Application Of Internet Of Things For Multimedia Utility In The Digital Libraries In The South Eastern Nigeria: Issues and Development

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ABSTRACT

The global trend of Industry 4.0 , the fourth industrial revolution that has arrived will not only affect industries in general and nations as a whole but also will include all the aspects of human lives, be it personal life , organisational culture, physical spaces, social spaces and psychological aspects of our existence . Part of the main objective of this study is to describe the role of suitable subject in industrial information service in the development, support and implementation of the latest industrial revolution talking about Industry 4.0, and also to present opportunities and challenges due to it and accuracy of information to achieve the industrial goal which implies economy growth, early detection, cheaper and faster production using modern Internet gadgets , Robotics, Artificial Intelligence ,Cloud Computing , machine Learning and Big Data technologies among other things. Digital library retrieves, collects, stores and preserves the digital information of ages as required for human intellectual and capital development. The Objective of Sustainable Millennium Development Goal 4 (SMDG4) on the universal declaration is to make sure that every child has access to quality and affordable education and learning. To achieve this, educational institutions, information and knowledge givers are faced with numerous challenges of carrying everyone on the same page. Media must play its roles in disseminating useful information and providing pathway through emerging technologies that envisages pattern, process and various methods of accessing information in large databases. For this purpose, there is need to convert different formats of information such as text, images, video, audio, etc into a form that could enable access to be very possible and timely. This paper looked at data mining techniques as contrasted to multimedia files in the libraries. It attempted to define the term data mining in relation to its usage in driving restructuring in line with Nigeria government agenda for national development. It also covered different data mining features and standards. The paper explained why it is necessary to implement Internet of Things Multimedia Utilities in the Eastern Nigeria Institutions basically Libraries with the help of internet repositories. The choice of Eastern Nigeria is on the merit of economic stability, relatively peace and general orientation to Western civilization and culture. The design will be centrally built as knowledge repository otherwise referred as "Knowledge Power House" that will service other subregions through Wireless data sharing architecture . A sample of 240 higher education students participated in the study by completing the researchers' questionnaire. The results of the study indicate that students have already keyed into the expectation because they use their portable devices to access, exchange education-related messages and academic files with classmates, search the internet and library databases for

academic materials, practice online tests and hold discussions with course mates, tutors among others. The study also revealed to what extend had the Multimedia Internet of things been used to drive key innovations in the Libraries for human capital development.
Keywords: Multimedia, Data Mining, Digital Libraries, Internet of Things (IOT).

1.0 INTRODUCTION

The entire world is at the cross road, the juncture where nobody, no nation , local and foreign donors are ready to help anybody. We are in the era that can be ironically be referred to as "use what you have and serve yourself". The fourth industrial revolution regarded as "Industry 4.0" with its seemingly limitless opportunities and seemingly limitless options for innovative technologies , opportunities and investments in progressive a knowledge economy.

This paper attempted to project into the future of library and information science to point to what is about occur in the nearest future and to redirect priority and expectations of the modern librarianship in Nigeria context focussing on the South Eastern Geo-Political Zone. The state and Federal government budget in education support is continuously dwindling on the account that approximately 80% federal budget on education goes on Personnel cost and Overhead cost with just a negligible percent left for capital expenditure.

The growth rate of Nigeria's annual budgetary allocation to education shows fluctuating trends as the rate of education increases and decreases at different intervals. However, the year 2014 witnessed a declining rate of -20.31% because there was a decrease in the expenditure on education from the previous year 2013 from N390.42billion to N311.12. This is not good enough because the ratio of total budget allocation to education to total annual budget is a measure of relative degree of priority given to education (CBN, 2014; Ogungbenle and Edogiawerie,2016).

