

A Journey from IoT to IoE

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Abstract

In quick growing world the trends and technologies had been extended a lot. Internet is a globalize environment of related computers, servers, mobiles, tablets etc. which is ruled by means of standard protocols for communications system [1]. The utilization of Internet enables sending, receiving, or communication of statistics with remote servers, clouds and analytics systems. In paper talks about the transition phase from Internet of Things (IoT) to Internet of Everything (IoE) and usage of IoT&IoE.The changes isn't a momentary process but it happens step by step. This is very analytical to adapt to this progress to make our human livespleasant what's more, the gadgets have the alternative to speak with each other. This can be assured by solitary rework, and compel them to utilize them according to the requirements. IoT

and IoE are the study topic of now a day in the internetworking network. Here in this paper we have made an attempt to show the growth from IoT and to IoE and also make the differences between both the technologies. The paper consists of the explanation of IoT and IoE technologies and the major differences among them. The future scope and expectations from the IoE based devices are mentioned while concluding this paper. After examining the current progression in the fields of IoT and IoE, the paper presents situations for the promising future development of their applications.

Keywords: IoT, IoE, RFID, Device, Process

I. Introduction

We are getting into in a new technology of computing science i.e. Internet of Things (IoT). IoT is a kind of “universal world neural network” in the cloud which connects a number of things. The IoT is a intelligently linked devices and structures which comprised of smart machines interacting and communicating with other machines, environments, objects and infrastructures and the Radio Frequency Identification (RFID) and sensor network technology will rise to meet this new challenges. [1].

Technology is rapidly developing in today’s world. Internet of Things (IoT) and Internet of Everything (IoE) are two such rapid developments. Both of them help to increase productivity, accuracy and help to improve the quality of life[4].

Internet of Everything (IOE) is the integration of people, process, data and things into networked connections. Internet of Everything is basically Internet of things mixed with data from humans, enterprise processes, and data structures.

This new phase of IoT and IoE is quite new. If we assume lower back just 20 years ago, the majority of Internet-connected units have been desktop PCs and different immobile hardware[13].

Then, large mobile gadgets began to be introduced.

IoT: -to enable conversation between things, acquire and exchange data

IoE: IoT + data analytic + services to the people + APIs that enable imparting the services

Simply put, the Internet of Things includes the interconnectivity of physical objects and records input and output, while the Internet of Everything is a complete time period that refers to the interconnectivity of various technologies, tactics and people. In our paper, part II describe IoTbasis, part III describe working of IoE,part IV describe transition of IoT to IoE,part V describe distinction between IoT&IoE and part VI describe future scope and expectations from the IoE.

II. What is IoT?

The IoT is a term coined by using Kevin Ashton returned in 1999 and the term rapidly gained popularity as a way to refer to physical units that are able to join and exchange data.[1]

The Internet of Things (IoT) is the network of physical objects—devices, tools, vehicles, buildings and different items embedded with electronics, circuits, software, sensors and network connectivity that permits these objects to accumulate and change data.

The Internet of Things approves objects to be sensed and controlled remotely across existing community infrastructure, growing possibilities for more direct integration of the physical world into computer based systems and resulting in accelerated efficiency and accuracy.

Looking at the evolution of the Internet we can classify it into five eras:

1. The Internet of Documents -- e-libraries, document primarily based webpages.
2. The Internet of Commerce -- e-commerce, e-banking and inventory trading websites.
3. The Internet of Applications -- Web 2.0

4. The Internet of People -- Social networks.
5. The Internet of Things -- Connected devices and computer

IoT refers to a myriad of internet-connected devices, capable of sensing and sharing information with one some other – an automated system except any human intervention. IoT is a network of interconnected physical devices/objects which collects and exchange information over wireless networks.[1]

Internet of Things has two fundamental components i.e ‘Internet’ which is the backbone of connectivity and ‘Things’ meaning to object/physical devices. It brings the strength of the internet, data processing and analytics and decision making to the real world oof physical objects[5].



