CHALLENGES OF USING BIG DATA ON ASSESSMENT OF STUDENTS ACADEMIC PERFORMANCE IN RESEARCH IN UNIVERSITY

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Abstract
This paper examined Challenges of Using Big Data on Assessment of Students Academic Performance in Research in University .The study was guided by two research questions. The study adopted a descriptive survey research design. The study was conducted in Obio/Akpor Local Government Area of Rivers State. The population of the study comprised of 1800 Lecturers in university of Port Harcourt Rivers State. The sample consists of 327lecturers in Faculty of Education and Social Science Faculty in University of Port Harcourt using Taro Yamane formula. The instrument for data collection was a questionnaire titled: challenges of using big data on assessment of students academic performance in research (CUBDASAPR). The instrument was validated using experts in Measurement and Evaluation.The consistency reliability coefficient of 0.87 was tested using Cronbach coefficient alpha. Mean and standard Deviation statistics were used to answer the two research questions. The findings of the study revealed that adequate data analysis skills and the potential for bias in data interpretation were parts of challenges. It was recommended that Universities should leverage big data effectively to assess student academic performance in research while ensuring accuracy, fairness, and compliance with ethical and privacy standards.

Keywords: Big Data, Challenges, Assessment of Students, Academic, Performance and Research

Introduction

Big Data Technology can be defined as a Software-Utility that is designed to Analyze, Process and Extract the information from tremendously intricate and large data sets which the Traditional Data Processing Software could never contract with. Kiran, (2023). Big data technologies are the software tools used to manage all types of data sets and convert them into business insights. Bamiah, Brohi & Rad (2018) viewed Big Data as the process of combining enormous volumes of diversely outsourced data and analyzing them, using complex algorithms to inform decisions.

Tom (2016) opined that big data mainly refers to data sets that are too large or complex to be dealt with by traditional data-processing application software. Data with many entries offer greater statistical power, while data with higher complexity may lead to a higher false discovery rate.

Big Data Courtesy: Elena

Simplilearn (2023) defined The Five 'V's of Big Data

Big Data is simply a catchall term used to describe data too large and complex to store in traditional databases. The **"five 'V's" of Big Data are:**

Volume – The amount of data generated

Velocity - The speed at which data is generated, collected and analyzed

Variety - The different types of structured, semi-structured and unstructured data

Value - The ability to turn data into useful insights

Veracity - Trustworthiness in terms of quality and accuracy

Technological and methodological advances have equipped new potential for decision making based on big data. This use of big data has become well established in business, entertainment, science, technology, and engineering. Whereas big data is beginning to be utilized for decision making in higher education as well, practical applications in higher education *instruction* remain rare. Dede, Ho & Mitros (2016).

Educational institutions are using big data as a transformative tool for many aspects of education but crafting individual lessons and lesson plans are at the vanguard. Big data visualization helps academic institutions to appraise performance indicators in research and students' progress along with offering an adaptive learning module the engine to work from (Hayes, 2021). Big data analysis enables professors to use data in research on students achievement and identify potential opportunities for more in-depth participation processes, determine areas where students struggle or thrive, understand their individual needs, and thus develop strategies and assist with personalized education paths to ensure an efficient learning process (Bahrynovska,2022).

Bamiah, Brohi &Rad (2018) mentioned the challenges of using Big Data Technology on assessment of students academic performance such as:

Security:
Is a big concern for student assessment in research. Non-encrypted information is at risk of theft or damage by cyber-criminals. Therefore, data security professionals must balance access to data against maintaining strict security protocols. Traditional security techniques such as disaster recovery plans, strong password policy, firewalls, encryption and antivirus software are not sufficient to secure advanced technologies such as Big Data, Internet of Things (IOT), and Cloud Computing .Bamiah,Brohi & Rad (2018)

Data Privacy Concerns:Big Data often invoves the collection of vast amounts of personal information.Ensuring the privacy and security of students data is paramount and requirs strict adherence to data protection regulation (Acquisti,Taylor and Wagman,2016).Big Data in education requires transparency that reveals the identity of the learner to inform decisions. For example, the Massively Open Online Courses "MOOCs" collect, centralize, and analyze the learners' data. This tracking of learners' education records, performance, and how, when, and where they click each time to log in; can also be used by a malicious insider. Additionally, using Big Data Analytics (BDA) tools to predict learners' future outcomes, academic performance and engagement may violate their privacy. Bamiah, Brohi & Rad (2018)
777 educational breaches
comprising 14.8 million records of learners' data [37].

