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Design of a Gateway to Improve Learning Experience

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Abstract— Technology has affected every sphere of human life including the way we socialize and spread knowledge and information. It has changed the way of teaching as learning, nowadays, is not bound to the walls of classroom. A new dawn of technology demands better educational solutions to serve the needs of learners. The term 'SVIEW' is coined to provide a new solution to an old problem and also to state how better we understand the current pedagogy and implementation challenges that occur in the work environment around technology. This paper summarizes case studies based on research framework, we outline a set of requirements for IOT, and present a comprehensive review of the existing middleware solutions against those requirements. In addition, open research issues, challenges, and future research directions are highlighted.

Keywords—*component connectivity, sensors, actuators, interoperability, RFID, controllers, data analysis, IOT, IOE .*

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I. INTRODUCTION

Innovative ideas travel through time and has led to the transformation of ancient civilizations into modern societies. Technology is an outcome of such ideas only. Even the World Economic Forum has recognized the importance of information technology breakthroughs which are leading us to the Fourth Industrial Revolution. The term Internet of Things (IOT) was first coined by Kevin Ashton [1] while working with Auto – ID labs. Since then the development of the underlying concepts has ever increased its pace. In IOT many of the objects around us or that surround us will be on the network in one or another form. The IOT denotes the interconnection of highly heterogeneous networked entities and network following a number of connection patterns such as Human -to- Human (H2H), Human -to- Thing (H2T), Thing -to- Thing (T2T) or Thing -to- Things. Over a few decades the usage of internet came into existence. Now a day's two billion people use internet for various purposes and as the usage increases it gives rise to an another big area called IOT. IOT allows the objects to be sensed and controlled remotely over a network. IOT creates a world where all objects, are called smart objects, and these smart objects are connected to the internet and then communicated. The main goal of IOT is used to create a better world for human beings. Internet of Things continues to be the latest, most hyped concept in the IT world.
Today people want the world on their hands, It outlets the revolutions of computing and smart environment. Some technologies like ambient intelligence satisfy the maximum need of smart world but these technologies are not tightly coupled with internet, so the people need another technology extension. Internet of Things (IOT) is an ideal emerging technology to influence the internet and communication technologies. Simply "Internet of Things" connects „living and non-living things through internet. Traditionally in the object oriented paradigm everything in the world is considered as an object, but in the IOT paradigm everything in the world is considered as a smart object, and allows them to communicate to each other through the internet technologies by physically or virtually.

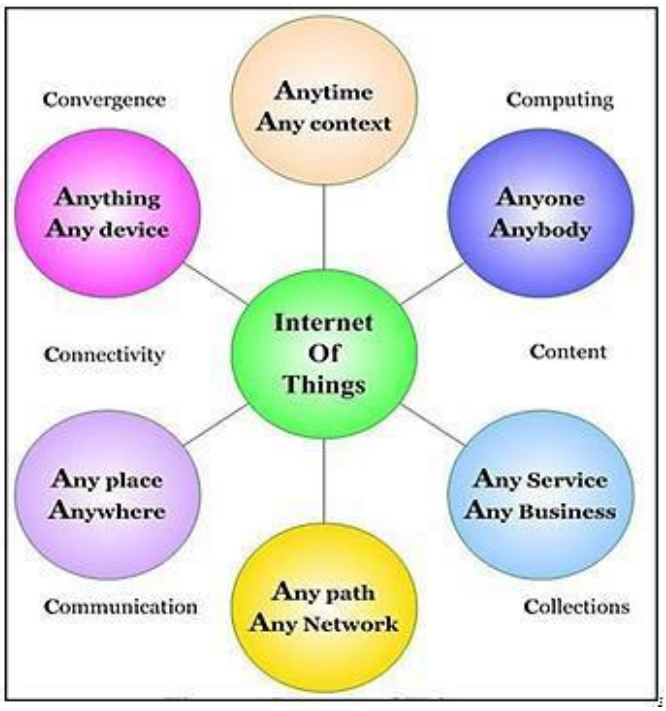

Fig. 1 Objective of IOT

The objective of IOT is Anything, Anyone, Anytime, Anyplace, Any service and any network Fig. 1 describes the coupling of C‟s and A‟s. That reveals, people and things can be connected anytime, anyplace, with anyone, ideally by using in any path/network and any service. This implies addressing elements such as Convergence, Content, Collections (Repositories), Computing, Communication, and Connectivity in the context where there is seamless interconnection between people and things and/or between things and things so the elements are present and tightly coupled.