Figure 1. Internet of Things(IoT)

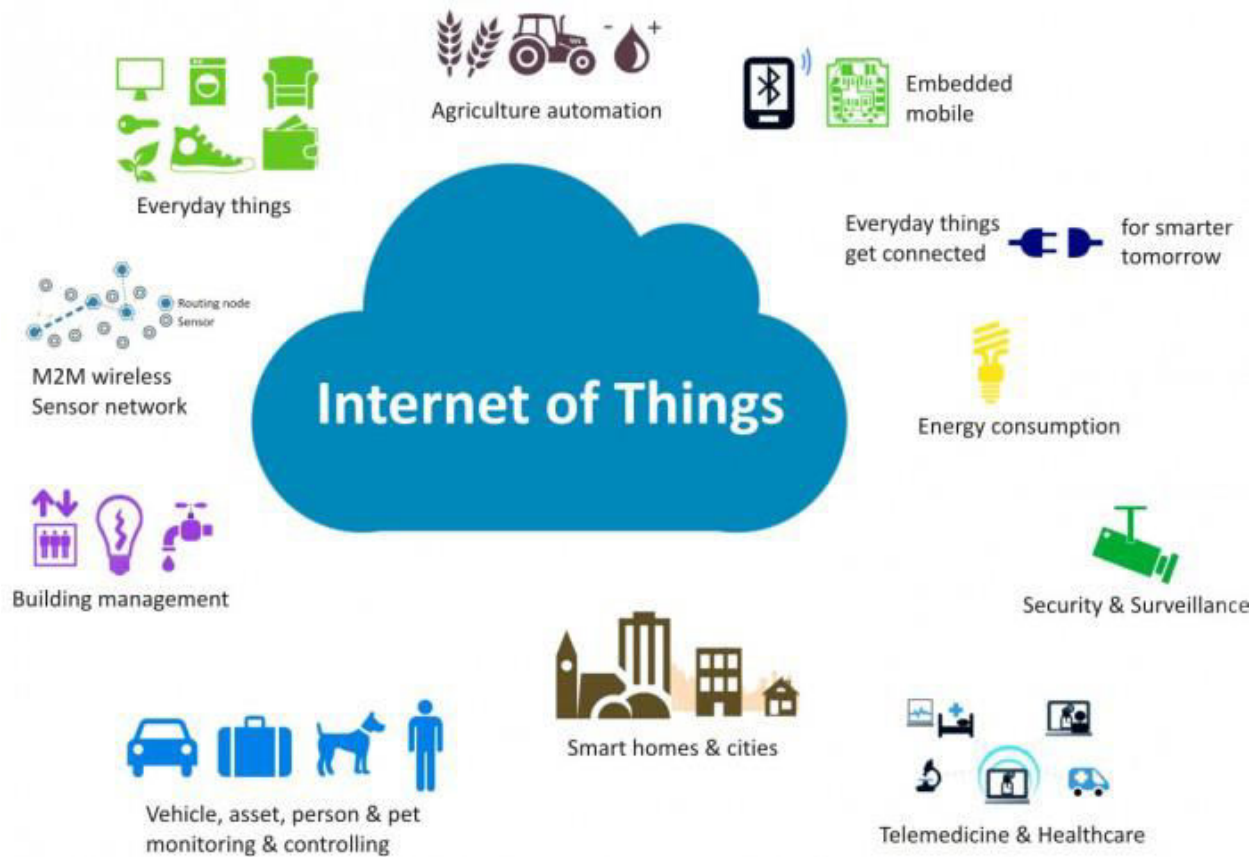


Figure 2.IoT Application

Internet of Things (IoT) is the key to the next phase of the industrial revolution. Technology permits physical devices to be introduced into the digital domain.

III.What is IoE?

After the inception of Internet of Things (IoT) a very new time period is get into existence i.e. Internet of Everything (IoE). Before discussing on Internet of Everything one must to recognize the means of it. In Internet of Everything process, people, data, and things are connected intelligently. Internet of Everything is a platform which makes the connection amongst process, people, data, and things greater precious and relevant. IoE generates new skills for businesses, persons and international locations by means of converting data intoactions [4]. Internet of Everything is based on Internet of Things with the inclusion of intelligence in the network. By intelligence in network we imply that a network of a

range of matters must possess visibility throughout earlier distinctive structures alongside with the orchestration and convergence properties.

