



The Relevance and the Use of Big Data in Tertiary Institutions in Nigeria

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Abstract

This study explored the relevance and the use of big data within tertiary institutions in Nigeria. The study critically reflects on how relevant it is to use big data appropriately in tertiary institutions. The study has been properly carried out through the sources of literature reviewed which include reports and different related journals in the field of research. The study is organized on desk research and sources of the literature examined were journals as well as scientific research articles, theses and conference reports. The study brings to conclusion that big data is deemed to be very essential since it proffer tertiary institutions the opportunities to their information technology resources strategically and bring about improvement in the quality of education and guide the various students as well. In recommendation, the study advised that tertiary institutions, particularly in developing countries should improve on the analytics and data skills for all the individuals (i.e. staff as well as students) through training and various institutes should improve on their digital literacy while the management system of various institutions and industries be encouraged to make investments in programs that can bring about enhancement and performance of students in terms of information technology.

Keywords: Big data, Information technology, Nigeria, Students, Tertiary institutions.

JEL Classification: M4

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Introduction

The relevance and the use of big data in tertiary institutions all over the world cannot be over emphasized. It is absolutely relevant for tertiary institutions to ensure that big data is appropriately used in order to gain more knowledge that will be of benefit to the people in our environment. In addressing number of pressing issues that are significant, big data analytics in educational system is found to be relevant (Marsh, Maurovich-Horvat & Stevenson, 2014). Since it has become necessary to ensure the use of big data within tertiary institutions both in developed as well as developing countries, what then is big data? Though big data does not actually have any single standard definition, but researchers have differently given their appropriate understanding

of the perception. Big data is understood by Youssra and Sara (2018) as the evolution and technological use that at the right time provide the right user with rightful information from the mass of data that has been exponentially growing in our society for a long time. Big data is concern with the data sets found to be big enough to create significant issue when making use of infrastructures and traditional tools for collecting, managing, processing and analysing the data within the amount of time adequately. Big data was also seen as the set of data big enough to significantly cause challenges when making use of infrastructures and normally available or traditional tools to process, analyze, collect, and manage the data within an acceptable time (Murumba & Micheni, 2017). Various institutions of education have the requisite to record different activities of data that are linked to academics. The tertiary institution is were great sum of data can be considered to be available and used. Higher education is covered by higher learning institutions with a wider range which includes the university (Sintayehu, 2018). Higher institution and university in some contexts can be interchangeably used (Assié-Lumumba, 2005). Sintayehu (2018) sees a university as an institution of higher learning which brings both men as well as women to the level of high development of intellectual in the field of arts, science and in the disciplines of traditional profession and also promoting high level research. Tertiary institution is generally known as a set which make up the university and this happens to be a part of the higher institution. Various institutions of tertiary education have the requisite to record various activities of data that are academically related. Higher institutions of education is required to record all data that are related to academic from various activities such as tutors' data, student data, registration data, courses data, assessment data etc (Minimol, 2018). The utilization of big data hold great opportunity for tertiary institutions and some of which are endeavor to be put into practice while the rest are to be discovered. The benefits spawned from the proper utilization of using this big data are essential and can then be seen in projects like. There is no uncertainty that big data definitely have a considerable role to take part in the prospect of tertiary institutional sector. The impact of big data within the tertiary institution is transformed activities which also bring about improvement in the process of teaching as well as gaining of knowledge. In the course of using big data, Drigas and Leliopoulos (2014) find that a better feedback can be provided on student's progress. The usefulness of big data likewise can be seen in the advancement of a research projects. Various academic students can as well make the impact analytics to a very large variety of data and then improve on the research value. It can assist them during the process as well as storage of massive volume of the research data. Technology has been intentionally introduced into tertiary institutions to enhance diverse processes such as keeping of course data, student's data, assessment data, tutor data etc. Social interactions have been noticed to have gradually moved online due to innovation of information technology (IT). The interactions taking place during the online process can be traced to collect and also form the vast entire data that can then be attentively seen to be big data. In spite of the relevance and the benefit involved in using big date, there are still some technical issues that are required to be examined and tackled. In having an impact on higher institution, big data so far, have not be much successful (Vatsala, Rutuja & Sathyaraj, 2017). IT infrastructure, tools as well as human expertise needed for effective collection of data, analysis, cleansing and visualization are lacked by a good number of the higher education sectors also while collecting as well as analyzing the data of student, institutions of higher education face some challenges like the issues of privacy, safety and that of security (Kaisler, Armour, Espinosa & Money, 2013 as cited in Minimol, 2018). Considering the challenges faced by most tertiary institutions, mainly in developing countries, there would be need to find out proper system of management as well as the guideline that can aid the tertiary institutions to overcome the various issues faced when using big data in tertiary institution, mostly in a developing country like Nigeria.

