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Future Internet: ICT, Internet of Things and Smart Education in India

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Abstract:- **The Internet is rapidly changing and evolving. In the past and present days the main form of communication on the Internet is human-human. But it will be imagined that future objects will have unique identification and these objects can be addressed so every object connected. The Internet will become Internet of Things in India. The form of communication will extend from human-human, human-machine and machine-machine. This will bring new computing that can occur using a device, in any location and any format and change human life. Now a day's education system in India following traditional system in some institutions accepting latest technologies making learning more innovative. Educational institutions in India are in a process of introducing innovating teaching and learning for creating smart learning facilities to develop student's talent. In this paper we discuss overview, architecture of IOT and how academic learning easy and motivating the students using ICT and IOT, introducing them to their subjects with smart learning and interactive. ICT provides a vide range of applications and devices for learning. Whereas IOT provides connecting devices making smart and self controllable.**

***Keywords*— ICT; IOT; Information Technology; Education; Smart Learning**

I. INTRODUCTION

The Internet of Things provides connectivity of every day devices at any time and place to anything. In this modern Internet society everything and everyone will be connected. To put it simply, the Internet of things enables machines to interact, coordinate and control with each other thereby reducing human involvement in everyday tasks. The IOT considered as the future evaluation of the Internet that realizes (Machine-Machine) learning. The definition of things in IOT is very broad and includes different types of physical devices. This network of different objects can bring enough amount of issues in developing applications and make existing issues more difficult to tackle.

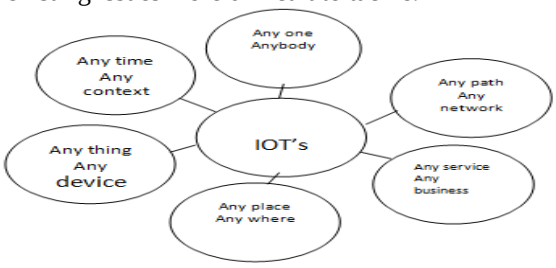

Fig. 1.Definition of IOT

II. IOT ARCHITECTURE

The Internet of things involves in an increasing number of smart interconnected devices and sensors that are transparent a n d not visible. The communication among these devices along with related services is expected to occur anytime, anywhere and it is often done in a wireless and autonomic manner. The services become more decentralized and complex. Thus to manage the complexity, IOT architecture is required. IOT architecture is defined as a structure for the specification of a networks physical components and their functional organization and configuration its operational principles

Fig.2 Basic architecture of IOT

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III. ICT AND IOT

In India educational institutions today are in a process of transforming in Hi-tech campuses like providing Wi-Fi services, interactive class rooms, smart classes, online courses, online library and many more advanced facilities to their students to acquire more knowledge. Students are dependent on technology for their studies. Now days in India, ICT has introduced and modernized the traditional way of education for improved quality of learning. The present education system in India has undergone different changes since the arrival of new technological trends and tools. Computer machinery, broad band services and other ICT devices have influencing the learning methods to acquire knowledge. The Right of Children to Free and Compulsory Education Act (RTE) 2010 in India guarantees that every child from 6 to 14 years has right to acquire quality elementary education and that the State, with the help of families and communities, fulfills this obligation. Though the government and education institutes are spending a lot on infrastructure and IT facilities, but the development of students have not been much satisfactory. According to NSSO's data, about 24.7 per cent of males and 28.4 per cent of females in rural areas and 22.9 per cent of males and 29 per cent of females in urban areas have reported the reason 'education not considered necessary' for refraining from educational institutions. Student's lack of interest in core subjects has been one of the main reasons of this scenario. In this paper, we have proposed implementations of ICT and IoT to be carried out by Indian educational institutes for two groups of students: (1) Attending Classes (2) not attending classes.

II.DEVELOPMENT OF IT ENABLED SERVICES IN INDIA

The Government of India's 'Digital India' program, an initiative to provide high speed internet services computerization of public sector, provision of digital identity, enhancement of banking sector etc. promises a better technological future, where citizens will benefit from staying
connected to fundamental resources through advancement of technology. According to the draft IoT document of Department of Electronics and Information Technology of Govt. of India, by 2020, India will have an IoT industry worth USD 15 billion which will account to a share of 5 to 6 % of global IOT industry. Research and development in assisting technologies, creation of IoT skill sets for local and global markets, development of IoT products explicit to Indian requirements are some main points mentioned in the policy. Moreover, as we are growing towards becoming a digital nation, the elimination of technology barriers and technical enhancement of government sector would prove helpful in development of ICT and IoT enabled services that will provide smart transmission of knowledge resources to the students in India. The quantity of internet clients in India has come to 354 million before the end of June 2015. The most recent figure demonstrates that India has more internet clients than the grown 17% in the beginning 6 months of this current year, including 52 million new clients.

