Significance of Big Data and Analytics of Student Success in Higher Education

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Abstract: The driving forces for using Big data and analytics of student success in Higher Education is the need to improve the retention rate among college students. This paper shows the significance of Big data Analytics in Higher Education. In the last few Years Big Data Applications has become increasingly important. Current challenges facing the higher education sector include a rapidly changing and evolving environment, which necessitates the development of new ways of thinking. This research paper evaluates how big data analytics can be used an efficient way for performance evaluation in education sector. The number of students enrolling for advanced studies are registering for various courses is increasing day by day globally. Big Data refers to the large volume of the data as well as the technology and tools used to processes and analyze data into usable information. This Paper addresses the retention rate issue, provides a history of big data, examines the analytic methodologies, and provides a short case study of the Student Success of any University.
Keywords— Big Data, Higher Education, Learning Analytics, Academic Analytics

I. INTRODUCTION (BIG DATA)

As institutions of higher education collect more and more data about their students, and as students' record databases have grown more complex and accessible – we are entering a new era of using data to improve student success, streamline processes, and more effectively utilize resources[1]. Higher Education needs to record all academic related data from various activities such as student's data, registration data, assessment data etc. Due to the advancement of information technology social interactions have increasingly moved to online. These online interactions can be traced and collected and will from a huge amount of data and considered as big data. Thus data collection and analysis have become a challenging task in higher education sectors [2]. The major objective of learning analytics is concerned

with beneficial information for data driven decision making. This can be achieved by the analysis of big data collected from various learning sources. However the greatest challenge in higher education is to determine how data is captured, processed, stored, presented and used for the benefits for tomorrow's outcome [3].Previously to Big data revolution companies could not store huge data set. Some few years ago, even a single terabyte was considered as a huge amount of data. But, today data is being described in petabytes, exabytes, and even yottabytes. Big data, as the name suggests is a huge amount of data that generally refers to the data size in terms of exabytes and beyond. It describes the data that is so big in volume that could not be gathered, stored, managed and processed by traditional database software traditional tools. Today the big data has taken many sectors by storm. Data has become an important factor for decision-making. The reason for this can be easily found in the definition of the Big Data Analytics- It is a process to examine large data sets for identifying the hidden pattern and other necessary information. [4].

As institutions of higher education collect more and more data about their students and as students' record databases have grown more complex and accessible – we are entering a new era of using data to improve student success, streamline processes, and more effectively utilize resources. Once the data is analyzed it promises better student placement processes; more accurate enrolment forecasts, and early warning systems that identify and assist students at-risk of failing or dropping out.

II. ANALYTICS IN HIGHER EDUCATION

Academic analytics will be an essential component of the future. It encapsulates all the activities in higher education affecting administration, research, resource allocation and management (Tulasi, 2013). Big data holds great opportunities for higher education some of which are attempted to be implemented while rest are the areas to be explored. It is because of the several benefits provided by the big data analytics. Big data technology can be used to both the institutes and their students' data (Vatsala, Rutuja Jadhav 2017). The higher education monitoring and evaluation are rich and can be broadly divided into two categories. The first category is to show the status of education and teaching through information technology. With big data technology, we perform data collection, cleaning, processing and storage for basic teaching information in colleges and universities. Then through statistical analysis and model building, we analyze and mine these data to generate technical reports in the form of charts. The second category is that the main body of higher education evaluation is the formation of a specific relationship among schools, teachers and society [6]. Organizations are competing in analytics not because they can – business today is awash with data and data crunchers, but also because they should .Many organizations including institutions of higher education are flooded with a lot of data and it has drawn interest in analytics. Quantitative analysis and statistical analysis have become popular in analytics and big data research methodologies [7].

