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## Smart Learning- Role of IoT in Modern Education Systems

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### Abstract

In today's generation internet plays a vital role both in learning and teaching. IoT is the new era of computing Technology. It is an ecosystem of connected physical objects that are able to accessible through internet.IoT can change the educational system into a better understanding way.IoT is used in institutions to enhance learning outcomes by providing more affluent learning experiences, , and gaining real-time experience to improved operational efficiency actionable insight into student performance. By IoT in higher education its potentially increases benefits and reducing the risks involved in it. Without human assist the IoT can facilitates the devices/objects to identify and understand the situation. These devices/objects can represent themselves digitally and these devices can be to control from anywhere and anytime. The new wave of changes has started from IoT.It gives massive volume of connectivity. The Internet of things expected to give strong impact on various areas of life including healthcare, Entertainment, education, Business, Smart Home, Smart Campus and Smart City etc.IoT not only expected to give great impact but also expected to give new opportunities and possibilities for the improvement on the various area. The collaboration between the people and Technology are very power full. This paper provides the future of IoT in the higher education during the next few decades, which can be offered by a number of research organizations and enterprises. On the other hand, IoT brings tremendous challenges in higher education. Hence, this paper presents the importance and challenges of IoT in higher education.

**Keywords:** Internet of Things, enhanced learning, tremendous challenges, affluent

## 1. Introduction

The Internet and its associated services and applications have strongly developed and influenced communication, it gathers information and marketing across the world via websites, blogs, e-mail and social networks. The changes in education has been registered major, especially since 2000, towards a new orientation of teenagers' in education, reflected through online documentation, and implementation of projects in virtual teams, and in online tutorials and much more. In 1999, there emerged a new term in the field, Internet of Things (IoT). The interaction between objects, people, internet and environment is called as "IoT". We live in 21st century where the Information and communication Technology (ICT) cannot detach from human. The ICT plays a vital role in current education system. With the support of IoT education system can enhance the learning process. With the help of IoT can bring the live classroom, where student can observe, understand and interact easily. The impact of ICT has changed the traditional education system towards significantly improved modern and quality education systems at various levels of learning. IOT has become the most essential thing in every human's life. The main concept of connected devices or things has given a new version to Internet, that it anything, anywhere can get connected with the Internet and becomes 'Smart.' Connected devices can communicate with each other and share information which can then further be processed to take some decisions. According to Mark Weiser, "The most profound technologies are those that disappear. They weave themselves into the fabric of everyday life until they are indistinguishable from it" [1]. Kevin Ashton was the first to use the term Internet of Things in 1999. Early the beginning of Internet of Things (IoT) many researchers have tried to define IoT in various ways like Internet of Everything, Internet of Anything, Internet of People, Internet of Signs, Internet of Services, Internet of Data or Internet of Processes [2]. According to [3], IoT represents 'anything at all, depending on requirements.' Cisco defines IoT as a network of connected physical objects. Cisco also uses the term Internet of Everything for both physical and virtual objects. Cisco states that "IoE brings together people, process, data, and things to make networked connections more relevant and valuable than ever before—turning information into actions that create new capabilities, richer experiences, and unprecedented economic opportunities for businesses, individuals, and countries."