Ethical Considerations surrounding the use of big data in education, such as in algorithms, fairness and transparency.Its essential to address these concerns to avoid unintented consequence or discrimination (Zook and Poorthuis,2016) and Lane,Stodden,Bender and Nissenbaum,2014). Big Data Technology (BDT) include identifying the institutional methods for preserving personal data privacy individual consent, data ownership, and transparency. These challenges arise as educational data collection, and use is not subject to any formal ethical review process. Data are collected through various media (online and on campus) using various methods and devices. The analyzed information also raises another ethical educational challenge of authenticity of who is accessing the data and what is it used for, i.e. prediction systems that link learners' demographic data with their past and current educational performances, their engagements with online course materials, or in-class participation levels, or their final grades outcomes. Bamiah, Brohi & Rad (2018)

Lack of Skilled Professionals
Since Big Data is an advanced technology, still there is a shortage of experienced staff and required skills. According to a survey conducted by Russom in Bamiah, Brohi & Rad (2018), 46% stated that "Inadequate staffing and skills are the leading barriers to BDA". Educators and learners need to be trained to understand the system

to be able to use it. To run these modern technologies and Big Data tools, companies Need skilled data professionals. These professionals will include data scientists, data analysts and data engineers who are experienced in working with the tools and making sense out of huge data sets. Companies face a problem of inadequate Big Data professionals. This is because data handling tools have evolved rapidly, but in most cases, the professionals have not. Actionable steps need to be taken in order to bridge this gap.Bamiah, Brohi & Rad (2018)

Data processing, storage, and interoperability

Education sector generates massive amounts of data from high-volume education transactions, learning management systems, sensors, online repositories, educational digital libraries, learners' information systems, social media, individual computers and administrative systems that contain information on courses and programs completion rates and learning pathways. Moreover, data comes from disparate sources and institute internal and external departments, which may result in loss of data. Additionally, data comes in different formats; structured, semi-structured and unstructured which poses the challenge of data integration, cleansing, and storage. The variety of data collected and stored are not always practical; it's hard to aggregate administrative data, classroom and online data which also pose an additional challenge .Bamiah, Brohi& Rad (2018).Furthermore, maintaining data quality is yet another challenge since there are no standardized measures and indicators for performing the international comparison

Data Integration

One of the most pressing challenges of Big Data is storing all these huge sets of data properly. The amount of data being stored in data centers and databases of companies is increasing rapidly. As these data sets grow exponentially with time, it gets extremely difficult to handle. Most of the data is unstructured and comes from documents, videos, audios, text files and other sources. This means that you cannot find them in databases. This can pose huge Big Data analytics challenges and must be resolved as soon as possible, or it can delay the growth of the company. (Sharma, 2022).

Securing Data

Securing these huge sets of data is one of the daunting challenges of Big Data. Often companies are so busy in understanding, storing and analyzing their data sets that they push data security for later stages. But this is not a smart move as unprotected data repositories can become breeding grounds for malicious hackers.Bamiah, Brohi & Rad (2018)

Measurement according to Ogomaka, Ekwuonye, Ukozor, Onah (2016) views it as systematic process of assigning numerical values or numbers to attributes or observations. It is also a procedure of finding out the extent to which an attribute is present or absent in an object, individual or event in quantitative or numerical terms. It is quantitative description of the attribute we are measuring.

Research in simplest terms is searching for knowledge and searching for truth. In a formal sense, it is a systematic study of a problem attacked by a deliberately chosen strategy which starts with choosing an approach to preparing a blueprint (design) and acting upon it in terms of designing research hypotheses, choosing methods and techniques, selecting or developing data collection tools, processing the data, interpretation and ends with presenting solutions of the problem (Grover, 2015). Creswell (2018) states that "research is a process of steps used to collect and analyze information to increase our understanding of a topic or issue". It consists of three steps: pose a question, collect data to answer the question, and present an answer to the question.

Assessment of student learning is defined as "the systematic collection of information about student learning, using the time, knowledge, expertise and resources available, in order to inform decisions about how to improve learning"(Walvoord, in Zacharis, 2010). Through assessment, educators develop an understanding on what learners have learned, how effectively they accomplished the assigned tasks as well as the efficiency of materials, methods and techniques applied upon students' learning (Zacharis, 2010). However, assessment should not be narrowed on how well a system or a learner performs but, based upon pedagogy, to decide where to go next and pave the path towards that direction (Hattie, 2012; Thummaphan, 2017). Assessment comprises formative, diagnostic and summative. Formative assessment is the process of gathering information about students' progress and making interpretations with the purpose to modify the teaching - learning processes according to learners' needs. Diagnostic assessment examines learners' prior knowledge and identifies misconceptions, which causes problems in learning with the purpose to acknowledge the nature of their difficulties (Fuchs, Hosp & Hamlett in Dega, 2019: and is painstaking as part of formative assessment. Summative assessment judges what the learner has learned at a particular time (e.g. completion of a unit or course) in relation to some goals or standards. Crossouard (2011) proposes an integrated approach of assessment blending summative and formative approaches while having learners assume an active role in monitoring their learning process and reflecting on it. Such an approach, he claims, brings together the advantages of both models with a positive impact on learners' development.

