier effects of lockdowns causing scarcity and vulnerabilities.

2. Global recession: Resultant low demand for goods and services, oil and gas shut down occasioning shortage in supply.

3. Increased economic vulnerability: - more volatile market situation, deepening uncertainty, poorer liquidity, and investor apathy will raise interest rate and more challenges for SMES to access funds.

4. Crowding effect of SMES and entrepreneurs- Survival actions of leading firms and multinational companies and large local enterprises will hit the cottage businesses most; whose businesses exist as value chains to this multinational companies or firms.

Data presentation and analysis of responses:

Table 1: To what extent do you agree that multiple taxes and rates exist in Bayelsa State?

Variable	Frequency	Percentage
Strongly agree	225	57.7
Agree	120	30.77
Disagree	19	4.87
Not Sure	26	6.66
Total	390	100

Source: field survey

Table 2: Do these taxes and rates create concerns to you as a business owner?

Variable	Frequency	Percentage
Highly concern	170	43.59
Concern	120	30.77
Not Concern	15	3.85
Not Sure	85	21.79
Total	390	100

Source: Field Survey

Table 3: which of these negative impacts can you say happens to businesses most as a result of multiple taxes?

Variable	Frequency	Percentage
Demotivation to Entrepreneurship	200	51.28
Business Failure	130	33.33
High Running Cost	33	8.46
High Prices	27	6.93
Total	390	100

Source: Field Survey

RESULTS AND DISCUSSION OF FINDINGS

Analysis of objectives 1, 2 and 3 are presented in the tables above. Table 1 shown that majority of the respondents 57.7% strongly agree that there is existence of multiple taxes in the state, 30.77% agree that there is multiple taxation, 4.87% of the respondents disagree while 6.6% of respondent were not sure (indifference) as to whether multiple taxation exist or not (these probably might be businesses who have breakeven, to which the existence of multiple taxes might not be notice. But as we can see in the table they are very few). Table 2 shows the responses as to whether these multiple taxes are of any concern? 45.59% of respondents shown that they are highly concern about the issue of multiple taxes and rates been demanded from them in the course running their businesses, 30.77% also shows that have concern about the multiple taxes and rates, 3.8% of the respondents shows they have no concern while 21.79% shows that they are not sure (indifference) as to whether they should be concern or not(this might be unconnected to the fact that they need to remain in business to sustain their means of livelihood and to keep soul- spirit and body together). Table 3 shown above indicate the various categories of negative implication of excessive taxes and rates have on businesses.51.28% responded to the facts that these excessive payments do cause demotivation to go into business.

This explains why the quest for white-collar job will never be abated. Also, 33.33% pointed to the fact that multiple taxation does leads to business failure, 8.46% of also agree that multiple taxes and rates do bring high running cost while 6.93% said it does leads to high prices of goods and services (as such excessive taxes have to be paid by customers).

CONCLUSION

In conclusion, a lot of businesses are optimistic to returning back to their ventures in the post COVID -19era, it will be a disservice and disincentives to the various stimulus empowerment programmes the CBN is rolling out to the economy if the issues of multiple taxes are not being tackled holistically. Also, as seen from the result of the survey carried out, an excessive payment situation through multiple taxes and rates will bring about a demotivation to entrepreneurship which will cause the teeming unemployed citizens to start looking for white collar jobs.

RECOMMENDATION

For an effective, efficient and fairly operated tax system that will not inhibit the smooth running of businesses in the state and the federation at large (especially in this COVID -19 era), the followings are recommended:

Ø There should be a tax holiday to newly established SMEs of a period of at least 3years.

Ø Existing businesses (SMEs) should be given a form of tax palliative I. e a reduction of about 50% in taxes and rates that must be paid.

Ø The national assemblies should harmonise all the state tax laws to eliminate multiple taxes.

Ø Tax enforcement agent must be trained to be courteous, professional and humane to the tax payers.

Ø Government should look out for more tax base as a way of increasing revenue instead increasing the tax rate.

Ø Government should be more transparent to engender public confidence in tax matters

REFERENCES

Anyanfo, A. (1996). Public Finance in a Developing Economy: The Nigeria case. Enugun: University of Nigeria , Enugu campus.

Anyanwu. J. (1997). Nigerian Public Finance. Onitsha.: Joanne Educational Publisher.

Anyanwu.J.C. (1993). Monetary Economics Theory, Policy and Institution. Onitsha.: Hybrid Publisher.

Appah. E. (2004). Principles and Practice of Nigeria Taxation. Port Harcourt: Ezevin Mint Printers and Publishers.

Appah.E. (2010). The Problems of Tax Planning and Administration in Nigeria: The federal and State Government Experience. Int. J. lab Organ .Psyechol. 4(1-2), 1-4.

Bhariia, H. (2009). Public Finance. New Delhi: 14th Edition Vikas Publishing house PVT Ltd.

David.C.C. (2002). Macroeconmics.

Ihezie, U. R., Umezurike, C. N., & Ekhameye, S. (2014). The Effect of Tax Policy Reforms on Economic Growth of Nigeria: An Econometric Analysis. Journal of Contemporary Social Science, 2(2), 306-315.

Maxwell.F.E. (2012). Personal Income tax in Nigeria: (In Theory and Practice),

owerri: 5th Edition Tonyben Publishers. 17-18.

Njoku C.V, N. A., & Oghechi, C. M. (2011). Business Management andEntrepreneurship('A functional Approach), owerri: Ambix Publishers.

Nzotta.S.M. (2007). Tax Evasion Problems in Nigeria: A Critical Nigeria Account. 40-43.

salami. A. (2011). Taxation, Revenue Allocation and Fiscal Federationin Nigeria: Issues, Challenges and Policy options. Economic annals, 33-34.

William.J. (2003). Economics Principles and Practice. 9th Edition.

Adebimpe Balogun (2015). " Developing internally generated revenue in an era of
di versification" Vanguard newspaper. http://www.vanguardngr.com/2015/04/developing-
internally- generated-revenue-in-an-era-of-diversification/

Saharareporter. (2020 , July, 9th). Lagos Local Government tax shop owners .http://saharareporters.com/2020/09/07/lagos-local-government-official-tax-shop-owners-n 10000-generate-fund-council

IMPROVING THE IMAGE OF THE LIBRARY THROUGH RESEARCH AND INNOVATION FOR SUSTAINABLE DEVELOPMENT IN FEDERAL POLYTECHNIC OKO ANAMBRA STATE.

OGUEDOIHU, Julia Chinwe
Alex Ekwueme Library,
Federal Polytechnic Oko, Anambra State.
Juliachinwe@gmail.com
&
ADINCHEZOR,Ifeyinwa Patience (CLN).
Alex Ekwueme Library,
Federal Polytechnic Oko, Anambra State.
adinchezorify@gmail.com.

Abstract
The study sought to investigate improving the image of the library through research and innovation for sustainable development in federal polytechnic Oko, Anambra State. The paper emphasized that innovation is a key component in research, that innovation and sustainability appear to be concepts that are opposite in meaning, but sustainability requires innovation.The study was guided by five research questions. The descriptive survey design was used and the population for the study was fifty (50) library staff of the institution studied. The entire population was adopted because the number is small and manageable as a sample size. All fifty (50) copies of questionnaires distributed were returned. Rating scales and checklists were used to read instruments for data collection. Data collected were analyzed using percentages, mean(x) scores (using 2.50 midpoint) based on the research questions and arranged in tables. The study revealed that all types of research were used in LIS, and innovative practices and strategies also improved the image of the library. The study concludes by recommending that LIS researchers should employ a large number and wide variety of research methodologies, LIS should regularly attending conferences, workshops organized by library profession where they can garner new ideas, and engaged in peer-review of paper for publication and among other recommendations to ensure research oriented training programmes in Federal Polytechnic Oko, Anambra State.

Key words:*Library, Research, Innovation, and Sustainable Development.*

INTRODUCTION

A library is a curated collection of sources of information and similar resources, selected by experts for digital access to material, and may be a physical location or virtual space or both. Davis (2021) opined that library research involves the step-by-step process used to gather information in order to write a paper, create a presentation, or complete a project. Secondary sources are studies by other researchers; they describe, analyze, and /or evaluate information found in primary sources. Library research is a form of structured inquiry with specific tools, rules, and techniques (George, 2008). Furthermore, it is unpredictable, sometimes frustrating, but ultimately rewarding as researchers examine

the findings, then the researchers can add their insights to make a compelling case.Allen (2018) asserts that library research is an integral component researchproject in most academic settings. Researchers are charged with the responsibility to carefully examine relevant information in order to determine usefulness, reliability, and authority in regard to the research projects in which they are involved.Libraries are now playing a relatively larger role in educating researchers in handling their research queries and fulfilling their objectives. Libraries of this generation are trying to provide high quality scholarly collections and resources to meet the requirements of researchers.

Libraries as gateways to information services, require continuous innovation and creativity aimed at continuous improvement. This peculiarity necessitates continuous production of new products and services and rendering techniques, creative and innovative acts which demands regular exposure to new ideas (Olowofila, 2019). Library innovation is a system of new ideas proposed by creatively thinking professionals or by a team (Muthu, Rameshbabu, and Baskaran 2015). In LIS, innovation is a complex process of creation, distribution and usage of novelties in order to enable library development as a social institute and enhancement of library performance (Lubanga and Mumba, 2021). Thus: innovation is generally defined as a change towards renovation or adoption of something new and useful in the practice (Gunjal, 2017). Colaklar (2014) opined that innovation entails the synthesis of new ideas and thoughts which will re-construct or re-combine present things, and it is an inner feature of humans. Trott (2005) perceived innovation as the management of all the activities involved in the process of idea generation and technology development. If innovation is seen as the process of idea generation, innovation therefore is the application of knowledge, and the successful exploitation of new idea is the essence (Atata, Oji, and Tom 2014).

Innovation is crucial to the continuing success of any organization. It refers to the process of translating an idea or invention into a good or service that creates value or for which customers will pay (Business Dictionary, 2019). Innovation is the common elements that include a novel application of ideas, the implementation of something new, improvement to an existing product or process and continued relevance (Skillicom, 2016).Elves (2015) identified three key reasons why libraries should innovate; the need to adapt to a changing environment, the need to improve existing products, and services, and the need to make use of new opportunities. As well, worth noting that in academic libraries, some innovations are disruptive while others are sustaining innovations. Colaklar (2014) echoed that the most important disruptive innovations in academic libraries identified were the open access movement and the web 2.0, and the first was highly regarded and was considered the most important innovation with impact in academic libraries. According to Buchannan, (1994); Adeleke, Okusaga, and Lateef (2002); and Dada, (2016) echoed that the success of any institution, country , society rests squarely on the adequacy of its library collections because the library is also seen as an agency for findings discovery, innovation, vocational skills, repository scholarship and research. Villarruel (2017) opined that a program of research represents persistence in advancing knowledge, and in the case of nurse researchers, for the purpose of promoting and improving health.

OBJECTIVE OF THE STUDY

The objective of this study was to assess improving the image of the library through research and innovation for sustainable development in Federal Polytechnic Oko Anambra State. The study is specifically:

1. To identify the types of research carried out in LIS, Federal Polytechnic Oko.

2. To what extent do researches in LIS adopt proper research methodology, Federal Polytechnic Oko

3. To ascertain the processes followed in peer review of researches in LIS, Federal Polytechnic Oko

4. To find out the innovative practices in LIS researches, Federal Polytechnic Oko

5. To what strategies can be adopted to improve the image of the library through research, Federal
Polytechnic Oko

LITERATURE REVIEW

Innovation is a key component in research, building a program of research is a hallmark of a successful academic career. Furthermore, Innovation and sustainability are two important components of impactful programs of research. That innovation and sustainability are integral to research both in the design of the research and in the implementation of products or processes that results from the research (Villarruel, 2017).Bhardwaj (2017) opined that conducting research by library professionals is crucial and utmost needed to enhance day to day problem solving and better decision making in libraries. It also makes libraries critical consumers of research publications and equips them to provide efficient information services to research scholars and faculty members.

Aspasia and Afrodite (2017) observed that the patterns of LIS research activity as reflected in the articles published between 2011 and 2016 in five well-established, peer-reviewed journals were described and analyzed. LIS literature addresses many and diverse topics. Information retrieval, information behaviour, and libraryservices continue to attract the interest of researchers as they are core areas in library science. As regards to research methodologies, the present study seems to confirm the well-documented predominance of survey in LIS research. Aspasia and Afrodite (2017) cited Dimitroff (1995) that the percentage related to use of survey research methods reported in various studies varied between 20.3% and 41.5%. Aspasia and Afrodite (2017) cited Powell (1999) who, in a review of the research methods appearing in LIS literature, pointed out the survey had consistently been the most common type of study in both dissertations and journal articles. In the words of Koufogiannakis, Slater, and Crumley (2004) that the majority of articles examined were descriptive studies using questionnaires/surveys. Survey methods represented the largest proportion of methods used in information behavior articles analyzed (Julien and Duggan 2000)

Aspasia and Afrodite (2017) opined that the connection of LIS with professional practice, on one hand, and other research fields on the other has influenced its research orientation and the development of methodological tools and theoretical perspectives. Furthermore, research problems are diverse, depending on the research direction, local trends etc. most of them relate to the professional practice although there are theoretical research statements as well. In the words of Aspasia and Afrodite (2017) LIS research strives to address important information issues, such as those of "information retrieval, information quality and authenticity, policy for access and preservation, the health and security applications of data mining". The research is multidisciplinary in nature, and it has been heavily influenced by research designs developed in the social, behavioral, and management sciences and to a lesser extent by the theoretical inquiry adopted in the humanities. Furthermore, the emergence of evidence-based librarianship in the late 1990s brought a positivist approach to LIS research, since it incorporated many of the research designs and methods used in clinical medicine.

