

# The Relation between Big Data Technology and E-Learning

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**Abstract**— Big Data has been an emerging topic especially when it is considerably linked with E-learning. In today's era, most of the people are interested in fetching major part of the information like to buy or sell (i.e. e-commerce transactions), are all performed through cloud which is the other name of internet. People are learning and even developing new sources of information and income through e-learning. But the problem is that web has a humongous amount of structured and even un-structured data which can be given a systematic presentation in E-learning and users may get maximum information through interfaces.

This signifies the reason that this literature may boost the upcoming learning techniques and technologies when we combine the benefits of Big Data to increase velocity and volume of E-learning and all its types. E-learning needs different sources to extract insights. And through this study help can be taken that how, the complex nature of Big Data can be taken a benefit of with using it in all different modes of E-learning and can promote the usage though many institutes are unaware of the usage of Big Data. A further research can also be conducted in which learning analytics can be extracted with the help of Big Data information in this study and new research in Artificial Intelligence and easy learning can be promoted through this study.

**Keywords**—Big Data; e-learning; technology

## I. BIG DATA

With the large amount of data available to society as well as the scientists, it is believed that we have now entered into the fourth paradigm of development (Harris 2012). Big Data is creating a new world for every sector and industry. It is replacing the IT sector which was created by companies like IBM and other ancient ones and has now widened the network that travels in clouds (Needham 2013, Laudon and Laudon 2011). Various companies like Yahoo, Hadoop etc. have been providing their services in this area of analyzability (Needham 2013, Mayer-Schönberger and Cukier 2013). Even IBM has built new learning Big Data associated platforms for NASA and has been influencing the new innovations and inventions of the world (Needham 2013). It is the blessing of technology that people have access to variety of knowledge elements and they do not have to put much effort on maintains them as well.

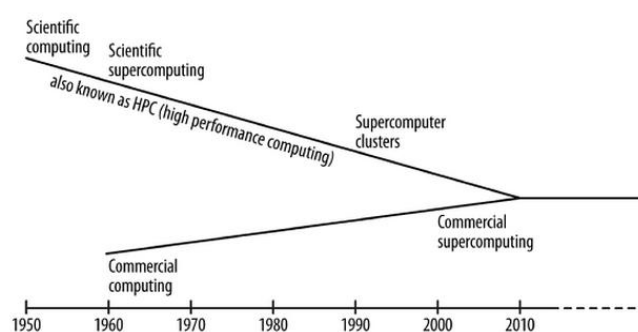


Fig. 1. Source: (Disruptive Possibilities: How Big Data Changes Everything, 2013)

This figure shows that how in every age the virtual existence of data did shift from being just in super computers to commercial usage and now from clusters to commercial supercomputing (Needham 2013). Anyone with an access can approach or sort the meaningful data (Laudon and Laudon 2011).

### A. Comparison of Big Data and Traditional analysis

In Traditional way of analyzing data, the information was extracted from set of sequential data and then were used to prove a hypothesis which was based on a static form, and then the reports were used for better internal decision making or decision support systems (Disruptive Possibilities: How Big Data Changes Everything 2013). This shows that the level of execution of such data was on a very small-scale.

In Appendix 1, traditional data writing was time consuming and mostly an individual had to invest his or her time to complete a file and then the data had to be clustered. Whereas through Big Data, the information is created by entries made in parallel by people sitting on distant locations and that data is easily extracted as the way it is expected to be.

### B. Functions of Big Data

When a Big Data is processed, it does not mean that it always remains as one. It is seldom, and is distributed into smaller packs which are extracted by matching the statement or query made by the user in any case. Big data storage locations act as big data repositories, from where the results are fetched (Berman 2013). As written earlier, that Big Data has data sets which are unstructured in form, but it is important for researchers and learners to give a structure

to the unstructured sets of data (Berman 2013). To analyze this data, incremental steps are used so that the extracted data is most relevant.