Imhabekhai and Tonwe (2001) in Ogungbenle and Edogiawerie (2016), reported that the federal government provide for over 80 per cent of all the funds needed for capital and recurrent expenditures in the tertiary institutions in Nigeria. The Federal Government of Nigeria is increasingly finding it difficult to meet the high cost of funding tertiary education in Nigeria most especially federal universities. According to (Udoh,2008 ; Ogungbenle and Edogiawerie (2016), the government finds it increasingly difficult to match the growing enrolment of students with qualitative funding due to drastic reduction in revenue and economic despondency experienced in the country. According to Okojie (2010) in Ogungbenle and Edogiawerie (2016), admitted that most federally controlled universities' administrators complain of inadequate funding and they are not allowed to charge undergraduate tuition fees.

Obonya's (2002) in Ogungbenle and Edogiawerie (2016), earlier observations alluding to deterioration of physical facilities; internal and external brain drain among the intellectual class; and overstretching of teaching, research and managerial capacities in Nigerian University system. Oyeneye (2006) affirmed that making qualitative education available to all citizens is a right but there can't be quality

education without adequate funding. He further stated that in Nigeria, it is difficult to ascertain the pattern of fund allocation.

Ekundayo (2008) posited that most of the capital projects being undertaken to meet the increasing number of students have been abandoned due to lack of funds. He also affirmed that the pressure on the inadequate resources has led to a decline on the staff welfare package and remuneration coupled with depreciation of working conditions and environment. The unavoidable effects are high brain-drain of professional staff, persistent strike action, rioting, high crime rate, and cultism, extortion of students, admission runs, embezzlement and all sorts of vices. These are dangers and terrible implications of depending over much on government for funding critical sector like Education sector, hence the need for emergent technologies to solve most of the problems facing Nigeria education sector.

The Industry 4.0 is an automation of information and data exchanges in manufacturing technologies, distribution and utilities cutting across disciplines library inclusive . The notion which include cyber-physical systems, the Internet of things (IoT), Datamining and Cloud Computing which in general referred to as smart factory. The convergence of IoT, Artificial Intelligence, Datamining , ICT and robots, among several other advancements, has paved way for smart factories as well as the quantum leap into Industry 4.0 with its prospects and challenges. The Rapid innovations in industrialisation and knowledge economy have engineered tremendous progress in developing the next generation of information manufacturing and consumable technologies. In 2013, part one of 10 'Future Projects' identified by the German government as part of its High-Tech Strategy 2020 Action Plan, the Industry 4.0 project was to establish itself as a leader of integrated industry. Every industry is driven by discovery , the quest and curiosity to find the unknown. Those steps through which industry adopted to arrive at the result of the unknown is regarded as research. In 2014, China's State Council unveiled their ten-year national plan, Made-in-China 2025, the mandate that was designed to transform China from the world's workshop into a world manufacturing power. China is assuming leadership role due to innovation and incredible knowledge economy put in place by the successive administrations . Made-in-China 2025 is an initiative to comprehensively upgrade China's industry including the manufacturing sector and information sector. In Industry 4.0 and Made-in-China 2025, many applications require a combination of recently emerging technologies, which gave birth to emergence of Industry 4.0, such technologies originated from different disciplines including cyber-physical Systems, IoT, Cloud Computing, Datamining, Industrial Integration, Enterprise Architecture, SOA,Business Process Management, Industrial Information Integration and others. In this paper, we briefly survey the state of the art in the area of Industry 4.0 as it relates to industries and particularly library and Information Service with focus on South Eastern Nigeria in accordance with Federal government Agenda on Restructuring. The study investigated budgetary strategies, Planning and implementation in the academic libraries under the ministry and supervision of Federal Ministry of Education. Four research questions were raised and answered. The objectives of the research was to determine sources and adequacy of funding for Public Libraries in the South Eastern Nigeria, adequacy of budgetary allocation, types of budgeting

system that are used, and to discover the level of involvement of the Library in the planning and budgeting for their operation to accommodate the scope of industry 4.0 revolution in knowledge management .In a similar development, the research suggested alternative sources of funding which is the entire essence of Industry 4.0 and Knowledge based economy.

