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# Transforming India's Education System through Internet of Things (IoT)

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### Abstract

Today, Internet of Things is transforming various industries and the realm of education is no exception to IoT's influence. Traditionally, the genesis of learning has been limited to the classrooms, conferencing, online tutorials etc, but with IoT, this started slowly and steadily taking a turn, for the better. Smart boards and digital highlighters allow transferring printed texts to phone or any other devices, digitally and then, interactive boards can receive, acknowledge, and reciprocate information making learning interactive and fun, also, accessible to everyone. Use of IoT in academics is like a new wave of change that has brought new opportunities and possibilities for the improvement of both teaching learning process and educational institutions infrastructure. This paper discusses the usefulness and applications of IoT in the field of education. Moreover, it tries to present the challenges and impact of IoT in future education.

Keywords: IoT; Smart Classroom; Smart learning, IoE; Connected devices; Education.

### Introduction

Technology is proving to be a disruptive influence on education today. With technology as a catalyst, education is moving from a

knowledge-transfer model to a collaborative, active, self-directed, and engaging model. This change couldn't have come at a better time for India. The urban population in India is expected to grow faster than its overall population by 2030 (Chetan, 2007). This will create a huge pressure on the economy and the education system. Along with this there are other challenges in our education system. First is the sheer capacity to deliver education to all sections of our society. The quality of existing educational institutions is another challenge. Technology has the capability to address all these issues. Trends such as the growing penetration of high speed broadband, low cost computing devices and a strong thrust from the Government are accelerating the transformation of India's education system.

### **IoT in Education**

The Internet of Things is basically a network of several devices which are attached with miscellaneous software, electronics, and network connectivity of distinct orientations, aimed at exchanging and compiling of any kind of information. IoT is applied in many industries including finance, travel, teaching, telecommunication, and so on. When it comes to implementing IoT in the education sector, the major reason is the IoT enhances the education itself and provides advanced value to the structures and environment (Ravindra, 2018).

A smart institute (a institute that uses IoT), with the facilities operating smoothly promotes a higher level of personalised learning. The smart devices used in a campus utilise Wi-Fi network for receiving instructions and sending data. A computational IoT nervous system for colleges and schools helps to keep track of major resources, create smarter lesson plans, design secure campuses, enhance information access, and much more. With its set of advanced tools, IoT can be regarded as a new method of classroom management.

We're at the dawn of the age of the Internet of Things (IoT) enabled by network, Wi-Fi, IT security, cloud surveillance and software applications for learning. Deploying these solutions will not only help institutes save costs, but provide connected learning experience that will make it easier for higher education institutes to collaborate on research projects. Although these are early days, IoT is opening up a new world of educational opportunities, not limited by time and place, for students to learn more, and in new ways, by connecting to resources around the globe.

### **Digitisation of India's Education System**

Government of India emphasis on the Digital India campaign looks to increase the scope of technology across the country. The campaign aims to ensure better connectivity and maximise the potential of India's much talked about demographic dividend. Creating broadband highways across the length and breadth of the country would go a long way in revamping the educational space digitally. The shortage of education institutes and faculty can be addressed when content on cloud or relevant technology is made accessible to everyone.

As richer data emerges and capabilities increase, IoT will continue to connect the formerly unconnected, close the gap in education, and develop practical solutions that improve the quality of education for all students. IoT is about giving students and educators new windows to the world, and new opportunities to learn without limits.

In this new ecosystem, education in several institutes is gradually migrating from campus based learning to eLearning or blended learning, curriculum on Internet/cloud, learning through mobile computing devices over secure Wi-Fi, collaborating over video, assessment through online tools and integrating all this for Any Time Anywhere Learning through applications like LMS (Learning Management Systems). It is time for India to ride the technology wave since it offers many distinctive advantages.

## **How internet of Things is Transforming the Education System**

In the past few decades, we have seen a revolution in technology comparable in magnitude to the transition from the middle ages to the modern world. However, the most profound technological evolution may have only just begun; the convergence of the virtual and physical worlds into the Internet of Things. The Internet of Things has already had a considerable impact in areas such as healthcare and customer service. The education sector is also likely to continue being impacted as colleges make greater use of connected devices. Students, educators and administrators collaborate more closely and derive insights from data as the Internet of Things continues to make inroads into the education sector.

The following are a few examples of how the Internet of Things is changing the education sector:

1. Global networking among students and educators: Students can now interact with peers, mentors and educators worldwide using connected devices such as digital highlighters and interactive boards, while sitting in the comfort of their home or classroom. Digital scanners aid the learning experience by digitally transferring text to smartphones. Similarly, interactive boards simplify and accelerate learning by receiving, acknowledging and reciprocating information (Hanan et al., 2017).
2. Enhancement of textbooks: Quick Response (QR) codes have made their way into the textbooks. Feedback, assignments and additional knowledge resources become easily available to students when they scan the QR codes with their smartphones (Singh, 2019)
3. Easier data collection and analysis: There are thousands of students in a college and monitoring the whereabouts and activities of each of them in an impossible task. Radio-

Frequency Identification (RFID) chips use radio waves to read and capture data that is stored as a tag attached to an object and can be read from several feet away and need not be within direct line-of-sight of the data collector. Institutes have started to initiate automatic data analysis using applications based on the cloud. Students gain a richer learning experience as they can get real-time insights into subjects they would otherwise only learn from their textbooks (Carma, 2019).

