IOT Strategic Research and Use Case Scenario: A direction to the smart life

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Abstract: IOT (Internet of Things) becomes an important technology which allows communication between objects, machines etc. IOT becomes the wide area for researchers. It is technology which help the objects to interact with internal as well as external environment, which in turn affects the decisions taken. The type of communication like human-machine, human-human or machine-machine. The IOT sensors have different types of connections such as GSM, GPRS, 3G, LTE, RFID, Wi-Fi, Bluetooth, and ZigBee. This paper covers the most important issues and challenges for Internet of Things technology. This paper elaborates the key issues with the help of different types of technologies as well as about current and future research and development efforts in this field.

Keywords: Internet of Things, RFID, technologies, research, use case scenario.

Introduction:

The Internet of Things (IOT) is a continuous and advancement in technology (figure 1) which describes a future where every physical objects can be connected to the Internet with the help of various devices like GSM, RFID, 3G etc. objects obtain intelligence and make themselves recognizable and identifiable.

Figure 1: Internet of Things

Objects through internet can communicate like one machine can communicate with another machine (M2M).according to a survey the number of internet connected devices will be upto 50 billion in 2020.
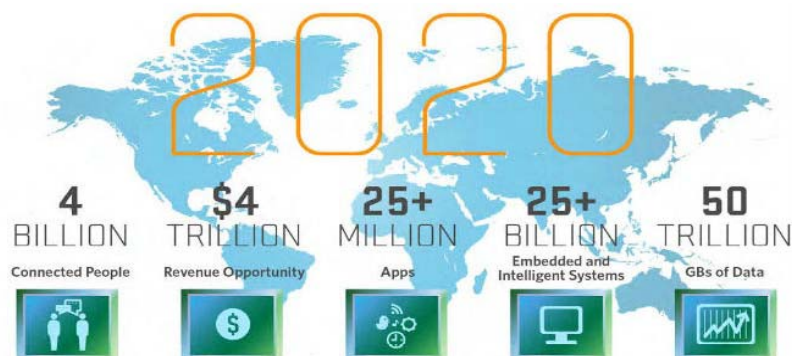

Figure 2 : installed base for IOT analysis (will grow upto 212 billion by 2020)

According to an industry analyst, International Data Corporation, installed base for IOT will grow up to 212 billion by 2020 (figure 2). International Data Corporation, analyze that this growth is driven by intelligent systems that will be installed and collecting data which is based on customer and industry specific.

IOT includes, for example, Cameras which connected to internet that allow you to switching off the lights automatically in a room when no one is around, changing the lane while driving safely, post pictures online with a single click. It also includes electric vehicle and smart houses that are security enabled with connectivity through internet. IOT can also be able to transfer data over the network without human interaction.

IOT Analytics and Characteristics:

IOT analytics examines and analyze the data. Sensors, RFID and other devices helpful to collect the data and on that data analysis is to be performed. IOT analytics consists of IOT data (in the form of different devices like smart vehicle, smart house, smart devices etc.) which are connected through multiple sensors with continuous and high volume data and that data store and blend and data is managed. The second step of IOT analytics (figure 3) is more complexity which consists of multiple and distributed analytics. That data is integrated with operation system and the final step is more automation which consists of bidirectional communication and control of end points.
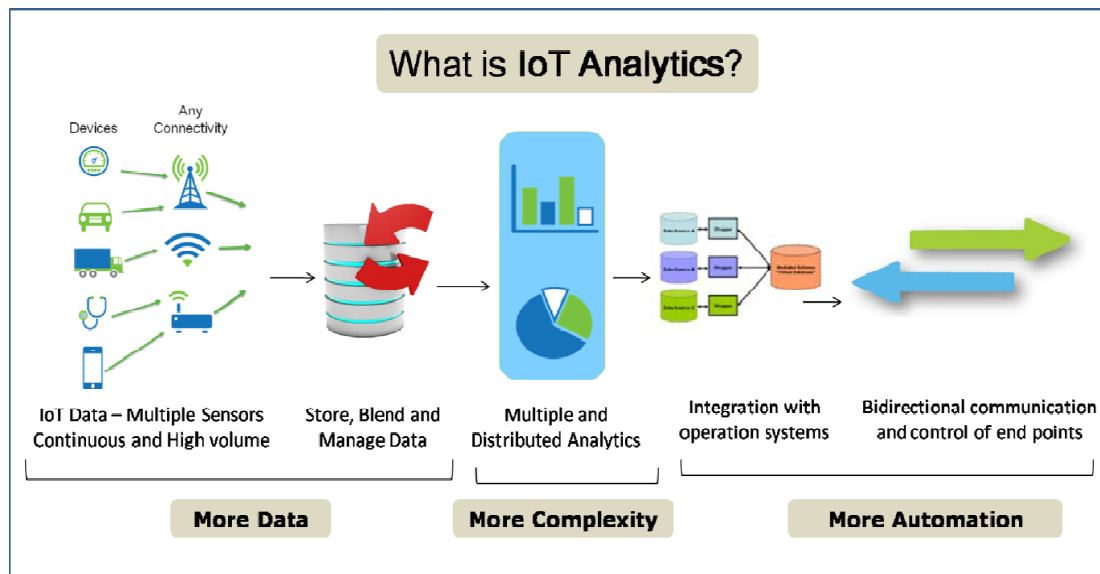

Figure 3: IOT Analytics

The main *characteristics* (figure 4) of IOT consist of:

- *Data:* Data is the first step in IOT towards action and intelligence.
- *Connectivity:* Connectivity involve to connect devices, sensors etc. with network compatibility and accessibility. The Devices are to be connected with any device, item, and actuators and to 'the Internet' or another network. Compatibility involves the ability to produce and consume data whereas accessibility means to connect to a network.
- *Communication:* The devices can be communicated through data and analyze data.
- *Intelligence:* With the help of algorithms which makes the devices smart and intelligent. Which is the main aspect as in the sensing capabilities in IOT devices.
- *Things:* The things which are connected with devices are the main characteristics of IOT. The thing-related services are provided by IOT, such as privacy protection and semantic consistency between physical things. The devices can contain sensors or sensing materials can be attached to devices.
- *Action.* The action can be physical action, or it can be based on some consequences or mechanization. The action is the outcome of intelligence. Overall, it is the most important part of IOT.
- *Ecosystem:* The ecosystem in IOT consists of expertise and ability which is required to create the value chain which begins with different mechanism and consists of different components like processors, modules etc.
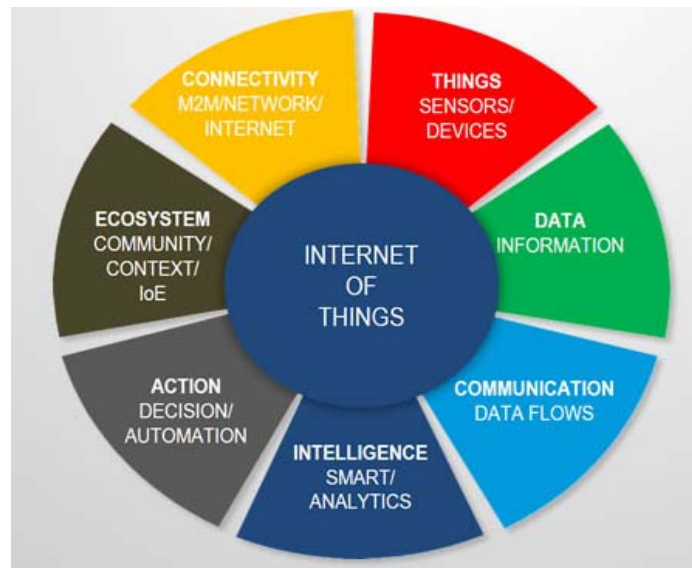
Figure 4 : IOT Characteristics

Internet of Things Strategic Research:

The Internet of Things is one of the most powerful techniques for the next industrial revolution and business activities. The IOT requires sound information processing capabilities and physical, digital, cyber and virtual worlds for the "digital shadows" of these real things. The European Research Cluster on the Internet of Things (IERC) has implicated experts from research, academics, Industries which provide their vision on IOT technologies, research challenges, and the key applications.