As the Researchers sought to understand why libraries should invest in Industry 4.0 to enable digital transformation, which will open up quantum reap into Knowledge economy. The researchers fielded a regional survey of some potential libraries in the South Eastern Nigeria to see the prospects and viability of the research proposal. As such, our regional survey focused on technology invention and Datamining and to examine how and where the institutions are investing or planning to invest in digital transformation; some of the key challenges they face in making such investments; and how they are forming their technical and organizational strategy around digital transformation. The survey revealed a mix of enthusiasm and ambitious plans for future investment as well as a series of disconnects between organizations' plans and actions.

Their digital transformation initiatives are driven largely by productivity, improvement and operational goals, essentially leveraging advanced technologies primarily to do the same things better but many issues needs to be addressed which what this paper is meant to achieve.

This new paradigm is bound to impact business models, consumer experiences and everyday life. It is bringing in new opportunities, but also risks privacy and security of data, managing of which is going to be a challenge. However, the supporters of IoT argue that, when technology evolves, it brings in opportunities, threats and solutions. When Internet for communications happened, privacy was breached at certain areas, but technology over a period of time provided solutions to control such intrusions, Shamprasad, M ,Pujar and Satyanarayan, K ,V (2015).

The Information and Communication Technology created new types of work culture, new forms of information storage, retrieval and means of communication and dissemination of information. The advent of electronic resources, computer databases and their increased use in libraries has brought about significant changes in storage and dissemination of Information.

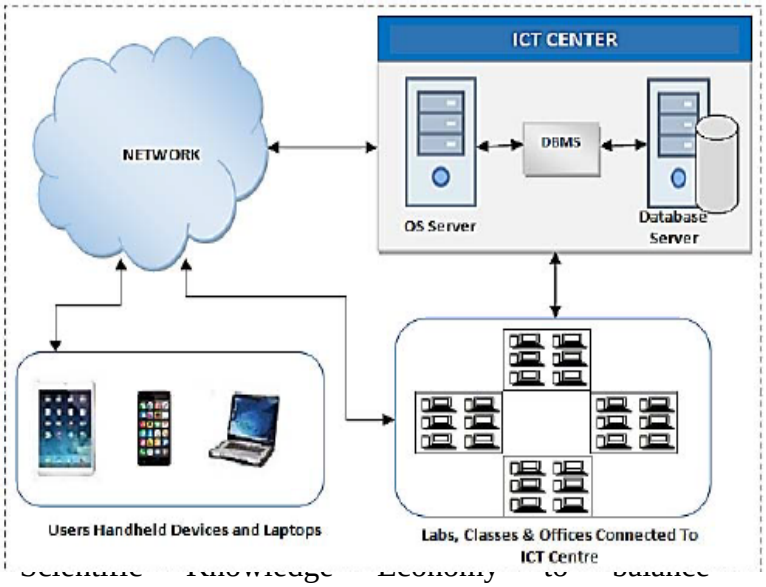
1.1 AIMS & OBJECTIVES OF THE STUDY

The objectives of this Scientific Research Proposal is articulated herein but not exhaustive, there are million lot to the design ;

I. **KNOWLEDGE REPOSITORY**:

The design is expected to provide storage capacities for knowledge Management in delivering Multimedia contents through interactive terminals to the client systems and work stations. It is an expectation to develop an interoperable scientific Knowledge repository for Nigeria and Africa. The research is borne out of necessity to save Nigeria and Africa from scientific research oblivion and brain drain due to low per capital income that hinder access to quality education and Scientific Knowledge. The third world countries are poor and Africa and Nigeria falls under this category. Greater percentage of the school age Children , Youths and Young Adults are out of school due to economic hardship at all levels. There is no job, low access to education and scientific knowledge, the entire African race are doomed because they are poor and will continue to

be poor . The knowledge divide between the North (First World, Second world countries) to the South



Scientific Knowledge Economy to balance favourable knowledge transfer in the Third World Countries Knowledge Economy using the technology potentials of industry 4.0 , the fourth industrial revolution.