Observation has shown that are Challenges in Data Collection and Analysis such that University data systems may not capture all relevant performance factors,

potentially skewing results, Combining data from multiple sources (e.g., administrative records, learning management systems) faces challenges due to inconsistencies and incompatibility. However, Balancing the need for comprehensive data with student privacy is essential. Moreover, limitations of Big Data can affect Academic success which encompasses factors beyond data points, such as motivation, soft skills, and external circumstances. Big data may overlook these crucial aspects, Algorithms used for data analysis can inherit biases present in the data, leading to unfair assessments of specific student groups.Implementing and maintaining big data analytics requires significant investment in technology and skilled personnel,Protecting vast amounts of student data from breaches and unauthorized access is a major concern.Finally, Overreliance on big data metrics could narrow curriculum and teaching methods, prioritizing data points over holistic learning. Therefore, Universities must be transparent about data collection and purpose, ensuring students have control over their information and Big data analysis could potentially be misused to label or categorize students unfairly, limiting their educational opportunities. By acknowledging these challenges, researchers can develop a more nuanced and responsible approach to using big data in university research. This ensures a focus on improving learning outcomes for all students while protecting their privacy and fostering a fair and equitable learning environment.

The main purpose of this study was to find out the challenges of using Big Data on assessment of students in research and measurement, specifically, the study sought to

1. Investigate are the challenges faced in collecting and managing large-scale academic data in University.
2. Find out thestrategies that can be implemented to address the challenges and maximize the benefits of using big data for assessing students academic performance in University

Research Questions

1. What are the challenges faced in collecting and managing large-scale academic data in University?
2. What strategies can be implemented to address the challenges and maximize the benefits of using big data for assessing students academic performance in University?

Methodology

The study adopted a descriptive survey research design. The study was conducted in Obio/Akpor Local Government Area of Rivers State. The study was guided by two research questions. The study was conducted in Obio/Akpor Local Government

Area of Rivers State. The population of the study comprised of 1800 Lecturers in university of Port Harcourt Rivers State. The sample consists of 327lecturers in Faculty of Education and Social Science Faculty in University of Port Harcourt using Taro Yamane formula. The instrument for data collection was a questionnaire titled: challenges of using big data on assessment of students academic performance in research (CUBDASAPR). The instrument was validated using experts in Measurement and Evaluation. The consistency reliability coefficient of 0.87 was tested using Cronbach coefficient alpha. Mean and standard Deviation statistics were used to answer the two research questions.

Results

Research Question One: What are the challenges faced in collecting and managing large-scale academic data in University?

Table1: Teachers mean responses of the challenges faced in collecting and managing large-scale academic data.

S/n	Statement	Mean	SD	Remarks
1	Inadequate knowledge professionals	3.31	0.64	Agreed
2	Inadequate understanding of massive Data	2.52	0.74	Agreed
3	Big Data growth issues	3.08	0.81	Agreed
4	Confusion while selecting Big Data Tools	3.10	0.81	Agreed
5	Accumulating data from different sources	2.95	0.88	Agreed
6	Finding and fixing Data Quality issues	3.01	0.57	Agreed
7	Inadequate Security	3.90	0.87	Agreed
8	Scaling Big Data System	3.43	0.68	Agreed
9	High cost of Data and infrastructure projects	3.06	0.59	Agreed
10	Validating data	3.71	0.59	Agreed
	Grand Total Grand mean (average)	3.20	0.70	

Table 1 show that the teachers agreed with all the statements regarding the challenges of using Big Data in assessment of students in research and measurement. The grand mean score of 3.20 was the decision rule of 2.50. The acceptance of the students was indicated by their mean scores for items 1-10 being higher than the criterion mean of 2.50.

Research Question Two: What strategies can be implemented to address the challenges and maximize the benefits of using big data for assessing students academic performance in University?

Table2: Teachers mean responses of the strategies implemented to address the challenges and maximize the benefits of using big data for assessing students academic performance.

