BIG DATA: NEXT LEVEL EDUCATIONAL PLANNING FOR NATIONAL DEVELOPMENT IN INFORMATION AND COMMUNICATION TECHNOLOGY

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Abstract

It is public knowledge that the Nigeria educational system has suffered many set backs as a result of a series of policy somersaults or failed programmes and projects with its untold negative impacts on her citizens dealing with Information Communication and Technology. Big Data which presents a potent recipe for proper educational planning in this regards is still in its nascent stage and as such is yet to take firm root in the system. Instruction in many facet of the country's education is also majorly teacher-centered, this accounts for the slow take off of the Big data initiative in ICT implementation. This paper sheds light on the affordances of the big data architecture and the need for its introduction in the sector for the collection of roboust data which finds relevance in higher levels of educational planning in the country. The place of the integration of ICT in learning as an enabler and driver of the big data concept was also highlighted.

Key words: Big data, Integration of ICT in Instruction, Educational Planning, Policy somersault

Introduction

Proper planning is key ingredient in the administration of any public educational system. The Nigerian National Policy on Education described education as a powerful tool for the overall development and societal transformation of a people (FGN, 2013). A nation's educational system can only play this role effectively if and only if her policies, programmes and projects are on point to address the issues that are bedeviling the system. The past few decades in the country have witnessed a number of policy somersault due to lack of or inadequate data which makes proper planning and by extension effective delivery of quality education a tall order. Educational Planning is a process of administering education through logical procedures andanalys is with the aim of engendering educational development by making the system respond more effectively and efficiently to the yearnings of the populace (FGN, 2018). Modern day planning is far more than the usual experienced or intuition-based planning. The Federal Ministry of Education, as the general overseer of the education industry needs to step up her game, go beyond the traditional or administrative data analysis and come up to higher levels of educational planning which promises more direction by virtue of its actionable insights in ICT.

Just as it is impossible for a father who hardly knows the number of his own offspring to adequately provide for their upkeep, so also it is for a government without good information and knowledge of its citizens to be able to offer a helping hand at least such as is expected of a government to her people.
Stakeholders in the Nigerian educational system are growing increasingly impatient with the system as they do not know any good reason why the country's Knowledge industry should not deliver on her mandate and place the ICT at an enviable height like her counter parts in other climes despite the magnitude of resources that have been buried in the sector over the years. An International Labour Organization (ILO) Mission to Nigeria in 1981 likened policy making without accurate and timely data to a man running around in the forest in the middle of the night without a touch light (FGN, 2018).
It is a known fact that a credible, accurate, timely and comprehensive data has a prominent role to play in all of these changes brought about by an efficient educational planning on ICT (UNESCO, 2017). Often times, non-implementable policies are traceable to inaccurate data and resources committed to such policies

ends up in the drain hence evidence-based planning saves cost since resources would be allocated efficiently (UNESCO, 2017).

Statement of the Problem

Armed with adequate data about the populace, things work better in most advanced countries' education sector especially on ICT. Hardly can you see a classroom scenario where only 44 students would sit comfortably while 66 colleagues of theirs would be standing or sitting on the window while a lecture is going on, yet no one expects them to fail. Inconsistencies in policy formulation such as is commonplace in this clime is unheard of over there. Decision making are precise and in accordance to the issue on ground. Their educational policies are data driven, of course, ICT devices have been incorporated into every aspect of school activity, so data collection or falsification, politicization of data seizes to be an issue since these technological devices automatically records everything, structured, semi structured or unstructured are gathered and processed. It also provides a platform where students can learn and study under one online learning environment.