The IOT innovations affects on many industries, research as well as big organizations. Some important technologies like embed systems. These systems are filling the gap between physical world of real things and cyber space. As shown in the figure 5, how IOT society knowledge integration, filling the gap between real physical world and virtual cyber world. There is bidirectional communication between digital world and real physical world which shows things integration, between digital world and virtual cyber world which shows data integration and also between real physical world and virtual cyber world, which shows semantic integration.
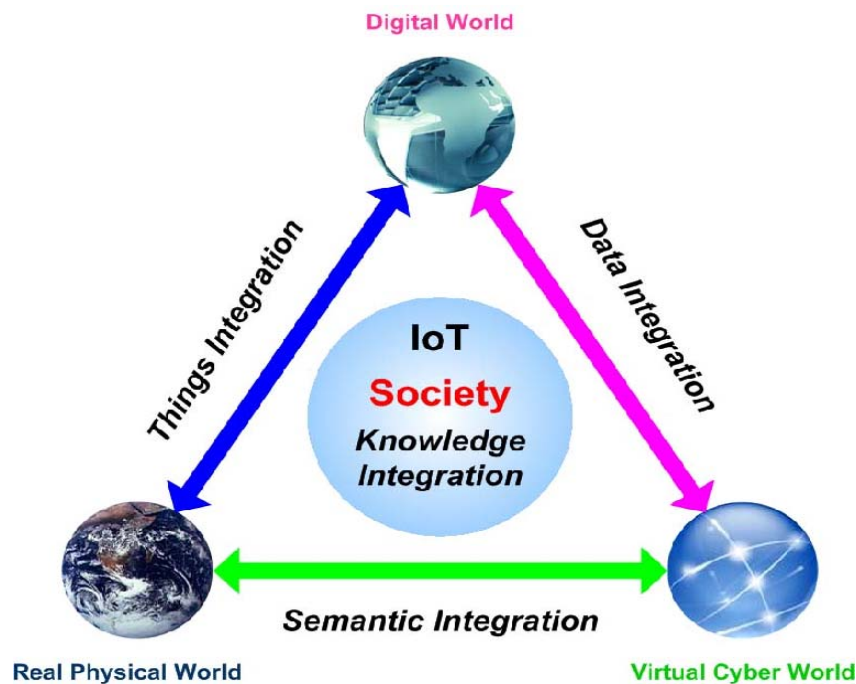

Figure 5 : the relationship between Real physical world and virtual cyber world using IOT

The IERC Research and Innovation Agenda focus on the most important aspects of IOT. The most important technologies like identification, communication, architecture, network technology, security, cyber security, interoperability, data and signal processing etc. The Strategic Research is developed with the help of European-led community consisting of different types of projects. Most of the research in the area of cloud system, cyber physics, social networks etc. has been done.

Internet of Things Applications:

There are lots of life applications that we normally see and these applications are smart but not communicate with each other. So to communicate them, there are lots of applications for their communication. Some of the applications are:
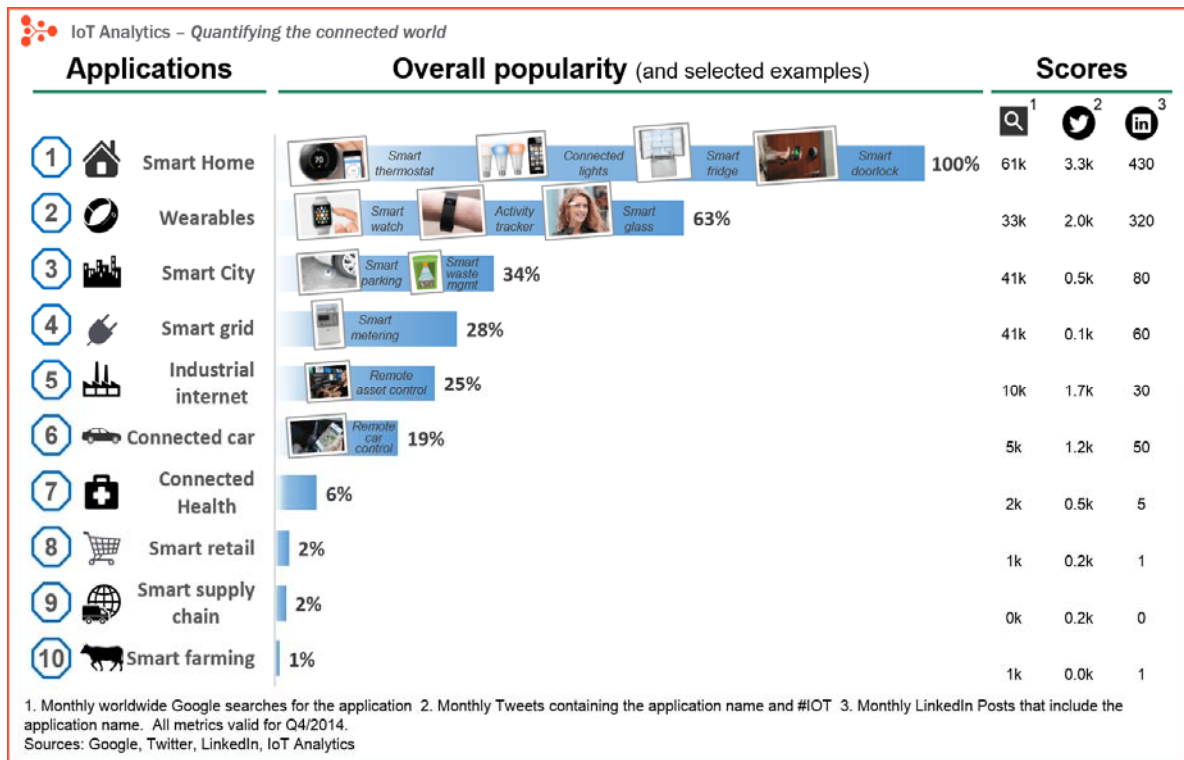

Figure 6: IOT Applications

- *Smart Home:* Smart Home ranking as highest IOT application. More than 70,000 people search for the term "Smart Home" each month. Smart Home has become the innovative steps of success in residential space. IOT also provide the solutions for Home Automation through which we can control the home appliances. By using smart applications for smart home will save energy, time and money.
- *Wearable's:* Wearable's also the most important IOT application. There are lots of available in the market like smart watches, smart headphones, smart gesture control, smart bracelet.
- *Smart City:* Smart city is another powerful application of IOT. Smart city span with variety like urban security, water distribution, traffic management, waste management and environmental monitoring. By using smart city application it also solve the problem of pollution, traffic congestion problems, reduce noise. With the help of sensors, citizens can find out the free available parking slots nearby.
- *Smart Grid:* Smart Grid is also the popular application of IOT. It will improve efficiency, economics, reliability, whether it is used for any manner.
- *Industrial Internet:* Industrial Internet has become the biggest push for internet websites like facebook, twitter etc. and it is the new buzz in the industrial sector. It is give power to industrial engineering with big data, sensors etc. IOT provides great potential for quality control and sustainability in case of industrial internet.
- *Connected Cars:* The automotive new digital technology worked to optimize vehicles with its internal functions which are based on smart applications. A large number of auto makers are working on connected car solutions. The connected car is a vehicle which is able to optimize it's own operation, maintenance, comfort of passengers etc. with the help of internet connectivity and sensors.
- *Connected Health:* Connected health becomes the most important part of IOT applications. Smart Medicare devices and connected healthcare system bears potential for companies as well as for people.