According to Lubanga and Mumba (2021) observed that research and development is generally thought to consist

of three main activities, basic research, applied research, and development, further explained that in the library set up, research and development could entail all the activities undertaken by librarians to create new or improved products, services and processes to meet user expectations and demands. Library and information science research is equally important for the education system and the growth of LIS research. Sarah (2016) conducted a study in public universities in Nigeria and found that librarians publish maximum research in international journals rather than local. The major motivating force behind research publishing of libraries is career promotion. Further, the study found several hindrances faced by librarians in publishing such as, (i) lack of interpretation skills, (ii) exorbitant publication fees by journal outfits, and (iii) indiscriminate rejection of manuscripts by journals. The study suggested organizing adata analysis training programme for librarians from time to time. Bhardwaj (2017) cited Ogbomo (2010) revealed that heavy demands of daily work routine, journal rating, lack of research orientation, academic freedom and lack of interest are major difficulties limiting publication output of librarians. Wikinson (2013) supported the research outcome of Ogbomo's study which found that librarians often do not do research, major inhibiting factors being lack of time and lack of research skills. The study suggests that time management and collaboration can help to overcome these barriers.

Olowofila (2019) cited Chunli and Jinmin (2011) contend that librarians have to innovate in references and information services to meet the clients changing needs because what the clients need in the digital age are not only information into products. Therefore, libraries have to adapt to the needs of the users. Innovation involves the making of a change in something (Atata, Oji, and Tom 2014) Anyanwa (2010) defines innovation as the ability to apply new ideas that will enable the researcher to undertake activities differently. The core component of his definition is application of new ideas, in which case new ideas are not meant to be static and dormant; there should be room for application for it to yield fruit innovation therefore, is the application of knowledge. It is worthy to note that all innovation begins with an idea.

Lubanga and Mumba (2021) cited Li (2006) emphasizes that present and future academic libraries should continue to redefine their roles in the digital environment, and there is a growing need for academic libraries to leverage their strengths and be innovative to create responsive and convenient services to users. Lubanga and Mumba (2021) pointed out that innovative library products and services include ICT based services, (use of internet, email, online information literacy training, ask a librarian virtual reference); digital archives and e-libraries. Muthu, Rameshbabu, and Baskaran (2015) identified mobile services in libraries (short messages services to users, Global Position Point Services (GPPS) to locate remote libraries, web OPAC on mobile phones subscription to RSS feeds on mobile phone applications and software); and information communication innovations (Digital resources, electronic catalogues, online electronic document delivery form, online interlibrary borrowing form, online reference form, online resources, accessible 7/24, a different type of communication email, skype, facebook, virtual reference services, ask a librarian, e-publication).

Adeloye (2003) presented a number of practical ideas such as the use of promotional techniques including brochures, library guides and exhibitions. According to Colaklar (2014), innovation is a strategy that has allowed organizations to survive in a context of changes, many of them that are disruptive in nature. In the library context, research, development, creativity and innovation breed's new library products, services and practices that can transcend both time and distance, and that can best meet the needs of tech-sway users. Elves (2015) notes that libraries should engage in research and development, be creative and innovative to adapt to the rapidly technological changing environment. Most importantly, research, innovation and creativity in library and information services are aimed at achieving sustainable development of the information provision and professionals because of the attributes to the intellectual, inspirational, and physical development of man which helps him to overcome challenges in his search for scholarly activities, knowledge and development (Atata, Oji, and Tom 2014).

METHODOLOGY

This study adopted descriptive survey research design. The total population of this study was 55 library staff inFederal Polytechnic Oko. The population was small and manageable; therefore, the researcher adopted the census enumeration technique to study the entire population. It has six clusters, section A is demographic variables of the respondents, and other sections have clusters in line with the research questions. Instruments for data collection were questionnaires presented as rating scales and checklists, and are tagged "improving the image of the library through research and innovation for sustainable development in Federal Polytechnic Oko Anambra State" (IILRISDFPOAS). The study adopted frequency counts, simple percentages and mean(x) scores (using 2.50 midpoint) and the data were presented in tables.

RESULTS AND DISCUSSIONS

Table 1: Demographic Information

Job titles	Frequency	Percentage
Lecturers	15	30 %
Librarian's	6	12%
Higher library officers	29	58%
Total	**50**	**100%**
Sex		
Female	38	76%
Male	12	24%
Total	**50**	**100%**
Highest Academic Qualifications		
HND	28	56%
PGD	1	2%
BLS	5	10%
MLS/M.Sc	14	28%
Ph.D.	2	4%
TOTAL	**50**	**100%**
YEAR OF SERVICE		
1-4	3	6%
5-8	2	4%
9 & ABOVE	45	**90%**
TOTAL	**50**	**100%**

Table 1 shows that 58% of the respondents were higher library officers and the female were 76%. Staff with HND were greater in number at 56% while those who had worked for 9 &above recorded the highest score of 90%.

Research question 2: Types of research carried out in the library, Federal Polytechnic Oko

S/n	Types of Researches	Mean (x)	Decision
1	Descriptive research	3.6	Positive
2	Experimental research	3.2	Positive
3	Historical research	3.36	Positive
4	Exploratory research	2.8	Positive
5	Sequential research	3.24	Positive
6	Observational research	4.	Positive
7	Cohort research	3.	Positive
8	Cross research	3.28	Positive
9	Applied research	3.18	Positive
10	Correlational research	3.3	Positive

Analysis on types of research are carried out in the library and information sciences (LIS) shows that descriptive research, Experimental research, Historical research, Exploratory research, Sequential research, Observational research, Cohort research, Cross research, Applied research, Correlational research, have mean(x) scores 3.6, 3.2, 3.36, 2.8, 3.24, 4., 3., 3.28,3.18, and 3.3 above 2.50 midpoint, respectively.They were carried out in LIS, Federal Polytechnic Oko, Anambra State.

S/n	Other types of research that can be carried out in library and information science (LIS)	Freq.
1	Survey research	10
2	Case study	8
3	Theoretical research	5
4	Explanatory research	3
5	Qualitative research	4
6	Quantitative research	4
7	Causal-comparative/Quasi experimental	2
8	Longitudinal research	3
9	Analytical research	5
10	Conclusive research	4
	Total	**48 (96%)**

The above presentation shows that 96% of the respondents suggested the following researches as other research that can be carried out in LIS and they includes; Survey research, Case study, Theoretical research, Explanatory research, Qualitative research, Quantitative research, Longitudinal research, Analytical research, Conclusive research, and Causal-comparative/Quasi experimental.

Research question 3: Extent do researches in LIS adopt proper research methodology

S/n	Extent of researches	Frequency	Percentage
1	To a great extent	**49**	**98%**
2	To a greater extent	**47**	**94%**
3	To a lesser extent	**20**	**40%**
4	To that extent	**42**	**84%**
		100	

Analysis from the tables above shows that 98% of respondents were to a great extent, 94% were to a greater extent, 40% to a lesser extent, while 84% were to that extent that researchers in LIS Federal Polytechnic Oko, adopted proper research methodology.

Research question 4: Processes followed in peer review of researches in library, Federal Polytechnic Oko

S/n	Processes followed in peer review of researches	Mean (x)	Decision
1	Submission of paper	3.8	Positive
2	Editorial office assessment	3.32	Positive
3	Appraisal by the editor in chief (EIC)	3.2	Positive
4	EIC resigns an associate editor (AE)	3.7	Positive
5	Invitation to reviewers	4.	Positive
6	Response to invitations	3.48	Positive
7	Reviews are conducted	3.68	Positive
8	Journal evaluates the reviews	3.58	Positive
9	The decision is communicated	3.46	Positive
10	Acceptance or Rejection	3.1	Positive
11	Publication	3.8	Positive

The table above shows that all the question items possess mean(x) scores of 3.8, 3.32, 3.2, 3.7, 4, 3.48, 3.68, 3.58, 3.46, 3.1, and 3.8 above 2.50 mid-point. This implies that they followed processes in peer review in LIS for Submission of paper, Editorial office assessment, Appraisal by the editor in chief (EIC), EIC resigns an associate editor (AE), Invitation to reviewers, Response to invitations, Reviews is conducted, Journal evaluates the reviews, The decision is communicated, Acceptance or Rejection, and Publication.

S/n	Are you presently or you have been in peer review	Yes	No
1	Respondents	10 (20%)	40 (80%)

The above presentation shows that 20% out of the respondents agreed to be in peer review while 80% of the remaining respondents are not involved in peer review as at the time for collection of this data.

Research question 5: Innovative practices in library, Federal Polytechnic Oko researches

S/N	Innovative practices researches	Mean(x)	Decision
1	Virtual reference services	4.	Positive
2	Awareness and guidance about plagiarism issues	3.8	Positive
3	Marketing (advertising) of library with online tools	3.66	Positive
4	Mobile servicers like apps &sms	3.6	Positive
5	Enough ICT infrastructures with high bandwidth internet connectivity, broad band/wi-fi	3.7	Positive
6	Exposure towards research literacy such as publishability, citation and impact factor	3.9	Positive
7	Computerized SDI/CAS, literature search, digital reference and allied online services	3.5	Positive
8	Extended library timings	3.4	Positive
9	Re-designing of library sections/ seating space	3.64	Positive
10	Library orientation/ information literacy programs/virtual library tour	3.56	Positive

All the question items possessmean(x) scores above 2.50 midpoint according to analysis in this table on innovative practices in LIS research, federal polytechnic Oko. This implies that innovative practices improved the image of the library through Virtual reference services, Awareness and guidance about plagiarism issues, Marketing (advertising) of library with online tools, Mobile servicers like apps &sms, ICT infrastructures with high bandwidth internet connectivity, broad band/wi-fi, Exposure towards research literacy such as publishability, citation and impact factor, Computerized SDI/CAS, literature search, digital reference and allied online services, Extended library timings, Re-designing of library sections/ seating space, Library orientation/ information literacy programs/virtual library tour, and have mean(x) scores of 4., 3.8, 3.66, 3.6, 3.7, 3.9, 3.5, 3.4, 3.64, 3.56, respectively.

S/n	Other innovative practices in LIS	Freq.
1	Big data	6
2	Artificial intelligence	4
3	Block chain technology	7
4	Internet of things (IOT)	3
5	Library bookmark app	8
6	User-focused interfaces and application	3
6	Augmented reality	2
7	Digital interfaces for printed books	4
8	Driverless cars (emerging library technology)	2
9	Drones	2
10	Cloud computing	5
	Total	**46 (92%)**

The above presentation shows that 92% of the respondents suggested the following as other innovative practices that can improve the image of the library, and they include: Big data, Artificial intelligence, Block chain technology, Internet of things (IOT), Library bookmark app, User-focused interfaces and application, Augmented reality, Digital interfaces for printed books, Driverless cars (emerging library technology), Drones, and Cloud computing.

Research question 6: Strategies can be adopted to improve the image of the library through research in Federal Polytechnic Oko

S/n	**Strategies can be adopted to improve the image of the library**	**Mean(x)**	**Decision**
1	Published guides	3.8	Positive
2	Website announcements	3.9	Positive
3	Online advertising	3.7	Positive
4	Workshops	3.6	Positive
5	Exhibits /displays	3.5	Positive
6	Tracking information	3.4	Positive
7	One-to-one conversations	3.68	Positive
8	Knowledge sharing	3.8	Positive
9	Social media	3.4	Positive
10	Training sessions	3.6	Positive
11	Disseminating information	3.52	Positive
12	Library website	3.46	Positive
13	Webcasts	4.	Positive
14	Library tours	3.9	Positive
15	Face-to-face events	3.7	Positive

Analysis on strategies can be adopted to improve the of the library were shown as they had mean(X) scores above 2.50 midpoint that Published guides, Website announcements, Online advertising, Workshops, Exhibits /displays, Tracking information, One-to-one conversations, Knowledge sharing, Social media, Training sessions, Disseminating information, Library website, Webcasts, Library tours, Face-to-face events, have mean(X) scores of 3.8, 3.9, 3.7, 3.6, 3.5, 3.4, 3.68, 3.8, 3.4, 3.6, 3.52, 3.46, 34., 3.9, 3.7, which are positive. This shows that these strategies can improve the image of libraries.

