Big Data Analytics for Accreditation in the Higher Education Sector

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Abstract- This paper gives an insight of how to improve the quality of education or uncover additional value from the data generated by Education institutions. Huge amount of heterogeneous data is generated by institutions. The generated data become useless due to lack of proper data analytics methods. Big Data Analytics using Hadoop plays an efficient role in performing meaningful real-time analysis on the huge volume of data and able to predict the emergency situations before it happens. This paper also discusses about the need, opportunities and challenges of Big Data Analytics in Accreditation purpose.

Keywords: Big Data Analytics, Hadoop, Map-Reduce

1. INTRODUCTION

Big Data is the capability to manage a huge volume of disparate data, at the right speed and within the right time frame to allow real time analysis and reaction. Its characteristics are

Volume: Big data can handle large amount of data generated. At present, the data existing is in peta bytes and is supposed to increase to zeta bytes in nearby future. The educational data such as data about students, teaching and non teaching staff, existing are themselves producing data in order of terabytes everyday and this amount of data is definitely difficult to be handled using the existing traditional systems.

Velocity: The speed in which the data collected from various sources are really very fast. Velocity in Big data is a concept which deals with the speed of the data. This characteristic is not being limited to the speed of incoming data, but also speed at which the data flows. For example, the data from the sensor devices would be constantly moving to the database store and this amount won't be small enough [1]. Thus, our traditional systems are not capable enough on performing the analytics on the data which is constantly in motion.

Variety: Inconsistencies of the data flow is considered by the variety of different types of Data. Data loads become challenging to be maintained especially with the increase in usage of the social media which generally causes peak in data loads with certain events occurring.

Veracity: How much accurate is that Data in predicting Business value. Veracity of Big Data refers to the quality of the data. It sometimes gets referred to as validity or volatility referring to the lifetime of the data. Veracity is very important for making big data operational. Because big data can be noisy and uncertain, it can be full of biases, abnormalities and it can be imprecise. Data is of no value if it's not accurate, the results of big data analysis are only as good as the data being analyzed.
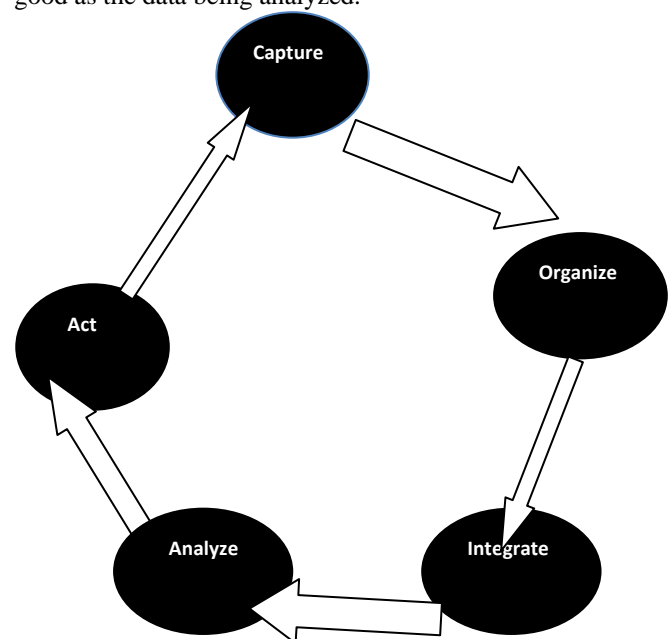

Figure 1 : The Cycle of Big Data Management

Figure 1 shows that Big Data is important to capture huge volume of data, organize them and integrate them as the data are from different sources. The data are then analyzed and the decisions are taken in the business at the right time, to gain the right insights. With Big Data, it is now possible to virtualize data so that it can be stored efficiently and utilizing cloud based storage, more cost effectively as well.

The rest of the paper is organized as follows. Section 2 gives the importance of Big Data in Education. Literature review is described in Section 3. Need for Big Data Analytics in Education is pointed out in section 4.

Section 5 gives the opportunities of Big Data in Education. Section 6 deals with the challenges and section 7 compares the existing algorithms. Finally, conclusion is given in section 8.

2. IMPORTANCE OF BIG DATA IN EDUCATION

Technology is making abrupt changes in higher education. Technology has been strategically introduced into higher education to enhance different processes like teaching learning. When it is aligned with educational objectives and standards the impact is profound. The dynamics of higher education is changing and emphasizes the need to adapt rapidly. Higher education is under scrutiny from accrediting agencies, government and other stake holders to explore new means for improving and monitoring student success and other institutional policies.

Future education is more often connected with new technologies like omnipresent [2] computing devices, flexible class room design .But the most appropriation aspect which is overlooked and which would revolutionize the field is "data". Higher education is a field where tremendous amounts of data are available. Analyzing this data would lead to realization of benefits of greater bound. Many institutions fail to make efficient use of the huge amount of data available.