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Technology has affected each and every sphere of human life. It has changed the way of teaching as learning, nowadays, is not bound to the walls of classroom. Rather than looking at education simply as a means of achieving social upliftment, the society must view education also as an engine of advancement in an information era propelled by its wheels of knowledge and research leading to development.

In this paper, we introduce a novel approach for smart virtual interactive e-learning for work (SVIEW), a complete system, composed of hardware and software components, that allows end-users to configure a smart classroom that responds to their needs. The system is designed to support two broad classes of users: Teachers, Students. We define Teacher users as those that conduct an interactive session in a classroom that includes under-graduate or advanced courses in computer science and engineering department. Teacher is an instructor basically who adopt a student-centered approach to instruction increase opportunities for student engagement, which then helps everyone more successfully achieve the course's learning objectives. Student users refer to users who play important role in improving and strengthening society and in turn nation. Engaging students in the learning process increases their attention and focus, motivates them to practice higher-level critical thinking skills and promotes meaningful learning experiences. of today lays the foundation stone of future society.

The remainder of this paper goes as follows: Section II presents the overall IOT vision and the technologies that will achieve it . Section III presents an overview of related works. Section IV details the proposed system. Section V presents future work. Finally, Section VI concludes this paper.

II. BACKGROUND

A. IOT where it began and where it is now

"Internet of Things" is the new buzzword that is technologically revolutionizing the world. Sci-fi stuffs seen only in the movies few years ago have become realistic now.. Everything around us is connected. This might seem magical, but it is a pure experimentation of technology of how every element of human life can be controlled by it. The IoT has been transforming lives since the mid-90s. It has grown exponentially since its evolution and has achieved a state of success that the Smartphone or Internet took twice the time to reach.

People were connected to Internet since its birth but in 1999 a new age gave rise to things being connected to the Internet. It was at that time; Kevin Ashton coined the term "Internet of Things". The term "Internet of things" might have been coined only in 1999 and technology advancements might have elevated from then, but the concept of things being connected to internet has been in existence for many years and researchers were passionate about it since the early 1800s. Carl Friedrich Gauss and Wilhelm Weber developed a short-range communicative electromagnetic telegraph dating back to 1832 in Germany. Another famous personality and his research regarding wireless communication and energy transfer was that of Nikola Tesla's. He once quoted in his interview back in the 1920s, "Wireless will achieve the closer contact through transmission of intelligence, transport of our bodies and materials and conveyance of energy. When wireless is perfectly applied the whole earth will be converted into a huge brain, which in fact it is, all things being particles of a real and rhythmic whole. We shall be able to communicate with one another instantly, irrespective of distance. Not only this, but through television and telephony we shall see and hear one another as perfectly as though we were face to face, despite intervening distances of thousands of miles; and the instruments through which we shall be able to do his will be amazingly simple compared with our present telephone. A man will be able to carry one in his vest pocket" From then on, Innovation has taken a leap to where we stand today. The Invention of big things like Circuit board, computers, radio to small things like bar codes, touch screens, Bluetooth etc. that is taken for granted today, have been made in a short span of 20 years, but we forget the several decades of effort and inspiration that has taken to reach this point.

Starting a firm in IOT sector cannot be mentioned 'easy', but the process is becoming less complicated. To give a comparative look, this is the phase of which 'www' face in late 1990s among investors. The lifetime of the startup in IOT sector seems to reduce at the rate, equal to the gain in market size. In spite of being at early stages in market with niche customer base, it has gained the attention of not only investors, but also giant players in market like Google, Facebook, Amazon, IBM, Cisco and many more. This means, any potential startup will be keenly watched out by giants to be acquired down the lane within years or months of start.

IOT is a companion and not a necessity at this stage, but the future is very clear. This is the next smartphone market with just half the period or less of 'time to market' that smartphone took. While the argument of technology push or market demand still is a debate just like in any other case, IOT is a technology push that has or will become a human need.

The transitioning of the internet from the "Internet of Things (IOT)" to the "Internet of Everything (IOE) described four phases of the internet as follows:

Phase 1: Connectivity:

The internet started with the connectivity phase in the military, with digitizing access to information through emails, web-browser and search.