4. Higher collaboration in group projects: Educational institutions promote a collaborative environment with the help of the Internet of Things. While working in groups, students are encouraged to transmit their data to a collaborative work area by simply scanning an RFID tag or a QR code, using their smartphones (Satu et al., 2018).
5. Greater safety in campuses: Digitised identity cards and wristbands are used to track visitors, staff and students. Data on the last-known locations are stored on a server which ensures that every area on campus is accessed only by the right people. The cards and wristbands also act as digital wallets and enable cashless payments. School buses are also enabled with GPs tracking, which makes the journey to and from school safer and lets parents know their child's whereabouts (Mitesh, 2018).
6. More efficient Institute Management: Streamlining the day-to-day operations using IoT helps to focus more on actual teaching activities like, devices that automatically detect the student presence in the institute can eliminate the need for taking attendance and also allow institute officials to send an electronic message to the parents. They can team up with IoT sensors and use it to unlock doors only for verified entries and send alerts to the management, in case of any unwanted visitor. Similarly, RFID technology is used to

track institute resources such as projectors and lab equipment. The Internet of Things also helps reduce energy costs by monitoring energy usage (Mitesh, 2018).

7. Helping hand for the disabled: Unless you're hard of hearing or you are in close connection with someone who is, you have no idea what sign language is, which is frustrating for people who depends on it. With the help of IoT, sign language now can be translated into text and speech. It is also an excellent way to ensure that hearing-impaired people are able to obtain the best possible sign language education. Whenever a learner with the gloves on makes a sign, the sensors fetch the signal, analyses it and provides a feedback on his/her accuracy.

Thus, the Internet of Things is transforming the education system and promoting collaborative, safe and fast learning. The future looks even more promising considering the predictions for the growth of IoT. Some experts believe that by 2025 approximately 22 billion things will be connected, while others estimate the growth at 40-50 billion (Lueth, 2018). Irrespective of the number of devices, market spending is also likely to witness a substantial increase.

### **Impact of Internet of Things on Higher Education**

The IoT is going to affect every part of society at some point in the near future. Higher education institutions in general, and universities in particular, can work across disciplines and lead the progress of the IoT technologies, business models, ethics, and leaders of the IoT enabled economy of the future. Medical colleges can empower the Internet of Medical Things as well as, Law colleges can teach IoT ethics, privacy, and policy. Higher education institutions commence to develop and leverage solutions such as radio frequency identification (RFID) and cloud computing through IoT technologies, they will be able to analyse and manage Big Data.

The IoT is not just a technology update and development within the industry, but can lead to expand the change to the whole society including higher education institutions. IoT will lead to changes in educational technology, reform the education, change in teaching, change in learning, management of change, experimental and practical changes, changes in campus, teaching resources changes and others.

With the development of IoT, the prospective application in higher education lies in the three aspects: students' progressive evaluation, integration of current teaching platforms and development of educational middleware. This change provides increased convenience for students, and makes the teaching process more effective for instructors and professors. The flow in connected devices and technology means that instructors and professors can focus on the actual learning that is more useful to the students rather than perform the routine task.

### **Future of IoT in Higher Education**

Universities have long realised the ability of technology to disrupt teaching, learning, and assessment. Furthermore, technology disruption is fundamental if a modern university is to distinguish its student offer, so increasing admissions, improving retention, and delivering desired outcomes. But preparing students to be confident for the world of work is complex. It requires strong academic leadership, access to a high quality curriculum and content, and the exposure of students to the effective use of new technology. With the development of IoT, many institutions of higher education have started to focus on the related technology and application of the IoT. The Internet has deeply rooted itself into colleges and universities, and e-learning has become common practice in most universities systems. Although it is not an obvious application of the IoT, however, education is on that list and the applications of the IoT in universities are numerous, and the implications for this are massive. IoT will allow for better operational efficiency in all

learning environments. IoT can support classroom instruction by improving learning setting, enhance learning resources, improve methods and techniques of learning, raise Management efficiency, and save management costs. The resources available for learning on devices, like e-books, are more engaging and interactive. However, there is a constant need for new technologies for learning process, for instance, high-speed wireless networks with the bandwidth for streaming audio and video lessons.

### **Challenges of IoT in Higher Education**

IoT brings tremendous challenges and opportunities to higher education. The unique growth of ubiquitous computing, developing IoT technologies such as cloud computing, and big data and analytics are helpful not only in improving the core values of teaching and quality of research but also developing an IoT society and encouraging a new digital culture. With increasing online degree opportunities and seamless access to instructional content in both structured and unstructured formats, the IoT leads digital momentum into higher education institutions (Ravi, 2015). IoT is a dramatic shift in the traditional instructional paradigm while integrating broader disciplines, including social science, to enrich the value of big data available from social media.

### **Conclusion**

The Internet of Things will be further integrated into the education system in the near future. Thus, the Internet of Things is transforming the education sector and promoting collaborative, safe and fast learning. The future looks even more promising considering the predictions for the growth of IoT. Most of the institutes may use it to prepare their students to become highly tech-literate while others may use it to harness data, save money, and for other specific needs. Our understanding of education must shift if we want to integrate IoT into the education. IoT systems have tremendous potential to bring significant values to higher education by engaging and motivating the students and staff, and to increase speed of



learning. The purpose of this study was to find out the potential of IoT in higher education and how to maximise its benefits while addressing its challenges and reducing the risks involved with it. Therefore, our future work will be to focus on IoT implementation in higher education.

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