S/n	**Other strategies that can be adopted to improve the image of the library**	**Freq.**
1	Public talk/book talk/lecture series	10
2	Suggestion box and timely response	7
3	Online bulletin board/ online readers advisory services	5
4	Libraries database	4
5	Best library user award	3
6	Library brochure	2
7	Indexing and abstracting services	3
8	Institutional repository/ digital data management	3
9	Open access/ blogging services/ web portal services	4
10	Displaying new arrivals of material	1
11	Library entrepreneurship	3
	Total	**45 (90%)**

The above presentation shows that 90% of the respondents suggested the following as the other strategies that can be adopted to improve the image of the library and they include: Public talk/book talk/lecture series, Suggestion box and timely response, Online bulletin board/ online readers advisory services, Libraries database, Best library user award, Library brochure, Indexing and abstracting services, Institutional repository/ digital data management, Open access/ blogging services/ web portal services, Displaying new arrivals of material, Library entrepreneurship.

Findings in LIS, Federal Polytechnic Oko on Improving the Image of the Library through Research and Innovation for Sustainable Development.

1. It was found that all the types of research are carried out in the LIS, Federal Polytechnic Oko
2. That the extent was revealed on how researches in LIS adopt proper research methodology
3. It was found that the processes followed in peer review of researches in LIS were revealed that

orientation is needed to be conducted in order to meet user's expectations.

4. That the innovative practices in LIS researches were revealed that users will gain a lot of ideas
5. That the strategies was found that can be adopted to improve the image of the library through

research, if properly applied.

CONCLUSION

Research and innovation in libraries also flourish in the presence of monetary support by the present dispensation that makes LIS not to be maximized in research. Because of this, the quantum of research in librarianship is disappointing and also a shortage of research – oriented librarians. Further, the library profession has a part to play in building from time to time to encourage librarians in pursuit of research and publishing. This will not only add value

in delivering the best in LIS but also improve the level of research in academic institutions. Group based and collaborative research ought to be encouraged so that concrete research outcomes can be expected from these professionals.

RECOMMENDATIONS

1. LIS researchers should employ a large number and wide variety of research methodologies
2. LIS should regularly attend conferences, and workshops organized for library profession
where theycan garner new ideas, and engage in peer- review of paper publication.
3. LIS should be up-to-date by providing research and innovative practices to the users.
4. Research oriented training programmes ought to be conducted on a periodic basis, so that new
entrantsin the profession can also learn the nuances of conducting pure, applied, and action
research.
5. Train librarians to create e-content and deliver information at the right time to the right user. E-
content means digital text and images designed for display on web pages.
6. Train researchers to generate quality research and showcase their work to society via libraries.
7. Identify and support innovation in small and rural areas. Local literate people can assist the
elderly to document local knowledge and practices with the help of nearby research/academic
librarians to ensure their preservation

REFERENCES

Adeleke, O, Okusaga, T. & Lateef, E.B. (2002). Preservation and Conservation of Information Bearing Information resources. Journal of Readings in Education, Development and Globalization. 13(1)132-142.

Adeloye, A. (2003). How to Market yourself and your Library Organization: a solo Librarian
guide. The Bottom Line, 16(1), 15-18.

Allen, M. (2018). The sage Encyclopedia of Communication: Communication and Media
Studies, Sociology: Library Research, https://dx.doi.org/10.4135/9781483381411.n296.
Online Publication December 19, 2018.

Anyanwu, k. A. (2010). Practice of Entrepreneurship and Youth Empowerment Owerri:
Uzopietro Publisher.

Aspasia, T, &Afrodite, M, (2017). Research Methods in Library and Information Science. Electronic Journal, http://dx.doi.org/10.5772/intechopen.68749. 43-64

Atata, E. A, Oji, E. H, & Tom, E, S, (2014). "Libraries as Platform for Innovation and Creativity
in Information Delivery Services in a Depressed Economy: an Overview of Nigeria". Asia
Pacific Journal of Multidisciplinary Research 2(5); 125-131.

Bhardwaj R, K. (2017). Research Activities of Library and Information Science Professionals in
Indian Higher Educational Institutions: Competencies, Support and Engagements,
DESIDOC Journal of Library and Information Technology,
DOI:10.14429/djlit.37.1.10672 (37) 30-37.

Buchannan, S. (1994). An Evaluation of the Book Keeper Mass Deacidification
Process: Technical Evaluation Team Report for the Preservation Directorate.
Available:
http://www.provenance.ws/paper%20 permanence.htm [October 2016].

Business Dictionary, (2019). Online Business Dictionary. Available
https://www.businessdictionary.com/definition/innovation.html

Chunli, J. D. &Jinmin, H. (2011). Innovative information services in the digital age. Retrieved
athttps://www.ifla.org/past-wlic/2011/197-li-en.pdf.

Colaklar, H, (2014). "Evaluation of Innovative Services at University Libraries". Journal of BalkanLibraries Union 2(2), 12-25.

Dada, K. S. (2016). Assessment on the Preservation of Information Resources at Federal College
of Education, Zaria. Project: Ahmadu Bello University, Zaria.

Davis, B. (2021). What is library method: term paper. Retrieved at
https://www.mvorganizing.org/what-is-library-research-method-2/&

Dimitroff, A. (1995). Research for Special Libraries: A Quantitative Analysis of Literature.
Special Libraries 86(4) 256-264.

Elves, R. (2015). Innovation in Libraries: Report from the Business Librarians Association Annual
Conference. Melbourne: Business Librarians Association

George, M. W. (2008). The elements of Library Research: what every student needs to know.
Princeton University Press, United Kingdom.

Gunjal, B. (2017). Innovative Services in Libraries: trends, issues and challenges. Retrieved

fromhttp://www.iiserpune.ac.in~library/life2017/progaram/16/14-bhojaraju.pdf.

Julien, H. & Duggan L. J. (2000). A Longitudinal Analysis of the Information needs and uses
Literature. Library and Information Science Research. 22(3): 291-309. DOI:
http://doi.org/10.1016/so740-8188(99)00057-2

Kim, S. J, &Jeong, D. Y, (2006). An analysis of the Development and use of theory in Library
and Information Science Research Articles. Library and Information Science Research. 28(4); 548-562. DOI: http://doi.org/10.1016/j.lisr.2006.03.018.

Koufogiannakis D, Slater L, & Crumley, E, A (2004). A content Analysis of Librarianship Research. Journal of Information Science. 30(3); 227-

Li, X. (2006). "Library as Incubating space for Innovations: Practices, Trends and skill sets".
Library Management, Bradford, 27(6/7), 370-378.

Lubanga, S. C. & Mumba, J. (2021). Research and Development (R&D), Creativity and innovation
in Academic Libraries in Malawi: a way to rethink Library Development in the Twenty-First Century. Electronic Journal. DOI:10.2139/SSRN.3867430. Researchgate.net.

Muthu, M., Rameshbaku, R, &Baskrarn, C, (2015). "Rethinking of Innovation LIS Services for
Libraries in the Digital Era". Knowledge Librarian. An International Peer Reviewed Bilingual, e-journal of Library and Information Science 2(2): 31-56.

Ogbomo, E. F. (2010). Publication output of Librarians in Tertiary Institutions: A case study of
Delta State University, Abraka, Nigeria.
Library Philosophy and Practice E-Journal

1-9.
http://digitalcommons.unl.edu/libphilprac/322.

Olowofila, M. O. (2019). Creativity and Innovation in Library and Information Services in the 21st
Century: A Review. Nigerian Communication and Information Technology Journal. 1(1)
Harmattan. Available from https://ncitj.com/journals.

Powell, R. R. (199). Recent Trends in Research: A methodology essay. Library and Information
Science Research. 21(1): 91-119. DOI: http://doi.org/10.1016/so740-8188(99)80007-3.

Sarah, O. (2015). Research and Publication Productivity of Librarians in Public Universities in
South-West Nigeria. Library Philosophy and Practice E-Journal. Available from
http://digitalcommons.unl.edu/cgi/viewcontent.cgi?article=3472&content=libphilprac.

Skillicom, N. (2016). What is Innovation? 15 innovative experts give us their definition. Retrieved from https://www.ideatovalue.com/inno/nickskillicorn/2016/03/innovation-15-experts share-innovation-definition/March 18, 2016

Trott, P. (2005). Innovation Management and new Product Development;Harlow, England: Prentice Hall.

Wikinson, Z. (2013). Oh, how Pinteresting! An Introduction to Pinterest. Library Hi Tech News,
30(1); 1-4.

Villarruel, A. M. (2017). Building Innovation and Sustainability in Programs of Research: clinical scholarship. Journal of Nursing Scholarship. Sigma theta tau International. (50) 5-10.

INDIRECT TAXATION AND ECONOMIC GROWTH IN NIGERIA

ONYEWUCHI,Veronica Eyuche(Ph.D)
School of Financial Studies
Accountancy Department
Federal Polytechnic
Oko
Eyuvera@Gmail.Com

Abstract
The mono-product nature of the Nigerian economy has hindered it from achieving its economic growth objectives. This inadequacy is further worsened by the fact that its revenue from its mono-product source is facing dwindling fortune. Over the years, it has been observed that revenue generated from indirect taxation has been substantial and constantly on the increase. This study therefore explored the effect of indirect taxation on economic growth as a possible means of diversifying the Nigerian revenue. Time series data were applied in carrying out this research work. Ordinary Least square (OLS) method of analysis was adopted after determining the stationary of the variable using Augmented Dickey fuller technique and finding ample long run and short run relationship among variables using the Johansen cointegration and Vector Error Correction Mechanisms respectively. The result showed that of the two indirect tax sources, Value Added Tax and Customs and excise duties, Value Added Tax that had a positive significant relationship with economic growth. Customs and excise duties on the other hand had a negative relationship but was tested and found to be insignificant. But the overall relationship between the indirect tax sources and economic growth was found to be significant. Against the above result, the researcher recommended among others that the number of goods on the VAT list should be increased and the burden of custom duties should be lessened on infant industries, all aimed at boosting indirect tax revenue accruing to the country and ultimately stimulating economic growth.

Keywords*: Taxation, Value Added Tax, Custom and Excise duties, real GDP, economic growth.*

INTRODUCTION

The mono product nature of the Nigerian economy has received series of criticism in recent times. According to Okonjo Iweala (2012) without diversification, the Nigerian economy will soon collapse. In order for the country to achieve the requisite level of economic growth, it needs to diversify from crude oil being the sole driver of the economy. Anyaehie and Areji (2015) in their research, found that economic diversification has the propensity to meet the basis for development (sustained growth) like meeting the poor basic needs which revolve around the provision of jobs, food, health, clothing and shelter by opening diverse avenues of economic activity which accommodates a broad

spectrum of people.

Economic diversification is a process of broadening the range of economic activities both in the production and distribution of goods and services. It does not necessarily entail increase in output but it enhances stabilization of economies by diversifying their economic base. The mono-product nature of the Nigerian economy is such that it depends majorly on crude oil export for its revenue. In the current year 2015, Nigeria's dependence on crude oil export for revenue based on the projected price and the assumed production is 53% of the total revenue (Okonjo Iweala; 2015 Budget Speech). During the second quarter of 2012, oil revenue accounted for over 76% of government revenue (Ebosele and Adekoya, 2012). The implication of this overly dependence on oil revenue is the boom -and -burst nature of the economy (Akpokodge; 2000). In the 2015 budget speech, the following was pointed out, "...

The IMF in October 2014 revised downwards its projection on global growth to 3.3% and 3.8% respectively. So ladies and gentlemen, the message I want to pass across here is that the world economy is not in shape over the short to medium term. On the back of this weak global growth performance comes the recent steep drop and incredible volatility in the price of oil -a phenomena that affect us greatly. This steep price decline of about 49% so far this year, has come as result of demand from our biggest markets and a supply glut that involves the arrival of new oil producers in Africa and increased exploitation of shale oil and gas in the U.S" (Okonjo Iweala; Budget speech, 2015).

Taxation forms part of the non-oil revenue sector of the economy. In the first quarter of 2014, non-oil sector became the main driver of the Nigeria economy recording 7.89% growth in real terms in the same period (National Bureau of Statistics, 2014). Tax revenue on its part, is made up of two broad components and several sub components, the broad components being Direct and Indirect taxation. Following Atkinson (1977), the researcher defines direct taxes as those taxes that may be adjusted to the individual characteristics of the tax payer and indirect taxes as those that are levied on transactions irrespective of the circumstance of the buyer or the seller. Due to the fact that direct taxes are dependent on the individual characteristics of the tax payer, it is at the mercy of the subjective assessment of the individual paying the tax. In such a case, some contra principles of taxation such as tax evasion (reduction of actual income value in order to earn reduced tax) and avoidance tend to abound. Indirect taxation on the other hand has limited cases of evasion and avoidance as it is not subject to the individual characteristics ·of the tax payer.

Indirect tax sources include Value Added Tax (VAT), excise duties, customs duties and tariffs. Taxation has been a major source of revenue to the government contributing about 25.5% of government revenue in 2002. These revenues come mostly from indirect sources of VAT, import and export duties (custom duties). Indirect taxes contribute up to 15% of the government revenue with which it carries out certain developmental expenditures; this percentage can still be increased. Researches, carried out by Bleaney and Gemmel (1999); Bird (2003); Arisoy and Unlukaplan (2010); and Scarlet (2011) found a positive relationship between indirect tax and economic growth. This research work therefore is an attempt to provide a channel for Nigeria to diversify its economy and achieve economic growth.