Phase 2: Networked Economy:

The second phase started in the late 1990s and was the "Networked Economy" phase. This was the birth of e-commerce and digitally connected supply chains. It changed

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the way people shopped and how companies reached new markets.

Phase 3: Collaborative Experience:

The third phase started in the early 2000s and is known as the "Collaborative Experiences" phase. This phase is dominated by widespread use of social media, mobility, video, and Cloud computing. This phase completely transformed the world of work.

Phase 4: Internet of Things -> Internet of Everything (IOT -> IOE)

The current phase is called the "Internet of Everything (IOE)". This phase connects people, processes, data, and things, turning information into actions that create new capabilities, richer experiences, and unprecedented opportunities. An 'actuator' produces linear or rotatory motion from a source of power under the action of a source of control, like a sensor. Sensors monitor a system or things. Sensors help to collect data from non-computers as it helps get them online for 'interoperability' with computers and with other IP-enabled devices. They use Radio Frequency Identification (RFID) to communicate and track what they are embedded into. They are programmed to take measurements, translate the data into signals and send the data into a main device called 'controllers'. These controllers are responsible for collecting data from sensors through a process, provide an internet connection, may have power to make immediate decisions and may send data to a more powerful computer for 'data analysis' which may be on the same LAN with the computer. Thus, data analysis of data collected by things undergoing processes is conducted by 'people' after 'Data Mining', thus expanding IOT into IOE.

In summary, IOT = M2M
Whereas, IOE = M2M + M2P + P2P

B. Technologies Involved

The Internet of Things [15] was initially inspired by members of the RFID community, who referred to the possibility of discovering information about a tagged object by browsing an internet address or database entry that corresponds to a particular RFID or Near Field Communication [16] technologies. In the research paper "Research and application on the smart home based on component technologies and Internet of Things", the included key technologies of IOT are RFID, the sensor technology, Nano technology and intelligence embedded technology. Among them, RFID is the foundation and networking core of the construction of Internet of Things [17]. The Internet of Things (IOT) enabled users to bring physical objects into the sphere of cyber world. This was made possible by different tagging technologies like NFC, RFID and 2D barcode which allowed physical objects to be identified and referred over the internet [18]. IOT, which is integrated with Sensor Technology and Radio Frequency Technology, is the ubiquitous network based on the omnipresent hardware resources of Internet, is the Internet contents objects together. It is also a new wave of IT industry since the application of computing fields, communication network and global roaming technology had been applied. It involves in addition to sophisticated technologies of computer and communication network outside, still including many new supporting technologies of Internet of Things, such as collecting Information Technology, Remote Communication Technology, Remote Information Transmission Technology, Sea Measures Information Intelligence Analyzes and Controlling Technology etc. [19].

1. Radio Frequency Identification (RFID) Radio Frequency Identification (RFID) is a system that transmits the identity of an object or person wirelessly using radio waves in the form of a serial number [20]. First use of RFID device was happened in 2nd world war in Brittan and it is used for Identify of Friend or Foe in 1948. Later RFID technology is founded at Auto-ID center in MIT in the year 1999. RFID technology plays an important role in IOT for solving identification issues S. Madakam et al. 170 of objects around us in a cost effective manner [5]. The technology is classified into three categories based on the method of power supply provision in Tags: Active RFID, Passive RFID and Semi Passive RFID. The main components of RFID are tag, reader, antenna, access controller, software and server. It is more reliable, efficient, secured, inexpensive and accurate. RFID has an extensive range of wireless applications such as distribution, tracing, patient monitoring, military apps etc. [21].

2. Internet Protocol (IP) Internet Protocol (IP) is the primary network protocol used on the Internet, developed in 1970s. IP is the principal communications protocol in the Internet protocol suite for relaying datagrams across network boundaries. The two versions of Internet Protocol (IP) are in use: IPv4 and IPv6. Each version defines an IP address differently. Because of its prevalence, the generic term IP address typically still refers to the addresses defined by IPv4. There are five classes of available IP ranges in IPv4: Class A, Class B, Class C, Class D and Class E, while only A, B, and C are commonly used. The actual protocol provides for 4.3 billion IPv4 addresses while the IPv6 will significantly augment the availability to 85,000 trillion addresses [22]. IPv6 is the 21st century Internet Protocol. This supports around for 2128 addresses.

