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Improving Institutional Effectiveness - A Big Data Approach

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Abstract: ***Educational Institutes are generating a staggering amount of data which needs to be analysed to extract knowledge, Information and Wisdom. The usage of learning management systems in education has been increasing. Most of the institutes are focusing on applying data mining tools and techniques to analyse LMS data and build models for improving learning experiences. As the competition for getting better students is increasing, institutes need to have another look at how they are analysing potential students. Big Data can actually involve to education and play a role to improve Institutional effectiveness in terms quality of teaching and learning process. Big Data positions IT to provide new tools and methods bypassing the traditional difficulties and open new way of education. This paper presents a review of the current big data research in education exploring applications, opportunities and challenges.***

Keywords: Data Analysis, Big Data Analytics, Institutional Effectiveness

1. Introduction

Higher education plays an important role in build skilled students who can evolve economically and professionally and helps in development of society and nation. The higher education landscape is undergoing significant change as a result of technological innovations.

We are witnessing changes in the way higher education is taught and in the way students learn. While the conventional setting of the lecture hall will continue to form bedrock of higher education systems, it will be enhanced by the integration of new tools and pedagogies, and it will be complimented by many more online learning opportunities and a greater variety of providers in higher education.

The use of Information Communication Technologies (ICTs) in education has played a major role in transforming the traditional Classroom learning. Learning theories provide useful guidance for learning professionals when designing, building and delivering learning solutions.

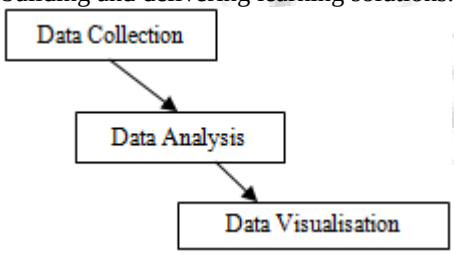

Figure 3: Stages required to unlock the value of Big Data

2. Big Data in Education

Data warehouse, Business Intelligence or data analytic capabilities are being presented as summaries of Big data which is an experiment started by institutions. In the early 1990s, institutions wrote reports with reference to standalone data systems. Institutional inputs around admissions, revenue, expenditures were the main motivation. [4]

Big Data today is providing thoughtful perception to student success, informing curriculum design, recommending shortest path to degree attainment and initialising interventions that have the motive to keep students on the right track. Big Data-informed strategies are able to transform results to the delight of stakeholders.

There's more to be learned from Big Data. Student success examples, there lies a lot of opportunities to authorise Big Data for improving the efficiencies and effectiveness of our institutions. The rapid progress in computational power, analytics, image processing, sensors ,data storage, systems integration tools, and advanced search capabilities among other key advances provide thoughtfulness into performance of system, process deadlocks, dependencies, and other user-based, event-based, and device-based data.[4]

Most IT systems produce huge log files of detailed data on events and user activities. However, most logging functions illuminate the severe events given that the logs are manually reviewed and less frequently correlated among different systems (e.g. servers, storage, applications, network).

Big Data technology allows to analyse in real time the log files concurrently ingested and alerting staff to IT situations across the enterprise. This improves IT staff efficiencies and effectiveness in resolving problems in an increasing complex networks, cloud and on premise services. Big Data helps in providing users by building profiles of applications used, information consumption, location data, and related security events and many more applications. [4]

Student utilization of services like libraries, activity centres, transportation, co-curricular events and computer laboratories among many others can be captured by beacons and can identify service utilization. Big Data can help institutions to identify which students are using these services, the frequency of usage, and their sentiments about the institution. This helps institution to gain insights into student behaviours and successful outcomes.

Big Data can be used to combine various business process workflows logs which will provide complete views of how business is accomplished on campus or how business goals are achieved. Combining CRM data with imaging system workflows, registration processes and other business triggers among disparate systems can provide how students naturally engage or navigate a myriad of often disjointed required activities.

Security logs, and unusual activity like phishing attacks resulting in logins from remote locations, last-minute direct deposit changes, or the absence of expected activity can be detected by Big data.[4]

The ability to process multiple log files in real time leads to early detection of problems and hence they can be resolved at early stage, thwarted cyber-attacks, reduced blame-games among system owners and stakeholders and improved performance and availability of systems like reduced DOS attacks.

Universities can use Big Data in number of ways for their advantage like by providing personalized feedback to students or like monitoring student satisfaction, increasing attainment, and to empower students by offering them ways to reflect on their own learning.

3. Big Data Tools

Tools that are being used collect data from various digital devices and applications that generate enormous data in the form of logs, text, voice, images, and video. In order to process these data, several researchers are coming up with new techniques that help better representation of the unstructured data, which makes sense in big data context to gain useful insights that may not have been envisioned earlier.[2]

Not only Structured Query Languages (NoSQL): Relational Database Management System (RDBMS) is the traditional method of managing structured data. RDBMS uses a relational database and schema for storage and retrieval of data. A Data warehouse is used to store and retrieve large datasets. Structured Query Language (SQL) is most commonly used database query language. The data is stored in a data warehouse using dimensional approach and normalized approach.
In dimensional approach, data are divided into fact table and dimension table which supports the fact table.

In normalized approach, data is divided into entities creating several tables in a relational database.

Due to ACID constraints large volume of data cannot be handled by Relational Database Management System (RDBMS). It is incapable of handling unstructured and semi-structured data and these limitations led to the concept of NoSQL.