Cisco elaborates-

The “Internet of Everything” builds on the foundation of the “Internet of Things” by adding network intelligence that allows convergence, orchestration and visibility across previously disparate systems.

The Internet of Everything (IoE) “is bringing together people, process, data, and things to make networked connections greater relevant and valuable than ever before—turning statistics into movements that create new capabilities, richer experiences, and remarkable financial possibility for businesses, individuals, and countries.”. (Cisco, 2013) Internet of Everything (IOE) is the integration of people, process, facts and matters into networked connections. Internet of Everything is basically Internet of things blended with data from humans, commercial enterprise processes, and statistics structures.

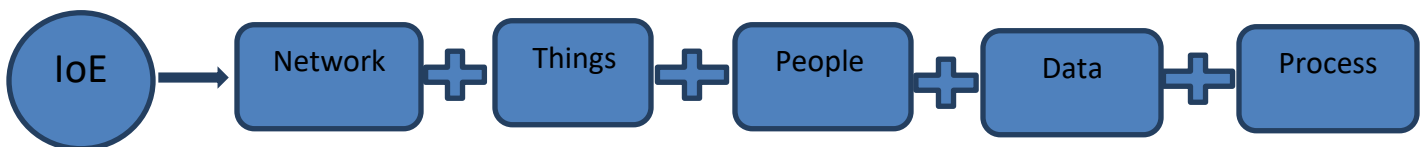


Figure 3. Internet of Everything

Pillars of Internet of Everything [2] : To understand it properly we will want to dive into the core parts of IoE. IoE is an umbrella term combining the following 4 properties in one place:

1. People: People are the human beings using linked devices to deliver insights about their private and professional self. This data can encompass interests, preferences, work, private health etc. Connecting this data to enterprise needs can provides insights bearing on the wants and wishes of potentialities for businesses. Additionally, this can be used to tune overall performance and pain factors of human resources [2]

2. Process:

The process is the way to make certain deliverability of right information at the right time to the right man or woman or machine. Here data is more about insightful information or an action than just random chunk. Figuring out a way to decipher the right float of records is key to making the great use of massive data[2].

3. Data:

With the increase in sources and sorts of data, we will also need to classify the information and analyze it to convey useful insights. Data alone is nothing however once combined with analytics and analysis this new statistics can help corporations in selection making and managing the organization.

4. Things:

This is the place we come across the term Internet of Things(IoT). Internet of things is the interconnectivity of units that send and obtain information throughout networks like the internet. With each and every signal injected into the network, data is generated which needs to be collected, summarized and analyzed efficiently.