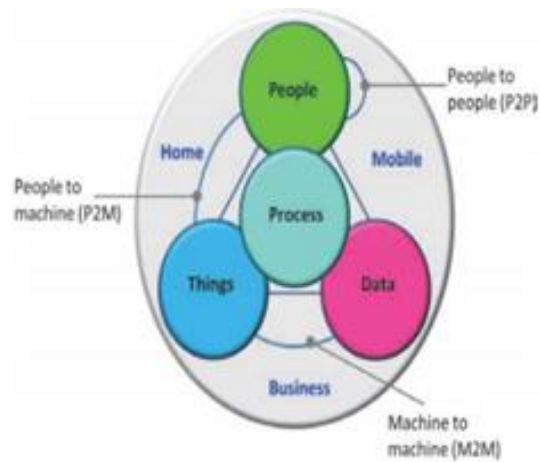


Fig:1 Internet of everything

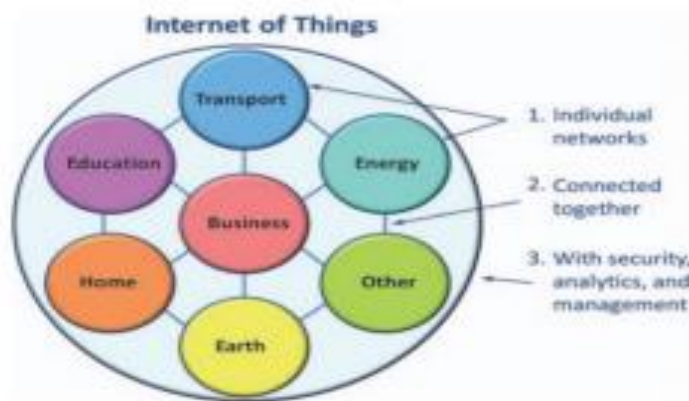


Fig:2 Using internet in all different sectors

According to Gartner's forecast, 20.8 billion new things will be connected by 2020. According to Machine Research, the growth of IoT connections is : from 6 billion in 2015 to 27 billion in 2025. The number of cellular IoT connections will be 2.2 billion, and 45% of these will be in connected cars. The revenue forecast of IoT in 2025 is 3 trillion US\$. IoT will also generate over two zettabytes of data, generally from consumer electronic devices.



Fig: 3 Five predictions of IOT till 2025

## Previous Studies

**2.1 The Traditional Education:** Traditional classroom education has been around for decades and almost all members of society, and for many centuries using it. Class room education continues to be an important way of learning, and there are many benefits that accompany this method of education. In a traditional education, students are able to interact with their teachers and personally.

### Online Education:

The results of this study indicated that the participants were aware of the facilities of using e-books and they were content with the facilities of usage. The main resource of multiplying education is the teachers therefore; the teachers should build a relationship with technology and should use it in a sufficient level in their current and future classes. Moreover, each teacher should follow technology and apply it in their course. Therefore, the design of the digital electronic book is prepared to be adaptive for this generation of students because in general, they are digital readers.

## 2. Objective of the study

The objective of this study is derived as below,

- To study the need of IoT in Education.
- To know the Technology enhanced learning
- To understand the Internet of Things

- Advantages of IoT in Modern Education

### **3. Research Methodology**

This research was carried out based on the secondary data and the data. The data used for this research is descriptive and qualitative from secondary sources. This data has been filtered and analyzed in a structured analytical format. Since the topic is evolutionary and is subject to fast changes, only the qualitative data updated from time to time is used. The main source of data collection is wiki, websites, blogs, YouTube, books, articles and journals.

#### **2.1 To study the need of IoT in Education.**

##### **Individualization**

The Student can more and inside based on the interest with personalized learning pattern and this will lead much more opportunity to learn with complete understanding the subject.

- **Smart Campus using IoT**

In general now a day's all universities, colleges and schools are connected with internet of things. The concept of smart campus involves with the intellectual environment equipped with fully sophisticated and installed with advanced technology smart things and aids. The smart classroom occupied with the set of smart things such as LCD Projector, Microphone, Speaker, cameras, smart board / Interactive board, Visualizer, Virtual classroom, Google Classroom which can be used for the ICT based enabled learning. A smart campus is a collection of smart multiple things [5]. The smart campus may include the following things.

- IoT based Classroom
- IoT based Laboratories
- Possibilities of E-Learning
- Smart Library
- Smart Attendance system for faculty and Student
- Smart canteen
- Smart office

In addition to smart parking, smart tracking of student, wi-fi enabled campus. The purpose of the smart campus is making the environment user friendly.