III. BIG EDUCATIONAL DATA

In Higher Education Academic Analytics are essential components. It affects administration decision and management. In the higher education sector, both the college and its students are equally important. A college cannot exist without students. Similarly, the students do need colleges for their higher education. The institute provides its resources such as faculty, technology (such as labs and software), infrastructure facilities, knowledge, course materials and a degree to its students. In return, students provide the college finances, their preparations, and participation ensuring smooth running and functioning of the system. So, we can say that college is co-created. So, the colleges need to deliver a good service to their students in return for high tuition fees. There are considerable opportunities for using Big Data in higher

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education. It is important that universities use Big Data to continue to deliver the very best learning environments for the good of society. There may also be possibilities around using Big Data to link research to education – both by making better use of latest research practices and outcomes to inform teaching and in enabling research activities to be undertaken as part of education.

IV.Big Data Analytics

Big Data analysis differs from traditional data analysis primarily due to the volume, velocity and variety characteristics of the data being processes. To address the distinct requirements for performing analysis on Big Data, a step-by-step methodology is needed to organize the activities and tasks involved with acquiring, processing, analyzing and repurposing data. The upcoming sections explore a specific data analytics life cycle that organizes and manages the tasks and activities associated with the analysis of Big Data. From a Big Data adoption and planning perspective, it is important that in addition to the lifecycle, consideration be made for issues of training, education, tooling and staffing of a data analytics team. Many students drop out of the college every year and this number is increasing rapidly for several reasons. Institutes can identify those students who could possibly drop out and take the necessary steps. Indian   higher education institutions are trying to gain more insight into student experiences to monitor and improve teaching and learning, and assist with changes and improvements that will benefit student's success. The use of big data offers some excellent opportunities. The challenges faced by Indian Higher Education are interrelated to each other and may be responsive to the big data capabilities such as: a) Real-time feedback and Recommendations b) Personalized Learning and Continuous Improvement c) Sentiment and Behaviour Analysis and d) Improved Student Retention. One of the biggest challenges every institution face is how to improve student retention.

For Example, I am presenting data (Fig.1) of Kolhan University, Chaibasa. In UG,PG Final Exam 2018 all Streams.
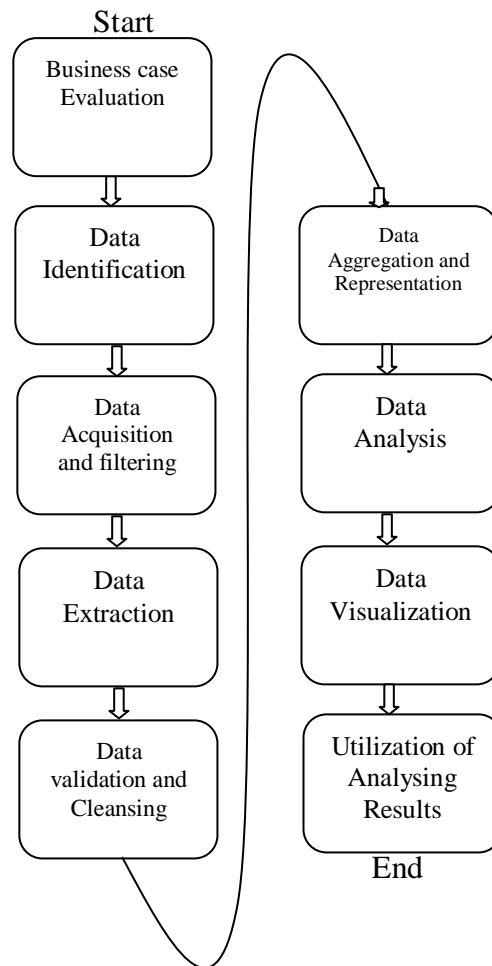
Sl.No.	Class	Streams	No.of Students Appeared	Passed	Failed
1	B.A	Arts	9111	7614	1497
2	B.Com	Commerce	4348	3838	510
3	B.Sc	Science	1388	1256	132
4	M.A	Arts	2420	2381	39
5	M.Sc	Commerce	296	281	15
6	M.com	Science	908	888	20

Fig.1

There could be several reasons for student attrition including: academic, disinterest with content, motivational, psychosocial, and financial (inability to afford fees).
The Big Data analytics lifecycle can be divided into the following nine stages.