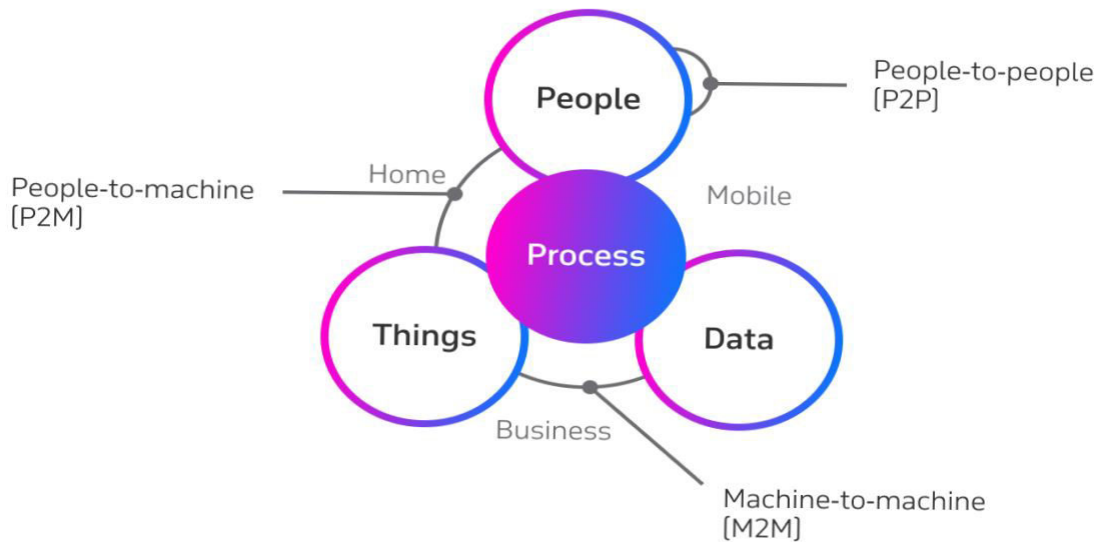


Figure 4: Piilar of IoE [14]