3. Electronic Product Code (EPC) Electronic Product Code (EPC) is a 64 bit or 98 bit code electronically recorded on an RFID tag and intended to design an improvement in the EPC barcode system. EPC code can store information about the

type of EPC, unique serial number of product, its specifications, manufacturer information etc. EPC was developed by Auto ID Centre in MIT in 1999. EPCglobal Organization [Wikipedia, "EPCglobal", 2010] which is responsible for standardization of Electronic Product Code (EPC) technology, created EPCglobal Network [Wikipedia, "EPCglobal Network", 2010] for sharing RFID information. It has four components namely Object Naming Service (ONS), EPC Discovery Service (EPCDS), EPC Information Services (EPCIS) and EPC Security Services (EPCSS).

4. Barcode is just a different way of encoding numbers and letters by using combination of bars and spaces of varying width. Behind Bars [23] serves its original intent to be descriptive but is not critical. In The Bar Code Book, Palmer (1995) acknowledges that there are alternative methods of data entry techniques. Quick Response (QR) Codes the trademark for a type of matrix barcode first designed for the automotive industry in Japan. Bar codes are optical machine-readable labels attached to items that record information related to the item. Recently, the QR Code system has become popular outside the automotive industry due to its fast readability and greater storage capacity compared to standard. There are 3 types of barcodes of Alpha Numeric, Numeric and 2 Dimensional. Barcodes are designed to be machine readable. Usually they are read by laser scanners, they can also be read using cameras.

5. Wireless Fidelity (Wi-Fi) Wireless Fidelity (Wi-Fi) is a networking technology that allows computers and other devices to communicate over a wireless signal. Vic Hayes has been named as father of Wireless Fidelity. The precursor to Wi-Fi was invented in 1991 by NCR Corporation in Nieuwege in the Netherland. The first wireless products were brought on the market under the name WaveLAN with speeds of 1 Mbps to 2 Mbps. Today, there are nearly pervasive Wi-Fi that delivers the high speed Wireless Local Area Network (WLAN) connectivity to millions of offices, homes, and public locations such as hotels, cafes, and airports. The integration of Wi-Fi into notebooks, handhelds and Consumer Electronics (CE) devices has accelerated the adoption of Wi-Fi to the point where it is nearly a default in these devices [24]. Technology contains any type of WLAN product support any of the IEEE 802.11 together with dual-band, 802.11a, 802.11b, 802.11g and 802.11n. Nowadays entire cities are becoming Wi-Fi corridors through wireless APs.

6. Bluetooth wireless technology is an inexpensive, short-range radio technology that eliminates the need for pro- S. Madakam et al. 171 prietary cabling between devices such as notebook PCs, handheld PCs, PDAs, cameras, and printers and effective range of 10 - 100 meters. And generally communicate at less than 1 Mbps and Bluetooth uses specification of IEEE 802.15.1 standard. At first in 1994 Ericson Mobile Communication company started project named "Bluetooth". It is used for creation of Personal Area Networks (PAN). A set of Bluetooth devices sharing a common channel for communication is called Piconet. This Piconet is capable of 2 - 8 devices at a time for data sharing, and that data may be text, picture, video and sound. The Bluetooth Special Interest Group comprises more than 1000 companies with Intel, Cisco, HP, Aruba, Intel, Ericson, IBM, Motorola and Toshiba.

7. ZigBee is one of the protocols developed for enhancing the features of wireless sensor networks. ZigBee technology is created by the ZigBee Alliance which is founded in the year 2001. Characteristics of ZigBee are low cost, low data rate, relatively short transmission range, scalability, reliability, flexible protocol design. It is a low power wireless network protocol based on the IEEE 802.15.4 standard [25]. ZigBee has range of around 100 meters and a bandwidth of 250 kbps and the topologies that it works are star, cluster tree and mesh. It is widely used in home automation, digital agriculture, industrial controls, medical monitoring &power systems.

8. Near Filed Communication (NFC) Near Field Communication (NFC) is a set of short-range wireless technology at 13.56 MHz, typically requiring a distance of 4 cm. NFC technology makes life easier and more convenient for consumers around the world by making it simpler to make transactions, exchange digital content, and connect electronic devices with a touch. Allows intuitive initialization of wireless networks and NFC is complementary to Bluetooth and 802.11 with their long distance capabilities at a distance circa up to 10 cm. It also works in dirty environment, does not require line of sight, easy and simple connection method. It is first developed by Philips and Sony companies. Data exchange rate now days approximately 424 kbps. Power consumption during data reading in NFC is under 15ma.