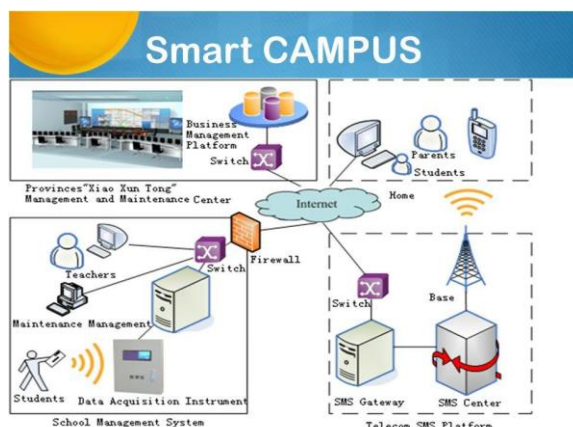


Fig :4 IOT in Smart campus

## 2.2 To know the Technology enhanced learning

- **IoT based Smart Classroom:**

The use of IoT devices for teaching and learning purposes is a top trend among institutions across the world which provides a new and innovative approach to education and classroom management [5]. Through smart classroom faculty can explain the subject in a more reality based and make the student to understand easily.

In the era of Digital technology, the rapid evaluation of Information and communication technology has created a new paradigm of internet known as Internet of Things. The Internet of Things changed the way to communicate with people and object in different manner. This has created the new form of communication between the teacher and student to allow them to improve the teaching and learning process. ICT have a great power to improve the quality outcomes of teaching learning.

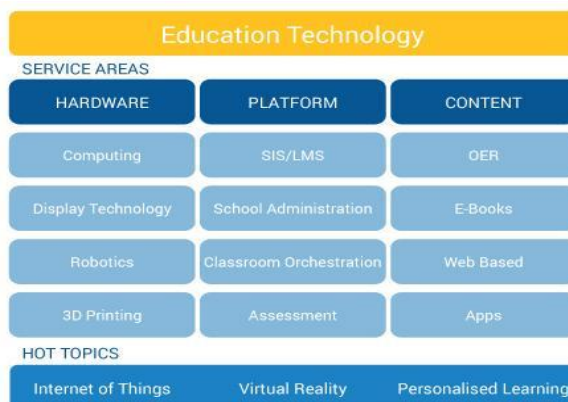


Fig:5 Educational Technology Market Research[8].



- **Advantage of Smart Classroom:**

Smart classroom plays a significant role in the student life. Smart classroom helps to transform the traditional education into modern education, with the help of smart education student can learn from anywhere, anytime anything and everything. The level of connectivity offered by the internet is beyond belief. It helps students to enrich the learning process all over the world. This offers to improve the quality of education and academic achievements. IoT enables to break the barrier of learning in the classroom. IoT give the platform to access globally. Some of the common tools are used in the classroom are.

- Smart board / Interactive white board
- LCD Projectors
- Lap tops and Tablet Pc
- E-Library
- ID Cards for Student and Faculty
- CC Cameras for security
- Attendance tracking systems
- Printer and Scanners
- Speakers and Mikes
- Media Center
- Environment friendly
- Advanced teaching and learning experience
- Easy maintenance



Fig:6 IOT in smart class rooms

Smart things are helps the teacher to explain the class in more interactive and more realistic way. The student can able to understand the concept very easily and put more attention with the help of the above mentioned smart devices in the Smart classroom. The flow of connected technology means professors and teachers could make grades faster. Their checking/grading also would be eased, less prejudiced and more efficient. When educators have devices connected to the cloud, they would be in better connect. Thus, tutor/ teachers could see which student requires more concern and focus. Other processes, with smart technology helps us in making lesson plans, adjusting schedules and many more. While the task is to connect over smart devices, teachers are able to focus more on their teaching and research.

- **IoT based Research:**

Research is a one of the emergent technology in the education system. Research gives the real opportunity to upgrade knowledge. Research will give the opportunity to know the concept very well. Internet of Things will give the more opportunity and it helps everyone to understand the concept and we come to know the opinion of others in the world. IoT will give the benefit of the wider research area and it will lead a valuable innovation to the world.