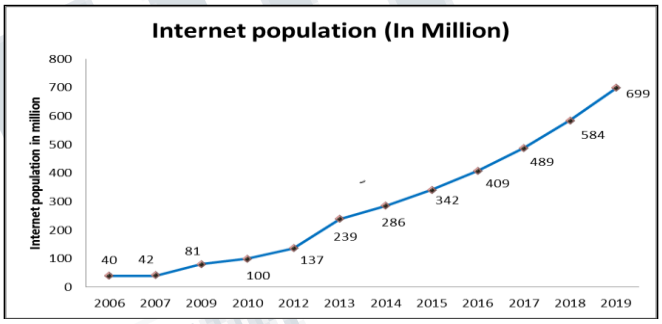

Fig 3. Internet Population of India

We live in an age which is called information age and internet is the biggest revolution in this age. Although slow initially, India is gradually gaining the momentum and in the process of becoming the country with highest number of internet literate population in the world. According to a report released in November 2013 by Internet and Mobile Association of India (IAMAI), by June 2014 internet users in India will be world's second largest online community after China leaving America behind.Rural India has witnessed a year on year growth of 58% of active Internet users since June 2012. As per the report, out of the 205 million of internet users in India in Oct 2013, 137 million belonged to urban India and the rest to rural India. As per data released by TRAI, India's total internet subscribers stood at 238.71 million as of December 31, 2013. The report released by IAMAI further states that more than 50% of the urban internet users access Internet daily. According to the report, the number of mobile internet users has also witnessed a steady rise, with 110 million mobile internet users in October 2013. This analytic conclusion has been arrived

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based on reasons like higher internet penetration in India, which has resulted in increased compliance of online shopping among Indians and better online shopping experience offered by the e-commerce websites. Following chart represent the year wise internet use India in Millions. It can be seen that internet users in India are growing at a CAGR of 20%. As a result number of internet users in India supposed to reach the figure of 700 million by 2019.

But these astonishing figures don't tell the actual scenario. The number of users is growing at a rate of 20% that is true but all of them are not regular users. People who at least open internet once in a day or once in 3 days can be regarded as regular users. A detailed study tells that a major chunk of the internet population of the country does not use internet on a daily basis. Although a recent report from Internet and Mobile Association of India (IAMAI) tells that more than 50% of the urban internet users access Internet daily. Surprisingly however, high frequency usage is not controlled to only the youth and the Working Men this habit of accessing the Internet daily is seen among other demographic segments as well, including Older Men and Non-Working Women.

III. SCOPE OF ICT AND IOT IN EDUCATION

The primary part of ICT in Education is to interface individuals with assets. The number and sorts of connecting systems utilized as a part of education have become adaptive on the grounds that communication technology is always extending, particularly in the zone of telecom. On the other hand, Internet of Things comprises of development of objects featuring IP addresses for communicating with each other and taking smart decisions based on the acquired data through sensors. According to ZHANG. The IoT is supposed to bring about following changes in educational technology:

- Information technology changes the addition of assets for teaching, publishing tools and communication channels.
- Simulation technology will develop the effectiveness of practical training.
- 3D real-time training and remote experimental teaching will reduce the learning gap
- Virtual technology to enhance the theoretical teaching model.
- The use of Smart intelligent devices will enhance the subjectivity of the educated.

The evolution of wearable technologies that can assemble data, track activities, and modify familiarities to users' needs and requirements. The IoT comprises of all technologies, which include "smart devices" built with microchips, sensors, and wireless communications abilities.

IV. PROPOSED INTERACTIVE LEARNING TECHNIQUES

A. For School/University going students

1) Associative way of learning

Learning is a continuous process during one's life. During this period a person acquires sufficient of knowledge but as time passes it starts to fade. The merely things that remain for a long time in the memory are visuals, incidents or instances that leave an impact on us. Student's perception of concepts can be made stronger by associating their course concepts with scenarios that relate to their interests. ICT applications focus on High school students should be developed in such a way that they learn their academic concepts while enjoying them. Associative learning is a method in which theory concepts are associated with practical examples to make students understand in a good way. Technologies such as increased reality, 3D animation, visual effects, etc. can help in the execution of Associative Learning.

2) Depending on variety of courses schools and other institutions provide Laboratories to their students. All practical's can be done in assigned labs whereas theory is been taught away from the practical environment. Many students not understand concepts that require practical executions such as programming languages, database management, microprocessors and other lab oriented subjects. In India some educational institutions are not equipped with modern technologies and labs, it becomes important for the teachers to expose their students to practical executions in some alternate mode. In such scenario, ICT services can be utilize to create a centralized lab server for all labs based on software implementations, which can be accessed remotely any time within the Institute. Internet of Things on the other hand promises a better environment for the students who want to have hands on experience with technology. The Interactive White boards in classrooms used for display purpose can be further utilized to connect to the lab servers and execute required computer programs in the classroom during the theory sessions. Other ICT devices can also be connected to lab servers for analyzing theory lectures.

