Benefits and Impact of Big Data in future E-Learning Industry

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Abstract: E-learning is changing and we will witness new models, new technologies and designs that will emerge in future. May be the “e” from e-learning should be dropped and “e” shall be replaced with “Big D” calling big e-learning or may be (“Big D-Learning”). E-learning in today’s world is gaining lot of importance in educational and corporate sector. Future e-learning is dependent on emerging technologies and improved instructional design models. Big data has a prominent role in the future e-learning.

Keywords: Big data, e-learning, big data learning, future e-learning

I. WHAT IS BIG DATA IN E-LEARNING?

In e-learning, bigdata is the data that is created by learners while they are taking an e-learning course or training module. For example, if an employee is interacting with a training module centered on company policies, his/her progress, assessment results, social sharing, and any other data being produced during the e-learning course is “big data”. Data is collected by the “Learning Management System” (LMS) through e-learning Authoring Tool, social media, multimedia, etc, that have been set by the organization or the e-learning professionals.

In e-learning “big data” can be the volume of data itself and also the individual pieces of data that are being collected. This data can be analyzed by e-learning professionals to determine

- The way in which learner is acquiring information,
- The pace at which e-learning is made, and
- To know the problems that may exist in an e-learning strategy.

In the e-learning context, when the learner interacts with an e-learning course, his progress, passing scores, social sharing – all these bits of information combined together generate the ‘Big Data’.

All these data can be tracked through Learning Management Systems (LMSs) and other social networks. Some examples of big data in e-learning scenarios are

- 48 hours of video are uploaded on YouTube every minute, resulting in nearly 8 years of content every day,
- Zuckerberg noted that 1 billion pieces of content are shared via Facebook’s Open Graph daily.

II. BENEFITS OF BIG DATA IN E-LEARNING

There are several benefits of big data to e-learning professionals [1]. These benefits impact the future of e-learning and revolutionize the way of analyzing and assessing the e-learning.

1. Big data allows e-learning professionals to understand how the e-learners are learning and their demands of e-learning. For example, through big data, e-learning professionals will be able determine whether a reality-based scenario is more effective than a text-based problem solving activity.

2. Big data enables e-learning professionals to find out the areas that must be improved within an e-learning course or module. For example, if multiple learners are taking an excessive amount of time to finish a particular module, this probably means that the module need to be improved in order to make it more manageable for the learners.

3. Big data enables us to analyze which e-learning modules are most visited, which e-learning modules or social links are shared with other learners. For example, you can determine which link was shared via Facebook the most.
4. Data is received almost immediately, rather than having to wait for long periods of time to receive assessments. This means that e-learning professionals can begin implementing changes or utilizing the data to fine-tune their e-learning strategy right away.

5. Based upon patterns, e-learning professionals have the power to predict where learners may struggle or excel. This way, they can develop their e-learning courses so that learners get the chance to achieve the best possible results.

In the e-learning many interesting experiments are being carried out around the world, in order to understand the huge potential of Big Data.

Big data can help the e-learners in the following ways:

- The pages they revisit often
- The areas in which they get stuck
- The sections they recommend to their peers
- The learning styles they prefer
- The time of the day they learn better

Thus, coming to the benefits of Big Data again, it allows e-learning professionals to design highly custom-made e-learning courses that serve the needs of the learner in a particular location.

Big data also enables to figure out the best possible e-learning strategy. For example a company’s employees in a location X (may be an urban area) are finding it easy to learn while others in a location Y (may be a rural area) are finding it difficult. Thus, the learning strategies in these two locations should be changed so that people in both the locations can learn easily.

Big Data, due to its tracking feature, enables learning professionals to capture data on types of learners, their learning patterns, how they have performed in assessments and so on. Thus, with all this information in hand, it becomes easy for learning professionals to devise a scalable approach for an e-learning course based on all the data they have tracked.

In a nutshell, Big Data in e-learning will help us know the real behavior patterns of e-learners more effectively than traditional learning patterns. Such patterns will give highly valuable information on what and how they learn and thereby helping us make well-informed decisions about the learning programs and even identify design flaws. Big Data also helps us to forecast or predict scenarios and take preventive action. For example, with the help of Big Data, one can predict how strong e-learners are in every concept and where they are likely to struggle or fail.

Through big data we can predict learners’ performance and outcomes well before a training program commences. We can also forecast the trends and draw conclusions about our learning and development initiatives.

III. REVOLUTIONIZING E-LEARNING WITH BIG DATA

Big Data is revolutionizing the way e-learning is designed, developed and delivered [3]. A technological innovation in e-learning has opened the door for immense possibilities of making learning more effective. More personalized and adaptive learning programs can be designed for e-Learners.

Big Data has the potential to change [4] our approach to learning and development by challenging the most important beliefs and principles of learning design. It promises to help us push the limits of what we can achieve using present tracking standards. This new technological solution may even force us to redefine our traditional approaches to learning design including the processes, systems and procedures that we are presently following. Such possibilities were never even imagined or visualized earlier.

The following two e-learning sites can serve as an example where bigdata is being used to revolutionize the process of e-learning:

- [http://www.knewton.com/](http://www.knewton.com/) is helping learning companies and institutions around the world to improve student achievement.
- [http://www.civitaslearning.com](http://www.civitaslearning.com)is helping schools, colleges and universities improve success rates for both students and institutions.

Big Data has evolved not just to stay but help learning professionals build effective learning content for learners. It also enables organizations to generate better Return on Investment (ROI). Thus, the time has come to reap the benefits of this new technology to succeed in maintaining a steady growth and gaining a competitive advantage.