Fig. 1 **Data Mining and Data Warehousing Model of the Scientific Knowledge Repository Aminu A., G., Abdullahi B.A., and Ugochukwu M.O.(2019).**

II. BUDGET SIZE DOWN:

The design is expected to reduce the cost of textual and printed copies of books and supply chain anomalies in the libraries thereby freeing the budget cost so that government can channel its focus to other sectors for economy growth. The money budgeted for printed items , Map and editorial procurement can geared towards bandwidth internet subscription and other Library infrastructures that are capable of developing library and widen its scope of services and operation . In Nigeria for instance , The 2018 Federal Government budget on Education stood at N605.79bn which includes Universal Basic Education grant of N109.06bn'a big commitment by the government to ensure her citizens have access to quality education. There was an increase of 12.04% when compared to 2017 education budget of N540.89bn, though small, if the budget sizes of 2017 and 2018, of N7.44 trillion and N8.61 trillion respectively, were considered. The percentage of the education budget when compared with the budget sizes in 2017 and 2018 (both proposed and approved) are 7.41% and 7.14% respectively .In 2018, the sector received its highest allocation since 1999. The proposed budget had a slight increase in the capital expenditure of N4.7bn which still did not show any political will to improve the education sector in any meaningful way. A huge statement was made when The National Assembly inserted 471 new projects spread across all departments and agencies in the education sector. This automatically increased the capital expenditure from N56.9bn in 2017 to N102.9billion in 2018. This is an increment of N45.91bn and a percentage increase of 80.5% when compared to the previous year, Okeowo Gabriel ***et all***., (2018).

III.COMMUNITY SERVICE:

The initial design is expected to service the entire South East Geo-Political zone of Nigeria comprising of five states that make up the south eastern Zone (Anambra , Imo, Enugu, Abia and Ebonyi state) will be connected through a digital

grid. "The Knowledge Repository" will be hosted in Anambra State while the substations will be located in each of other states in the region while all operations will be directed from the central repository to ensure consistency.

IV. MULTIMODAL/MULTI-SENSORY CONTENT DELIVERY:

The design will incorporated Educational Content (Multimedia educational Content) with option of real

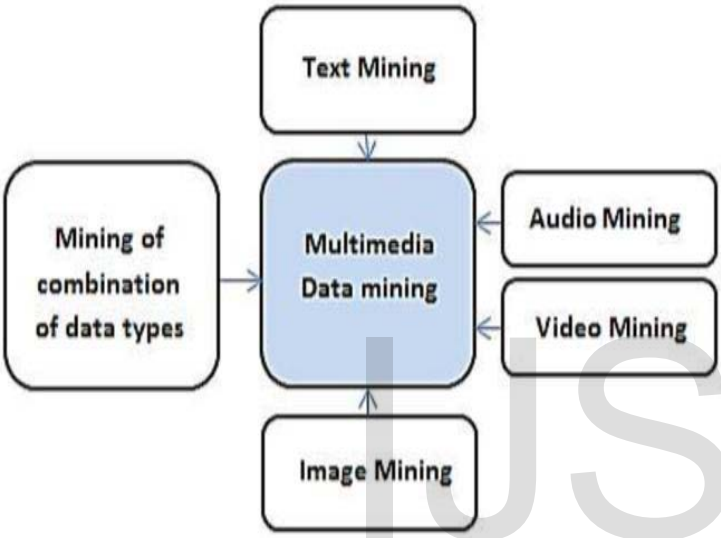


Fig 2. Multimodal Datamining Model of the Scientific Knowledge Repository
Aminu A., G., Abdullahi B.A., and Ugochukwu M.O.(2019).

V. COLLABORATIVE INNOVATION:

The design is highly smart and collaborative with features and capacities to engage audience on individual or group participation enhancing knowledge transfer in a collaborative atmosphere. Furthermore, the lectures series [Module] is divided among the best in the industry (Educators) providing opportunity to learn from different professor who may not necessarily come from a student institution including foreign academic experts . The logic is , professor in California University , deliver your lecture in the California university , retrieve the Video of the lecture , Edit it and add features relevant in Nigeria context , Upload the video in the knowledge repository, student in Nnamdi Azikiwe University Awka , Anambra State , Nigeria , Login in to your department Repository , select your Module , Listen to the lectures , digest the video content and use the knowledge obtained , organize your studies and prepare for your exams or any other academic business not excluding inventions and innovations.