STATEMENT OF PROBLEM

The mono-product nature of the Nigerian economy has posed a lot of problem to the Nigerian economy, amongst which is the creeping growth rate of the Nigerian GDP. This has made it impossible for Nigeria to attain its vision in the areas of overall development of its economy. The current running Nigerian national development plan is vision 2020 and this plan has not materialized in terms of achieving its objective as a result of over-dependence on crude oil and its inherent price and demand instability. The vision 2020 aims at placing Nigeria among the top 20 ranking economy in the world by the year 2020, by attaining a GDP of about $900 billion and ensuring that the GDP of Nigeria grows by at least 10% every year till the year 2020 (Adeleke; 2012). So far, this has remained utopian, as the GDP of Nigeria has not been able to attain such a growth rate nor is it close to the required GDP figure with just 2 years left in the plan. This shortcoming has exposed the need to find and develop other economic variables which has the potentials of fast tracking the growth rate of the country's national income. One of such variables is indirect taxation. It is of no doubt that indirect taxation has had strong positive effect on the revenue of the government. In 2016, Nigeria raked in 830 billion Naira from Value Added Tax and 890 billion Naira from custom and excise duties (National Bureau of Statistics, 2014), but, there is need to know if this progress recorded in the area of revenue has translated to helping the economy grow. This study ended with mixed and diverse findings on the effect of indirect taxes on economic growth. Of this work done, to the best of my knowledge none has significantly ascertained the effect ofindirect taxes on economic growth in Nigeria. Therefore, to fill the knowledge gap, this study empirically ascertains the effect of indirect taxes on economic growth in Nigeria.

OBJECTIVES OF THE STUDY

The broad objective of this study is to assess the effect of tax revenue on economic growth in Nigeria while the specific objectives are;

(i) To determine the effect of value added tax on economic growth in Nigeria

(ii)To evaluate the effect of custom and excise duties on economic growth in Nigeria

Research Questions

The following research questions were stated:

a) What is the effect of Value added tax (VAT) on economic growth in Nigeria

b) What is the effect of Custom and Excise duties on economic growth in Nigeria

Research Hypotheses

The following research hypotheses were formulated;

HO1: Value added tax has no significant effect on economic growth in Nigeria.

HO2: Custom and excise duties have no significant effect on economic growth in Nigeria.

LITERATURE REVIEW

Concept of Indirect Taxes

These are taxes levied on persons or groups who are not intended to bear the burden or incidence but who will shift them to other people. They are normally levied on commodities or services in which incidence does not fall directly on the producer or first payer but the final payers and consumers. That is in most cases, consumers end up paying some or all of any indirect tax introduced into a market. The bulk of government income in developing countries like Nigeria is principally derived from indirect taxation, while in the developed countries like the USA, the bulk of government revenue is rather derived from direct taxation (Igweonyia, 2011).In this study, indirect taxes selected are value-added tax (VAT), and custom and excise duties.

Value Added Tax in Nigeria

VAT is the acronym for valued added tax. This tax which is in other words called

consumption tax and is being defined as the amount charged by the government for every goods or service purchased from time to time. This means it can only be paid when there is a consumption of goods or services, and its burden is bored by the final consumer. VAT as an indirect tax is imposed on goods and services at each stage of production, starting from raw materials to the final product. This assertion is affirmed by the definition of Ajakaiye (2000) that VAT is a "multi-stage tax imposed on the value added to goods and services as they proceed through various stages of production and distribution. VAT is adopted in virtually all countries of the world including Nigeria. It was introduced in Nigeria in 1993 by the General Ibrahim Babangida administration to replace sales tax which hitherto generated revenue for the state governments. It was to be federally-collected and a uniform rate of 5 percent was fixed on all affected items while VAT proceeds are shared among the three tiers of government at an agreed proportion. Currently, with the passage of the new finance bill into law in January 2020, a new VAT rate of 7% took effect from February 2020. There are mixed reactions on how effective this new VAT rate will enhance the economy and brings about economic growth. To some it will impact positively on the economy whereas to others it will increase the hardship on Nigerians.

Custom and Excise Duty

Custom Duty is a major source of revenue for the Federal Government which is payable by importers of specified goods. Custom duties also serve as protection to indigenous industries against foreign industries. Whereas, excise taxes are charges imposed by the government on specific commodities produced in a country at differing rates to raise revenue and to discourage the manufacturing and consumption of certain goods deemed harmful to people's health like tobacco and alcohol. In summary, custom duties are taxes levied on imported items while excise duties are taxes levied on the manufacture of domestic commodities. Adegbie and Falike (2010) in their study on the development and growth of the Nigerian economy stated that there is a strong relationship between customs and excise duties and the economic development of Nigeria; meaning that this is a source of income that Nigeria should rely on and develop. The Nigeria Customs Services is saddled with the responsibility of collecting customs duties, excise, fees, tariffs, and other levies so imposed by the Federal Government on imports, exports, and statutory rates.

Concept of Economic Growth

According to Salami et al. (2015), economic growth can be defined as the sustained increase in a country's productive capacity, and per capita national output or net national product over a while. These increases are the basic causes of economic growth. Fiscal policy is one of the most important too is that have a significant effect on all economic sectors and have a real effect on economic variables like the Gross national product, inflation, unemployment, etc. Taxes can be seen as a fiscal policy, macroeconomic and internal revenue mobilization tool for the attainment of economic growth. Economic growth can be proxied, using different economic indicators, ranging from Real Gross Domestic Product (GDP), for economic growth (the dependent variable) and value added tax, customs and excise duty, inflation (explanatory variables). Inflation is included in the model to cancel out the effect of price changes on indirect tax revenues.

Theoretical framework

This study beckons on the expediency theory. The expediency theory was invented by a French economist, Maurice in the year 1954. This theory explains an economy's effectiveness and efficiency in tax collection instrument for enhanced economic growth. This theory further asserts that every tax proposal must pass the test of practicality. Anyanfo (1996) and Bhartia (2009) explained that the expediency theory is based on a link between tax liability and state activities. It assumes that the state should charge the members of the society for the services provided by it. This reasoning justifies the imposition of taxes for financing state activities by inferences, which provides a basis, for apportioning the tax burden between members of the society. Accordingly, a tax system should not be designed to serve individual members of society but should be used to cure the ills of society as a whole. This theory is appropriate for this study because it enable us to assess the extent to which indirect taxes have to enhance economic growth in Nigeria.

Empirical Review

Ikeokwu and Leyira (2019) examined the influence of indirect taxes on economic growth in Nigeria. Secondary data were extracted from the CBN statistical Bulletin data base and FIRS. Ordinary Least Square (OLS) Multiple Regression was adopted to test the data gathered. The study revealed that indirect tax has a significant influence on economic growth in Nigeria. In a related study, Enokela (2010) examined the relationship between value-added tax and the economic growth of Nigeria. Secondary data were extracted from CBN statistical Bulletin database while multiple regression was used to analyse the data gathered. From the analyses done, the study revealed that Gross Domestic Product (GDP) is positive and statistically significant to Value Added Tax, while Gross Domestic Product per Capita (GDPPC) is negative and statistically significant to Value Added Tax. Owino (2019) carried out an empirical investigation on the relationship between value added tax and economic growth in Kenya from 1973 to 2010. Econometric exposition adopted while the ordinary least square technique was used to estimate the model. The study revealed a positive and insignificant relationship betweenvalue added tax and economic growth in Kenya.

Also, Akwe (2014) used the OLS regression technique to explore the impact of non-oil tax revenue on economic growth in Nigeria from 1993 to 2012. The study revealed that non-oil tax revenue has a positive association with economic growth in Nigeria. Ebiringa and Emeh (2012) examined the impact of various taxes on the economic growth in Nigeria, using a period of 1985-2011. Results showed that customs and excise duties were negatively related to gross domestic product, implying that an inverse relationship existed between customs excise duties and economic growth in Nigeria. In the same vein, Abomaye - Nimenibo et al. (2018) carried out a study on tax revenue and economic growth in Nigeria from 1980 to 2015. The ordinary Least Square (OLS) method was used to analyse the data gathered. The study revealed that there is no significant relationship between custom and excise duties and economic growth in Nigeria. Also, Nmesirionye et al. (2019) carried out an empirical investigation on the impact of indirect taxes on the economic performance of Nigeria for a period of 1994-2017. Secondary data were used and extracted from the central bank of Nigeria Statistical Bulletin and the National Bureau of Statistics. OLS multiple regression technique was used in the data retrieved. The study revealed that value-added tax has a positive and insignificant impact on the real gross domestic product of Nigeria while custom and excise duties have a positive and significant impact on the real gross domestic product of Nigeria.

In a related study, Akhor et al. (2016) examined the impact of indirect tax revenue on economic growth in Nigeria. Secondary data were collected from the Central Bank of Nigeria statistical bulletin from1993 to2013.Time series research design was

used while the data collected were analysed through correlation, unit root test, co-integration test, and error correction model regression. The result revealed that value-added tax had a negative and significant impact on real gross domestic product. It also revealed that custom and excise duty had a negative and weakly significant impact on real gross domestic product.

Also, Inyiama and Ubesie (2016) examined the effect of value added tax, customs and excise duties on Nigeria economic growth. Secondary data was extracted from the CBN statistical bulletin and analysed with the simple regression technique and correlation analysis. The study revealed that all the non-oil tax revenue affects Nigeria Gross Domestic Product. Oladipupo and Ibadin (2015) examined the impact of indirect taxes on the economic growth of Nigeria. The study employed a time series data spanning a thirty-four-year period, from 1981 to 2014. The unit root test and the Error Correction Model were utilized in the study. The study revealed a positive and significant impact of VAT, PPT on the RGDP. In the same vein, Stailova and Patonov (2012) examined the impact of taxes on economic growth from 1995-2010. Regression analysis was used to test the data gathered. The study revealed that the impact of direct taxes on economic growth is significant. Also, Ilaboya and Mgbame (2012) examined the relationship between indirect tax and economic growth in Nigeria. The study adopted a combination of co-integration and error correction mechanism to check the adequacy of the specified model. The study revealed a negative and insignificant relationship between indirect tax and economic growth in Nigeria.

RESEARCH METHODOLOGY

The ex post facto research design was adopted for this study. Time series data were applied in carrying out this research work. Ordinary Least square (OLS) method of analysis was adopted after determining the stationary of the variable using Augmented Dickey fuller technique.

Sources of Data

Data used was secondary data which was source from the Central Bank of Nigeria Statistical Bulletin from 2003-2018, World Bank development indicators and various credible journal articles.

Model Specification

The model is specified as follows:

GDPR= f (VAT, CED, INF)

This function may be further represented in a linear econometric format thus:

LnGDPR = Bo + B1LnVAT + B 2LnCED + B 3INF+ Ui

Where:

GDPR= Real Gross Domestic Product
VAT= Value added Tax
CED = Customs and Excise Duty
INF = Inflation
B's = Slopes or the parameters of the coefficient of the regression model
Ui=Stochastic disturbance or error term.

The above model is stated in the natural logarithmic form, to standardize the variables and aid interpretation.

DATA PRESENTATION AND INTERP RETATTION

The use of OLS method of regression analysis is based on the assumption that the values of the variables have no unit root and hence are stationary.

Table.1.1 Summary of the Augmented Dickey Fuller Unit Root Test

st Difference	Variables	ADF Test Statistics	5% Significance Level	Lag length	Remark
	LNGDPG	-4.410302	-2.948404	1	Stationary
	LNVAT	-6.879544	-3.004861	1	Stationary
	LNCED	-6.202937	-2.948404	1	Stationary
	INF	-5.522626	-2.948404	1	Stationary

Source: Author's Computation

From the result on Table 1 above, shows that it is clear that all the variables are stationary after the first difference. Using the AIC (Akaike Information Criterion), the appropriate lag length was determined as 1.

Therefore, we proceed to carry out the Johansen co-integration test to find out if there exists any relationship among the variables.

Table.2: Summary of Johansen Co-integration test

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.746929	54.26869	47.85613	0.0111
At most 1	0.454772	24.03883	29.79707	0.1988
At most 2	0.297259	10.69470	15.49471	0.2310
At most 3	0.124846	2.933826	3.841466	0.0867

Source: Author's Computation

Trace test indicates 1 co integrating eqn (s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level

Interpretation of table 2: Table 2 above shows the existence of at least one (1) co integrating equation between the variables as we reject the hypothesis of none as denoted by the asterisks sign. It is therefore necessary to test the existence of short run adjustments between the variables, using the error correction model.