The fact that the Nigerian educational system has tried her hands on a number of unsuccessful policies and programmes in the past and present is public knowledge. The inconsistencies in policies and major decisions had devastating effects on her products not being able to rub shoulders with their peers in other climes. Below are some of the national progammes/policies that cannot be described as successful. The Universal Primary Education (UPE) was launched in 1976 but failed before it could be said to have taken off, this was followed by the 6-3-3-4 system introduced in 1989, the most important aspect of that policy which attempted to introduce youngsters to vocational education with a view to encouraging young Nigerians to do things on their own thereby reduce the unemployment problems was never implemented. The next in line is the 9-3-4 system or Universal Basic Education launched in September, 1999. The aim of this particular policy was to align with the Education for All (EFA) policy of the UN, World bank and the Millennium Development Goals (MDGs). As we speak, with a total of 10.2 million, Nigeria is one of the countries with the highest Out of School Children (OOSC) despite the aforementioned interventions (Aluko, 2019). One of the reasons behind the failure or near failure of some of these educational policies is due to the lack of adequate and reliable projections (data) (Elechi, 2016).

Iyilade (2015) posited that the development and transformation which Nigerian's clamor for is data-dependent. Big data is where the paradigm is shifting to, the earlier we accept and take action in this regard the better for all of us. As a matter of urgency, instruction must be technology mediated, the only way to unlock big data potentials as data is automatically generated with every interface with ICT devices for teaching and learning purposes.

What is Data?

Data, in everyday language refers to unprocessed information. In line with Merriam-Webster (2019)'s definition, data are information that are real such as statistics or measurement which can be taken as a basis for decision, discussion or calculation. It also described data as information output that include both relevant and irrelevant information which needs different levels of cleaning up or processing. Kale (2017) stated that data is a collection of facts that can be converted into useful information. It is noteworthy however that data is of different types, the common type is the structured, traditional or administrative data, which comprises of majorly of figures and texts, unstructured data on the other hand includes images, sounds, ideas, pictures, recordings, facts, and so on.

Educational Management Information System (EMIS) and ICT, remain very instrumental to the achievement of SDGs Goal 4 which pertains to provision of quality education for all. Montoya (2018) posited that EMIS can and should do more than mere collection of administrative data bothering on

enrolment and other related data. An effective EMIS should among other functions: be a source of accurate and reliable data for stakeholders, thereby enhance decision making; Promote robust planning and policy development at all levels of the educational system; by so doing EMIS helps to enhance the efficiency of the operations of the system; Generally EMIS assists in propelling education towards its stated goals. (Government of Khyber Pakhtunkhwa (KP), 2018) views EMIS simply as the Information System for Educational Managers. However, FGN (2018) considers EMIS as the method of data gathering, warehousing, processing, and retrieval, distribution of information for effective and efficient policy formulation, monitoring, planning and administration of the knowledge industry.

NEMIS on the other hand is the arm of the Federal Ministry of Education saddled with the responsibility to carry out the functions mentioned above on behalf of the country's education industry. SEMIS and LEMIS represents the state and local government version of NEMIS respectively performing similar functions for onward transfer to NEMIS. (FGN, 2018). Having said this, it is imperative to stress that the Nigerian Education Management Information System (NEMIS) has to step up to higher levels of educational planning if Nigeria is to be where more developed nations of the world are in terms of educational planning (FGN, 2006) The way up when it comes to provision of adequate, accurate, timely and comprehensive data for the smooth running of the sector is to leverage Big Data so that policy formulation will be based on actionable insights rather than experience, estimation, subjective reasoning or mere intuition. (Daniel, 2015). The World Economic Forum (WEF) likened Big Data to a precious mineral such as 'Black Gold' or 'Crude Oil' with potentials to make things happen in every sectors of the economy (Iyilade, 2015; Slade & Prinsloo, 2017).

What is Big Data?