9. Actuators An actuator is something that converts energy into motion, which means actuators drive motions into mechanical systems. It takes hydraulic fluid, electric current or some other source of power. Actuators can create a linear motion, rotary motion or oscillatory motion. Cover short distances, typically up to 30 feet and generally communicate at less than 1 Mbps. Actuators typically are used in manufacturing or industrial applications. There are three types of actuators are (1) Electrical: ac and dc motors, stepper motors, solenoids (2) Hydraulic: use hydraulic fluid to actuate motion (3) Pneumatic: use compressed air to actuate motion. All these three types of actuators are very much in use today. Among these, electric actuators are the most commonly used type. Hydraulic and pneumatic systems allow for increased force and torque from smaller motor.

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10. Wireless Sensor Networks (WSN) A WSN is a wireless network consisting of spatially distributed autonomous devices using sensors to cooperatively monitor physical or environmental conditions, such as temperature, sound, vibration, pressure, motion or pollutants, at different locations. Formed by hundreds or thousands of motes that communicate with each other and pass data along from one to another. A wireless sensor network is an important element in IOT paradigm. Sensor nodes may not have global ID because of the large amount of overhead and large number of sensors. WSN based on IOT has received remarkable attention in many areas, such as military, homeland security, healthcare, precision agriculture monitoring, manufacturing, habitat monitoring, forest fire and flood detection and so on [26]. Sensors mounted to a patient's body are monitoring the responses to the medication, so that doctors can measure the effects of the medicines [27]. 4.11. Artificial Intelligence (AI) Artificial Intelligence refers to electronic environments that are sensitive and responsive to the presence of people. In an ambient intelligence world, devices work in concert to support people in carrying out their every- S. Madakam et al. 172 day life activities in easy, natural way using Information and Intelligence that is hidden in the network connected devices.

It is characterized by the following systems of characteristics
(1) Embedded: Many Net- worked devices are integrated in to the environment
(2) Context Aware: These devices can recognize you and your situational context
(3) Personalized: They can be tailored to your needs
(4) Adaptive: They can change in response to you
(5) Anticipatory: They can anticipate your desires without conscious mediation.

III. Related Work

(A) Indoor localization
Indoor localization has been a trending research area for many years. GPS does not provide reliable positioning indoors. Most current research in indoor localization, focus on determining mobile node's position using existing pervasive radio technologies such as WiFi, Zigbee, Bluetooth and etc. The popularity of using existing wireless infrastructure to determine position comes from its advantage, which doesn't require purchasing extra equipment and existing widespread deployment of these technologies. Currently, indoor RSSI localization can be categorized into three types: plain multilateration [18], fingerprinting based localization [19] and statistical localization methods [20]. Multilateration methods that use RSSI only, may suffer from performance degradation in complex situations due to multipath fading and temporal dynamics [21]. A more accurate approach for indoor positioning is using fingerprinting localization [22]. Fingerprinting consists of two phases; first phase is a learning phase, which involves forming a database that contains signal fingerprints at each known location. The second phase is online phase where mobile nodes location is found by matching the RSSI fingerprint to the one's already stored in the database. Statistical methods involve refining the position by attempting to reduce location deviation caused by environmental factors [23].

(B) Related resource management systems.
Several research papers related to classroom management were published. A classroom access control system which tries to solve classroom access with RFID card readers was proposed [24]. In this case the system consists of one Arduino Uno and one master node and communicates wirelessly through ZigBee. Social network integration was also explored. The typical usage scenario of the system is as follows:
1. Teacher enters classrooms and swipes his smart card against NFC Reader of the classroom node.
2. Classroom node, which consists of Arduino Uno, NFC reader and RF link, transmits the RFID key of the teacher to the master node through ZigBee
3. Master node consists of Arduino Ethernet, which receives the RFID key of the teacher and authenticates it against the teacher database and stores the record on Xively.
4. Client application, developed with Google maps API, shows a map of classrooms and whether or not they are occupied and also displays the name of the professor who occupies the classroom.
In another research [25], the authors proposed a platform for the Internet of Things and perform a case study of a Smart Office. The authors propose to develop a web-based authoring tool that will store and handle the ontologies created by the web-based authoring tool for each service domain. Also to demonstrate the feasibility of the Integrated Semantics Service Platform (ISSP), the authors developed a prototype service for an office domain using ISSP. Ontologies express meanings of data and relationships using knowledge representation. The ISSP consists of two software packages: the web-based authoring tool and the integrated semantic service server. The web-based authoring tool provides four main input fields: 1. Service domain topic. This field is used to allow developers in each service domain to create the class topic which will become a super-class of an ontology created with the values of the second input field to represent particular service domain knowledge in a smart city. 2. Ontology schema and relationship. This field is used to input the name of the class, object properties, data properties, domain, range and restriction in order to create an ontology reflecting the service domain knowledge. 3. Reference resources. This field is used to input information about IOT resources such as URLS for RESTfull APIs. 4. Semantic web rule language. This field is used to input SWRL for reasoning based on added ontologies.