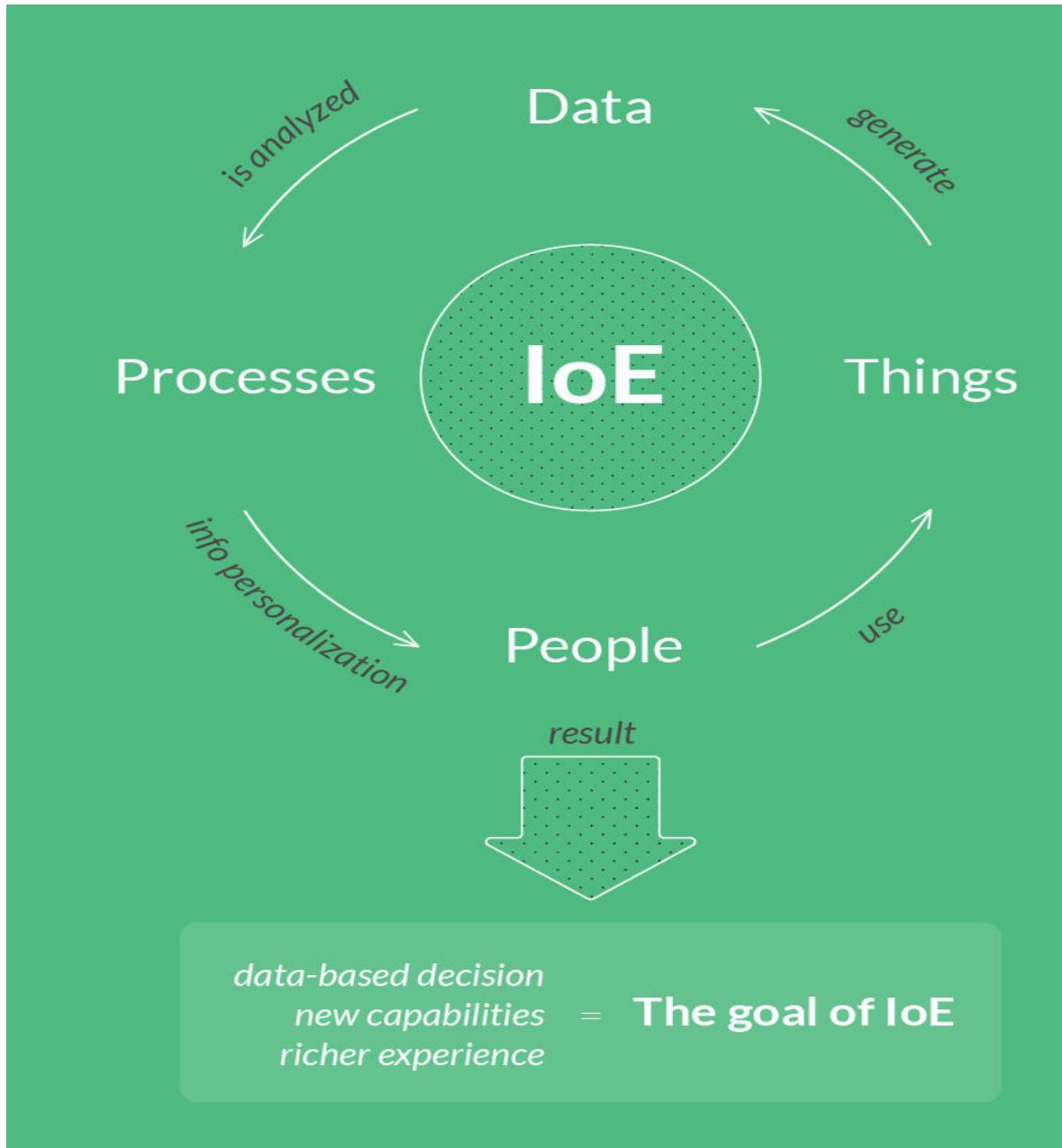


Figure 5: Working of IoE[2]

IV. Transition from IoT to IoE

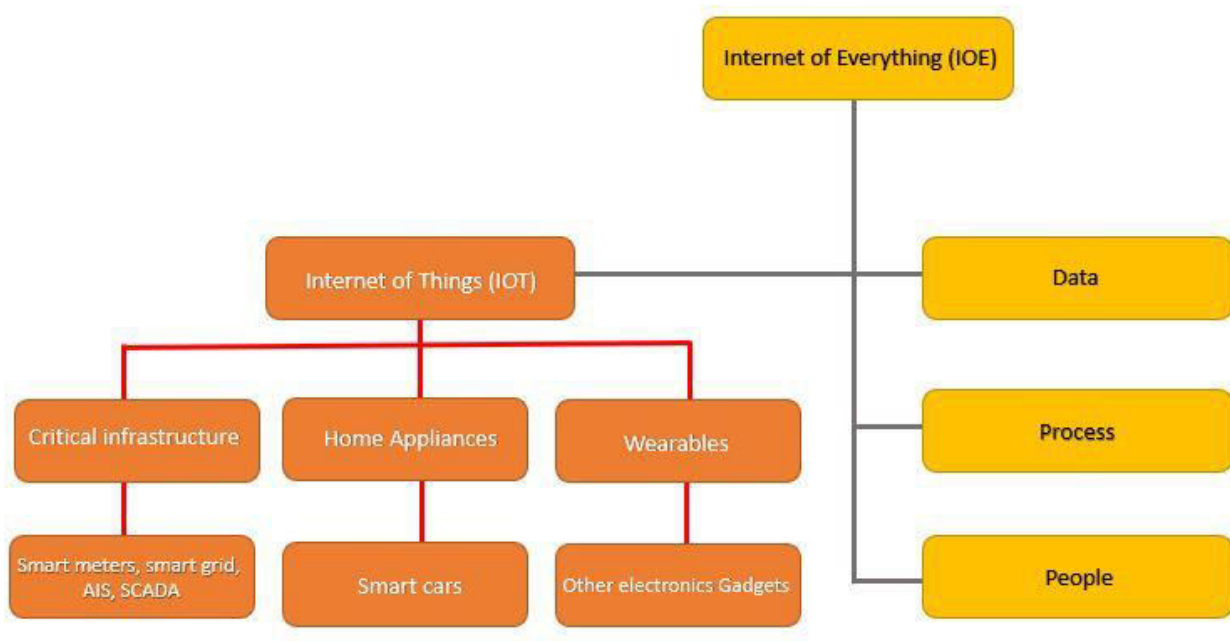


Figure 6. How the Internet of Things is slowly evolving into the Internet of Everything [08]

IOT = Network + Things

IOE = Network + Things + People + Data + Process [3]

The IoT is usually one-way (the sensor says that knows no "receive" anything from Internet). The future IoE will be two way, the "thing" not just transmit what it knows, however it asks (receive data) to the Internet (Cloud Computing) extra information to perform other processing. The "thing" in the technology of IoE has become most intelligent.

Cisco defines the Internet of Everything (IoE) as the networked connection of people, process, data, and things. The advantage of IoE is derived from the compound affect of connecting people, process, data, and things, and the value this extended connectedness creates as "everything" comes online.

