Big Data Analytics in the Education Sector: Needs, Opportunities and Challenges

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Abstract - 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 will describe the needs, opportunities and challenges of implementing big data analytics in the education sector.

Keywords – Big data, Learning analytics, Academic analytics, Education

I. INTRODUCTION

Currently “big data” has become buzzword in business, education, Health studies, statistics and many other fields [1]. With the advancement of technology we are constantly generating ever-increasing amount of data. Big data analytics is a process to examine this large data set for identifying any hidden patterns and other necessary business information [2].

Public expectations for accountability and transparency have increased in every sector, including education. Through the implementation of big data analytics students can track their academic and behavioral progress and faculty visibility into student performance can also be improved [3]. The problem identification and the success rate clarification for an institution are also becoming necessary. So, academicians are now hardly tries to implement the big data analytics in their institution to find the achievement and weakness of both the learners and organizations and to relate with other institution.

This paper will review the types of analytics that can be used in the education sector and also the needs, opportunities and challenges in case of implementing big data analytics in this sector.

II. ANALYTICS FOR EDUCATION SECTOR

The rapid advancement of big data analytics makes it necessary for any organization to coincide it with their management and measurement processes. While considering the education sector it is now becoming essential to analyze data for the development of both learning and academic activities. So, the analytics in education sector can be divided into two broader categories: learning analytics (LA) and academic analytics [4].

LA is the measurement and analysis of collections of data about learners and their contexts for making learning more and more effective. Learning analytics are largely concerned with improving learner success [5] [6] [7]. Greller and Drachsler [8] uses a general morphological analysis (GMA) to divide the learning analytics domain into six critical dimensions whose are Stakeholders, Objectives, Data, Instruments, Internal limitations, External constraints. Chatti et al. [9] provides a systematic overview on learning analytics through a reference model based on four dimensions namely data and environments (what?), stakeholders (who?), objectives (why?), and methods (how?). Powell and MacNeil [10] pointed out that there is a broad consciousness of analytics across educational institutions for various stakeholders but that the way 'learning analytics' is defined and implemented may vary. They also stated that some motivations and implementations of analytics may come into conflict with others for example there may
have potential conflict between analytics for individual learners and organizational stakeholders.

Academic analytics is concerned with the improvement of resources, processes and workflows of the academic institution through the use of learner, academic, and institutional data [11]. Academic analytics, akin to business analytics, are concerned with improving organizational effectiveness [12]. The adoption of academic analytics in higher education is expectant because of increased competition, accreditation, assessment and regulation. Although there are lots of essential data in the institutions of higher learning but the collected data is not being analyzed. Consequently, higher education leadership is bound to make critical and vital decisions based on inadequate information while that could be achieved by appropriately utilizing and analyzing the available data [13].

Some other analytics like predictive analytics, business analytics or action analytics can also be taken as consideration for the big data analytics in the education sector. But form all of these analytics LA in the academic domain is focused specifically on learners, learning processes and their learning behaviors [8].

III. NEEDS, OPPORTUNITIES AND CHALLENGES

Big data analytics is now becoming a great challenge for the educationalist. People are now concerned about the intelligent outcome of institution to know students learning and academic progresses. But it is becoming hard for the management of the institution to just drive for the big data analytics without knowing its aspects. Figure 1 represents the educational (learning and academic) analytics from three aspects: Needs, Opportunities and Challenges.

A. Needs

There is a large variety of uses of analytics in educational system with different purposes. However, the actual purpose of analytics should be vigilant. Which one is the specific issue of concern of analytics is a vital question now. A number of broader strategic aims of educational analytics are summarized here.

1. To help individual learners: LA can help individual learners to identify their weakness and achievements and to relate their behavioral patterns with others. Learner’s motivation, success and confidence can be enhanced by providing them timely information about their performance. Suggestions on individual’s activities can also be provided to identify significant knowledge gaps. Rapid achievements of learners are possible through providing them access to the tools to evaluate their progress and to identify the activities that produces best results.

Fig 1: The Needs, Opportunities and Challenges of Big Data Analytics in the Education Sector.
2. To help mentors: Analytics can make it easy for teachers to identify the students who require extra support and attention. Mentors can utilize their time and effort from the analytical information on students’ weakness and ability and can find proper interventions for individual students. They can also identify the proper teaching practices that have the best impact on the students.

3. To help developing curriculum and learning processes: Through analytics it is convenient to find out the flaws of current courses and contents and to improve the curriculum offerings. Through the utilization of analyzed data generated during real time learning activities, better curriculum development and advanced quality learning can be achieved. Individual learner can receive resources and training according to their knowledge state through the personalization and adaptation of developed learning process and contents.

4. To help administrators: Administrators can take decisions on different efficiency and effectiveness measures based on the analytical information of real time data. So, it becomes easy for them to identify retention, progress and completion factors of the organization. It is also possible to reduce attrition through the early detection of at-risk students and generating alerts for learners and educators.

B. Opportunities

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

C. Challenges

In spite of having lots of necessity and opportunities educationalist must have face some challenges to implement big data analytics. Some of these challenges are:

   1. Ensuring data flow: acquiring 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. Training practitioners: 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. Transforming thinking into actions: 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.

IV. CONCLUSION

Through the proper use of big data analytics the revolutionary development on the education sector could be achieved. Instead of some innate challenges, big data analytics can represents 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.

REFERENCES