Table.3: Summary of VECM

Error Correction:	D(LOG(GDPR))	D(LOG(VAT))	D(LOG(CED)	D(INF)
CointEq1	-0.065369	-0.071621	0.035011	-17.34673
	(0.04429)	(0.08019)	(0.24689)	(2.84866)
	(-1.47586)	(-0.89310)	(0.14181)	(-6.08943)
D(LOG(GDPR(1)))	0.152916	-0.269039	0.070651	19.86363
	(0.22940)	(0.41534)	(1.27872)	(14.7540)
	[0.66659]	(-0.64775)	(0.05525)	(1.34632)
D(LOG(VAT(-1)))	0.185234	0.452654	0.267423	-4.990453
	(0.11562)	(0.20933)	(0.64447)	(7.43591)
	(1.60214)	(2.16239)	(0.41495)	(-0.67113)
D(LOG(CED(-1)))	-0.026818	-0.095861	-0.181987	0.514946
	(0.04558)	(0.08253)	(0.25407)	(2.93152)
	(-0.58837)	(-1.16158)	(-0.71628)	[0.17566)
D(INF(-1))	0.000165	0.001921	0.002016	0.111365
	(0.00115)	(0.00208)	(0.00642	(0.07403)
	(0.14357)	(0.92183)	(0.31418)	(1.50439)
C	0.012732	0.112950	0.125346	-2.552928
	(0.03009)	(0.05447)	(0.16771)	(1.93505)
	(0.42318)	(2.07346)	(0.74740)	(-1.31931)

Interpretation of Table 3:

The result of the co integration equation shows that the short run adjustments exist among the variables. The adjustment in real GDP, Value Added Tax, Custom and Excise duties complete in less than one year shown by their coefficients which is less than one, while inflation completes it adjustment in more than one year shown by its large coefficient. Having established ample long run and short run relationships among the variables, we can proceed to the OLS estimates and assess fully the impact of indirect taxation on economic growth.

Table.4: OLS Regression Estimates

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	22.08539	0.73540	230.03174	0.0000
LOG (VAT)	0.355007	0.059373	5.979244	0.0000
LOG (CED)	-0.003554	0.07 2382	-0.049105	0.9613
INF	0.004937	0.001915	2.577748	0.0180

R -squared	0.944140	Mean dependent var	31.26735
Adjusted R –squared	0.935761	S.D. dependent var	0.469910
S.E. of regression	0.119101	Akaike info criterion	-1.266682
Sum squared resid	0.283700	Schwarz criterion	-1.070339
Log likelihood	19.20018	Hannan -Quinn criter.	-1.214592
F- Statistic	112.6790	Durbin - Watson stat	1.214627
Prob(F- statistic)	0.000000		

Source: Author's Computation

Interpretation of table 4:

From the estimates shown above, VAT revenue and Inflation have significant positive relationships with economic growth proxied by real GDP. While a percentage in VAT on average will cause a 35% percent increase in the real GDP, holding all other variable constant, increasing inflation as well will lead to 0.4% increase in the real GDP on average, holding other variables constant. The fact that the probability figures of both VAT and Inflation are less than 0.05 depicts that both variables are significant in the model. On the other hand, Customs and Excise duties (CED) showed an insignificant negative relationship with economic growth. Such that a percentage increases in Custom and Excise duties on average will reduce real GDP by 0.3%.In overall, the model has been shown to be significant: Considering the high F value and the very low probability figure of the F value (0.000), we can conclude that the model is significant. Also the coefficient of determination (R2) has a value of 0.944140 and the Adjusted R2 value of 0.935761 which still gives give credence to the validity of the model. It follows that at least, 93% of changes in the dependent variable are explained by the regressors

DISCUSSION OF FINDINGS

The findings of this research, suggests the existence of ample long run and short run relationships between the various components of indirect taxation and economic growth proxied by Real GDP. Based on the hypothesis formulated earlier, the following has been discovered from the research:

a) Value Added Tax (VAT) has a positive significant relationship with economic growth, such that increase in VAT revenue will in effect boost economic growth in Nigeria. This can be explained that increase in VAT revenue will translate to increased government expenditure in direct consumption or investment activities which will spur economic activities in the country.

b) Custom and Excise Duties (CED) on the other hand had an insignificant negative relationship with economic growth such that an increase in custom duties will stunt economic growth. This can be explained in the context that Nigeria is a consuming nation and that most of the goods consumed, traded and sold in the country come from external sources. Imposition of customs and excise duties will make such good expensive and discourage demand. It may even get to the stage where companies that source for raw materials abroad will have to close shop or move to countries with fairer custom and excise duties.

c) Inflation on the other hand showed a positive relationship with economic growth, but the small coefficient of 0.4% shows how infinitesimal this positive effect is. This can be as a result of the fact the inflation requires people to spend just a little bit more to obtain basic goods and services and thence, this extra expenses and such extra expenses will translate into a positive effect on economic growth.

CONCLUSION

In executing this study, the Ordinary Least Squares (OLS) was applied after determining the co-integration of variables using the Johansen technique. From the results obtained from the OLS, it was observed that all independent variables, Value Added Tax (VAT) and Inflation (INF), had a positive relationship with economic growth in Nigeria, while Customs and Excise duties (CED) had a negative effect, of which VAT and INF that had a significant effect on economic growth in Nigeria. In conclusion, therefore, value-added tax has a significant effect on economic growth whereas custom and excise duties have an insignificant effect on economic growth.

RECOMMENDATIONS

The following recommendations were made

in respect to the findings of the study.

i. The government should put in place mechanism to close up the loopholes in the VAT collection system since its effect on gross domestic product is negative and insignificant.

ii. The government through its agency Nigerian custom service should computerize all its tax collection processes with adequate internal control system so as to boost revenue generated from custom and excise duties.

iii. Government should Increase the Number of goods and services on the VAT list to account for more sectors that have become more productive since 1994. For instance pharmaceutical products.

iv. Companies remittance of VAT revenue should be addressed by the government to ensure full compliance.

v. Government should ensure that manufacturing industries sourcing for raw materials abroad should not be charged excessive custom duties, to enable them thrive most especially the infant industries.

vi. Government should ensure that VAT revenue is properly utilized in the provision of autonomous capital investment as against paying salaries.

REFERENCES

Abomaye-Nimenibo, W. A. S., Michael, J. E. M., & Friday, H. C. (2018). An empirical analysis of tax revenue and economic growth in Nigeria from 1980 to 2015. Global Journal of Human-Social Science: Political Science, 18(3), 9-40.

Akhor, S.O., Atu, E. C., &Ekundayo, O.U.(2016). The impact of indirect tax revenue on economic growth: The Nigeria experience. Igbinedion University Journal of Accounting,2(1), 62-87.

Anyaehie. M., &Areji, A. (2015). Economic Diversification for Sustainable Development Nigeria. Open Journal of Political Science. 5, 87-94.

Akwe, J. A. (2014). Impact of Non-Oil Tax Revenue on Economic Growth: The Nigerian Perspective International Journal of Finance and Accounting.3 (5), 303-309.

Adeleke, A. (2012). Issues, Challenges and Prospects of Vision 20:2020; Conference Paper, Yaba College of Technology Conference and Research air. Lagos, Nigeria

Arisoy, I., &Unlukaplan, I. (2010). Tax Composition and Growth in Turkey: An Empirical Analysis. International Research Journal of Finance and Economics.59, 51 –61.

Adegbie, F., &Falike, A. (2010). Customs and excise duties contribution towards the development and growth of Nigerian economy. European Journal of Economics, Finance and Administrative Sciences, 29, 133-144.

Ajakaiye, O.D. (2000). Macroeconomic effect of value added tax in Nigeria: a computable general equilibrium analysis, AERC Research Paper, 92.

Atkinson, A. (1977). Optimal Taxation and the Direct versus Indirect Tax Controversy. The Canadian Journalof Economics. 10(4), 590-606.

Anyanfo, A. M. O. (1996). Public finance in a developing economy: The Nigerian Case. Department of Banking and Finance, University of Nigeria, Enugu Campus. Enugu.

Budget Analysis (2015, January 30). 2015 budget shows government not committed to austerity. Premium times.

Bird, R. (2003). Taxation in Latin America: Reflections on Sustainability and the Balance

Between Equity and Efficiency. Joseph L. Rotman School of Management, University of Toronto ITP paper 036.

Bhartia, H. L. (2009): Public Finance. 14th Edition. Vikas Publishing House PVT Ltd.

Bleaney N. S., &Germmel , M. P. (1999). The impact of income tax rates (ITR) on the economic development of Botswana. Journal of Accounting and Tax Revenue, 1(1), 8-
22.

Barro, R. (1990). Government Spending in a Simple Model of Endogenous Growth. Journal of
Political Economy. 98, S103 -S125.

Barro, R., & Sala-Martin, X. (1992). Public Finance in Models of Economic Growth. Review of
Economic Studies, 59, 645- 661.

Central Bank of Nigeria (2013). Statistical Bulletin.

Central Bank of Nigeria (2010). Annual Reports and Accounts.

Cremer, H., Pestieau, P., & Rochet, J. C. (2001). Direct versus Indirect Tax: The Design of the
Tax Structure Revisited. International Economic Review, 42 (3), 781-799.

Dahlby, B. (2003). Restructuring the Canadian Tax System by Changing the Mix of Direct and
Indirect Taxes. In H. G.Grubel, Tax Reform in Canada: Our Path to Greater Prosperity.
Vancouver British Columbia Canada: The Fraser Institute, 77-108.

Ebosele, M., & Adekoya, F. (2012). Worries Over Great Reliance On Oil, Neglect of Real
Sector. The Guardian 29 (12,303), 2.

Ebiringa, O. T., &Emeh, Y. (2012). Analysis of tax formation and impact on economic growth
in Nigeria. International Journal of Accounting and Financial Reporting.2 (2),367-385.

Enokela, S. A. (2010). The impact of value added tax on economic development of Nigeria.
Journal of social and management Sciences, 3(2), 19-40.

Emran, S., & Stiglitz, J. (2005). On Selective Indirect Tax Reform in Developing Countries.
Journal of Public Economics. 18, 599-620.

Federal Ministry of Finance, (2015). A Transition Budget. http://finance.gov.ng

Greenidge, K., & Drakes, L. (2009). Tax Policy and Macroeconomic Activity in Barbados.
http://www.centralbank .org.bb.

Gujarati, N. (2007). Basic Econometrics, 5th Edition. New Delhi: McGraw-Hill Education (India)
Pvt Limited.

Gujarati, N. (1995). Basic Econometrics, 2ndEdition. New York : Oxford University Press.

Harmon, J.K. (2007).Improving the Nigeria Tax System from Canadian Experience. Wordsmith
Printing and Pack aging ltd, pages 101-104.

Harris, D. (1995). Using Cointegration Analysis in Econometric Modeling. 1stEdition.New
Jersey:Prentice Hall Publishers.

Harberger, A. (1964). Taxation, Resource Allocation and Welfare. In NBER, and the Brookings
Institution: The Role of Direct and Indirect Taxes in the Federal Reserve System.
Princeton: Princeton University Press 25 – 75.

Ikeokwu,Q.C.,&Leyira, C.M. (2019).Indirect taxes and economic growth in Nigeria. Advance
Journal of Management, Accounting and Finance, 4(4), 13-31.

Inyiama, O. I., &Ubesie, M. C. (2016). Effect of value added tax, customs and excise duties on
Nigeria economic growth. International Journal of Managerial Studies and Research
(IJMSR), 4(10), 53-62.

Ilaboya, O. J., &Mgbame, C. O. (2012). Indirect tax and economic growth. Research Journal of
Finance and Accounting, 11(3), 70-82.
Igweonyia, Y. T. (2011). Value added tax and export: The case of selected countries around the
world. Journal of Economics and Behavioural Studies. 2(2), 2-15. Investopedia.com
Jhingan, M. L. (2010). Macroeconomic Theory. 5thEdition.New Delhi: Vrinda Publishers
Johansen, S. (1988). Statistical Analysis of Cointergrating Vectors. Journal of Economic
Dynamics and Control, (12), 231 - 254.
Jarque, C.M., &Bera, A.K. (1987). A Test for Normality of Observations and Regression
Residuals. International Statistical Review. 55 (2), 16-172.
Koch, F, Schoeman, J., & Van -Tonder, J. (2005). Economic Growth and the Structure of Taxes
in South Africa: 1960-2002. South African Journal of Economics, 73 (2), 190-210.
Kneller, R., Bleaney, F., & Gemmell, N. (1999). Fiscal Policy and Growth: Evidence from
OECD Countries. Journal of Public Economics, 74, 171-190.
Musgrave, R. A and Musgrave P. B. (2004). Public Finance in Theory and Practice (5th ed.).
New Delhi: McGraw Hill Publishing Company.
Musanga, B. (2007). Effects of Taxation on Economic Growth (Uganda's experience: 1987-
2005). Unpublished Misc Qualitative Economics. University of Makerere.
Martinez-Vazquez, J., Vulovic, V., & Lui, Y. (2009). Direct Versus Indirect Taxation: Trends,
Theory and Economic Significance. International Studies Program Working Paper, 09 – 11.Georgia State University.
National Bureau of Statistics, (2018). www.Nigerians tat.gov.ng
National Bureau of Statistics, (2014). www.Nigerians tat.gov.ng
Nmesirionye, J. A., Jones, E., &Onuche, E. V. S. (2019). Impact of indirect taxes on economic
performance of Nigeria (1994-2017). European Journal of Accounting, Finance and
Investment, 5(4), 32-39.
Nzotta, S.M., (2007) Tax evasion problems in Nigeria: A critique. Nigeria Account. 40(2), 40-43
Owino, O. B. (2019). An empirical analysis of value added tax on economic growth. Evidence
from Kenya data set. Journal of Economics, Management and Trade, 22(3), 1-14.
Oladipupo, A. O &Ibadin, P. O.,(2015). Indirect taxes and economic growth in Nigeria, EKON.
MISAO I PRAKSA DBK. GOD XXIV. (2015.) BR. 2. (345-364).
Okonjo-Iweala, N. (2014). In Bassey Udo; Amid revenue uncertainties, Nigerian consumers may
pay more VAT. Premiun Times, December 17.
Okonjo-Iweala, N. (2012). Diversification of Nigeria Economy. Sunday Punch, 18, (19), 685:57.
Olatunji, O. (2009). A Review of Value Added Tax (VAT). International Business
Management.3 (4) 61-68.
Salami, G. O., Apelogun, K. H., Omidiya, O. M., &Ojoye, O. F. (2015). Taxation and Nigerian
economic growth process. Research Journal of Finance and Accounting, 6(10), 93-101.
Stailova, D., &Patonov, N. (2012). An empirical evidence for the impact of taxation on
economy growth in the European Union.Tourism and Management Studies, 3, 1030-1039.
Scarlet, N. T. (2011). Macro Economics: Dimension of Competitive Indicators and Policy
Performance. Dominus Press.
World Bank Data, (2017). http://data.worldbank.org
Ukpabi A. L. (2019). The Consequences of Indirect Taxation on Consumption in Nigeria.
Taiyuan University of Technology, 030024, Taiyuan, Shanxi, China.