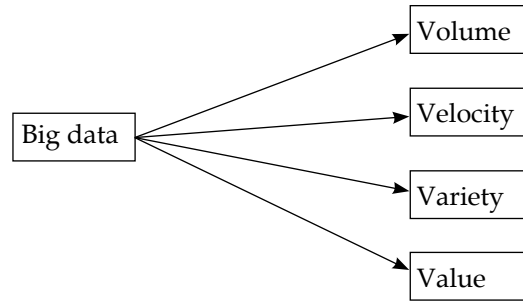
Review of Literature

Big Data Concept

Big data concept can be applicable in the direction of a range of administrative as well as instructional applications which include the process of recruitment and admissions, monitoring of students performance, donor tracking and financial planning. Prakash, Hanumanthappa and Kavitha (2014) opinionated that the notion of big data analytics can therefore be applicable to diverse administrative as well as instructional applications which consist of the process of recruitment and admissions, donor tracking, financial planning as well as student performance monitoring. Big data provide to various institutions of education the opportunity to make use of IT strategic resources in other to build up the standard of the value system of education and lead the direction of various students to higher rates of completion. It does not actually have any single standard definition, but researchers have differently given their appropriate understanding of the concept. Banica, Burtescu and Stefan (2014) described big data in their study as very big collection of shareable data which originate from any form of public or private digital sources, and can stand for on its own source for the continuing discovery, analysis as well as business intelligence and forecasting. Big Data is far more than just the collection of reports generation and information. It can be seen as a resource that can strategically be use for improvement of the quality of education. Big data approach to the management of it in institutional system can assist to reduce challenges that are connected with the analysis of traditional data which can have the prospect to expand the system of education with most recent ways of leaning as well as making decisions by policy makers effective. Big data has been described as sets of data depict to be too complex and large that the applications of traditional data processing cannot handle (Anikweze, Ugodulunwa & Mainoma, 2019). Big data for instance, consist of the volume of data that can be shared online on a daily bases, YouTube videos viewed, locating data of mobile phone and twitter feeds. Due to the innovation of IT, social interaction has gradually stirred online. These interactions of online can be traced and collected and can be considered as big data, and will form a huge amount of data (Minimol, 2018). Opportunities are provided by big data in various institutions of education for their information technology resources to be effectively used so as to bring about the development of various institutions and direct students to an advanced rate of achievement and likewise improve the persistence and outcome of students.

Big data was described by Oracle by focusing on four Vs (four key attributes): Volume, Velocity, Variety and Value (Briggs, 2014). Banica and Radulescu (2015) further illustrate on the content as well as the significance of each key attributes of four Vs approach:

- (i) **Volume:** This refers to data size. It is usually not easy for the limits of big data to be defined, it is an aspect that is relative for every field of application and that of education as well. The idea is, even if data is originated from so many students in one institution of higher education, that data is considered as big data.
- (ii) **Velocity:** Corporations do make use of data analytics online for the processing of instant data by considering the fact that whichever decision that comes late will lead to missing of business opportunities.
- (iii) **Variety:** Big Data can be said to be the grouping of various kind of formats, unstructured and that of multi-structured.
- (iv) **Value:** Concerns the big data of the scientific or the commercial value. Hence, it is essential for corporations to ensure the use of effective data that is originated from social media as it is combined with internal data so that their businesses can be developed.