Fig :7 IOT in research

- **Smart Attendance System – Biometric Systems:**

Regularly taking attendance is a big task in the classroom. To overcome that we have introduced a new technology with the help of iot that is radio frequency identification (RFI) which will substantially help, biometric fingerprint sensor and password based technologies are integrated to develop a cost effective, reliable attendance management system [6]. Smart attendance system and biometric system are the most secured things, also it is very difficult to manipulate the data and complete integrity proof on the data and information.



The internet enabled radio frequency identification will enable to notify the assigned concerns on defined interval or customized periods.

The recorded data from the biometric can be stored and retrieved any time and each educational establishment wants it to be secure and endangered from any unsolicited visitors. However the specialists that are involved in security guard, they cannot monitor every corner of the facility. That is why IoT can help administration control. Facial recognition systems helps us to identify faces by scanning them and to be saved in data base. That is how the Internet of Things works and how it may be beneficial.



Fig:8 IOT used for security

- **IoT based Feedback Form:**

Google Form is a one of the platform to access the student with the help of the technology .It is a one of the easy way to take the feedback using the internet of things. Google Form is a open source available for everyone. Using this form student can answer the query from everywhere and any time.24/7 available in the internet.

- **IoT based Google Classroom:**

Google classroom is free. Google classroom can be accessed from any computer or mobile device via Google chrome. It is a blended platform with lot of benefits available for both faculty and students. Google classroom is a one of the online learning system, using this we can send, announce or pass any kind of information to the everyone. It has lot of benefits such as accessibility, Time saving, Communication, paperless transaction, collaboration, Data Analysis and feedback [7] etc. We don't need any papers to do assignments, as we can save our data through google classroom. The Internet of Things impacts education in a lot of ways. It is this asset

intellect, which enable institutions to make more informed decisions, in an attempt to improve operational efficiency, learning experience and campus security

### **2.3 To understand the Internet of Things**

As per the above discussion we can able to understand the value of Internet of Things in the society especially in the education system. IoT promotes a heightened level of awareness about our world [13]. IoT enables numerous applications ranging from the micro to macro and from the insignificant to the serious [13]. IoT plays a significant role in the field of education. IoT plays a major role everywhere in the society. The era of the technology our dream becomes true. IoT support the way to build the flexibility of the system and cost effective way. With the help of IOT we can transfer several areas in everyday life .Although it seem to be good in education.

Software development education is widely offered by most colleges and universities, offering fully online degree programs as well as the traditional on campus programs, which is helping the rural people who is far away from the university access get benefited.

### **2.4 Advantages of IoT in Modern Education**

Today's more and more tutors and educators are using the internet for the betterment of the education systems. The students are the main chain links of the education process. Internet of thing is a new system introduced to provide wide connectivity between the people and the technology where we cannot imagined before. The scope of learning is enormous with the help of the IOT based devices like Tablet, Laptops, Mobile Phones, Desktops, etc.It helps the students as follows.

#### **Individual learning**

Interactive based learning

- Increase the curiosity of learning
- Learn everywhere
- To learn and understand the things in easy and better way.
- To validate the information by interpret the data from various sources.

- Improve the learning Process
- No more loss of information
- Create the curiosity towards the subject
- The growth of engagement
- To improve the results
- Smart way to monitor the students

**Conclusion:**

The future of IoT is massively unlimited and will be improve a quality of education system because of advances in technology, though the IoT contain plenty of information ,however the user can get the relevant data and information by data interpreting, The Wi-Fi as made it possible to connect people and machines. IoT can change our whole world within few years.Strongly believed that the use of technology especially the era of IoT transform the educational environment towards the modern education [9].With the help of IoT we can collect the lot of data, that data we can convert to Information . These kinds of Information are going to help in the society for everybody everywhere.the students who is not able to attend the regular physical classes ,can be highly benefited on the learning progress ,because of the wider education by IoT the quality of human will be improved and the poverty of the nation subsequently improved .

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