The concept of Big data has been defined differently by scholars from their respective perspectives; (Slade & Prinsloo, 2017; Daniel, 2015)'s idea of big data is from a technical point of veiw; the partners defined big data as huge datasets that cannot be processed with the traditional techniques {Database Management Sytem (DBMS)} but with the use of some sophisticated software like NoSQL databases and Hadoop not just because of its size but also as a result of rate at which data is being generated (velocity) and the diverse nature of these data (variety). Iyilade (2015) defined Big Data as datasets that are massive and varied in nature and can be analyzed in order to bring out a trend or actionable information from it. Cope & Kalantzis (2016) opined that Big Data deals with keeping records of all learning activities and interactions in a digitally mediated environment, it also refers to different data types that are analyzable and actionable. (Daniel, 2015; Daniel, 2016; Iyilade, 2015; Slade & Prinsloo, 2017; Dietrich, Heller, & Yang, 2015; Morabito, 2015) posited that Big data comprises of huge, massive or humongous and complex datasets, usually containing both structured and unstructured datasets that may be processed to understand trends, patterns and associations as well as deviations from trends that are not known or seen before.

They are so called because they are usually too large and are generated too quickly for any kind of traditional or computing processing, and requires some complex computer applications to bring up meaningful or actionable insights for educational improvement (Cope & Kalantzis, 2016; Vaitsis, Hervatis & Zary, 2016; Daniel, 2015) Likewise, (Iyilade, 2015) also described Huge or humongous data as big data is also called as a very important base for modern day IT related economic as well as educational activities.
Big Data seeks to draw useful inferences from huge volumes of data regardless of the nature, be it structured or unstructured. Apart from the quality of being large and being of various types, Daniel (2019) further stated that big data usually originate from human, applications and machines unlike regular data that are usually generated strictly by humans. Perry (2017) opined that big data is not about the volume but rather about the insights derivable from such a data. Zango (n.d.) corroborated this view in his definition of big data which included the veracity and variety nature of big data, hence he explained the concept as the process of making meaning and value out of a humongous dataset comprising of different varieties with a characteristically high rate of generation (velocity)

Shotayo, E. O. & Ogunlade, B. O.

Big Data Analytics

Data Analytics is interested in working through data sets with a view to bringing out trends for actionable insights with the aid of sophisticated instruments and software. (Rouse, 2018) it could also be described as a complex way of measuring, interpreting and analyzing massive data sets with a view to unraveling salient information, trends, patterns and hidden correlations which could assist managers of organizations or educational institutions make precise and accurate decisions which results in efficient and effective systems (Rouse, 2018; Iyilade, 2015). Big Data involves advanced analytics techniques such as text analytics, machine learning, predictive analysis, data mining, statistics and natural language processing (IBM, n.d). The following are some of the prominent big data analytical tools: NoSQL databases, Hadoop and co such as YARN, MapReduce, HBase, SPARK, Hive and Pig (Rouse, 2018)
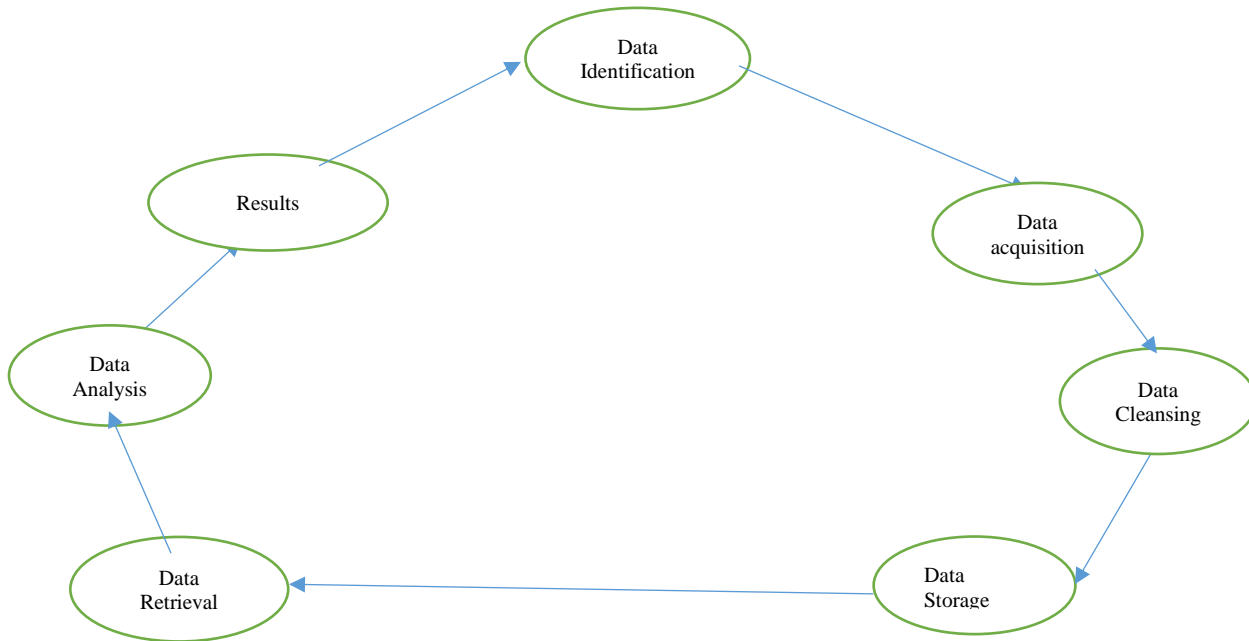
Types of Big Data Analytics