An example of this can be taken from the restaurant locator applications which most of us use, and so, may easily order food by just sitting in our home (Berman 2013). This seems to be as one of the Artificial intelligence techniques as it displays all the relevant alternates available by judging the need of the customers. Another example is Google Maps that we use. We just write a house number then street number and in seconds we find the relevant data on screen which shows, how fast, quick, and easy the world seems with the use of data which is in cloud (Berman 2013). The three main functions (See Appendix 2) which any software fulfills while analyzing big data is (Berman 2013):

- Preparing; gathering or collecting data into specific clusters;
- Sharing; resources being shared on certain obligations to be filled on protocols;
- Analyzing complexity; analyzing the linkages and web.

## II. THE MAJOR PURPOSE OF STUDYING BIG DATA

The major purpose, which leads various institutes, and firms to study big data, was to cluster them into sets of information, and form a system which has various security options available (Harris 2012). This also means that we should involve hierarchy in distributing data and so that would not remain as big as it is thought to be. Here comes contradict, which also is important for our field and problem statement that, is e-learning that safe for students or any individual? Can it be rather categorized as a mode of hypnotism for the people who do not dig in for real evidences.

About in 1957, data repositories from various “World Data Centers” were taken by IGY (Harris 2012). These data centers rejuvenated the data and now we can have a look on the gaining capacities of these centers (Georgiev, Georgieva and Smrikarov 2004, Harris 2012).

## III. THE NEED OF BIG DATA

### A. Ubiquity in data

Due to this factor which has been added to the data with the advancements in science, mathematics, engineering and new technology (i.e. STEM), now people have started using data, or one can be said as manipulating data from the population to make it usable for new reasons (Liebowitz 2013, Georgiev, Georgieva and Smrikarov 2004).

- Info Lab by AT&T

This concept of E-learning has been used in offices and a lab has been created to study the information that has an access on through this lab (Liebowitz 2013).

### B. Data mining

These Big data practices were also observed to be progressive by various studies done in 2009 and now, Educational systems have been flung into new dimensions

which have created a differentiated report generation and analytics as well for no matter how big a university is, a sequence and simplified manner has been observed to be growing (Baker and Yacef 2009).

- Knowledge Discovery

Databases were managed and so are being done now by the use of Big Data which is in one way or so related to cloud computing as well in this study and together these tools have promoted new knowledge discoveries and are also have driven E-learning (Baker and Yacef 2009, Perera, et al. 2009).

## IV. HELP FROM CLOUD COMPUTING

It is not possible that while discussing Big Data and E-learning, we do not discuss cloud computing which can be characterized as the result of these to technological aspects. Cloud computing is managing the databases, or storing the data which is situated on a distant place, and is space which helps companies save time and money (Sultan 2009). This is important to be implemented because not all companies, who have a vast network, and need data to be distinctively, and actively to be available on cloud, can manage a healthy position (Baun, et al. 2011). It becomes highly expensive to keep all data on one place or to even manage the historical researches and so many major companies have now started seeking help from other companies.

## V. THE INTERNAL VALUE OF DATA

The story of big data is an existence created by a failure. In late early 80's, a person failed the opportunity of getting a ticket on lower rate and hence was forced to bring on idea which gave the existence to the concept “Big Data” (Mayer-Schönberger and Cukier 2013, Davenport 2014).

## VI. THE FOUR V'S OF BIG DATA

Velocity, Volume, variety and variability, make a combination that defines it, i.e. the big data (Akerkar 2013). “ A great amount of data enters as a volume on the cloud, then through the maintenance of a certain velocity, this data is accessed, processed and then preserved on their respective locations, and then is the data structure and the compatibility of the data being stored, and so, is the variability of the data” (Akerkar 2013). How and where the data has to be stored or requires to be stored in is the major problem which the analysts have to deal in (Akerkar 2013). By combining all these things together, data becomes complex and hard to interpret without using any useful software which presents the data in the best forms for electronic or we can say as educational learning. Global data related to research has been infrastructure on the internet and has been made to be used daily.