3. LITERATURE REVIEW

Big data and its analysis are one of the most prominent technological trends amongst academia and business as it allows treat massive, varied and complex structure of data sets from numerous sources to gain deeper insights and greater values from these data analytics. A study explore the factors necessary for Big Data implementation and provide understanding how enhance these factors in higher education accreditation using qualitative case study of Saudi universities [3]. This found six key factors are essential for big data implementation in higher education accreditation in Saudi universities; they are security issues, preserving privacy, analytical skills, IT infrastructure, top management support and collaborative information-sharing projects. Another study introduces the Big Data technology along with its importance in the modern world and existing projects which are effective and important in changing the concept of science into big science and society too. The various challenges and issues in adapting and accepting Big Data technology, its tools (Hadoop) are also discussed in detail along with the problems Hadoop is facing. The paper concludes with the Good Big data practices to be followed [4] Academic institutions are now drawing attention in finding methods for making effective learning process, for identifying learner's achievements and weakness, for tracing academic progress and also for predicting future performance. People's increased expectation for accountability and transparency makes it necessary to implement big data analytics in the educational institution. But not all the educationalist and administrators are ready to take the challenge. So, it is now obvious to know about the necessity and opportunity as well as challenges of implementing big data analytics. This paper describes the needs, opportunities and challenges of implementing big data analytics in the education sector. [5] The purpose and value of higher education is transforming. Technology is strengthening the capabilities of institutions to face the new challenges. Higher education has access to realms of data which can be used to improve decision making. The use of Big Data and analytics in higher education is relatively new area. The relevance of analytics is profoundly seen in many areas and higher education is no different. This paper examines the role of Big Data and analytics in higher education. Another survey is a study on the use of Big Data in Education [6]. Analyzed how the Big Data and Open Data technology can actually involve to Education. Furthermore how big mounts of unused data can benefit and improve education. Providing some new tools and methods bypassing the traditional difficulties, opens a new way of Education. One of the missions of Computing after all is to shares content. More business and government agencies are discovering the strategic uses of large databases. New software tools and techniques are assumed to analyze the data for beneficial inferences; a radically new type of "knowledge infrastructure" is materializing [7]..

4. NEED FOR BIG DATA ANALYTICS IN EDUCATION

The quality of education can be improved by considering the following:

Student centric services:
Academics
- To prepare interim reports to the parents by providing up to date information.
- Identifying weak students at the earlier stages based on the data available and provides remedial classes to improve their results.

Extracurricular
- Identifying the Talents of students*: This can be identified by examining the previous details of the students.

Institution oriented services
- *Monitoring the Institution's quality :* Monitoring whether the institution is setup according to the norms by university. This periodical check-up helps government in taking necessary measures against disqualifying institutions.
- *Improving the Teaching methodology:* Teaching/learning process can be improved for delivering high quality education to the students. This can be done by monitoring continuous assessment of students.

Staff centric Services
- *To reduce unemployment rate:* To minimize unemployment rate by predicting the job needs before based on the admission rate. This can be achieved by analysis of the students graduating each year.
- *To improve staff retention policies:* To identify the needs of staff and to provide necessary policies to retain them

5. OPPORTUNITIES OF BIG DATA IN EDUCATION

Higher and professional education is a domain which constantly needs to be evaluated and transformed to follow the fast pace of changing trends in different sectors in the market which in turn creates a variety of needs in workforce. A major factor that has radically altered the way education is conducted is technology. Examples of different types of technologies used in education are mobile devices and apparatuses, teleconference and remote access systems, educational platforms and services and other that students, teachers, academic faculty, evaluation specialists, researchers and decision-makers in education interact with and use in an effort to impact and improve teaching and learning but also to realistically reflect in the learning stage the usage of modern technologies used in real settings [8]. The interaction with these technologies generates large amounts of data that range from an individual access log file to an institutional level activity. Still the educational systems are not yet fully prepared to cope with and exploit them for continuous quality improvement purposes. In particularly, health professions education or health education is a context that these technologies are predominantly used, producing a wide range of educational data. In addition, health education is in constant need of reflecting the growing body of medical knowledge and evidence in order to practically embed it in education and prepare the future health professionals to meet the future challenges of healthcare systems. The need to govern these challenges within health education is now more than ever timely, and therefore, attention has been paid to different approaches such as big data and analytics that could be useful in investigating and exploiting educational data too.

Big data analytics will create a number of opportunities for the educational institution, administrators, policy makers, educationalists and also for the learners. These opportunities include:

1. Collaboration and comparisons among the institutions would become more comfortable.
2. Improved knowledge flow and learning success across the organization would be achieved.
3. Learning effectiveness would be improved through the self measurement of learners and educators
4. Cost reduction through managing financial performance could be possible

5. The learning and academic risk and complexity could be reduced.

6. CHALLENGES

Even though Big Data Analytics have needs and opportunities, Educationalist must have to face challenges to implement Big Data analytics. Some of the challenges are:

1. **Acquiring proper data:** Ensuring data for analysis is a great challenge for the implementation of educational analytics. It is difficult to access required data from poorly integrated database system and it will also be hard develop data warehouse for all the institutions. Besides, poor quality and incorrectly formatted data from less accessible database system can cause significant problems.
2. **Ensure Training:** To develop better understanding of the practitioners about the system will be time consuming. It would be difficult for the learners and educators to present information in an accessible and informative way and therefore would be inflexible to collaborate with the system.
3. **Reluctance to change:** Just implementing the analytical system is not overcoming all the challenges. Finally, to make the practitioners become used to with the system and to grow eagerness to cooperate would not be easy. As a result all efforts will be go in vain if the effective use of the analytical system could not be ensured.

7. COMPARISON OF SOME EXISTING ALGORITHMS

The comparison of the algorithms is given in table 1. The comparison is based on the factors/approaches used, benefits and drawbacks.

8. CONCLUSION

The revolutionary development on the education sector could be achieved through the proper use of big data analytics. Instead of some innate challenges, big data analytics can represent customized learning environments to the learners, can reduce potential dropouts and failure and can develop long term learning plans. All of these are possible through the effective development and use of big data analytics in the educational institutions.

Algorithm	Type	Factors/Approaches used	Benefit	Drawback
Hadoop	Clustering	Large block size reduce the number of disk seeks	Reliable Shared Storage system	Low Latency Data Access
Mapreduce	Clustering	uses the Data Locality property where it collocates the data with the compute node itself	Massive scalability	Operates only at the highest level where data flow is implicit

Table 1 : comparison of existing algorithms

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