# DATA-DRIVEN DECISION MAKING APPROACH FOR EFFECTIVE MANAGEMENT OF HIGHER EDUCATION IN NIGERIA

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***Abstract:***

*Data-driven decision making (DDDM) is an innovative managerial problem solving approach which has emerged as a powerful strategy in exploring data-based decision-making process for effective and quality service delivery in organizations. It is a process for deciding on a course of action based on data availability. Higher Educational system access data indigenously for many reasons which include data for, institutional planning, staff appraisal, strategy policy formation, financial record purposes, or as required by the government ministries for regulations. Management of higher education in Nigeria solely depends on the availability of data information about students, staff faculty/department, facilities, financial record, students' academic records; and the communities that educational institutions serve. With enormous challenges facing the utilization and appropriate management of higher education, this paper explores implementation strategy of DDDM in the management of higher education, it also highlight best practical approach for management of higher education, benefits of Data-driven decision making in higher education and potential challenges in the use of data for effective decision making process. Enabling educational leaders to optimize resources, mitigate risks, and improve student learning objective. The papa reviewed literature concepts in order to x-ray the importance of full implementation of DDDM in higher education in Nigeria. The paper also outlines various challenges facing the higher education and the need for managing of fiscal/non-fiscal resources.*

***Keywords***: *Data-Based Decision-Making, Educational Management Information Systems, Formative Data Assessment and Summative Data Assessment, Logic Model & Theory of Change*

## Introduction

The global competitive nature of education has set outright quality standard as benchmark in educational output, in this view countries of the world pursue quality standards, high quality service delivery and high productivity at all levels of education. The quality standard expected in the education system rest on managerial styles and the ability in harnessing resources and managerial data for appropriate decision making process and in view of decision making data becomes integral part of management. With the advent of information technology, educational institutions now need to manage the increasing amount of complex and heterogeneous data, institution data are complex in nature, it involves all the input and output data; such as total number of students, students' academic record, students' financial record, students' health record, number of accredited and non-accredited programmes, number of faculties and department, teaching stock and teaching material, number of teaching and non-teaching staff. Traditional management approaches based on intuition and experience no longer suffices in meeting the demands of today's knowledge-based society. Thus, it becomes essential to adopt a data-driven approach to optimize decision making based on data, Institutions of higher education are not left behind with these trends. The importance of data collection and analysis in higher education institutions is crucial and managing higher education required collection of data from many different sources and for many different reasons.

The achievement of good quality education depends on the quality of data information which propels and guide policy formulation, educational planning, management and monitoring processes (Makwati,

Audinos, and Lairez, 2003). The existence of data generates knowledge about the condition of education in a country. For example, without the existence of educational data, it would not be known that more than 12 thousand children dropout of school system yearly in Nigeria or that 92 thousand university lecturer left the school system between 2015 to 2023 because of unpaid salary and unpleasant condition of service in Nigeria or that 74 thousand students fail mathematics and English language in the national examination council (UNESCO 2023). Decision making in education often focuses on the use of formative assessment data and summative assessment data in decision making. However, many other sources of data are available in a wide range of assessment. Formative assessment data provides feedback and information during the cause of activities, such as teaching and learning process, Formative assessment data measures student progress in the school and teachers effectiveness in the classroom For example, when implementing a policy on core curriculum minimum academic standard (CCMAS) in the school, formative assessment data will be used to survey the new curriculum progress, determine whether or not the activity should be used or modified. A primary focus of formative assessment is to identify areas that may need improvement. These assessments data typically act as a gauge to students' learning, teachers' performance and administrative policy progress in order to determine effective management decisions. While Summative assessment data analysis the outcome of programme or activity, the assessment takes place after the progamme has been completed and data provides information and feedback that sums up the teaching and learning process. Typically, no more formal learning is taking place at this stage, other than incidental learning which might take place through the completion of projects and assignments (Hanna & Dettmer, 2004)

In Nigeria, Federal and State government through educational authority such as National University Commission (NUC), routinely collect data on higher institutions as part of their regular operations. Such data include location of schools, condition of school facilities, number of programmes offered, numbers of students by sex and age and number of staff by sex and qualification etc. Educational management information systems (EMIS) are designed to collect and analyze data on the educational system to improve planning, resource allocation, monitoring, policy formation and decision-making. An Education Management Information System (EMIS) is a comprehensive and unify system that brings together all the statistical record including, resources, policies, and technology within the educational system to provide quality education. Educational management information statistics should be timely, cost-effective, and sustainable in nature, at every administrative level, and to support selected operational functions, although many EMIS issues remain unchanged until advent of newer technologies.