Three types of Big Data Analytics will be examined in this paper:

Descriptive Analytics: When a system has just gone through a particular event or incident, for instance, a major policy failure. It is imperative to do a post mortem of the policy. A descriptive analytic helps to summarize and describe what actually led to the failure of the policy or programme (Iyilade, 2015; Acadguld, 2018). Doing this ensures the mishap does not repeat itself in future.

Predictive Analytics: As the name suggests, can alert an educational institution on what might likely happen in the nearest future. It makes use of machine learning, statistical analyses and modelling techniques to inform of the probability of an event occurring, an example of this is Scenario analysis (Iyilade, 2015). Descriptive Analysis can forecast how government policies or Government programme would play out long before it is rolled out. If this was done prior to the launching of

Prescriptive Analytic: Prescriptive Analytics is the best of them all as it does more than describe what took place in the past or forecast about the future, it actually does recommend some courses of action to be taking with the corresponding likely outcomes of such actions. As a result of this, data propelled policies, projects and programmes can be formulated and decisions taken that will work well for the populace (Iyilade, 2015; Ingram, 2017).

Big Data life cycle as put forward by Minimol (2018)

Before the affordances of big data can be unlocked, the cycle which starts with Data identification and ends in data analysis and results must be completed.

Characteristics of Big Data

The following are the characteristic features of Big Data, they are also known as the '3Vs':

Volume: As the name suggests, the volume of this kind of data is usually humongous or massive, it can be in gigabyte, terabyte or zerabyte, and so on. (Cope & Kalantzis, 2016). Although it has been said that it is not the massive nature of modern-day data that warrants the name 'Big Data', rather the very essence of big data is the big meanings that are extracted from it. (Perry, 2017)

Velocity: this has to do with the rapidity of motion or the rate at which these data is being generated as well as the different directions from which they came. Big data are mostly generated in real time or near real time. (Iyilade, 2015). The application of sophisticated ICT devices in promoting an increased generation of data by organizations which is relatively cheaper to run

Variety: Big data possesses different types of data, structured, semi-structured and unstructured. This data are derived from various online platforms like LMS, WhatApps, smart phones.
Aside the '3Vs', there are yet other important features of big Data as outlined below:

Veracity: Deals with abnormality that are present in datasets; It is noteworthy that there exist an inverse relationship between the first three characteristic features, namely the rate at which data is being generated (velocity), the size (volume) the diverse nature of the datasets (variety) and veracity which has to do with the issue of trust. Invariably, as the volume, variety and velocity of any dataset increase, so does the reliability or credibility of it reduces. (Firican, 2017; Daniel, 2015)

Validity: This deals with how accurate or appropriate the particular dataset is for the intended purpose. This underscores the importance of a good data governance policy to ensure appriopriate data for analysis. (Kanya, 2019; Firican, 2017)

Volatility: Handles how long a dataset will be before it is deemed irrelevant or outdated in respect to a particular research