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3. Constant analysis of student's academic progress
Student's Academic growth depends on their state of mind,
motivated students enthusiastically perform well in their courses. The Academic progress of a student needs to be evaluated persistently by his/her instructor. ICT can help the instructors in monitoring every student through various applications such as weekly progress calculator app, where each student's weekly achievements can be uploaded on the application which measures the student's performance through various analyses and displays it via graphs and pie charts for academic evaluation. This can help in finding out those students who need extra attention and by the end of every week the instructor will know whom he needs to concentrate on for the next week.

A device can be introduced to the students called Exam Pad, a tablet for each student which automatically monitors their academic performance utilizing the data from tests given by them. Each student is supposed to login into the institute's exam server through Exam Pad and give his/her weekly tests. As the marks are evaluated, they can be analyzed to measure student's individual performance.

B. For Students who are unable to attend classes due to personal reasons

1) Gamification of Tests and Assignments

The practice of making activities more like games in order to make them more interesting or enjoyable and the students' weekly progress can be determined from their game scores. The syllabus can be inculcated using timed tasks or quizzes to call up learner's interest. An overall grade amongst students of the whole class can be done, and the uppermost scorers can be displayed in the "hall of fame". This would encourage the students to compete with their age group without presence of classes and hence encourage a healthy learning environment. These games can be in the form of Internet apps downloadable by the students on their devices, and can be easily customizable by the teacher, depending on the course outline and assignments for the week.

2) Social networking as an education medium

Social network is found to be the most widely visited platform by youngsters for being constantly in touch with their friends. Students can access social media through smart phones, personal computers and Net Cafes. This can be used as the perfect means for efficient imparting of knowledge. Teachers could create pages or blogs on social networking sites and advice students to regularly follow the pages or blogs. The teacher can keep updating the blogs with the latest technological developments in the field, thereby provoking students' interest in the subject. Weekly assignments and work sheets can also be circulated and submitted on these sites, making the tasks easier. Social Networking can also be used to reach out to the rural parts of the country, where there is scarcity of schools and poor educational infrastructure. Video lectures and study material in native languages can be uploaded on the sites and a large group of students and adults of such areas can get educated merely through an internet connection. Universities must encourage professors to start official blogs for online education, to impart knowledge to the poor of the country, thereby improving the literacy rate of the nation.

3) School-Home Connectivity

If a person is able to access all the study resources at home then it becomes easier for him to carry on with his studies while being away from school. Today we are moving towards Infrastructure less mode of transmission. Wireless sensor networks and IoT technologies provide better modes of information sharing and hence can enhance learning. Students who aren't attending classes should be provided with wearable technologies or IoT gadgets that can help them to access study material from local servers. For example, in rural areas, a databank can be provided which contains all the study material for the rural students who are unable to attend classes due to their routine work. Wearable technologies such as watches or pendants can help them to access study material whenever they find time to study.

4) Virtual Classrooms

It is an ICT application, where tutors from remote institutes give lectures virtually over the internet via live streaming. The Govt. of India, has taken initiatives to conduct live sessions of faculties of premier institutes for an interactive session with students across states and district boundaries [10]. Virtual classrooms provide a platform for teachers and students to
interact with each other without being physically present at the same place. This application can be extended for remote students who don't find opportunity to attend classes. During their free time or weekends, a session can be held by the education institutes to educate such students by conducting live interactive lectures by faculties of different streams. For this kind of scenario, education institutes must find out such students through surveys and drives in less privileged areas.

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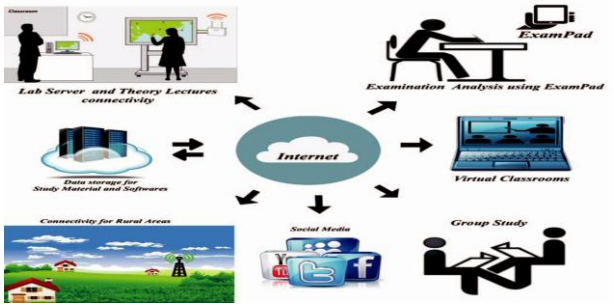

Fig 2. Proposed model for connecting students to study resources

V. CONCLUSION

In this paper, we have identified the growth of ICT and IoT technologies in the field of education for improvement of quality education, and proposed model for creating a digital learning environment at Indian schools and universities for different categories of students. The vision for Digital India can be achieved only when every Indian children are educated with required skills for driving the technological revolution. The more we are equipped with technologies the more we are ready for a better future. ICT and IoT form the base for development in education system and approaching billions of learners all over India. Implementation of smart Education requires latest sensing and computational designs that supplement, animate, and coordinate internet of things, advance seamless interfaces that link digital, physical, and human essentials for creative expression. Associative way of learning requires teachers to have good knowledge of technological tools and applications. Centralized servers require dedicated servers for managing data and provide all time access to lab utilities. Instructors need to be active in analyzing students' performance through various software and recommend required improvements and suggestions. Not all students find games interesting, there are many rural students who are unaware of online games and computer applications, for such student's puzzles and indoor games can be used for teaching. Social networking, mobile gadgets, Virtual classrooms require good internet connectivity which can be only possible if the government is able to provide fast and efficient internet facilities in rural and urban areas.

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