According to Marcia Bernbaum (2011) noted four major fundamentals about EMIS, including: • EMIS data need to be accurate. • EMIS data need to be timely. • EMIS data need to be reliable. • EMIS data need to be understandable. Accuracy can require more time than is allowed. Timeliness may require some relaxation of complete accuracy. Reliability is affected by external factors like funding, manpower, and political events. Turning data into information creating meaning from "facts" is a constant challenge of making data, then information, then knowledge useful for decision making. Furthermore, he further noted that Technology is often the most noticeable aspect of EMIS, but it is only a part of the education information solution. Increasingly, laptops are replacing desktop computers (more rugged, just as powerful using less power, consolidated into one piece, and often more reliable). As importantly, smaller computers (netbooks/"classmates"/even tablet computers) can now be used with much lower requirements for cooling, security, and electricity. Only some of these technologies have been available over the last twenty years in the school system hence their full application has not yet been tested. Cell phones have gotten much more powerful—capable of transmitting data via SMS or GPRS—in useable formats for "urgent" or high-demand information. Software has also improved with simpler to use software like EXCEL, ACCESS, or MySQL with enhanced features and better training, offering more options even at the school level. For larger systems, there are many more alternatives for school based EMIS as well as integration of all the various technologies—computers, servers, cell-phones, and paper make data more manageable.

As Education systems move toward capturing education statistics at all levels and increasing accountability for improving educational quality, access to and use of education data becomes a necessary part of policy implementation and review (Kitamura and Hirosato 2009). Even before decisions are reached, there is demand for data to inform the discussion process (Passey 2013). Policy makers often use education data as points of reference for political decisions, even in environments where the political economy of education suggests that policy analysis takes a backseat to political decision making in education (Crouch 1997). The goals of effectiveness, efficiency (including reducing costs), and equity drive the demand for evidence-based decisions. Data-driven planning is more effective for an education system. This type of planning reduces

system costs by more effectively allocating resources. Given that needed data exists and is timely, the added cost of improving this data is likely much lower than the implicit costs of bad information. Planning with old data inhibits optimal policy implementation, particularly with respect to resource allocation (Cassidy 2006). If enrollment data only becomes available nine months after a school year begins, there is little a government can do to reallocate teachers to improve student-teacher ratios across the school system for that year. Overcrowded classrooms will thus continue to exist while other classrooms nearby could be almost empty. The government response will be futile, coming one year too late. In addition, without the ability to verify or audit education system data, the volume of misallocated resources can be significant. If, for example, a government transfers resources based on enrollment and enrollment information is inaccurate, unnecessary funds will be spent

## OVERVIEW OF DATA-DRIVEN DECISION MAKING CONCEPT

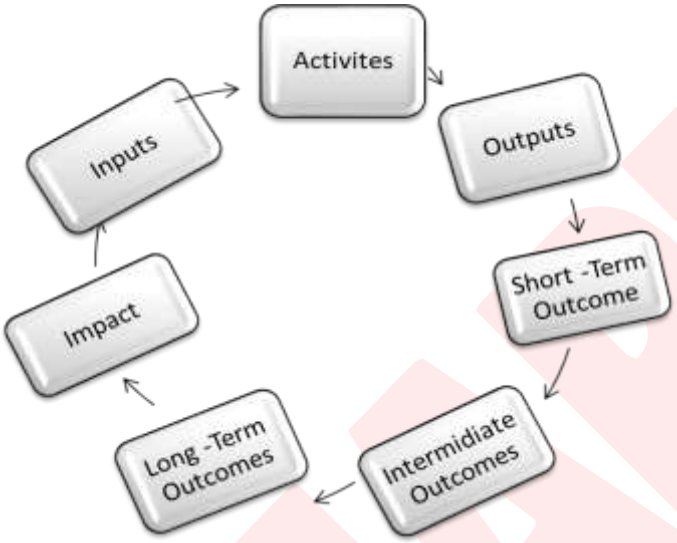
Data-Driven Decision making analysis are used by institutions to easily discover and locate the problem areas and deficient system, sub-system, institution, school in the educational system. For example, data concerning financing of the primary education may help to expose the level of underfunding or otherwise through unit cost analysis. This is an analysis that reveals what is spent on the average on one student. This is against taking decision by using the quantity or the size of money spent on the entire school system, which may be deceitful. Statistical analysis may reveal understaffing of the school facility situation etc. In fact, statistics facilitates situation analysis of the educational system. Diagnostic analysis also facilitates effective cure and remedying measures of any deficiency observed. Data-driven approaches help educators identify and address academic challenges promptly, tailor teaching strategies to optimize student engagement and retention, and deploy resources more efficiently.