INDISCRIMINATE LOCATION OF OUTDOOR ADVERTISEMENT ITS ENVIRONMENTAL IMPLICATIONS IN ABA URBAN.

NWAZUE,Stephen Chukwudi
&
OKORAFOR,Humphery Kalu.
Department of Urban & Regional Planning,
Abia State Polytechnic, Aba.
noscob@yahoo.com,

Abstract
Well placed outdoor advertisement will add to the aesthetics of a given city. But however, indiscriminate location of outdoor advertisements mayconstitute undesired effects to urban environments in a city. This paper is aimed at determining environmental implications of indiscriminate location of outdoor advertisements in Aba urban. Location and measurements of outdoor advertisements on six major roads in Aba urban were collected from the twoLocal Government Areas that make up Aba Urban. A hypothesis was postulated and tested in the study. The result shows that there is no significant difference between the standard specifications and observed dimensions of the existing outdoor advertisements. However, evidence from field survey shows that there is indiscriminate display of outdoor advertisements in the city occasioned by non-compliance with development control regulations. This has resulted in disorderliness and unsightliness in Aba Urban. The paper, recommends, among others, the enactment of Highway Beautification Act aimed at governing proper location, amount of spacing and quality of billboards to be erected in designated areas in the city.

Keywords: *Outdoor advertisements, sitting, billboards, Aba.*

INTRODUCTION

In many countries, outdoor advertisements add to the aesthetics of cities in addition to their communication and commercial purposes. However, in cities in Nigeria, the use of outdoor advertisements fast constitutes a serious urban menace. This is largely due to indiscriminate location of outdoor advertising media such as posters, banners, signs and billboards. It is a common feature to find environments and walls of private and public buildings defaced with posters and haphazardly located billboards in our cities.

Abuja, the nation's capital touted to be the fastest growing city in Africa is fast losing its beauty and aesthetic appeal. Reason: Indiscriminate posting of posters across the city is taking the shine of it (Nurudeen, 2010).

One can observe in Nigerian cities that posters are placed on houses, fences, bridges, electric poles and abandoned automobiles, thereby causing disorderliness and unsightliness in the cities. Moreover, billboards are haphazardly located at road junctions and medians without adequate setback.

This scenario is further complicated with different shapes and sizes of billboards ranging from those of politicians, political parties, religious bodies, corporate advertising, private organisations etc, all trying to attract peoples' attention. Such arbitrary display of posters and billboards cause congestion, visual intrusion and public nuisance in cities, thus creating an eyesore in the environment (Jane, 2006 and Obi, 2006).

In a bid to tackle these problems, the Federal and State Governments in Nigeria have made concerted efforts to enact legislations and agencies to regulate the activities of outdoor advertisers. Notable examples of these legislations are the Nigerian Urban and Regional Planning Law of 1992, the Control of Advertisements Edict of 1975, Abia State Singnage Agency (ABSA). For instance, the 1992 Urban and Regional Planning Law stresses the need for orderliness in sitting, dimension and appearance of outdoor advertisements.

Despite these efforts, posters are indiscriminately placed on unapproved places while billboards are haphazardly displayed along major roads, especially during election campaigns or other widely advertised programs. These posters and billboards assault all sensibilities and the country is being transformed into national eyesore (Silva, 2001). Evidence abound in Aba where billboards are haphazardly located on major roads such as Faulks road, Okigwe road and Ngwa road among others.

OBJECTIVES OF THE STUDY

The objective of the paper is to examine the environmental implications of poor siting of outdoor advertisements in Aba Urban.
This will be achieved through the following specific objectives:

a) Ascertain the dimensions of existing outdoor advertisements in Aba urban

b) To compare the standard specifications for location of outdoor advertisement and observed dimensions of existing outdoor advertisements

c) Make recommendations towards proper planning and well regulated outdoor advertisements in Aba urban.

One hypothesis was postulated to validate the study. It states that there is no significant difference between the standard specifications and observed dimensions of the existing outdoor advertisements in Aba urban.

LITERATURE REVIEW

The Advertising Practitioners' Council of Nigeria. (2005) and Dimeji (2007) define outdoor advertisements as any form of visual communication in a public space paid for by an identified sponsor, and directed at a targeted audience with the aim of improving information about a product, services, event or opinion. According to Broadbent (1990) and Barry (1991) outdoor advertisement is a group of activities aimed at dissemination of information in any paid, non-personal form concerning an idea, product or services to compel action with the intent of an identifiable sponsor. The International Journal of Communication (2005) notes that outdoor advertisement gets to the public through such media as posters, banners and billboards, among others. Similarly, the Outdoor Advertising Agency of Nigeria (2005) and Aronoff. (2010) observe that billboard and poster advertisements are designed to catch a person's attention and create memorable impression very quickly.

Agukoronye (2004) observed that well regulated outdoor advertisements create a positive image of a city which enhances confidence, sense of security safety goodwill and consequently attract more loyalty. Jane (2006) opines that appropriate use of posters and billboards is very dignifying to the surrounding

environment. Robert (1994) notes that organized outdoor advertisements enhance the visual environments in various ways, one of which is that they enhance local character or sense of place, thereby contributing to attractive environment to tourists. Highlighting illumination benefits derivable from properly displayed outdoor advertisements, Freeman and Fahey (1990) posit that light emanating from billboard provides security and visibility to many motorists and travelers.

Silva (2001); Kwate and Tammy (2007); Nurudeen (2010); iweluozor (2010) observe that haphazard visual Outdoor advertisement replaces orderly physical development with painlessness which destroys aesthetics. Farbry et al (2001); Wallace (2003); and Olusola (2010) posit that uncontrolled outdoor advertisements cause visual intrusion and block important traffic signs from motorists and pedestrians, thus causing avoidable accidents. Taylor and Taylor (1994) observed that the literature on billboard and outdoor advertising debate indicates that there are at least three major points of contention between pros and anti-billboard groups. The points of debate relate to the following three criticisms of billboard and outdoor advertising. The first is that they are unnecessary and aesthetically displeasing intrusion on road side scenery. Second is that many advertisement are harmful products and the last is that they may be detrimental to small businesses.

Adebayo (1996) and Ogbonna (2001) opine that as cities continue to urbanize, so are the problems presented by indiscriminately displayed outdoor advertisements. In general, they create a picture of visual disorder in the cities which is contrary to physical planning standards.

The Study Area The study area, Aba is a city and a big trading centre. Upon the creation of Abia State in 1991, Aba is divided into two local government areas namely; Aba North and **Aba South Local Government** Areas. Aba South is the main city centre and the heartbeat of Abia State, South East of Nigeria.

Abia State is located in the South Eastern part of the Nigeria, and lies between latitudes $5^0 05^1$ N and $5^0 08^1$ N and longitude $7^0 20^1$ E and $7^0 28^1$ E. Aba urban is bounded on the West by Osisioma local government area, on the East by Obingwa L.G.A. It lies East of a major expressway that runs from Port Harcourt to Enugu city. Aba town is one of the rail way towns on the Eastern Railway District of Nigeria. Aba is located on the Aba River. Aba is made up of many villages such as Umuokpoji Aba, Eziukwu Aba, Obuda Aba, Aba Ukwu and other villages from Ohazu merged due to administrative convenience. Aba was established by the Ngwa clan of Igbo people of Nigeria as a market town. It lies along the west bank of Aba River and it is at the intersection of roads leading to Port-Harcourt, Owerri, Umuahia, Ikot-Ekpene and Ikot-Abasi. All are neighbouring cities in varying states of Nigeria.

Aba Urban is an area of relative flat terrain with nucleated pattern of settlement; predominantly the residential land use forms the major land of the area followed by the commercial land use. The area is made up of residential, commercial and industrial (small scale industries) area from which a lot of solid wastes are being generated.

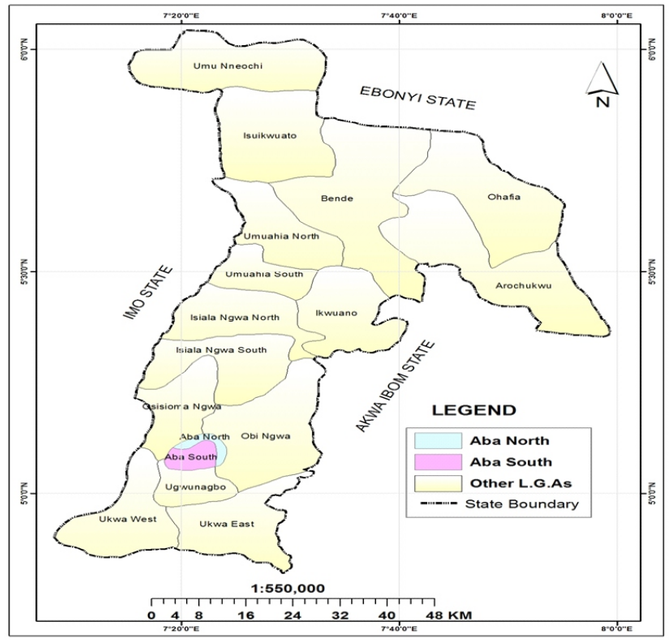


Fig. 1. Abia State Map showing Aba North & Aba South L.G.A
Source: Ministry of Lands, Survey and Urban Planning Abia State, Nigeria, 2021.

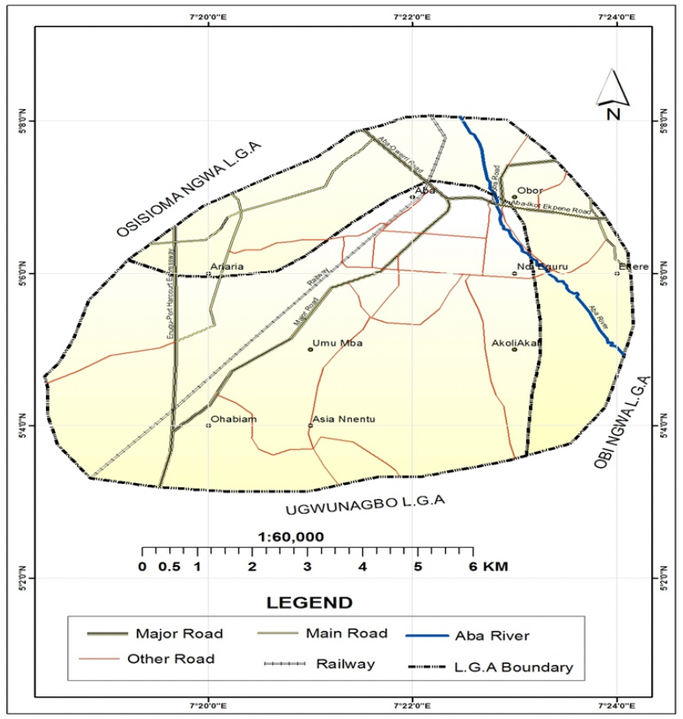


Fig 2: Map of Aba South and Aba North Local Government Areas.

Source: Source: Ministry of Lands, Survey and Urban Planning Abia State, Nigeria, 2021.

METHODOLOGY

Survey method was used to collect data for the research. Six secondary roads were randomly selected from the two local government areas which made-up Aba urban. Three major roads were selected from Aba North LGA (Okigwe road, Faulks road and Osusu road), Aba South LGA (Azikiwe road, Ngwa road, Port- Harcourt road). These roads were chosen because they host high concentration of outdoor advertisements. Measurements were taken for nine important outdoor advertisement types. They are: sign on business premise; business premise directional pan' street directional advertisement; street light poles; advertisement on double face; advertisement on board; advertisement on backlit advertisement on ultra electrical bulletin board (super structure) applicable height, width, length, set road and interval on highway were Standard specifications for advertisement.

ANALYSIS OF DATA AND FINDINGS

Table 1: Standard specifications and observed dimensions of existing outdoor advertisement in Aba Urban.