Fig. 1: Schematic framework on the four Vs of big data

Source: Author's schematic framework, 2020

Big Data in Tertiary Institutions

Tertiary institution is regarded as one of the key necessities for the growth as well as the development of a nation. The objective of tertiary institution is the pursuit to learn and also commit to make sure knowledge is been enhanced and likewise give proper training to intellectual for the betterment of individual's life and the society at large. Modern higher institution is seen as an organized institutional learning and that of training activities as well as institutions that consist of conventional universities like humanities, arts and science faculties and more specialized university institutions in engineering, science, technology as well as agriculture (Alemu, 2018). A student who is well educated is considered to be more skilled, both professionally and personally. The value of tertiary institution is changing and beginning to take a new dimension on a daily bases. Technology is today strengthening the capacity of various academic institutions in other to face the new challenges. To advance the outcomes of the value of learning, it is crucial that the large amount of data that is been produce by the system of education have to be adequately analysed in other to appropriately give support to recent challenges. Tertiary institution has access to the application of data and this can be employ for the progress of decision making. Using big data various in tertiary institution is an area that is noticed to be relatively new. Looking at the sector of the tertiary institution, the important of keeping students data in various departments and faculties cannot be overemphasized. The institutions do ensure the provision of resources like faculty, infrastructure facilities, technology (labs and software), knowledge and that of student's degree. The data within various educations can be accessed and communicated through mobile devices, personal computers, or laptops. In the recommendation, architecture of big data, information management imply the collection of data, storage, analysis, retrieval of data as well as output generation life cycle, diverse systems of information are used in various institutions of higher education (Minimol, 2018). Big data used in tertiary institution likewise covers the systems of database which can store huge quantities of longitudinal student's data activities of teaching and learning. When there is interaction of students with the learning of technological skills, they will leave behind the conduit of data that can disclose their social, intentions, connections and goals.

Big Data Significance in Tertiary Institutions

The significance and the use of big data within tertiary institution in this recent year of leaning is paramount for the accomplishment of higher institution and the improvement of the quality of the outcomes of learning. Big data in this recent year has started to attract the academia interest. Marsh Maurovich-Horvat and Stevenson (2014) deduced that it is completely important for universities to make use of the analytics of big data so as to make sure the best way to learn in

environments for societal good is delivered. Big data holds great prospect for tertiary institutions, attempt are made by some of them for implementation while others are areas needed to be investigated. And it is due to numerous gains present by the analytics of big data. In recent time, the technology of relevant big data is often used in both tertiary institutions as well as their students' data. The benefits for the use of big data in tertiary institutions are relevant and can be notice in projects like. Big data certainly have a major part to play in the prospect of tertiary institutional sector. The value of big data in tertiary institution is a transformed activity that brings about the improvement of the process of learning and teaching. The integration of data really plays a crucial role with the divergence in data formation and semantics being articulated in a structure that is computer comprehensible. Big data facilitate to resolve the problem of checking the cases of conflicting, missing data as well as the identification of hidden relationships (Tulasi, 2013). Big data is seen to be the next frontier that will definitely revolutionize tertiary institution. It will certainly lead to the latest gesture of technological improvement that will assist to boost the effectiveness in academic. A lot of analytical techniques of data analysis are used to manipulate, store and to discover the substantial information for various decision making process. These various kinds of tools will assist to derive accurate results with minimum efforts. Big data can influence the practice of tertiary institution from enhancing the experience of students to improve the program of academic to more efficient data based decision making.