Value: Another striking feature of Big data is that it adds value by helping to solve many issues in an educational instuitution, weak students are helped to bring out their best, it is also of value to educational administration and research. Whether a dataset is capable of producing a good return on investment is also of value here (Firican, 2017; Kanya, 2019)

Differences between Regular and Big Data

It is of essence to outline some of the distinguishing features of the Regular and Big data as identified by Kalota (2015).

i.   Regular data are easier to analyze, big data on the other hand is not simple and can only be processed with the aid of complex computer applications as a result of its unstructured nature.

ii.   The traditional or regular data is highly structured comprising mainly of figures and texts. Big data quite different from that, it consists of different varieties, structured, semi structured and unstructured.

iii.   Its common with the regular data for the user to collect, collate and analyze the data, unlike the big data situation whereby different stakeholders collect data for different purposes and any interested party can process for their use,

iv.   The cost of processing a typical regular data is usually cheaper than what is applicable to big data which could be prohibitively expensive to undergo.

v.   It is not easy to identify individual data points by tracing their rows and columns on the spreadsheet as it with ordinary or regular data. Locating data points can be quite technical

vi.   While big data is usually kept for long if not forever because analyses is expected to continue, administrative/regular/ordinary data is discarded once the aim is achieved.

Leveraging Big Data for Next Level Educational Planning in Nigeria

- It is imperative to state that the potentials of big data can only be fully unlocked where there is full application of ICT in education, such that every aspects of learners activities are captured and recorded, these is inclusive of all contributions made in class, assignments submitted or not submitted; questions answered and the time taken; even learners moods and inter relationships among peer groups are all under the big data radar (Cope & Kalantzis, 2016) It provides up to date information on student's activities within the campus such as students usage of the sick bay, dining halls, libraries, bus services etc by so doing, the school authorities are fully aware of who is doing what and when, which of these facilities are mostly used and which needs an expansion, this arrangement puts the school authorities fully in charge of happenings on campus;

- Nigerian educational system has had her fair share of unsuccessful policies which has affected her products negatively. The advent of big data ensures processing the massive data available at its disposal to extract value, meanings and trends that informs formulation of public policies, programmes or projects (Daniel, 2015). It is also able to state in clear terms what happened or led to the failure of some policies,

- Big data represents an opportunity for a learner centered type of education whereby teachers are facilitators or supervisors which provides the necessary guidance and assistance but by and large, the student is in charge of his academic activities and not the teacher, this invariably supports ICT furthered education;

Shotayo, E. O. & Ogunlade, B. O.

- Big data provides a platform where students learning experience can be boosted with the aid of technology mediated gadgets like phones, tablets, laptops and other devices which uses the internet. The teacher can create an online platform where Learners are taught, assessed and graded all in one learning environment through computer applications like Learning Management Systems (LMS) etc. (Daniel, 2015);

- Instead of the old-fashioned sampling of a population of interest in educational research, it is now possible to use up the entire population in order to get a sharper and clearer view of the situation of things;

- Big data helps to address the need to take accurate, precise and evidence-based decisions rather than administering the educational system with intuitive and subjective reasoning or even experience;

- Dropout rates can be drastically reduced with Big Data, using Predictive Analysis on all available data in order to figure out future retention rates (Rouse, 2018);

- Big data has the potentials to improve the quality of academic programmes and ensure the right materials are being passed down to students (Daniel, 2015);

- It is also possible to ascertain how a particular course, policy, programme or project would fare even before it is introduced in school or an entire educational system (scenario building);

- This new trend of big data also finds relevance in recruitment exercises. Employers of labour are also able to analyze and study applicants before they are brought into their organizations, it also arms international students with every information they might require to choose institutions of their choice faster and easily (Joshi, 2017)

- As it is often said, 'torture the data, and it will tell you whatever there is to know' (Coarse, 2019) It is with the aid of data that Governments in advanced countries are always ahead of the system. Data gives an idea what enrolment would look like in the next couple of decades or what expansion projects will be necessary, what challenges will likely emerge as a result of the expected growth in enrolment. This is because educational policies and decision making in those countries are data driven with no room for guess work. The Nigerian Educational system has been bedevilled with a lot of hiccups which has made achievement of stated goals and objectives a mirage.