## VII. WHAT IS E- LEARNING

Physical spaces are being avoided. It is not essential for us to be in the same place and so, places can be online. Electronic learning means to learn and educate people through electronic environment. This field becomes very vast and makes the learner to explore various things, due to the fact that data on the web is not easily countable when we write a single word. Even on private networks, people have managed to keep various sets of data and this may also

cause ambiguity to the people searching for a particular section n (Galusha 1997, Bates 2001).

### VIII. TYPES OF LEARNING WITH TECHNOLOGY

There are three types of learning, which are formed by the existence of technology, and are known as Distant Learning, Education Learning and Mobile Learning (Georgiev, Georgieva and Smrikarov 2004).

All three are linked with each other and are forming a sphere as shown in Fig. 2.

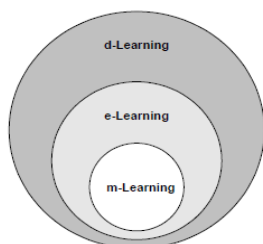


Fig. 2. Source: (Georgiev, Georgieva and Smrikarov 2004)

- M- Learning

This is the new mode of communication and technology which has brought a new change to the abilities of the e-learning. This has made things faster. According to the results concluded in the proceedings, the mobile- learning is till now having more disadvantages but it may progress later on (Georgiev, Georgieva and Smrikarov 2004, Jamalipour 2003). Examples of mobile learning devices which are creating a new path for the learners are tablet PC, PDA, and other cellular (see Appendix 3)

This learning is helping students a lot but has a major hurdle which does not support it to be linked with distant learning and that is the conversion and downloading of files (Pablos, Zhao and Tennyson 2011).

- D-Learning

Distant Learning is a technique which is being used by educational institutes and also by research firms at most. Various tools like, digital dashboards, video conferences and all other media tools, which can be used by electronic learning, are used in this type of learning (Pablos, Zhao and Tennyson 2011). This has benefits for those people who have disabilities and cannot interpret or take ideas as fast as normal humans. Many students have been benefitted from this as this also provides flexibility in timing for students and teachers (Pablos, Zhao and Tennyson 2011).

Many universities are running on this concept and also own their own channels where they keep on repeating lectures, which helps slow movers to be more active and learn more as well (Pablos, Zhao and Tennyson 2011). Furthermore, it also has a direct relation with Big Data. By using this technology and concept of distant learning, many new universities have been opened which work virtually, are funded by public and are also known as “Open Universities” (A. Bates 2005).

### IX. ISSUES IN USING BIG DATA FOR E-LEARNING

#### A. Societal issues

Whatever work is implemented or forecasted to be a part of future practices, is highly influenced by the society, culture and politics of the region (Berman 2013). This is because we can say that we can search anything but there are many places where they do not have an access to the whole data. Also, there are many archives of scientists which cannot be accessed by a common man (Berman 2013, A. Bates 2005, Mayer-Schönberger and Cukier 2013). This is for the reason that there are various cost issues as well as perceived risks which may not allow private sources to make their archives assessable to everyone (Berman 2013). However, yes there is an issue which says, that public is not given rights to keep their data away from scientists.

#### B. Blog Clusters

Daily millions of blogs are maintained and posted with solutions which indeed help students or even teachers to be fast in understanding things, but this also slows down their own capabilities (Berman 2013). According to Berman (2013), clusters of keywords help learners to sort a topic and extract relevant information as shown in the table. This shows that the work of a learner is shortened and no one has to strive for getting the information they want.

### X. WHEN IT COMES TO BOTH, E-LEARNING AND BIG DATA

In the later paragraphs, I discussed that, e-learning can also give a member of the society, and most commonly a student; a wrong direction. One of the biggest examples is “Wikipedia”, which most of the students consult to give a push to their learning process and end up into having a wrong direction to their study (Harris 2012).