- ***Smart Retailing and Supply-chain Management:*** Smart retailing is the most important part of daily life. IOT with smart equipments like with the help of RFID or sensors which supply lots of compensation to retailers like with the help of RFID, the retailer can track and detect the stocks and prevent them from going out of stock. With smart gadgets, it can track the supply chain management system and also generate graphs for useful strategies.
- ***Smart Farming:*** Smart farming has become the most important application the field of agriculture. With the help of smart equipments with sensor technology, farming becomes interesting and easy.

IOT Use Case Scenarios:

The future technology is based upon the IOT technology in which there are uniquely identifiable objects which are interconnected through a network for a new platform and growth (figure 7).
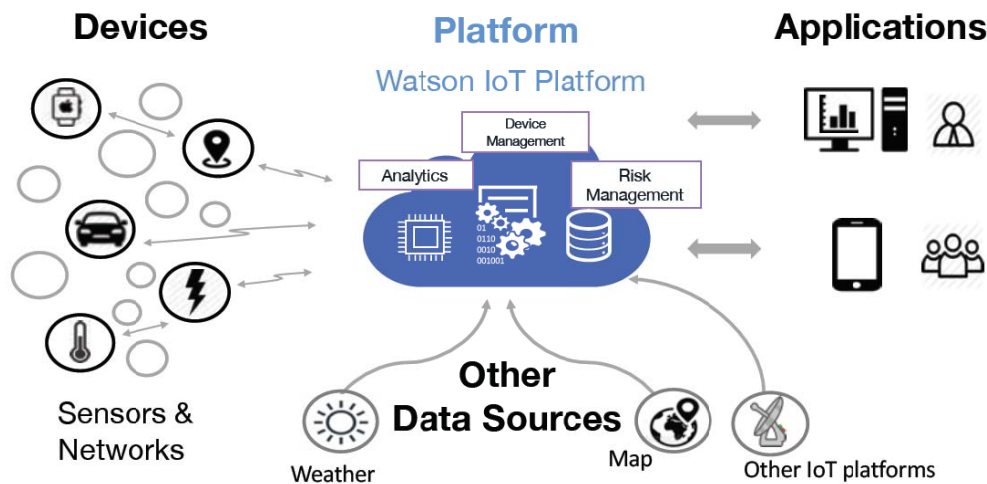

Figure 7: IOT Devices connected with network

There are different types of use case scenarios and real life examples related to IOT. These come across industries, some projects like pilot, simulation, robotics, AI, RFID. IOT also increase in the field of healthcare, smart city and various innovations.

During the data analysis from 2017 until 2022, in healthcare applications, the growth of IOT has increasing its demand day by day i.e. there is digital transformation in the healthcare industry. There is increasing perception of consumers regarding their health, which demand for remote and home possibilities keeps growing. There are different healthcare systems turn up with work of fiction approaches. eHealthcare is also the new area in the case of healthcare. So we can say that around 60% of healthcare organizations have introduces IOT devices into their facilities. Real time healthcare system is also a key area in the field of IOT and Big data analytics tools and processes which analyze the healthcare system.

The Internet of Things (IOT) is making possible to make cities smart and greener, safer and more efficient. In smart cities, many different stakeholders must work together to provide the best technology solutions. Governments and their partners can reduce energy and water consumption, keep people moving efficiently, and improve safety and quality of life by connecting devices, vehicles and infrastructure in the city. So the integration of technology which provide security and safety which is higher demand.

So by optimizing resources like urban farming, reducing traffic congestion etc. we can make a smart city. Smart city or it can be smart building, there is connectivity or data which enable various technologies and make them smart.