NoSQL manages unstructured data and these databases are also known as “Schema free” databases, as these databases enables features like quick upgradation without table rewrites.[2]

In NoSQL data management and data storage functions are separate which allows scalability of data.
Examples of NoSQL databases are MongoDB, Dynamo.

HADOOP:
Hadoop is a framework that supports storage of large data sets. Hadoop is open source and works in distributed computing environment.

Hadoop Distributed File System (HDFS)
HDFS is the fault-tolerant, scalable, highly configurable distributed storage system for a Hadoop cluster. Data in the Hadoop cluster is broken down into pieces by HDFS and are distributed across different servers in the Hadoop cluster. A small chunk of the whole data set is stored on the server. [2]

Hadoop Map Reduce
Map Reduce is a software framework for distributed processing of vast amounts of data in a reliable, fault-tolerant manner.

The two distinct phases of Map Reduce are:
1) Map Phase: In Map phase, the task is divided into smaller sub-tasks. The tasks are assigned to Mapper, which processes each unit block of data to produce a sorted list based on Key- value pairs. The output of mapper is passed to the next phase and this process is known as shuffling.
2) Reduce: In Reduce phase, the input is analysed and merged to produce the final output which is written to the HDFS in the cluster.[2]

4. Purpose of Big Data

Cloud computing technology add a significance to the Big Data. This technology helps in improving the educational services like access to low-cost content or like online instructors.

As per west’s sayings “Big Data can support the classic educational system helping teachers to analyze what students know and what techniques are most effective for each pupil.” So this helps teachers to learn new techniques and methods about their education work [1].

Technologies such as Data mining and Data analytics provides a fast feedback about academic performance and activities to students and teachers. These methods provides a deep analysis of some education patterns. Also it useful in extracting valuable knowledge from them [1]. With these collective and big scale data is useful for predicting which student needs more help from the education system, and avoiding the danger of failure or drop out [1].

This results to find pedagogic approaches that are most effective for particular students those who needs more help [1].

On the other hand, as Siemens and Gasevic say “Big Data can easily find apply at online education.” As we can see, the online education has a very big development at recent years and has a very increasing impact of the education sector.

Furthermore digital learning is actually a collection of data and analytics which can contribute to teaching and learning. With this many students will participate in online or mobile learning, where the new data is crated [1].Also with the help of social networks, it is helpful to the students with the different background to correlate between them and help to understand course concepts [1].

5. Benefits of Big Data

The new types of data help researchers' ability to learn about learning and thus making education more personal and executive. All these data comes from online courses or other technology-based learning platforms. In this case the analytics from them can improve students' ability learning and guide them to more efficient results than the traditional education [1].

Big Data can provide opportunities for new learning experience for children and young adults. Students can share information with educational institutions in this way they can expand their knowledge and skills. Educational institutes and Universities will be able to help their future students and improve institutional effectiveness [1].

Big Data can be used in many ways in learning analytics:

1) Performance Prediction
Student's interaction with other teachers and students can be analysed to judge student's performance.

2) Attrition Risk Detection
Risk of students quitting the courses can be detected by analysing the student's behaviour and appropriate measures can be put in place to avoid the same.

3) Data Visualization
As data related to education grows in abundance, reports on them have become more complex. Data Visualization comes to the rescue. Visualization can be used to identify trends and the relative relation amongst the data by having a glance at the reports.
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4) Intelligent Feedback
Learning systems can provide intelligent and immediate feedback to students in response to their inputs which will improve student interaction and performance. Immediate feedback can be provided to the students by the Learning Systems which will be generated as a response to their inputs, leading to improved student interaction and subsequently their performance.

5) Course Recommendation
New courses can be introduced for the students depending on their area of interest which will be identified by analysing their activities. This would ensure that a student is only choosing the field that he has interest in.

6) Student skill estimation
Here, Estimation of the skills acquired by the student.

7) Behaviour Detection
Detection of student behaviours in community based activities or games that help in developing a student model is followed here.

And in other ways too like grouping and collaboration of student and social network analysis.[3]

6. Conclusion and Future Work

Big Data can really improve the Institutional Effectiveness and has the potential to change the traditional learning methods to new enhanced learning methods, giving a new shape to education system. With this maximum benefit can be acquired by students.

Also teachers can use the new tools and the new pedagogies which they were not having before. With these teachers can make their decisions more specific and can learn new learning methods.

The traditional difficulties that were faced will no longer exists and the new learning ways will be more efficient.

Teachers can identify the weak points of students and will help them with new pedagogic methods.

Lack of experience in Big Data science and Big Data Analytics and such there are difficulties will be there.

Teachers have to study the tools and also the students must have to accept the use of new tools.[1]

AI can be integrated in systems as a future work. As BigData has to be analysed manually AI can help to automate the process.

As AI is an evolving technology it can help in analysing the BigData and improve the analytics.

AI just need the input and then it will help in analysis of data by its classification techniques and thus there will be improved solutions as the new pedagogies and it will be beneficial to the teachers and students.

References

[1] https://www.ijcsi.org/papers/IJCSI-11-5-1-58-63.pdf
[2] https://arxiv.org/ftp/arxiv/papers/1705/1705.04928.pdf
[3] http://ictactjournals.in/paper/IJSC_V5_I4_paper6_1035_1049.pdf
[4] https://evolllution.com/technology/metrics/the-past-present-and-future-of-big-data-in-higher-ed/
[5] https://onlinelibrary.wiley.com/doi/full/10.1111/bjet.12230