### XI. E-LEARNING IN EDUCATIONAL SECTOR

In educational sector, Institutes, try to mine out the data which is categorized or can be viewed from different angles. Through Big Data mining, educational institutes are able to manage the user data as well as the better record keeping of the students and also letting the different departments of an organization to study how each student can benefit to any entity (Akerkar 2013, Baker and Yacef 2009).

These evaluations may include<sup>1</sup> (Akerkar 2013):

- Accurately assessing student’s knowledge;
- Understanding the types of students present in an educational industry;
- The genuine learning problems they face;
- Customizing education, so that students understand the actual concepts;
- Making computational models and resources

Furthermore, some issues may occur and in which students may sue the institution for being personal on their

<sup>1</sup> This is the institutional point of view, to understand educational perspectives.

private life. This can not only complex educational system but can also harden or make a student go under certain complexes. Record keeping is beneficial to some extent. This removes the opacity and uncertainty that teachers have to some extent (Hildebrandt and K.Vries 2013).

#### A. Student Portals

Universities have managed to maintain portals where students can add data and also get lecture notes or relevant access to various scholarly libraries and in this way, privacy is maintained or is tried to be maintained by the users of the external data (Anttonen, Onnelo and Terho 2006, Hildebrandt and K.Vries 2013). Students can obtain any content that is required for their daily and weekly assigned assignments, submit, learn and even compare various scholars in this way.

### XII. HOW DOES BIG DATA HELP E-LEARNING

There isn't only a reason that supports the involvement of big data with E-learning, but is various benefits which an individual may use to learn. To learn not only means to educate himself, but to also learn clusters, such as for politicians, to learn who will vote for them, or for a celebrity to learn how much he is popular, or even to learn how much a quote is famous on the internet among the people (Einav and Levin 2013). Various services are being offered on the basis of these analyses like Apple Co. knows what to offer next to their prospective customers (Einav and Levin 2013). Predictive modeling is another aspect which is used by all major monopolistic organizations to understand how they can enhance or target or plan an action for the benefit of their business (Einav and Levin 2013).

#### A. Decision Making

In the figure shown in Appendix 4, stages of Data only 12 per cent of the businesses are using big data to make decisions for betterment. This shows that people still do not have faith on machine learning when it comes to investments and complex decision making as they still do not believe in the fact that they may learn in a better way if they invest on certain software.

Most of analysts also believe that people have now been given a new world through which they can learn things in just a pinch in time and save their resources. The biggest two examples of concern are Google and Facebook, where people learn, what is happening around the world, or they learn how they can save their time (Lohr 2012).

Though Big Data has problems of complexities, heterogeneity, scale and timeliness, but still Google alone had managed to contribute around 54 billion dollars in the 2009 economy of US (Lohr 2012, Agrawal, et al. 2011-2012).

- Example of Mark-Logic

Mark-Logic is a case which is an example of how e-learning can make the best use of operational data which is in structured form or even unstructured (Tozman 2012). This solution meets the security requirements made by government, is dependable on the real-time performance of the system, it gives a beat to all its competitors by having an edge on them as it unifies all the significant qualities which are required by big data analysis (Tozman 2012). These are

singles software and are many others who help in fulfilling such qualities which match the requirements of the real-time data.

#### B. Instance-Based learning

Big data when related to e-learning, forms an instance based artificial intelligence runway, in which the learners do not have to strive and instantly fetch information and also share their knowledge on websites and various discussion forums (Russell 2003). This can also be regarded as memory based learning, although in this we can save the document on any handheld device.

### XIII. CONCLUSION

Learning is made easy by using these online resources, and like ancient times, people do not have to keep all the books, and can even learn any language or translate it in any way by only a single click. When these two technologies are combined, they form a set of "Artificial Intelligence" for the learner as well (Russell, 2003). This is the main area where this study can be used in by proving the fact that these two technologies have led to AI. We can also study that by combining these two ideas, people have stopped using their personal data set that is processing with our own mind, but instead are using artificial minds.