VI. INTERACTIVITY:

The design will enable educators to collaborate and assume leadership and managerial function and provide opportunities for growth and intellectual exchanges. Our expectation in inventing this model is to unify the third world countries who are struggling to have access to scientific knowledge for growth. With current design and approach , a policy based computing will enable establishment of protocol useful in Nigeria and in Africa context. The services of best in education will be used to reinvent and duplicate scientific knowledge seamlessly.

VII. FLEXIBILITY AND USEABILITY :

The system is designed to be flexible and reusable to enable user study at his/her pace and monitor his /her individual progress. The design offers the opportunities to download the video , audio , Map , Infographics , Text file store it in your personal

device and use them at your convenient time , the same applies to every lectures module .

VIII. Self-monitoring and Self-Evaluation:

The design will contain test and Assessment dummy to enable students attempt at their own time.

IX. BASES FOR APPRAISAL:

Content performance, Methodology of Teaching , general student performance will afford the Tutor/Lecturer the opportunity to be appraised positively/negatively which has implication on job retention , promotion , Career progression and otherwise.

X. Paradigm Shift To Capacity Building:

The design will unveil opportunities for discovery , recovery of scientific knowledge that will pave way for knowledge economy leading to commodity product manufacturing , service reworking , innovation , technology and digital synchronization.

1.3 IMPLEMENTATION OF THE DESIGN

The design was implemented using Android-based operating system application with adaptation to run on Windows 8 and 10 Laptops or any other Mobile Computing devices . The design phase, consists of the Clients (Android supported mobile device), system administrator, Database and the server. Enterprise features such Reliability, Portability, efficiency and maintainability were incorporated into the subsystem using different Smart software technology. The subsystems were incorporated using programming component dynamic link library functionality. The application was Tested and Debugged severally on the emulator and actual devices to confirm the functionality of the different runnable components of Design. The App were installed on real Computing mobile device for the first Phase Test . The testing was done on Zpad 10-inch , White Color, Quad Core, 8GB Internal Storage, 16Gb Memory , Android 4.4 Version Jelly Bean, Internet use up to 7hours , Dual CAM, 3G, GPS, FM enabled Zinox Mobile. The Initial Version/edition was implemented for Android operating system Client Device. There is expectation that Smart operating systems such Windows 8 or 10 will be developed and configure to adapt for the purpose. To ensure availability and affordability, the app will be released on Google Play Store for public Access . The default home screen will contains 7-8 tabs for carrying out learning activities. Both instructors and learners are welcomed with Class Room, Repository, Conversations , Friends, Groups, Share and Broadcast tabs and other features yet to be updated in the subsequent design. The Prototype home screen is shown in **Fig. 8**. The courses are setup by the App system administrator, who is also responsible for managing users and Shares. The Tutor, after securing authentication can set his profile, select his course from “Class Room” tab, and connect with the students that have selected the course. Afterwards, the Tutor is able to offer E-learning resources, links(Video,Audio etc), quizzes, create groups, create

Android Mobile

Zpad 10-inch , White Color, Quad Core, 8GB Internal Storage, 16GB Memory , Android 4.4 Version Jelly Bean, Internet use up to 7hours , Dual CAM, 3G, GPS, FM enabled Zinox Mobile.