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1. Business Case Evaluation

2. Data Identification

3. Data Acquisition & Filtering

4. Data Extraction

5. Data Validation & Cleansing

6. Data Aggregation & Representation

7. Data Analysis

8. Data Visualization

9. Utilization of Analysis Results

Start

Business case Evaluation

Data Identification

Data Acquisition and filtering

Data Extraction

Data validation and Cleansing

Data Aggregation and Representation

Data Analysis

Data Visualization

Utilization of Analysing Results

End

The Data Analysis stage shown in above Figure is dedicated to carrying out the actual analysis task, which typically involves one or more types of analytics. This stage can be iterative in nature, especially if the data analysis is exploratory, in which case analysis is repeated until the appropriate pattern or correlation is uncovered. Depending on the type of analytic result required, this stage can be as simple as querying a dataset to compute an aggregation for comparison. Big data analytics is actively being used in many business organizations worldwide in business intelligence and in areas such as marketing and financial

forecasting[10]. In recent years Big Data has started attracting the interest of academia. Many academic institutions are moving to cloud architectures and with the increased use of digital devices by users in these ecosystems is leading to a situation more data is being collected in these institutions than ever before, creating considerable opportunities for using Big Data to analyze and correlate information that enhance decision making. Observed that it is absolutely important for universities to use Big Data Analytics in order to deliver the very best of learning environments for the good of society [5]. Big Data refers to humongous volumes of data that cannot be processed effectively with the traditional applications that exist. The processing of Big Data begins with the raw data that isn't aggregated and is most often impossible to store in the memory of a single computer. A buzzword that is used to describe immense volumes of data, both unstructured and structured, Big Data inundates a business on a day-to-day basis. Big Data is something that can be used to analyse insights which can lead to better decisions and strategic business moves . The definition of Big Data, given by Gartner is, "Big Data is high-volume, and high-velocity and/or high-variety information assets that demand cost-effective, innovative forms of information processing that enable enhanced insight, decision making, and process automation"[8].

V. BENEFITS OF BIG DATA ANALYTICS IN HIGHER EDUCATION

Analytics refers to the techniques used to analyze and acquire intelligence from big data. Indian higher education institutions are trying to gain more insight into student experiences to monitor and improve teaching and learning, and assist with changes and improvements that will benefit student's success. The use of big data offers some excellent opportunities. The challenges faced by Indian Higher Education in this study are interrelated to each other and may be responsive to the big data capabilities such as: a) Real-time feedback and Recommendations; b) Personalized Learning and Continuous Improvement; c) Sentiment and Behaviour Analysis; and d) Improved Student Retention. Big data analytics can make instant alerts and provide feedbacks to teachers and students on academic performance by analysing underlying complex data patterns. This approach will help in predicting a dropout student, student who needs additional help or even a student who needs more challenging assignment. With the help of big data, it is possible for the teacher to formulate formative assessments aptly challenging or demanding according to each student's talent and learning ability. This is possible through various methods such as setting up groups based on ability within the system, and allocating a particular student to an appropriate group. Based on the outcome of the formative assessment, students can be advised on their next steps: more advanced learning, or different content or more practice on the same topic [9].

VI. CONCLUSIONS

It is found that data and analytics can help University to better understand themselves, up-to-date and accurate knowledge of their own institutions. It is essential to shape the successful university of the future. There is potential for learning analytics to be used to help institutions to support their students through their educational journey. All institutions should consider introducing an appropriate learning analytics system to improve student support and performance. Future prediction is difficult, since anything can happen led by leading companies with heavy financial backup they are investing heavily on Big Data, so it is clear that "Big data" in the very near future. Big Data Analytics is a trend that will increase substantially in the coming period and will have a large impact on any education institution due to the many advantages. Traditional face-to-face instruction can support traditional data-driven decision-making processes, Institutions should identify appropriate big data analytics tool to harvest the benefits from the huge amount of data and how Big Data Analytics tools

can be used in a way to take decisions and drive the institution towards benefitting from the data.

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