Here are some key points which were considered in the whole study and are as:

- Not all societies have the proper access to all E-learning websites, which makes it useless for majority user (Berman, 2013);
- Uniqueness and value of skills has depreciated (Berman, 2013);
- Convenience in shopping and purchase of any travelling ticket has been given a boost (Mayer-Schönberger & Cukier, 2013);
- Value of a single data piece has been increased;
- And large volume of data is approached in small velocity.

What benefits us is that now many organizations are triggering e-learning by daily events and making their employees learn with the help of maintenance of logs and registers, and are using Big Data, along with cloud to promote E-learning on secure channel (Baker & Yacef, 2009). This shows that learning at every level is helpful and also makes it possible that companies and institutions do not make a certain mistake again and this "Big Data Learning", can store all the relevant information and benefit the economy by the end (Anttonen, Onnelo, & Terho, 2006).

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Appendices

Appendix 1

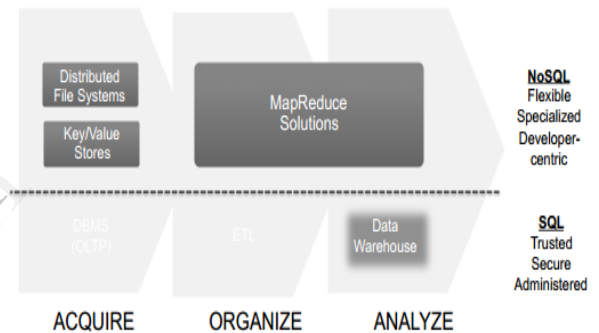
Table:

Big data and traditional analytics

	Big data	Traditional analytics
Type of data	Unstructured formats	Formatted in rows and columns
Volume of data	100 terabytes to petabytes	Tens of terabytes or less
Flow of data	Constant flow of data	Static pool of data
Analysis methods	Machine learning	Hypothesis-based
Primary purpose	Data-based products	Internal decision support and services

Source: (Disruptive Possibilities: How Big Data Changes Everything 2013)

Appendix 2



Source: (Principles of Big Data: Preparing, Sharing, and Analyzing Complex Information 2013)

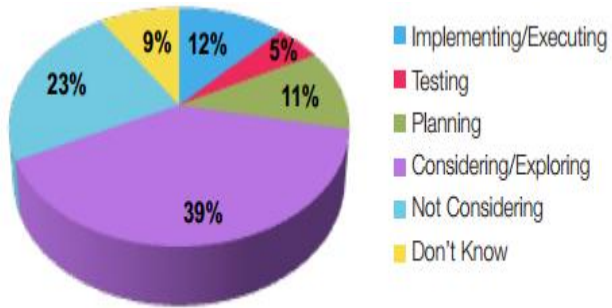
Appendix 3

Parameters	NoteBook	Tablet PC	PDA	Cellular phone	Smart Phone
Price	2000 €	1500 €	750 €	300 €	700 €
Weight	3 kg	1,5 kg	0,150 kg	0,100 kg	0,200 kg
Screen resolution	Over 1024x768 pixels	Over 1024x768 pixels	240x320 pixels	120x160 pixels	200x300 pixels
Memory	256 MB	256 MB	64 MB	300 memories	8 MB
Power capacity	3 h	4 h	8 h	10 h	10 h
Communication technology	IrDA, Wi-Fi, Bluetooth	IrDA, Wi-Fi, Bluetooth	IrDA, Wi-Fi, Bluetooth	WAP, GPRS, Bluetooth	GPRS, IrDA, Bluetooth

Source: (Georgiev, Georgieva and Smrikarov 2004).

Appendix 4

Stages of Big Data



Source: (SAS 2012)

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