Shares, Broadcast, Initiate Conversation , and receive students' Assignment including Multimedia files . The students likewise would need to obtain authentication and then access the learning platform as required to download textual Material and Video of the current Lectures and access them at their convenience in addition to class activities. Authentication is mandatory to protect the Tutor and learner works, copyrights, privacy and identification of learners. In addition to authentication is profile personalization to support context awareness of Tutors and students learning. Users have the opportunity to personalize their profile by updating profile picture – image or photo that depicts the user, display name – users' identification name, tagline – texts related with the user, password – secret key to access the platform, location – users' current position on the GPS are all added features of the design to met the designed expectation.The profile information will uniquely identify users and create learning contextualization. Class Room tab support users with functions such as Activities – offer a view of activity timeline, My courses tab – lists users subscribed courses, My mates – list course mates, **Discussion** – course chat among learners and teacher, **Quiz** – test to evaluate learners' course performance. Tutor's quiz interface is shown in **Fig. 9**. Multiple choice and true/false question types are supported on the quiz interface. Library tab has basically two functions: e-library provides link to open access electronic resources and course related materials, while library tab support learners with instructor's teaching materials such as slides, videos, audios, animations and notes. The Interface of the Multimedia Digital library tab is presented in **Fig. 10.** Learners and instructors can send and receive private mails through the Messages tab. This aspect is essential especially for instructors to discuss directly with a learner about important concepts and support peer-to-peer messaging. Before sending message to users, you need to be friends on the platform. Friends tab offers a view of users' current friends and friend invites. Teamwork skills and collaborative learning are enhanced through the Group tabs. Tutors s can place learners into groups to perform learning activities together. Announcement tab contains function for passing information about course activities and other relevant news. The authenticity of our design lies in the fact that the App is Collaborative to support blended learning for numerous students, while providing opportunity for assessment, collaboration and social networking especially in a computing education environment.

Fig 8. Profile View

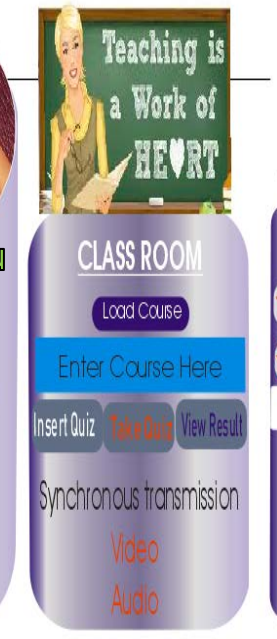


Fig 9 . Profile View

Fig 10 . Profile View

1.4 RECOMMENDATION

In view of the above findings, the researchers would like to recommend as follows that:

1) Library department should work closely with the Head of Departments to make arrangements for extensive user education and Information Literacy (IL)trainings for distant/learners.
2) The training should cover access to the library electronic resources, referencing and citations, Internet search and how to evaluate information sources.
3) Collaboration between librarians and faculties during the face-to-face session can help create time for the library training and coaching, building on modern librarianship ethics geared towards hospitality
4) Provision of platforms that ensure wider access to Electronic Resources (e-journals, eBooks, dynamic element audio, video).
5) Distant learners are separated by distance from the main library, the librarians should provide remote login credentials for the subscribed e-resources. New subscription to e-journals and eBooks should be timely communicated to the distant learners.
6) Provision of login credentials is not enough, the learners should be given subject guides (training manuals or guides on how to access the electronic resources off-campus).
7) Libraries' management should work together with faculties / departments offering learnable programs to draft friendly library policies that support effective usage of the main library or study centre notwithstanding their gap created by distance.
8) Libraries should consider adopting social media and social networking tools like Facebook, Twitter and WhatsApp for communicating with their library users.
9) The contemporary students are predominantly young and are actively on social media, they have a lot to achieve through the use of social media in communicating updates timely through social media. Librarians can pass announcements of new acquisitions and even send remote login credentials for students both within and without at ease

1.5 CONCLUSION

Data Mining is a cross-discipline, and it is one of the most cutting-edge researches in the international database and information system, so its application in the field of digital libraries is still in its infancy. We should strengthen the learning and applications of data mining. Firstly, we should update the idea and establish effective mechanisms of technology innovation and application. Library management should open minds and change ideas, encourage staff to try and innovate service technologies. Data Mining technology innovation is the basic premise of information survival and development which the bedrock of industry4.0 and the entire essence of knowledge economy . Multimedia Digital Libraries must establish a more perfect technology innovation system to survive the fierce competition and gain competitive advantages in the coming years.

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