Connected communities and engaged citizens also the important part. So the goals and is to shape the evolutions of and in smart cities on all levels. According to a survey, by 2019, around 40% of local and regional governments will use IOT to make smart city i.e. to turn infrastructure like roads, streetlights, traffic signals etc. Until at least 2020, smart city projects are poised to sharply increase as we move from ad hoc smart city projects to the first true smart cities.
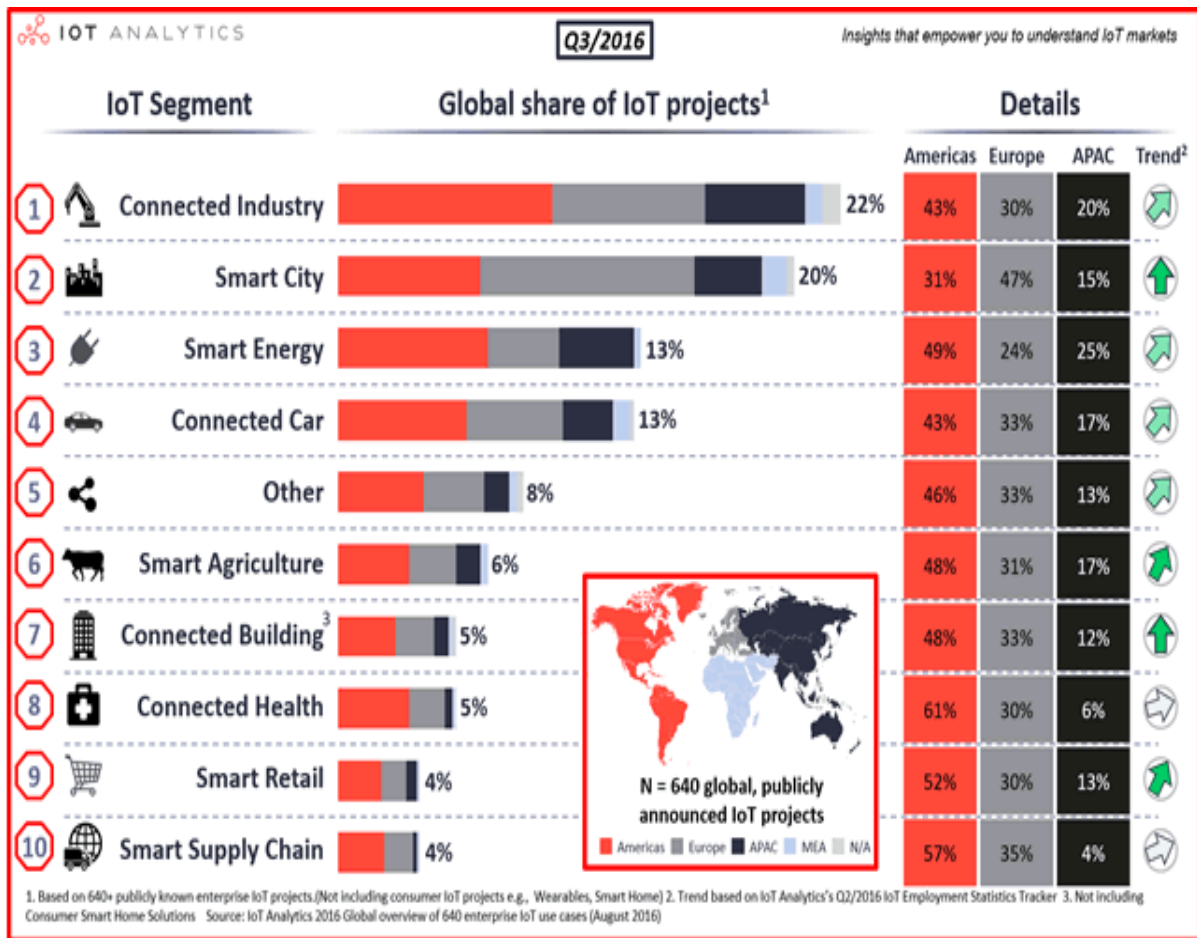
Figure 8: Use case Scenarios (*from source :IOT Analytics sells an Excel with of over 640 Enterprise IOT projects in the IOT segments in this illustration*)