- Big data is one innovation which has come to change many spheres of our lives, it is bound to influence educational systems worldwide especially technologically mediated environments, it is also capable of transforming our thinking processes and lifestyles (Cope & Kalantzis, 2016; Slade & Prinsloo, 2017)

- The society will also be spared the destabilizing effects of repeated failed policies because the effects as well as the implementation and implications of public policies can be ascertained long before they are introduced to the system

- Prescriptive analysis suggests the best programme or project for an educational system, based on historical and present data, big data is able to recommend appropriate courses of actions that will suit that situation.

Implications of the Implementation of Big data in the Nigerian education system

- Invasion of Privacy through increased surveillance of students' and staff's activities, the major price to be paid in exchange for the affordances of big data is our privacies, since the teaching and learning process is going to be done online, ICT devices captures every moment of the child in and out of class especially within the campus, the positive side to this development is that school authorities are able to notice truant or students with deviant behaviours at the nip of time before such aberrant activities spreads to others;

- The Government will need to address the issue of inadequate skilled manpower to manage the big data architecture. The services of Data Scientists, Statisticians etc would be required as well as training and re-training of NEMIS staff for efficiency;

- There is bound to be a high cost implication to the whole big data idea, considering the fact that teaching and learning will have to be done in a technology mediated environment. But if the Cost Benefit Analysis (CBA) of big data is undertaken, it will be obvious that the benefits accruable to the nation, especially in terms of resources that would be saved via efficient allocation of resources and the boost which instruction will receive will make the costs worthwhile. Former President Benjamin Franklin was quoted to have said 'an investment in education pays the highest interest' (Franklin, n.d.)

Way forward?

Every exploit that we read and see in other continents concerning advancement in education did not just happen, but were brought about through conscious and deliberate planning. If the Nigerian system is to take us higher, educational policies, programmes and projects must be data driven for maximum impact. The Education industry is one industry that has and keeps evolving, big data provides a platform where an education system can engage in higher level, long term planning desirable for the growth of the sector.

But it is necessary to ask a question; how does big data get its inputs? The body of data that forms what is being referred to as big data is far more than just the traditional figures and text comprising majorly of enrolment, continuous assessment scores, attendance, sex etc. Big data derives from the massive volume of data that is generated with interface with ICT devices like LMS, smart phones, tablets, laptops etc. This is made possible as a result of the inbuilt capacities of these devices to collect data by recording all learning activities which users of those devices engage in. It suffices to say that the traditional data which NEMIS warehouses does not possess the attributes of big data and cannot provide actionable insight capable of arriving at precise and well-designed policies which by extension is useful for higher levels of educational planning. Kalota (2015) pointed out that the amount of data that is generated every other day by virtue of the use of technology mediated devices is equal to the amount of traditional or regular data that has been created over the past two centuries! This serves to imagine the rate at which data are being produced.

The Nation's education system needs to as a matter of urgency, to integrate Information Communication Technology (ICT) into all facets of learning. At least, secondary and post-secondary (Tertiary) education should be fully technology-mediated. Gadgets like smart phones, tablets, laptops should be provided with application software like Learning Management System (LMS) either by the Government or parents so that this can be used to deliver and manage instruction as well as assess and grade the performance of learners and by so doing build a pool of data which higher levels of planning rely on.

Conclusion

Data is the answer to effective and efficient planning of the Nigerian educational system, however, the type of data that is being referred to here is not the traditional or regular data but BIG DATA. It is the ingredient to data driven policies, programmes and projects. Moore (n.d.) stated that 'without big data, we are like blind and deaf men in the middle of a race course'. How terrifying can this be! As of today, big data seems a far cry from the Nigerian educational system, but if we start from somewhere as suggested in this work, before long we shall get there.

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