	Standard Specification	Observed Specification
Sign on business premises	Maximum of 10m x5.00m with setback of 5m	4.57mx 2.50m with setback of 2.00m
Business premises directional panel	Maximum of 10mx5m with maximum height of 13m	2.50mx 1.8m with height of 8m
Street directional advertisements	6m high	7.21mx 3.6m with 13.10m high`
Advertisements on street light poles (pin-ups)	Maximum of 09mx09m	1.10mx0.9m
Advertisements on single or double face.	2.0m x3.00m	2.70 x3.60m
Advertisements on backlit billboards	3.00m x 4.00m with 4m high	4.13m x 11.11m with 8.00m high
Advertisements on ultra electrical boards	10.00m x5.00m with 4m high	INTERVAL on highways
Bulletin boards (super structures)	200m interval (on highways)	3.43m x 5.30m with 70m interval

Source: Abia State Ministry of Environment, 2019.

The result implies that the observed dimensions are still within the standard specifications of outdoor advertisements in the city. The data are shown in table 1. The problem with outdoor advertisement in Aba is their siting. They are placed in a scattered manner thus distorting the beauty of the road. The road medians are littered with old and weathered poster and banners. The continued presence of time related billboards, signage posters and banners long after the advertised event, reduce the quality of the environment. The investigation showed that indiscriminate siting of outdoor advertisement such as posters and billboards has contributed to disorderly environment in Aba (see plates). The investigation also showed that the major cause of indiscriminate display of outdoor advertisement in Aba is non-compliance with development control regulations that governs the area.





Plate 1 and 2 showing the indiscriminate siting of signage along the major roads in Aba urban.
Source: field study, 2021.

CONCLUSION

The paper examined the environmental implications of indiscriminate location of outdoor advertisements in Aba urban. The result showed that the observed dimensions fell within the standard specifications for their location in the city. However, investigation revealed that noncompliance with development control regulation engenders indiscriminate location of outdoor advertisement with adverse consequences such as confusion, disorderliness and declining environmental quality in Aba. The study among other things recommends the enactment of Highway Beautification Act aimed at governing proper location, spacing and quality of billboards to be erected in designated areas in the city.

RECOMMENDATIONS

The Abia State Signage and Advertisement Agencyshould urgently outlaw the siting of any banners, posters, billboards and signage within 10m from major roads and Posters. Similarly, no advertisements should be allowed on road separators to avoid obstruction and visual intrusion often experienced by motorists and other road users. The agency should designate some strategic areas for erecting

posters, billboards and other outdoor advertisements in the city. Such designated areas should be effectively monitored and regularly maintained to ensure compliance by the advertisers.

The State Government should establish a collaborative institutional framework for planning and management to streamline interagency functions. This can be achieved through the harmonization of the functions of the different but interdependent agencies.

There is the need to curb the activities of those who display posters, especially politicians and other advertisers. Any erring person should be severely sanctioned. In addition, the outdoor advertising regulatory bodies should effectively supervise posting of posers and display of billboards to maintain sanity in the living environment.

Government should come up with policies will that discourage indiscriminate advertising within the State. Offender should be adequately punished.

REFERENCES

Adeayo, R.O. (1996). "Development Control as a Tool for Enhancing the Quality of the Environment," Journal of the Nigerian Institute Town Planners, Vol. xix, No.1, pp. 1-17.

Advertising Practitioners Council of Nigeria (2005). Federal Government of Nigeria, Abuja.

Agukoronye, 0. C. (2004) "Arterial Right of way, Abuse and Traffic Flow in and out," Architectural Research Practice Journal. VoL2, No. 1, Pp.60-67.

Aronoff, J. (2010). "Eau Dc Marketing with Hint of Pepper," The Charlotte Observer htt://www. Charlotteobserver. Com. 2010 /06/03/147414/enu_de_marketingwith_ of_html June 8,

Barry, C. (1991) "Aesthetics in US Planning from Bill boards to Design Control,"

Boardbent, G. (1990). "Emerging Concepts in Urban Space Design," Van Nostrand Reinhold, London.

Dimeji, T. (2007). "Effectiveness of Poster Advertisements," www.thisdayonline.com, Accessed April 14.2011.

Farbry, J.; Wochingeor, K.; Shafer, T.; Owens N.; and Nedzesky, A. (2001). Potential "Research Review of Safety Effects of Electronic Billboards on Drivers Attention and Distraction", Washington DC: Federal Highway Administration.

Freeman and Fatey (1990)."Advertising: An Easy Way-out", Seat Publishers, Columbus, Ohio.

Garba, B. (2004) "Electronic Billboards, Pros,Cons and Safety Information," TheDigital Signage Insider, Wire Spring'sHog featuring tips and analysis from a team of industry experts

Unpublished Independent Project in Nigeria, Department of UrbanAnd Regional Planning, University Nigeria, Enugu Campus.

International Journal Communication (2005). An Interdisciplinary Journal of, Communication, No.2pp.156-164.

Obiweluozor, 0. (2010). "Where are the Beloved Posters www.sage.comaccessed April 2011.

Jane, A. (2006)."Poster as Environmental Problem in university of Nigeria, ",Unpublished BA. Thesis Department of Fine and Applied Arts, University of Nigeria, Nsukka.

Ogbonna (2001). "Implication of Outdoor Adverts Display: A Case Study of Umuahia," Unpublished BUR Dissertation, Department of Urban and Regional Planning, University of Nigeria, Enugu Campus.

Kwate, Naa. and Tammy, H.Lee.(2007)"Ghettoizing Outdoor Advertising: Disadvantages and Ad Panel Density in Black Neighborhoods, Journal of Urban Health, 84(1):1-31.

National Commission Population (2006). Federal Republic of Nigeria, Abuja, Official Gazette, Vol. 96, 2nd February, 2009.

Olusola, F.(2010). New Posters Jostle for Attention Abuja wwwihisdayonline.com Accessed April (2012).

Outdoor Advertising Agency of Nigeria (2005) www. Wlkipeedia.com the Free Encyclopedia.

Silva, J.L. (2001). "The Campaign Garbage onWalls and Poster stopped"Philippine Daily Inquirer, March.

Nurudeen, Y. (2010). ".Jndiscriminate Pasting of Posters, Take Shine of. Abuja," www.thisdayonline.com accessed April 2011,

Taylor, C. R and Taylor I. C. (1994). Regulatory Issues in Outdoor Advertising a Content Analysis of Billboard Journal of Public Policy and marketing 13(1)97-107.

Obi, CE. (2006) "A Comparative Study of Visual Outdoor Advertisement Display in Selected High Density and Low Density Areas of Enugu Metropolis,

Wallace, C. (2002). "Driver's Distraction by Advertising: Genuine Risk or Urban Mirth", Municipal Engineers. 156, 18.

INFLUENCE OF TEACHER'S MOTIVATION AND CREATIVITY ON KNOWLEDGE OF SCIENCE PROCESS SKILLS AMONGST CHEMISTRY STUDENTS IN CALABAR EDUCATION ZONE CROSS RIVER STATE NIGERIA

UGUMANIM, AndyAgbankwo
Department of GeneralStudies
College of health Technology ,Calabar
andyugumanim@yahoo.com
&
OROK,BasseyEtim
Department of GeneralStudies
College of Health Technology,Calabar
basseyorok59@gmail.com

Abstract
The study was structured to investigate the influence of teacher's motivation and creativity on knowledge of science process skills amongstchemistry students inCalabar education zone-Cross River State -Nigeria. Related literature and empirical works were cited while expo facto design wasused.Stratified random sampling techniques was used on the basis of local government and gender of respondents while proportionate random sampling was used to select the actual sample from an uneven population distribution. A total of three hundred and eighty (380) respondents which comprised of two hundred and fifty-two (252) SSII Chemistry Students and one hundred and twenty-eight (128) Chemistry teachers were sampled for representativeness. Teacher's motivation and creativity questionnairesand science process skills test were the two instruments used for data collection. The instruments were validated and tested for reliability through CrombachAlhpa reliability coefficient. The data were coded and analysed using Analysis of Variance (Anova) at 0.05Alphalevel of significance. The result revealeda significant influence of teacher's motivation and creativity on students' knowledge of science process skills. Based on the findings, it was recommendedthat,teachersbe motivated by relevant authorities and be creative in-service delivery especially during chemistry laboratory simulations.
Keywords:*motivation, creativity, process skills, laboratory*

INTRODUCTION

The development of scientific competency is highly advocated for the advancement of scientific enterprise of any nation. These competencies are embedded in students and can only manifest and orbe magnify through proper knowledge and acquisition of science process skills. In essence, scientific literacy is based on leaner's ability to understand, acquire, master and utilise science process skills in solving real world problems. Science process skills become expedient for quality science teaching because proper application of scientific skills in instructional delivery would enhance quality science education.Aydogdu, (2015).

According to Mbah and Leghara (2008), science is a two way activities that involves "product" (the knowledge and outcomes of Science) and "process" (the skills and scientific procedures of investigation). Science can be categorized into two dimensions – the process and the product dimensions. The process of science involves the methods or approaches employed and activities engaged in by scientists in order to arrive at a product. These include observation, classification, measurement, inferring, communication, predicting, controlling variables, formulating models, formulation of hypothesis, manipulating, interpretation of data, counting/number relations, experimenting, recording of data and making operational definitions. These processes are commonly called science process skills. Hilal. &Onner. (2010), argued that despite the awareness created by science a process approach(SAPA), students' knowledge and application of scientific skills in our various schools still fall below averagethus, acquisition of psychomotor skills and manipulative skills for the operation of science equipmentsbecomes relatively difficult.

Teacher's motivation is an intrinsic and extrinsic influence and disposition that stimulates desire towards events and regularities in nature. It represents reasons for teacher's actions and desire to act on specific situation. In this context, teacher's motivation depicts efforts geared toward the improvement of students learning processes, it connotes the teacher's psychological disposition to his or her job as influence by the available incentives. It follows that, if teachers are well remunerated and rewarded through proper incentives, their best services will be given. The contrary may daunt the teacher(s) and steed the attainment of requisite skills by the learner(s). Teacher's creativity on the other hand is an inherent attribute of the teacher to explore possibilities in difficult situations in the course of delivering lesson, It involves teacher's personal effort to develop new ideas that are intelligent, innovative, valuable and applicable in a given situation to solve identified problems. It is against this background that this study tends to investigate teacher motivation and creativity as determinant of chemistry student's knowledge of science process skills in the study area.

CONCEPTUAL REVIEW OF VARIABLES

Teacher's motivation and chemistry student's knowledge of science process skills

Motivation plays a significant role in the process of learning and acquisition of any skills. It requires intrinsic drives for quality teaching and instructional delivery during classroom interaction. UNESCO (2018) posited that, teachers' roles in instructional delivery must be complemented with hard work by the students towards achieving the desired goals.

. According to Aydogdu (2015), teaching profession is mostly aimed at producing highly qualify teachers who will in turn influence the behaviour of students and contribute towards the technological development. The researcher noted that, the attainment of these noble goals through the acquisition of skills depends to a large extent on ways and manner in which those vested with responsibilities are appreciated and rewarded.

Ezeliora (2014), conducted a research to underscore the relationship between reward system and staff productivity. The study measures the reward system like-improved salary, benefits, praise, promotions, good condition of service and job satisfaction as those intrinsic motivational strategies that could influence teachers productivity. The study revealed that better reward system was

instrumental to staff effectiveness and productivity.

It follows that, when teachers are motivated they build up high morale and enthusiasm to work while an unmotivated teacher becomes stagnant, resentful and un-resourceful in the discharge of his/her lawful duties.

However, Ejiofor (2007) examined the effects of "over rewarding" and "under rewarding" on teacher's motivation. He argued that when a teacher gets into a classroom unprepared, reluctant and ill-motivated there is bound to be complacencies and levity in his or her instructional delivery. He identified frustration, ineffectiveness and reluctance as negative attributes associate with unmotivated teachers. Supporters of financial incentives as means of motivating teachers argued that, it is the means of attracting and retaining good staff in the profession and encouraging hard work, research, innovations and high productivity. It was in recognition of these inputs that the government of Cross River State introduced Teacher Salary Structure (TSS) into her budget to further motivate the teachers for higher productivity. According to Aina (2012), teachers everywhere are basically the same. They want more money, more benefits and more satisfaction. Teachers yearn seriously for the following incentives; re-training programmes, better payment, housing subsidy, transport allowance, promotion benefits, pension, gratuity etc. It follows that motivation is not onlynecessary but instrumental to positive attitude of teachers, boost their morale for high productivity and in turns determines the extent to which the teachers motivate the students. Teachers' motivation of student is also keyed in the acquisition of science process skills. This teacher- student's motivation may be in the forms of practical illustrations by the teacher, positive reinforcement like praises, teachers nodding of his or her head in affirmation of good students' response, teachers prompt assessment of performance, correction and appraisal. On the other hand, teacher motivation of students may come in the form of reprimand like caution, punishment and other forms of classroom discipline that can foster effective and more participatory learning.