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Another paper [26] proposed IOT-Based user-driven service modeling environment that consists of the user, the IOT service market and IOT service platform. The authors focused on creating an easy to use web authoring tool which can be used by non-technical users to create their own IOT services. In other words, the IOT based smart space management service can be defined by one user and deployed to another user to increase its value through the service personalization and customization. Multiple places can contain various objects such as lamps, heaters, roll screens and etc. The data generated by each device is in itself heterogeneous, so the authors proposed RESTful Smart Space Gateway (RSSG) that provides multiple communication protocols and the object data translation to represent data as the web standard. The proposed environment provides predefined context to the user to support a simple and easy to use method of service definition. The authors use a concept of ontology which is defined as an explicit and formal specification of conceptualization. Ontology is needed to define sensor data in order to provide context aware IOT services and to describe the virtual world that represents the service domain.

(c)Case studies based on the research framework

Based on the research framework of smart education, we began to carry out some pilot studies. Here introduces few case studies mentioned in table 2. We have done comparison of case studies keeping in mind the main workforce or skills required as per 21st century.

TABLE I. COMPARISON OF VARIOUS CAS STUDIES

Case Study	Specifications								
	E-Learning	Self-regulated & collaborative learning	Higher Thinking	Cooperating & Innovating	Interactive Teaching	Micro assisted	Online Assessment	Smart Digital Environment	Security
Classroom Pilot Project	Yes	Yes	No	No	No	Yes	Yes	Yes	No
Online J-Classroom	Yes	Yes	No	Yes	Yes	Yes	No	No	No
Punahsa School	No	No	No	No	No	No	No	Yes	Yes
Amrita University	Yes	No	No	Yes	Yes	No	No	Yes	No
Samsung Smart School	No	No	No	No	Yes	No	No	Yes	No
Smart Classroom of Tomorrow	Yes	Yes	Yes	No	Yes	No	No	Yes	No
MIT-Technology enabled classroom	No	Yes	No	Yes	Yes	No	No	Yes	No
MIT-Crowd sourced learning	No	Yes	Yes	No	Yes	No	No	No	No
MIT-Light Board for Lecture video Capturing	No	No	No	No	Yes	No	No	Yes	No

1) Database

Big Data NoSQL databases were pioneered by top internet companies like Amazon, Google, LinkedIn and Facebook to overcome the drawbacks of RDBMS. RDBMS is not always the best solution for all situations as it cannot meet the increasing growth of unstructured data. As data processing requirements grow exponentially, NoSQL is a dynamic and cloud friendly approach to dynamically process unstructured data with ease.

As web statistics we have compared various NoSQL databases in table II.

TABLE II. NOSQL

	Performance	**Scalability**	**Flexibility**	**Complexity**	**Functionality**
Key-Value Stores	high	high	high	None	Variable (none)
Column Stores	high	high	Moderate	Low	Minimal
Document Stores	high	Variable (high)	High	low	Variable (low)
Graph Databases	variable	variable	high	high	Graph theory
Relational Databases	variable	variable	low	moderate	Relational algebra

IV. PROBLEMS NEEDED TO BE ADDRESSED

V. PROBLEMS INTENDED TO BE ADDRESSED:-

1. Outreach remote area students : To reach out to underprivileged children and help them in developing technological skills
2. Ease for understanding and makes learning enjoyable which in turn improves the academic performance of the student : Smart classes are the fact that this kind of education is perfect for all kinds of students. A classroom has students with varied power of understanding and learning, and studying from notes and other materials becomes difficult for some

