

# IOT And Big Data Analytics In E-Learning: A Technological Perspective and Review

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## Abstract

The internet of things & Big data analytics in eLearning brings tremendous challenges & opportunities to educational institutions & students. In recent trends, the growth of Pervasive computing, Social media, evolving IoT capabilities, technologies such as cloud computing, and big data and analytics are improving the core values of teaching and conducting research but also instilling a new digital culture and developing an IoT-centric society. The primary purpose of this paper is to provide an impact of IoT & Big data analytics in the area of E-learning and study on different E-learning approaches.

**Keywords :** *Internet of things(IoT), Big data analytics, Pervasive computing , E-Learning.*

## 1. Introduction

E-Learning focuses on usage of technology in the field of education and learning. E learning provides an enabling platform by virtual classrooms of which the learners can upgrade their knowledge without traditional learning methodologies.

In the current scenario, the rapid growth of information and communication technology has led to the alphabet “e” becoming the symbol of this latest age of information technology. The alphabet “e” is used as abbreviation for electronics. Thus, words prefixed with “e” are currently emerging in every second field, like e- learning, e-health, e- business, e-government and many more. The world is being dominated by globalization, networking and information technology has reached its peak, e-learning plays a vital role in the field of education [1].

Social media in eLearning also plays a major role for learner centric. Now a day’s many of them rely on social media to promote courses information, training programs, learning materials & to enrol new courses. The most popularly used to promote are YouTube, LinkedIn, Twitter, Facebook & Google plus. The below statistic shows the number of social media internet users in india [37].

## 2. Definitions

### A. Big Data

“Big Data” means enormous volumes of data. The data can be divided as structured data and unstructured data. Various methods are applied to collect these data. These data can be analysed and designed in such a way to fit the institution or e-Learning professionals. With the availability of data, opportunity can be

created to determine how the e-learner can acquire various information for problems that may exist. Advanced computing technologies and with other technical tools the data can be tailored for specific usage which benefits the requirement. Big data are used for studying the trends of the industry, user behaviour pattern by applying logical association within data set. Both big data and analytics play a vital role which impacts E-Learning [2].

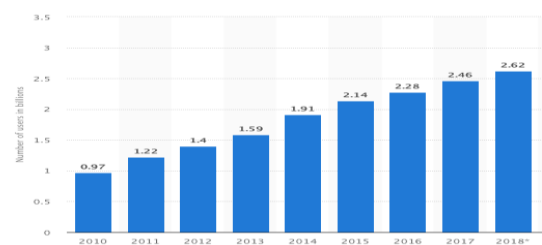


Fig 1: Incremental growth of Internet users

### B. Internet of things

IoT influences education in many ways. It is this asset intelligence that enables institutions to make more informed decisions in an effort to improve student learning experiences, operational efficiency and campus security. It is this asset intelligence that enables institutions to make more informed decisions in an effort to improve student learning experiences, operational efficiency and campus security and many more [3].

### C. Pervasive computing

Pervasive computing, also called ubiquitous computing, Ubiquitous computing leads to ubiquitous learning. Technology

provides abundant opportunities for sharing information, constructing knowledge and stimulating personal growth. The term ubiquitous learning means that we are going to change the “culture of learning”, that we are being continually surrounded by and absorbed in learning experiences. Handhelds can be used anywhere inside an educational institution or outside. Handhelds can provide access to computing at the places where students’ activities and learning occur [4].

### 3. E-Learning through Cloud computing, IoT, Big data analytics

This section presents literature survey on ELearning process. Many learning methods are introduced in Education system like self-learning, learning through cloud computing, Lifelong learning environment, virtual E-Learning, Ubiquitous learning, Mobile learning, IoT based learning. We also presented feasibility study and security. Table 1 summarizes the detailed literature Survey of E-Learning approach.

**Table 1:** Literature Survey on E-Learning

Sl.no	Analysis	Approach
1.	Self-learning [9]	Bayesian framework algorithm which supports autonomous learning
2.	Security and Privacy[10]	Review and classification
3.	Applications [11]	IoT potentials to transform education and to improve student performance.
4.	Cloud Computing [12]	Heterogeneous e-learning components through IaaS, PaaS and SaaS cloud service models.
5.	Internet of Things (IoT)[13][36]	Implementation, research challenges and open problems .
6.	A Feasibility Study on Developing IoT/M2M [14]	Created a suitable IoT/M2M curriculum for our students.
7.	A comprehensive study of parameters [15]	The impact of several parameters of the physical environment in a classroom
8.	Ubiquitous Teaching and Learning System [16]	Personalised Ubiquitous eTeaching & eLearning (UTiLearn) framework.
9.	Lifelong learning environment [17]	Established learning analytics
10.	E-learning based on crowdsourcing [18]	Described a prototype
11.	Task-Based Language Learning [19]	Investigation of using wearable and Internet-of-Things (IoT) technologies .
12.	Big Data Analysis [20]	Introduced a framework for traditional e- learning systems
13.	ETesting - Virtual eLearning Space [21]	Presented a architecture of an eTesting system
14.	Knowledge Networks in the Cloud [22]	“learning about how to learn to learn”: MOOCs..
15.	Individualized Learning Activities [23]	Proposed an integrated adaptive framework .
16.	Cloud E-learning [24]	Usage of cloud computing in holistic
17.	Learning internet of things[25]	Presented a model based on a web-service oriented cloud platform.
18.	Mobile Learning [26]	Review of the framework on mobile learning.
19.	IoT as educational tool [27]	Integrated development to lead to a websockets-supported system.
20.	Future Internet of Things [28]	Described about the teaching methodology
21.	Teaching and experimental research [29]	Featuring network interfaces: from the hardware perspective & software perspective
22.	Fog Computing and Big Data Streams [30]	Proposed big stream and fog-based educational framework.
23.	Secure integration of IoT and Cloud Computing [31]	Survey on security challenges
24.	Robots for Teaching [32]	Introduced a framework of methodology for robotics-oriented teaching .
25.	Adaptive Learning[34]	Highlights a number of theoretical and technical issues.
26.	Collaborative Learning [36]	Demonstrated the implementation of project-based learning.