Furthermore, strategic planning reliant on data facilitates informed decision making at operational, tactical, and executive levels of education institutions. Researcher are of the view that data-based decision-making can contribute to an increase in teaching and learning process, however, in order to realise the full potential of data in education, more insight is needed urgently in terms of the best ways to use data to improve the quality of education. According to Kim Schildkamp (2019), School improvement may be conceptualised as an iterative process in which the use of data plays an important role. With goal setting playing a crucial role and all the other steps in the school improvement process need to take these goals into account. Goal setting, therefore, is placed at the top. Further, data collection needs to be related to the goals; sense-making should revolve around the goals; actions should be directed towards these goals; and the evaluation should focus on whether or not the goals were achieved. Once different types of data have been collected, a process of decision making has to start. This process is described in the work of Mandinach (2008) and Marsh (2012). Some key questions are: how can the collected data be analysed and interpreted, and what do the data mean in relation to the goals? As described in such models, this process of decision making will lead to the implementation of concrete improvement actions, the outcomes of which subsequently need to be evaluated, based on data, to determine whether the previously set goals were achieved. This process broadly and generally integrates elements of different models from the field of data use and combines these models with knowledge from the fields of formative assessment, research use and ‘big data’. Of importance here is the way that the different components of the model are put into practice.

Data-driven decision management is usually undertaken as a means of gaining a competitive advantage. A study from the MIT Center for Digital Business found that organizations driven most by data-based decision making had 4% higher productivity rates and 6% higher profits (Wigmore & Rouse, 2013). Research shows that if instructional plans at the private, state and federal based educational system rely on assessment information relevant to the desired learning outcomes for students, the probability is increased that they will attain these desired learning outcomes (Feldman, 2001). According to Marsh, Pane, & Hamilton, (2006) theoretical framework, acknowledges that various data categories including; input data, outcome data, process data and satisfaction data can enlighten the decisions making in higher education, but that the presence of raw data does not assume its effective use. Moreover, furthermore, Marsh & e tal, emphasized that data-driven decision making does not guarantee effective decision making since just having the data does not mean that it will be used appropriately or lead to improvements. Suggestion and consideration for both analysis of the data and taking actions based on the data will yield a good outcomes of data-driven decision making on improvement of instruction, student achievement, and other outcomes, such as staff qualifications, trainings needed and academic publication.

**Logic Model Concept**

According to Coster (2013), a logic model translates the theory of change into the "language" of data collection and evaluation. It includes four major components; inputs data, activity data, output and outcome data




**Inputs Data** are the financial, material, and personnel resources needed to implement a program, along with the population that will be served. Common inputs include funding, office space and equipment, information technology (IT), and trained staff.

**Activities Data** are the interventions that will be implemented in response to the problem or need of the target population. Common client-level activities include intake assessments, home visits, and family group decision meetings. Common program-level activities include joint case management, trauma-informed service approaches, and parent partner/mentoring. Internal activities (e.g., staff training) that contribute to the intended outcomes may also be included.

**Outputs Data** are the immediate, concrete results of activities, typically expressed in quantifiable terms (e.g., counts or percentages). Examples include number of staff trainings and number of clients completing a parenting class. Outcomes are the changes expected as a result of the activities.

**Outcomes Data** may include client outcomes (i.e., child and family outcomes) and program and staff outcomes. Client outcomes are typically categorized in terms of changes in knowledge, skills, or behaviors that lead to long term positive impacts

**DATA MANAGEMENT CHALLENGES OF HIGHER EDUCATION**

Due to the nature and complexity of higher educational data, an institutionalized solution is needed that looks at the whole education system in a comprehensive, structured, and systematic manner through the used data. Bruns, Filmer, and Patrinos (2011) noted that decision makers of higher education suffer from a lack of information about their education systems, yet they need to manage information related to the system, answer policy questions, and respond to changing reforms in the system. A system of this type informs policy interventions related to high-stakes questions, such as "What is the impact of teacher qualifications on student performance?" In recent years, many countries have substantially reformed their education systems by collecting more data at local levels and using performance indicators and measurements of learning out comes in order to monitor educational performance (Bruns, e tal, 2011). This demonstrates the importance of collecting information on performance at subnational levels in relation to education targets, outcomes, and costs. Because of these developments, the need to adopt data driven decision making strategy in management of education system is critical.