Creativity on the other hand, is an inherent factor that is implored by teachers to stimulate learners and drive home the needed behavioural change. In most science classrooms and laboratories the needed learning materials are grossly inadequate and sometime put teachers in a fixed. Teacher creativity is keyed in resolving the challenges often faced by the short fall in resources. Omujuwa (2011) asserted that teacher creativity requires teacher competences, sound knowledge of subject matter, as well as effectively imparting the methods and skills relating to the subject. In other words, teachers' creativity involves teachers demonstrating the ability to make students learn. . One of the ways to identify teachers' creative competence could be in the teacher's ability to improvise, Improvisation according to Eniayeju (2009) is another way of designing and providing alternative materials which can serve the same purpose when a shortage is being experienced to achieve the same objective. That is, the teacher can use available materials as a substitute for the needed materials or even produce a replica of the original materials.

. This suggests that, teachers' creative ability is fundamental in ensuring that the right and purposeful materials are made available during practical classes. A creative teacher therefore needs to be zealous, proactive and patience to be attentive to the students' puzzles and provide explanations for possible clarification.

Inyang-Abia (2014) opined that a creative

teacher ensure that, instructional materials and suitable alternatives are put in place to make the undesirable become functionally desirable..Ogwo (2004) confirmed that, creative development of instructional materials by the teacher can lead to discovery of new concept and knowledge. This is because new things are to be learn during the construction of the facility or equipment from available raw materials. As quoted by Ofsted (2003), "Creativity processes have four characteristics. First, it involves thinking or behaving imaginatively. Second this imaginative activity is purposeful; that is it is directed to achieve an objective. Third, these processes must generate something original. Fourth the outcome must be of value in relation to the objective''. This implies that, a creative teacher will explore illustrative approaches to make for easy comprehension of difficult concepts. The teacher therefore has a herculean task and role to ensure that, scenarios/ illustrationare created that will drive home the points and skills to be acquired. Coherency is another predictor of teacher's creativity in a typical science classroom situation. The teacher at this point is sensitive to the difference in his or her students' viewpoints, here opinions are differentiated from facts, ideas are separated from imaginations and intuitive attempts differentiated from real efforts made by the students. The teacher is bound to weigh the student's inputs and explore veritable measures that make for easy understanding of the skills to be acquired.

Again, in an empirical study conducted by Adah &Ihejiamaizu (2013), on teachers' creativity in secondary school chemistry curriculum in the three education zones in cross river state, the researchers used a sample size of 311 chemistry teachers , implore descriptive survey design and analysed the data obtained through the use of mean, standard deviation and independent t-test. The result revealed that teachers' creativity was very crucial in the implementation of a given curriculum. The study equally revealed that teachers' creativity was not gender sensitive. It follows that acquisition of science process skills amongst secondary school students is to some extent hitched on the creative efforts of the teachers. In examining the essence of creativity in a science classroom, Jeffred and Wood (2016), posited that, when creativity is applied in science teaching, learners appreciate the quantitative aspect of learning, develop strong passion for inquiry, discovery and experimentation. The researchers also suggested some creativity related indicators in a science classroom to include but not limited to the teachers' ability to: identifying the students creative ability, encouraging students to believe in their creativity ability and fostering creativity related behaviours like-curiosity, imaginative thoughts, resiliency, resourcefulness, flexible thinking, problem solving, consistency, inventiveness among others. Stressing on the importance of creativity in science classroom, Starbuck (2006) stated that, the result of education is more of transfer of skills than knowledge hence, there is a greater demand for creativity in science teaching than ever before. Teachers' creativity therefore requires time and is driven by experience.

.

METHODOLOGY

The research design used for this study was ex-post facto. The design was considered most appropriate for the study because it is used in investigating possible cause and effect relationship. The population of the study consisted of all chemistry teachers and all senior secondary two (SSII) chemistry students in the eighty one (81) public secondary schools in Calabar education zone. This population was considered most appropriate for the study because they are actively involved in teaching and learning of the subject matter. Data obtained from the Planning, Research and Statistic department of Cross River State Education board(2020)

revealed that there are eighty-one (81) government approved secondary schools within the zone with a total chemistry teacher's population of two hundred and thirteen(213) and SS1I chemistry students population of two thousand five hundred and twenty (2520) students in the Calabar education zone. The sampling technique for this study was a multistage sampling procedure. The first stage involved stratification based on gender and local government. In the second stage, proportionate sampling technique was carried out to select the sample from the population of the study.

To achieve this, forty percent (40%) of the total numbers (81) of schools in the seven local government area was calculated and used for the study. Thus, thirty two (32) schools were considered for the study.The third stage involved simple random sampling to select the number of schools in each local government.. The fourth stage involved proportionate sampling to select sixty percent (60%) and 10% from the population of teachers and students respectively for each local government. The sample for the study comprised of 380 respondents drawn from sampled schools in the thirty two (32) public schools sampled.. Out of this figure, 252 were mainly senior secondary two (SSII) chemistry students while 128 were chemistry teachers. Two instruments were used for data collection. First was the questionnaire tagged- Teacher factors questionnaire(TFQ) designed by the researchers to reflect teacher's motivation and creativity. The questionnaire was divided into two parts. Part one was designed to collect demographic data from respondents. Part two consisted of twenty(20) test items structured on a four point likert scale which measured teachers motivation and creativity. The second instrument was science process skills test (SPST). This instrument was structured to elicit information on science process skills knowledge amongst Chemistry students. The instrument consisted of fifty 50 multiple choice questions drawn mostly from science process skills which is the dependent variable.

. To establish the face validity of the instruments, the instrument was given to two measurement and evaluation experts, and two experienced chemistry teachers for scrutiny. Table of specification was also constructed to determine content validity of the instruments. To determine the reliability of the instrument, a trial testing was done using a sample of twenty students and twenty teachers who were not considered as part of the main study but poses relevant qualities as those in the study. Using Cronbach Alpha reliability coefficient the reliability of the instruments were established at 0.89. The data collected were analysed using Analysis of variance (Anova)

Hypotheses

H_o1. Teachers' motivation does not significantly influence knowledge of science process skills among Chemistry students in Calabar Education zone.

Ho.2 Teachers' creativity does not significantly influence knowledge of science process skills among Chemistry students in Calabar Education zone.

RESULTS AND DISCUSSION

This section is focused on results of data analysis, Interpretation of results and discussion of findings.

H_o1. Teachers' motivation does not significantly influence knowledge of science process skills among Chemistry students in Calabar Education zone.

The unit of analysis is teachers. The average of the scores on knowledge of science process skills obtained by the 5 students taught by a particular teacher was calculated and used in the analysis together with the teacher's motivation score. The teachers were divided into three groups according to their motivation scores as follows: Low motivation 10 – 20; Moderate motivation 21 – 30; High motivation 31 – 40. However, none of them belonged to the low motivation group. Notwithstanding, one – way analysis of variance (ANOVA) was used as the test statistics. The results are shown below;

TABLE 1
One – way ANOVA of influence of teachers' motivation on students' acquisition of science process skills.

Teachers÷Motivation	N	Mean	SD		
High	39	26.282	5.790		
Moderate	86	25.581	5.420		
Source of Variation	Sum of squares	Df	Mean squares	F	Sig. level
Between Groups	13.172	1	13.172	0.430* .	0413
Within Groups	3770.828	123	30.657		
Total	3784.000	124			

*p> .05

The results in Table 1 indicate that the calculated F value of the one – way ANOVA is.0430 and it is not statistically significant because the corresponding p value (.0413) is less than .05. This implies that, students taught by teachers with high motivation have a higher mean science process skill acquisition score (= 26.282, S = 5.790) than those taught by teachers with moderate motivation (= 25.581, S = 5.420), the observed difference in students' knowledge of science process skills was significant. Therefore the null hypothesis is rejected while the alternative hypotheses was upheld.

H_o: 2. There is no significant influence of teacher's creativity on knowledge of science process skills amongst students in Calabar education zone.

. The average of the scores on knowledge of science process skills obtained by the 5 students taught by a particular teacher was calculated and used in the analysis together with the teacher's creativity score. The teachers were divided into three groups according to their creativity scores as follows: Low Creativity 10 – 20; Moderate Creativity 21 – 30; High Creativity 31 – 40. One – way analysis of variance (ANOVA) was used as the test statistics.

TABLE 2
One – way ANOVA of influence of teachers' creativity on students' acquisition of science process skills.

Teachers÷Creativity	N	Mean	SD		
Low	2	25.000	8.485		
Moderate	54	25.037	5.177		
High	69	26.420	5.771		
Source of Variation	Sum of squares	Df	Mean squares	F	Sig. level
Between Groups	59.262	2	29.631	0.382*	.0382
Within Groups	3724.738	122	30.531		
Total	3784.000	124			

As shown in Table 2, students taught by teachers with high creativity in teaching have a highest mean knowledge of science process skills score (= 26.420, S = 5.771), followed by those taught by teachers with moderate creativity in teaching (= 25.037, S = 5.177), and then those taught by teachers with low creativity (= 25.000, S = 8.485). However, the observed difference in students' knowledge of science process skills is not significant because the calculated F value of the one – way ANOVA which is 0.971 is not statistically significant since the corresponding p value (.0382) is less than .05.Therefore the null hypothesis is rejected. Teachers' creativity in teaching do significantly influence knowledge of science process skills among Chemistry student.

DISCUSSION OF FINDINGS

The result indicated that the calculated F value of the one - way ANOVA is 0.430 and it is statistically significant because the corresponding p value (.0430) is less than .05. This implies that students taught by teachers with a high motivation have a higher mean science process skill acquisition score (u = 26.282, S = 5.790) than those taught by teachers with moderate motivation (= 25.581, S = 5.420),Itimplies that, Chemistry students taught by highly motivated teachers performs significantly better in terms of acquisition of the needed skills and techniques compared to those °whose teachers are poorly motivated.. The result validated UNESCO (2008) report that, when teachers are adequately motivated, they will in-turn spur the students and predispose them to explore new grounds and decipher between ideas and opinions. The res-nits led credence to the disposition of Ezeliora. (2014)who maintains that motivation gives positive feedback and intuitively spur the learners to engage in competitive and corroborativeresult oriented learning. The indices of the study further strengthens the claims of Ejiofor(2007) and Aina (2012) who independently posited that teacher's motivation tends to enhance better performance and productivity,

Analysis of the second variable revealed that teachers creativity during classroom or laboratory simulation do influence student knowledge of science process skills, The p-value (.382) being less than .05 is a reference point of decision, therefore the null hypothesis was rejected. This implies that attainment of science process skills amongst the students becomes easier when highly creative teachers are involves in instructional delivery. This again is in consonance with the position of Omujiawa(2011) who stress the need for competence science teachers to man the laborator for effective service delivery. The result consolidates the view point of Eniageju (2009) on the improvisation of material during practical simulation especially when the desirable is not available.The result of this analysis succinctly supported the empirical work of Adah &Ihejiamaizu on teachers' creativity in secondary school chemistry curriculum in the three education zones in cross river state, the researchers maintained that teachers' creativity was very crucial in the, implementation of a given curriculum. The interactive effects of me two variables showa complementary role of the variables on attainment of science process skills amongst chemistry students,. ..

CONCLUSION AND RECOMMENDATIONS

Based on the findings of the study it was concluded that teachers' motivation and creativity significantly influence knowledge of science process skills among Chemistry students in Calabar Education zone. Arising from the findings of the study the following recommendations were put forward.

1. Science based curriculum should be anchored from our elementary school level to lay a formidable foundation for our secondary school sciences and beyond.

2. Relevant authorities and educational stake holders should prioritize teachers' motivation to enhance better services delivery

3. Creative science teachers should be encourage to man the secondary school science laboratories

REFERENCES

Adah S. A: Ihejiamaizu C.C & Ibe J.O (2014) Evaluation of pedagogical Skills acquisition Among National Teacher Institute (NTI) trainers in Basic Science and Technology in Cross River State, Nigeria : The Intuition, Journal of Science Teaching Vol. 6,No.I (235-247)

Aina, O. (2002). Personnel management in Nigeria. A worker -cantered approach. Ikeja: Edition F. Communication

Aydogdu B. (2015). The investigation of science process skills of science teachers in terms of some variables. Educational research review. 10(5) 582-592. Retrieve fromhttp://www.academicajournals

Eniayeji, F (2009). Improvisation in Integrated Science: A practical Demonstration. STAN Conference Proceedings, 3(2), 15-18

Ejiofor P. N. (2007). Management in Nigeria theory and issues. Onitsha: African Feb. Publishers.

Ezeliora, B. (2014). Motivating Secondary School Science Teacher to face the Challenges of third Millennium. Journal of the Science Teacher Association of Nigeria. Vol. 39, No. 1 &2.

Hilal, A &Onner, E (2010). The effect of scientific process skills on students Holt. Rinehart and Wilson home community science3(2) 131-134.

Inyang-Abia M. E (2004). Essentials of Educational Technology. Calabar:Wusen Publishers

Jeffrey, B & wood, P (2003). The Creative School. A Framework for success, quality and effectiveness. London. Routledger / Felmer

Mbah, C.N. &Leghara, B.N. (2008). Science education in Nigeria: Current curriculum practices and implication for National Development. 49th Annual Conference

Ofsted G.N (2013). Expecting th unexpected. Developing Creativity in Primary and secondary schools: London Office for Standard Education.

Omajuwa, J. (2011). Senior secondary school students' difficulties in chemistry process skills acquisition. Unpublished M.Ed dissertation, Delta state University Abraka.

Unesco 2014: Research method in education 4(3). 42-32