Big Data Challenges in Tertiary Institutions

The interest to make use of big data is gradually increasing in so many tertiary institutions and many believe that it is vital for higher educational accomplishment. For the quality of learning outcome to be improved, it is essential for huge volume of generated data by the systems of education to be analysed effectively in other to smoothing the progress of existing challenges. There are diverse challenges that are linked with the relevance to use the data in various sector of the economy in this recent time. In other for the gains that are provided by the relevance of using this big data to be fully utilized, the tertiary institutions as to make sure that the challenges that are linked with the usage of big data should be addressed. The educational sector, of course faces those essential issues that other sectors do face as a result of its speed, size and variety. There are numerous challenges that can be said to be specific to educational sector. It is noted that the collection as well as analysis of data have become an issue of challenge in higher educational sectors. The various issues can be generally sort as issues of storage, management as well as processing (Kaisler, et al., 2013). A lot of challenges that are associated to handle big data appropriately are broadly as a result of the attributing properties namely; velocity, volume, variety, value and veracity (Murumba & Micheni, 2017). Further explanation indicate that the various challenges faced is therefore integrating the sources of data heterogeneously as well as the type of data found in this big data era since sources of data varied; for instance, there should be a need for the integration of social media data, data of cameras, sensors data, etc, all of these are found to be different in terms of format, binary, byte, number, string, and so on. Kaisler, et al. (2013) explained that while data of student is collected and analyzed, institutions of higher education face some challenges like safety, privacy, and security issues and most of the sectors of higher education lack the infrastructure of proper information technology, tools and human expertise that are required for proficient collection of data, cleansing, analysis and visualization also. Murumba and Micheni (2017) generally explained that big data barriers in various institution entails the inability to relate vital business issues with big data solutions, lack of executive vision, the matter of data quality, cost, lack of analytical tools as well as data warehouses, executives rooted in a old technologies, users and simply leaving a good number data to be uncollected leading to no analyses. The use of the widespread analytics is mostly limited to the progress of

student areas, enrollment management, as well as resource optimization (Bichsel, 2012). To process the extracted data into information that is usable for students, instructors, administrators as well as the public, the analytics of big data in higher institution faces the issues to ascertain the means of extracting knowledge from the extensive sets of data that is being spawn on a daily bases. Higher institutions require sufficient amount of budgets in other to address and update various infrastructures, tools and human expertise that are wanted for an effective collection of data, analysis, cleansing, and visualization that will guarantee that all the infrastructure and human expertise are properly and diligently made available.

Solution to the Challenges of Big Data within the Tertiary Institutions

For the challenges of ethics to be properly dealt with, such as the privacy of students' consent, various institutions must ensure the processing of data. Big data does not just only advance on the quality of the process of teaching, learning and providing services to those on campus but also assist to plot out an effective as well as a sustainable model of management. The gathering of data should be adequate and relevant for a specific purpose. It as to be stored properly and used for the time that is only required. Vatsala et al., (2017) explain in their study that drawing out the strategies as well as the effectiveness of planning around, the strategic questions could have impacts on a wide area. The analytics systems of self-correction can be make use of to evade a number of manipulations of the system. For instance, if this particular system discovers that an individual (student) use a reasonable hour on the study portal (online) than is needed, this particular system will stop suddenly taking into account this basis for assessment. The tertiary institution can deal with the question of data security by ensuring the use of good data management systems. For institutional capability to be improved, the institutes need a good system of management. The system must recognize the sensitivity of data and also ensure its encryption for it to be protected and for staff capability to be improved, the institutions involved, have to advance on the analytics and data skills for various persons through the method of training. Various institutions of education should improve on their digital literacy. Big data collaboration can be created jointly by different institutions and industries. The management system of various institutions and industries must ensure the distribution and development of open-access analytic tools of software. Most of the tertiary institutions that lack the infrastructure of proper Information Technology (IT), tools and human expertise that are considered necessary for effective collection of data, analysis, cleansing and visualization must ensure that all the infrastructure and the right human expertise are properly and diligently made available. Leaders of various institutions must have the assurance of yielding them a result that is profitable before they assent to make any technological investment, since the Pursuit of big data can be very expensive. Thus, the IT leaders of higher institution should demonstrate ideally the significance of the technologies to make use of big data in their tactical plans in information technology, in order to show how various plan presented by them address crucial issues of information.

Empirical Study

Fadiya, Saydam and Chukwuemeka (2014) conducted study on the future and technology integration of big data in education. A design as well as the implementation of the basic structure that contributes united to the tools was depicted in the study. A preparation of email technology with super-high-speed for real-time, give learners as well as organizations to have rapid access to run data capture and monitoring and that of data to offer access to investigators in the area of advanced education institutional research. The study recommended that big data technology should be integrated in educational sector.