### 4. IoT & Big Data Analytics in E-learning:

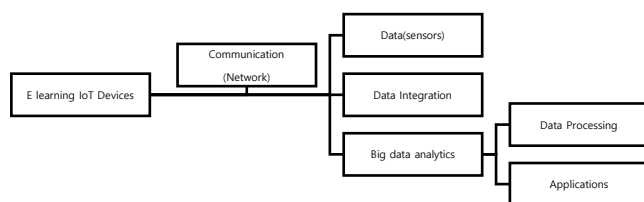
The Internet of Things & Big data analytics is changing everything, and eLearning is no exception. It is this asset intelligence that enables eLearning Professionals to customize the eLearning experience to provide learners with more informative, engaging, and engaging eLearning courses.



**Fig 2:** Analytics & IoT Centric E-Learning

The main objective is to achieve optimized ELearning platform for learners & professionals. The Analytics & IoT centric system for e-learning includes the platform devices, Big data analytics management and the supporting software and tools. The network

infrastructure includes of ELearning Virtual database, Visualization technique, distributed resources and a high-speed network. The main components of e-learning platform are Big Data Analytics application platform and IoT infrastructure of network. The IoT Centric management aspect involves managing the online courses, Modules, the resources and the process of learning. Some of the supporting tools and software to perform Big Data analytics for processing data related to Instructor requirements. This also helps to assess the platform in different fields. The IoT on the smart devices is about the data. The data generated from IoT sensors are communicated through network and the integrated data are analysed through big data analytics as represented in IoT and Big data functional view in ELearning [8]. This new trend influences E-learning in Six ways [5][6].



**Fig 3:** IoT and Big data analytics Functional View

#### **A. Learners Will Utilize Content Distinctly & Analyses Feedback.**

In future, most of the learners and course providers will prefer for video tutorials and need to optimize for mobile. Video is easily integrated into small IoT-enabled devices and can be more effective than the written word, so eLearning students and professionals will have to change the way they deliver content. The advantage of video-based learning is easy to create & upload, distribution is easy over the network & cost-effective. Big data analytics offers online surveys and feedback regarding the effectiveness of eLearning courses and can assess the learners where need to be improved.

#### **B. The Flexible Design For E-Learning Courses Will Survive and Thrive**

Big data analytics in ELearning courses gives the opportunity for professionals to analyse how the learners are gaining information and can predict which works best for them in terms of content and delivery helps in designing high quality modules to meet the individual needs of the learner. The Flexible design helps to succeed in this ever-evolving digital landscape.

#### **C. Refinement of Testing & Tracking Learner Patterns**

With internet access instructors test students in portal this will change the pattern of question-and-answer exams to research-based projects. Rather than answering multiple choice questions with the IoT centric system students will have to use the internet to spot answers. As an eLearning professional, this will be the best way to Assess your students. With the use of big data analytics, eLearning instructors can track how the learner performed on a test

or challenge throughout the entire eLearning module, from start to finish.

#### **D. Expectations & Estimating of the ELearning system will change.**

The IoT and Big data analytics will change the expectations of the people, this system will become the new model to access the information. As eLearning professionals, it's essential design the course more interactive and convenient to attract students when introducing any new course to stand out unique from other courses. Big data analytics gives us a chance by learning analytics and academic analytics to analyse how the learners are responding to the courses provided by us. We can also estimate the efficiency of which course delivery method made students to grasp information. This information can then be worn to take our eLearning design to the next level.

#### **E. Targeting Effective ELearning Strategies will lead in new jobs and reaches goals.**

ELearning professionals need to focus on introducing new curricula for learners with the rise of development of IoT centric & Big data analytics in education sector. This change in advance learning will offer new career opportunities for students in recent trends. Big data analytics analyses which eLearning strategies are working and gives which strategies aren't helpful in terms of eLearning goal achievement.

#### **F. IoT And Analytics will achieve global job competence.**

E-Learning in IoT is a network enabled transfer of knowledge which is allowing learners to get close together by connecting everyone to the web through virtual classrooms. In future jobs will become more competitive, learners need specific skills to survive. ELearning professionals with the big data analytics may help their students in incorporating different learning materials to make them industry ready in competitive career fields.

## **5. Conclusion**

E-learning is the globalization of education system. Due to advancement in technology, it's incredible to imagine where the world will be after another 20 years. Application of IOT & big data analytics in eLearning will achieve the revolutionary development. This combination also reshapes customized learning environments to the learners, can reduce failures and it's a conquest situation for both the eLearning professionals and the learners.

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