The above diagram shows the different industries uses IOT and their global share of IOT projects. There are some firms which made lists, based upon publicly available customer success stories and other sources, different use case scenarios are made like IOT analytics. There are more real examples of IOT like analyst firms and research companies. So we can say that the effective IOT use case scenarios and examples start with challenges and end goals in mind. Then the effective way for organizations to look at the possible way of IOT deployments to succeed in their digital transformations by optimize their efficiency and better serve their customers.

Conclusion:

IOT will grow to around 30 billion units, installed in 2020 representing almost 30-fold increase from 0.9 billion in 2009. At European and global level the economic value is added by 2020. The IOT applications are still under development by different industries applications, but there is some grown in the industries like sensors, electronic processing, micro controllers, information and communication services. From the use case scenarios we state that not all industries grows at the same speed. IOT will also facilitate the new business models based on real time data based on billions of sensor nodes which will be the enhancement and development in the smart technology.

References:

[1] Amrita Sajja, D. K. Kharde, Chandana Pandey. A Survey on efficient way to Live: Smart Home - It's an Internet of Things. ISAR - International Journal of Electronics and Communication Ethics, Volume 1. Issue 1, 2016.
[2] Bill Chamberlin. Healthcare Internet of Things: 18 trends to watch in 2016. IBM Center for Applied Insights. https://ibmcai.com/2016/03/01/healthcare-internet-of-things-18-trends-to-watch-in-2016.
[3] Banniza TR, Biraghi AM, Correia LM, Goncalves J, Kind M, Monath T, Salo J, Sebastiao D, and Wuenstal K (2010) Project---wide Evaluation of Business Use Cases. Project report. FP7 ICT-2007-1-21604--4WARD/D1.2.
[4] Conner, Margery(2010) Sensors empower the 'Internet of Things'", EDN Magazine, 2010:http://www.edn.com/article/509123Sensors_empower_the_Internet_of_Things_.php
[5] Debasis Bandyopadhyay, Jaydip Sen. Internet of Things - Applications and Challenges in Technology and Standardization. arvix 9 may 2011.
[6] Kevin Ashton, "That 'Internet of Things' Thing", RFID Journal, 22 June 2009.
[7] M. A. Ezechina, K. K. Okwara, C. A. U. Ugboaja. The Internet of Things (Iot): A Scalable Approach to Connecting Everything. The International Journal of Engineering and Science 4(1) (2015) 09-12.

[8]   Patrick Guillemin, et al., Internet of Things Position Paper on Standardization for IoT technologies. European research cluster on the internet of things; January, 2015.

[9]   Rafiullah Khan, Sarmad Ullah Khan, Rifaqat Zaheer and Shahid Khan, "Future Internet: The Internet of Things Architecture, Possible Applications and Key Challenges," in Proceedings of Frontiers of Information Technology (FIT), 2012, pp. 257-260.

[10] Rosario Miceli. Energy Management and Smart Grids. Energies 2013.

[11] Sapandeep Kaur, Ikvinderpal Singh. A Survey Report on Internet of Things Applications. International Journal of Computer Science Trends and Technology Volume 4, Issue 2, Mar - Apr 2016.

[12] Sarita Agrawal, Manik Lal Das ―Internet of Things – A Paradigm Shift of Future Internet Applications‖ Institute of technology, nirma university, ahmedabad – 382 481, 08-10 december, 2011.

[13] S. Misra et al., Security Challenges and Approaches in Internet of Things. Springer Briefs in Electrical and Computer Engineering, 2016.