S/n	Statement	Mean	SD	Remarks
11	Ensure strict protocols for data security and privacy to protect students sensitive information.	3.92	0.94	Agreed
12	Establish processes to ensure the accuracy and reliability of the data being collected.	2.65	0.86	Agreed
13	Develop clear guidelines and ethical frameworks for the collection,analysis and use of student data to prevent misuse or bias.	2.68	0.90	Agreed
14	Communicate with students,faculty and staff about how their data will be used.	3.40	0.68	Agreed
15	Use big data analytic to identify students strengths,weaknesses,and learning preferences allowing for personalized learning paths and interventions.	2.33	0.70	Agreed
16	Utilize predictive analytic to identify at -risk students early on and provi de timely interventions to support their academic success.	2.87	0.77	Agreed
17	Regularly review and refine data analytic models and methodologies based on feedback and outcomes to improve their effectiveness over time.	3.52	0.63	Agreed
18	Provide training and support for faculty and staff to effectively use big data tools and insights in their teaching and decision-making processes.	2.71	0.90	Agreed
19	Foster collaborations with industry partners,researchers and other institutions to share best pr actices,resources and insights in utilizing big data for academic assessment.	2.79	0.75	Agreed
20	Continuously assess the impact of using big data on student outcomes,institutional goals,and teaching practices to measure effectiveness and make necessary adjustments.	2.23	0.70	Agreed
	Grand Total Grand mean (average)	2.90	0.80	

Table 2reveals that 8 out of 10 items statements were in agreed upon by the respondents as the

strategies that can be implemented to address the challenges and maximize the benefits of using big data for assessing students academic performance in University. However, two respondents disagreed with item 15 and 20 with scores 2.33 and 2.23 respectively while other items strongly agreed by the respondents as the strategies that can address the challenges. The grand mean score of 2.90 was the decision rule of 2.50. The acceptance of the students was indicated by their mean scores for items 8 items being higher than the criterion mean of 2.50.

Discussion of Findings

Challenges faced in collecting and managing large-scale academic data in University of Port Harcourt.

The study revealed that collecting and managing large scale academic data in University of Port Harcourt requires a combination of technological solutions and organizations changes and strategic investment in data management capabilities. The findings are in support with Baty,2019,Jones & Salaway,2016 and Chen etal,2012 who posed several challenges faced in collecting and managing large-scale academic such as data volume, and variety, data quality, data integration, data security and privacy, data governance, data analytic capabilities and infrastructure requirements. This finding agrees with Simpli learn (2023) who listed the challenges of Big Data such as storage, processing, security, finding and fixing data quality issues, scaling big data system, evaluating and selecting big data technologies, big data environment, real-time insights.

Strategies can be implemented to address the challenges and maximize the benefits of using big data for assessing students academic performance in University

The study revealed the strategies to address the challenges and maximize the benefits of using big data for assessing students academic performance in University. The findings is in line with the study of Lawton(2022) who mentioned ten Solutions to tackle Big Data such as plan for an incremental changes, monitor and fix any data quality issues constantly, maintain access to a variety of data sources and having dedicated big data integration strategies, evaluate the complex data preparation, capabilities required to feed Artificial intelligence machine learning and other advanced analytics systems, employ business analytics professionals, statisticians and data scientists with machine learning expertise, establish a culture for attracting and retaining the right talent, treat data as a product and finally collaborate with those closest to the technology to manage risk and ensure power alignment.

Conclusion

The challenges of using big data for assessing students academic performance in university research point to the need for careful consideration of data privacy, security and ethical concerns. Moreso, issues related to data quality, interpretation, and bias must be addressed to ensure fair and accurate assessments. Inadequate data analysis skills and the potential for bias in data interpretation were parts of challenges. Despite these challenges, leveraging big data can offer valuable insights into student learning patterns help tailor educational strategies for better outcomes.

protection and business model generated in the application of big data technologies and adopt some key measures to prevent and respond.

.Key methods to promote application of big date of higher education

Form the analysis above, combined with the characteristics of big data in education, big data technologies play an important role in educational decision-making, quality management of teaching process, education evaluation, learning and development of students. However, universities should concern about the security management, privacy protection and business model generated in the application of big data technologies and adopt some key measures to prevent and respond.

4.1. Establishing security defense system of big data and taking multiple measures to ensure to promote application of big date of higher education

Form the analysis above, combined with the characteristics of big data in education, big data technologies play an important role in educational decision-making, quality management of teaching process, education evaluation, learning and development of students. However, universities should concern about the security management, privacy protection and business model generated in the application of big data technologies and adopt some key measures to prevent

Recommendations

Based on the findings of this study, the following were recommended;

1. Big Data workshops and seminars should be organized at universities for every staff.
2. Researchers may need basic additional training for all employees who are handling data regularly to effectively utilize big data tools and interpret the results meaningfully.
3. Universities should leverage big data effectively to assess student academic performance in research while ensuring accuracy, fairness, and compliance with ethical and privacy standards.
4. Universities must ensure big data is used to support faculty and students, not replace their judgment and expertise.

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