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students. But the use of smart classes and modern technology eases the learning process for all students

3. Smart Classroom incorporate flexible design that will enable multifunction use of the learning spaces by multiple users
4. Users including pre-service teachers; practitioners, students with special needs; curriculum writers across various arrangements (e.g. long term access to the classroom; multiple sessions across a period of study; repeat visits yearly).
5. Eco- Friendly : Smart classroom reduces the use of paper and most of the work is done automatically without use of paper.
6. Better utilization of Energy : To rescue instructor's energy from irrelevant work to the intentioned goal . Along with this the biometric sensor device saves electricity consumption as it turn off all the devices immediately an instructor ends the lecture and punch before leaving class.
7. Analyzing data in a real-time smart-classroom: Using the analyzed data in making informed judgments for the benefit of student.
8. Stronger Institutional Image in the society.
9. Bridging the digital divide among the students and building better bonds between teachers and the students.
10. A next generation teaching aid with a plethora of references

VI. PROPOSED SYSTEM

The proposed methodology will involve a modeled, prototyped and implemented SVIEW. The proposed system will enhance the learning of student by calculating certain attributes of learning in the class and will be deployed on cloud. There is also one e-attendance feature which is supported by a biometric sensor device which will sense the data and send the structured data into a database containing Instructors and Students thumb-impression to Mac-address mappings. The proposed system will then run application that will help mark any student who comes after the instructor had come as a late comer and thus will not be allowed to throw questions to the Smart-board during class. With the help of the proposed system the instructor can monitor student's activities from one end. This proposed method will also allow the biometric sensor device to trigger actuators that will wake the smart-classroom thus: automatically turn-on the smart-board, the projectors and the rest of the electrical sockets using Dual Tone Multi-frequency (DTMF), immediately sensing of the instructor's thumb impression on the device, as he enters the class. The devices will turn off when the instructor electronically signs off after class.

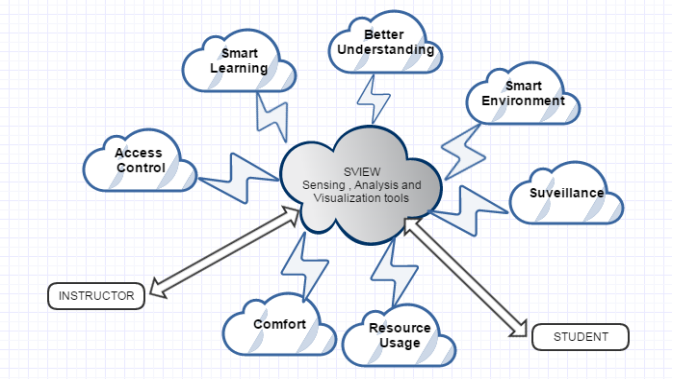

Fig .3 Proposed System

Thus the summary of the proposed smart-classroom as shown in fig. 3:

- Learning enhancement solution
- Late management solution
- Electronic attendance solution
- Smart resource usage i.e. smart classroom power –Up n Off using DTMF
- Smart Tutorials using Smart Boards

VII. FUTURE WORK

In future, we are planning to deploy the system using practical smart systems to test the real world implementation and feasibility of the system. Also to develop a simple and flexible database for IOT middleware using credit card sized computer hardware and Mongo DB database engine as affordable database server. While the model we have presented demonstrate some of the ways that can added to make classroom more smarter, works remains to create a fully realized, secure and smart university. We first need to implement the proposed model and compare it with already existing models and in next paper we give the well-defined algorithm and implement results. Development of reliable and quality models and performance indices of total system will also be our concern.

The analysis and testing of the work will be done by applying the performance metrics on the data. Different performance metrics like Precision, Recall will be calculated based on user preferences. The accuracy will be compared and evaluation will be done by viewing the relevant graphs and charts. Also, the analysis and comparison of the various novel algorithms proposed in our research will be conducted with the previous developed methods and techniques. The above tasks will be performed with the help of SPSS software.

VIII. CONCLUSION

In this paper, we proposed an IOT-based SVIEW system in order to achieve smart classroom to facilitate the students. SVIEW will enable better utilization of time saved by automatic attendance monitoring, reduction in rate of late-coming of the students to classes, better understanding of Student and will support better tutorial experience with

unexpected and unplanned increase in tutorial hours and increased students' participation and throwing of questions.

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