Daniel (2014) conducted a research on the opportunities and challenges of big data and analytics within the higher education. A number of opportunities as well as diverse issues that are connected with big data implementation within higher institution context were outlined in the study. In conclusion, the study drew future directions that relates to the implementation and development of an institutional development on the use of big data. The use of big data in higher institution was recommended in the study as it can facilitate to provide awareness to give good support to student's knowledge.

Vatsala, Rutuja and Sathyaraj (2017) carry out an investigation on the review of big data analytics in higher educational sector. The study established the two majority crucial kinds of analytics to be learning as well as academic. Also the fundamental attributes like speed, size, variety as well as other determinants can be accountable for a number of challenges and issues to the use of analytics in this particular sector. The study recommends that due to upward interest in the data as well as that of the analytics, there would be a need for the improvement of research techniques, tools and methods in this area.

The role of big data management and analytics in higher institution was investigated by Adalia and Fawaz (2017). In other to achieve the objective of the study, a qualitative research methodology was employed by the researcher for the collection and analyses of data. The study finds that a significant relationship exists between big data and analytics as well as quality of performance as big data management and analytics primarily aims to achieve tasks quickly with the least effort and cost. The study then recommends the needs for institutions to develop key performance indicators, metrics as well as the various ways to capture, process and visualise data so as to realize excellence in the use of big data and analytics within higher institution,

Murumba and Micheni (2017) investigated big data analytics review in higher education. The relevant of the attribute of big data to educational institutions as well as the limiting determinants that could bring hindrances to big data that are used in higher learning institutions were examined in the study. In conclusion, the study finds big data to be important as it offer various universities the prospect to their Information Technology (IT) resources strategically and bring about improvement to the quality of education and guide universities, colleges and students to see analytics value. The research work recommends the need for institutions to ensure investment is been carried out in analytics programs as well as in individuals so as to bring in an appropriate data science.

Minimol (2018) undertook an exploratory study on the efficient way to apply big data analytics for performance evaluation within the sector in the higher education. The study considered the massive amount of students' data in the institutions of higher education to be as big data. The study then brings to recommendation that academic institutions must ensure the use of advanced technologies in other to acquire the benefits from this vast amount of data.

Conclusion and Recommendation

This study examined the relevance and the use of big data within tertiary institutions in Nigeria. The study critically reflects on how relevant it is to use big data appropriately in tertiary institutions. The paper has critically examined various issues of big data in tertiary institution and how there can be an improvement in the system of educational sector. Issues relating to the concept of the use of big data within the tertiary institution, big data significance in tertiary institution, empirical studies of previous researchers, big data challenges in tertiary institutions and solutions to the challenges of the use of big data in tertiary institution were properly examined in this study. Big data does not actually have any single standard definition, but diverse

researchers gave their understanding appropriately to the perception. Big data can be identified to be the sets of data that are big enough to make important challenges when making use of infrastructures as well as the traditional tools use to process, collect, manage and then ensure data are properly analyze within suitable amount of time. There are diverse issues that are connected with the recent application of the use of big data analytics in different sector of the economy. In other for the gains provided by the relevance of using big data to be fully utilized, the various institutions have to be ensured that the issues that are associated with the use of big data must be properly addressed. For ethical challenges to be properly dealt with, such as students' consent as well as their privacy, the educational institutions must ensure the processing of data. This Big data does simply just bring about improvement in the quality of the process of learning, teaching as well as campus services, it likewise assist to build up effective as well as sustainable model of management. Big data is considered to be very essential since it proffer tertiary institutions the prospect to their information technology resources strategically and bring about improvement in the quality of education and guide the various students as well. This study then brings to recommendation that tertiary institutions, particularly in developing countries should improve on the analytics and data skills for various staff and students through training, various institutes in the educational sector should improve on their digital literacy while the management system of various institutions and industries be encouraged to make investments in programs that can boost the performance of students in ICT and in the development of skills so as to acquire the value for using big data because big data can assist in cutting down costs and also leading to the improvement of education by allowing administrators to formulate specific decisions and also affords the important tools of teachers to choose from a diversity of learning.

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