Big data and e-learning analytics are reshaping everything. Industry can use them to great effect, to better understand markets and educate customers, manage supply chains, and increased profits. In the field of medicine big data and e-learning can be utilized for better understanding of health care industry.

Using big data in e learning predictive learning of relationships between knowledge concepts and business
events can be done. Big data in e-learning is considered as a market opportunity[4] driven by market requirements.

IV. BIG DATA ANALYTICS

Big data in e-learning can be used for analysis and decision making. There are two main process involved in this namely data management and analytics [2][5] (Fig.1). Data management contains processes and supporting technologies to acquire, store, prepare and retrieve it for analysis. Analytics refers to techniques used to analyze and acquire intelligence from big data.

Big Data Management has three sub processes namely
- Acquisition & Recording
- Extraction, Cleansing and Annotation
- Integration, Aggregation & representation.

While Analytics comprises
- Modelling & Analysis
- Interpretation

![Big data Processes](image)

**Fig.1. Processes in Big Data Analytics**

Big data analytical techniques can be used for structured and unstructured data. Few techniques that represent a relevant subset of the tools available for big data analytics are:

**Text analytics**

Text analytics (text mining) denotes to techniques that extract information from textual data. Social network feeds, emails, blogs, online forums, survey responses, corporate documents, news, and call center logs are illustrations of textual data held by organizations. Text analytics include statistical analysis, computational linguistics, and machine learning. Text analytics support businesses to convert large volumes of human generated text into meaningful summaries, which support evidence-based decision-making.

**Audio analytics**

Audio analytics analyze and extract information from unstructured audio data. When applied to human spoken language, audio analytics is also referred to as speech analytics. Since these techniques have mostly been applied to spoken audio, the terms audio analytics and speech analytics are often used interchangeably. Presently, customer call centers and healthcare are the primary application areas of audio analytics.

**Video analytics**

Video analytics, also acknowledged as video content analysis (VCA), contains a variety of techniques to monitor, analyze, and extract meaningful information from video streams. Although video analytics is still in its infancy compared to other types of data mining various techniques have already been developed for processing real-time as well as pre-recorded videos. The increasing prevalence of closed-circuit television (CCTV) cameras and the booming popularity of video-sharing websites are the two leading contributors to the growth of computerized video analysis. An important challenge, nevertheless, is the sheer size of video data. To put this into perspective, one second of a high-definition video, in terms of size, is equivalent to over 2000 pages of text.

**Predictive analytics**

Predictive analytics encompass a variety of techniques that predict future outcomes based on historical and current data.

Predictive analytics can discover patterns and capture relationships in data. Predictive analytics techniques are subdivided into two groups. Some techniques, such as moving averages, attempt to discover the historical patterns in the outcome variable(s) and extrapolate them to the future. Others, such as linear regression, aim to capture the interdependencies between outcome variable(s) and explanatory variables, and exploit them to make predictions. Based on the underlying methodology, techniques can also be categorized into two groups: regression techniques (e.g., multinomial logit models) and machine learning techniques (e.g., neural networks). Another classification is based on the type of outcome variables: techniques such as linear regression address continuous outcome variables (e.g., sale price of houses), while others such as Random Forests are applied to discrete outcome variables (e.g., credit status).

Predictive analytics techniques are mainly based on statistical methods. Several factors call for developing new statistical methods for big data. First, conventional statistical methods are rooted in statistical significance: a small sample is obtained from the population and the result is compared with chance to examine the significance of a particular relationship. The conclusion is then generalized to the entire population. In contrast, big data samples are massive and represent the majority of, if not the entire, population. As a result, the notion of statistical significance is not that relevant to big data. Secondly, in terms of computational efficiency, many conventional methods for small samples do not scale up to big data. The third factor corresponds to the distinctive features inherent in big data: heterogeneity, noise accumulation, spurious correlations, and incidental endogeneity.

Even though major novelties in analytical techniques for big data have not yet taken place, one anticipates the emergence of such novel analytics in the near future. For example, real-time
analytics will likely become a prolific field of research because of the growth in location-aware social media and mobile apps. Since big data are noisy, highly interrelated, and unreliable, it will likely lead to the development of statistical techniques more readily apt for mining big data while remaining sensitive to the unique characteristics. Going beyond samples, additional valuable insights could be obtained from the massive volumes of less ‘trustworthy’ data.

V. CONCLUSION

Big data will Impact the future of e-learning. Offering invaluable feedback, allowing e-learning professionals to design more personalized e-learning courses, targeting effective e-learning strategies and e-learning goals, and tracking learner patterns and expanding our understanding of the e-learning process.

There are several benefits of Big Data in the context of e-learning. Big Data in e-learning helps e-learning designers make learning highly effective and also ensuring better Return-on-Investment (ROI). Companies can use Big Data to drive their business decisions and can succeed in maintaining a high competitive advantage over others.

Big data and e-learning are ubiquitous. In future we'll have more and more e-learning centers which will use tools made especially for big data analytics to analyze the user-generated information and deliver meaningful and valuable conclusions about user performance or course content optimization. Big data analytics will help e-learning providers to better understand the learning process by tracking learner and group patterns and performing a thorough feedback analysis. E-Learning providers will be able to offer full course personalization and compile a comprehensive ROI report for learning. Big data in e-learning will have an important and impressive role in the coming generations.

REFERENCES


AUTHORS BIOGRAPHY

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