Some challenges faced in data based management of education system include;

1. Fraudulent Compilation of Institution Data Record: educational Planners such as NUC and ministry of education in Nigeria rely heavily on information and data from educational institutions' records. But

when records are fraudulently compiled, it becomes unreliable.

2. The Secrecy or Confidential Nature of Some Data Documents: most important records and documents, where investigators and planners could obtain data and information are not readily available and accessible. This is because such documents are marked Secret or Confidential.
3. Absence of Data Storage or Bank: Data banks are created in many developed countries to make data and information easily accessible and retrievable. Such data banks are not available in educational system in Nigeria. A data bank is to scientifically collect, collate and store data for the use of researchers, planners, government and various use. Data bank regularly updates and review data and their reliability.
4. Inadequate Funding: Many developing countries including Nigeria has low budget for education and do not have enough funds to invest on many important developmental needs. Generating primary data is very costly and demanding. Because of inadequate fund, many data are fraudulently compiled. Many researchers 'juggle' figures, many compile data in their rooms and offices to save cost.
5. Incorrect Data Stored: Many secondary data are not reliable because they are fraudulently obtained. Some data are collected with bias and full of errors. The error could be a result of the sampling and poor enumeration.
6. Inadequacy of Information and Computer Technology (ICT) Use: The world has gone technological. Data collection, retrieval, storage and processing today are technologically advanced. But it is costly to install ICT for statistical purposes. This is a big problem in Nigeria. In addition, many people, even scholars, are not ICT compliant or proficient. Many people are still computer illiterate.

**ADOPTION OF DATA-DRIVEN DECISION MAKING STRATEGIES IN MANAGEMENT OF EDUCATION:**

Several strategies are critical for adopting DDDM effectively in education management:

**1. Establishing a culture of Data Literacy:**

Promoting data awareness and utilization skills among administrators, faculty, and other stakeholders is very crucial and stimulating data literacy across all educational personnel must be adopted. Data literacy can be conceived as the skill or ability needed to read, create, and communicate data as information. Despite the best planning efforts, the need for continuous improvement on personnel data literacy practices are vital in decision making. With the view of establishing data culture base, it is important to empirically and systematically ask vital questions such as. Is the system utilizing the elements of data literacy in efficient ways? The measures being used in analyzing data still meets the objective of the institution. The continuous focus on improving data literacy moves us toward more efficient and effective use of data. An important outcome of Reflection and Improvement is to reduce undue burden on educators and improve their ability to use data for various purposes. It allows us to be responsive to ongoing changes in staff, data sources, infrastructure, and stakeholder needs. Key Data Literacy Activities include; Identify inefficiencies across elements and work with stakeholders to define strategies for improvement • Monitor fidelity to the data literacy processes • Plan for scale-up of successful strategies and processes • Increase sustainability through professional development opportunities Husein (2014).

**2. Collection and Integration Data**

After the goals have been set, data must be collected to determine if these goals are being reached. an broad and inclusive definition of data as proposed by Schildkamp, and Hubers (2017), including the following aspects: ● Formal data: This includes any systematically collected relevant information about students, parents, schools, school leaders and teachers, and the community in which the school is located. These data may be derived from both qualitative and quantitative (Lai and Schildkamp 2016). At this stage of formal data collection which often referred as data-based decision-making, data-driven decision-making or data-informed decision-making, which can be defined as the process of 'systematically analyzing existing data sources within the school, applying the outcomes of analyses in order to innovate teaching and curricula, administrative performance, and, implementing necessary decisions.. ● Informal data: heads of higher institutions collect information on the needs for everyday academic decision. for example, by observing their students and by engaging in conversations with their students within an assessment for learning approach: 'Part of everyday practice by students, teachers and peers that seeks, reflects upon and responds to information from dialogue, demonstration and observation in ways that enhance ongoing learning' (Klenowski 2009, 264).

These data are often collected quickly so to make quick decision which often times referred to as professional judgment (Vanlommel and Schildkamp 2018). ● Research results: Teachers can also employ existing research with the aim of improving instruction. This is often referred to as research-informed teaching practice, which, as Flood and Brown (2018) note, has been defined as 'the process of teachers accessing, evaluating and applying the findings of academic research in order to improve teaching and learning in their schools' (Flood and Brown 2018, pp.347–348). Within the category of research results, a distinction can be made between practitioner or action research results (derived from practitioners conducting research in their own schools), scientific research results from a study in which a school participated, and scientific research results from a study in which a school did not participate (Brown 2015). ● 'Big data': Big data are characterised by the so-called 'three Vs': Volume, Variety and Velocity. Big data concern huge amounts of data (Volume), in varied forms (Variety), being continuously added to and updated (Velocity) (Laney 2001). These data can be used to monitor as well as to predict the performance of an organisation (Veldkamp et al. 2017)

**3. Collaborative Decision-Making Structures:**

Creating platforms for diverse stakeholders to facilitate interaction, data analysis, and decision-making processes. The general model of decision-making collaboration was proposed by Herbert Simon. It is a process composed of several phases such as: intelligence formation and design of alternatives models, and choice of a solution to be used for implementation. In collaborative decision-making possible model consists in the following phases: • Preparation, Collective understanding of problem, Solution generation meant to identify or design alternatives and applicable models to solve the problem; • Negotiation and confrontation of viewpoints to enable stakeholders to elaborate their contributions • Decision for selecting, according to the criteria previously agreed, the ideas which have been voted by most of stakeholder, or which have received the consensus within the institution, • Monitoring phase which covers the entire decision-making process so that any problem can be solved in the allocated time period. It includes generating a report on the decision-making process and ensures the implementation of the adopted and assumed solution. To better understand the nature of the data that is collected and analyzed, the case of SEEU is presented at two different levels. First, the types of reports and surveys/questionnaires and trainings it conducts. And second, placement of the data mining in SEEU in the model developed by Baker, which was analyzed in the previous section, is conducted. Since the data is collected and represented by two main bodies in SEEU, the following section conducts analysis of the Office of QAM, and SSD

**4. Evaluation and Validation of Data**:

Regular evaluation of data-driven strategies to monitor success and continuous improvement in higher institution of education is of importance. Another important step is the validation of data source. Source of data should be consistent with the definition, scope, classification, time of recording, reference periods, and valuation of education statistics. Well-defined measures are standardized and systematically implemented to validate data sources and use of school registries tools are encouraged to promote accuracy and periodically assessment. Statistical discrepancies and other potential indicators of problems in statistical outputs must be regularly investigated.

**5. Investing in appropriate Technology such as Educational Management Information System:**

Implementing advanced technological solutions to facilitate data analysis, visualization, and predictive modeling. With the use of the Educational Management Information System (EMIS), in facilitate data base management in higher educational system will enhance managerial performance. An education management information system (EMIS) provides systematic, quality data in a well-structured enabling environment that facilitates utilization of the information produced in planning and policy making. EMIS functions as a mechanism that keeps track of inputs and helps assess the quality of policies and ultimately informing decision makers on student learning and other outcomes and policy actions of educational system. One of the recommendations made by the World Bank's Education 2020 Strategy is to invest smartly. One value-added dimension of an EMIS is that it empowers a decision maker to make smart spending decisions, based on data and analytics of investments proven to contribute to learning (World Bank 2014)

**Conclusion**

Adoption of DDDM approaches presents several important advantages, such as informed decision-making, increased transparency, and precision in resource allocation. However, potential pitfalls may arise due

to data limitations, privacy concerns, and overreliance on quantitative data which might lead to overlooking important qualitative educational factors. Overcoming Implementation Challenges: Implementation of DDDM involves multiple challenges that need to be navigated strategically: Educator buy-in and Readiness: Recognising the importance of data-driven approaches and providing professional development opportunities. Data Privacy and Ethical Guidelines: Maintaining data confidentiality and adopting ethical practices. Data Collection and Quality Issues: Ensuring robust data collection systems and mechanisms for consistency and reliability. Collaboration and Shared Ownership of Data: Fostering collaboration between administrators, educators, and other stakeholders in developing strategies based on shared understanding. Adopting DDDM strategies holds great potential to revolutionize education management around the globe. Through a culture of data-driven decision making, educational institutions can overcome current and future challenges and effectively address their objective of imparting quality education. Moreover, continuously revising and adapting DDDM strategies based on evidence and emerging technologies will enable educational systems to flexibly respond to the evolving expectations and needs of students and communities.

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