IoE is creating exceptional opportunities for organizations, individuals, communities, and nations to recognise dramatically higher value from networked connections among people, process, data, and things. By comparison, the “Internet of Things” (IoT) refers in reality to the networked connection of physical objects (doesn't consist of the “people” and “process” elements of IoE). IoT is a single science transition, while IoE comprises many technology transitions (including IoT).

We see the Internet of Things extra from an Internet of Everything perspective, which is again part of a broader context. The Internet of Things is not a thing. Data which is acquired, submitted, processed or sent to devices, in most instances travels across the Internet, fixed lines, across cloud ecosystems or via (tailored) wifi connectivity technologies which are developed for precise purposes of IoT (e.g. wi-fi technologies for the IIoT). Bridging digital, bodily and human spheres thru networks, connected processes and data, turned into knowledge and action, is an integral factor in this equation. In latest years the center of attention in the Internet of Things has shifted from the pure component of connecting units and gathering records to this interconnection of devices, data, enterprise goals, humans and processes, really in IIoT.

The IoE network is constructed on present IoT infrastructure. IoE adds brain to the IoT community which allows convergence, visibility as properly as orchestration throughout previous heterogeneous system elements. This make individual separate structures into cohesive one.

V.IoTVsIoE

The core distinction between the Internet of Things and the Internet of Everything is the number of pillars for these concepts:

- IoT focuses on physical objects only

- IoE encompasses 4 components (things, processes, data and people) [5]

The IoT, in essence, is the interconnectivity of physical objects that send and receive data, while the IoE is a wider term that includes, apart from IoT, numerous technologies and people as the end-nodes.

Although IoT and IoE are different terms, there are additionally some similarities between them:

- Decentralization — both systems are disbursed and don't have a single center; each node works as a small administration center and is capable to perform certain duties independently
- Security problems — distributed structures are still exceedingly vulnerable to penetration and cyberattacks; the extra devices are linked to the network, the greater the susceptibility to breaches[5]

On the one hand, decentralization is one of the IoE and IoT advantages, since the total machine doesn't fail even if there are issues in a couple of nodes. On the other has, such a distribution causes disadvantages in the form of threats for data safety and personal privacy.

SERIAL NO.	INTERNET OF EVERYTHING (IOE)	INTERNET OF THINGS (IOT)
1.	The term IoE is coined by CISCO.	The term IoT coined by Kevin Ashton in 1999 during his work at Procter & Gamble.
2.	IoE is the intelligent connection between people, process, data and things by creating 'web of things' which is the next generation of internet.	IoT is the network of physical devices where collection and exchange of data occurs without human intervention.
3.	The goal of IoE is turning	The goal of IoT is to form an

SERIAL NO.	INTERNET OF EVERYTHING (IOE)	INTERNET OF THINGS (IOT)
	information into actions, providing data based decision making and provide new capabilities and richer experiences.	ecosystem of connected objects/physical devices. Or to create an ecosystem connecting from Thing to Thing.
4.	In IoE, communication occurs between Machine to Machine, Machine to People and technology assisted People to People.	In IoT, communication occurs between Machine to Machine.
5.	It is more complex than IoT as IoE includes IoD (Internet of Digital), IoH (Internet of Human) and IoT (Internet of Things).	It is less complex than IoE as IoT(Internet of Things) is considered as a part of Bigger IoE ecosystem.
6.	It has four pillars people, process, data, and things.	It has one pillar things i.e it focuses on physical objects only.
7.	It is considered as the superset for Internet of Things(IoT), along with IoH, IoD, communication technologies and the internet itself and it is considered a generation after IoT.	It is considered as the subset of bigger Internet of Everything(IoE) and IoT is considered one generation before IoE.
8.	Example are Connecting roads with hospitals to save more lives, Connecting homes for comfort living, Connecting food and people	Examples are Wearable health monitors, Connected appliances, Autonomous farming equipment, smarter energy management

SERIAL NO.	INTERNET OF EVERYTHING (IOE)	INTERNET OF THINGS (IOT)
	in the supply chain, Elderly care monitoring.	systems, Smart surveillance

Figure 9: Difference between IoT & IoE[10]

VI. Future Scope and expectations from the IoE

Time progression: Internet of things hype cycle

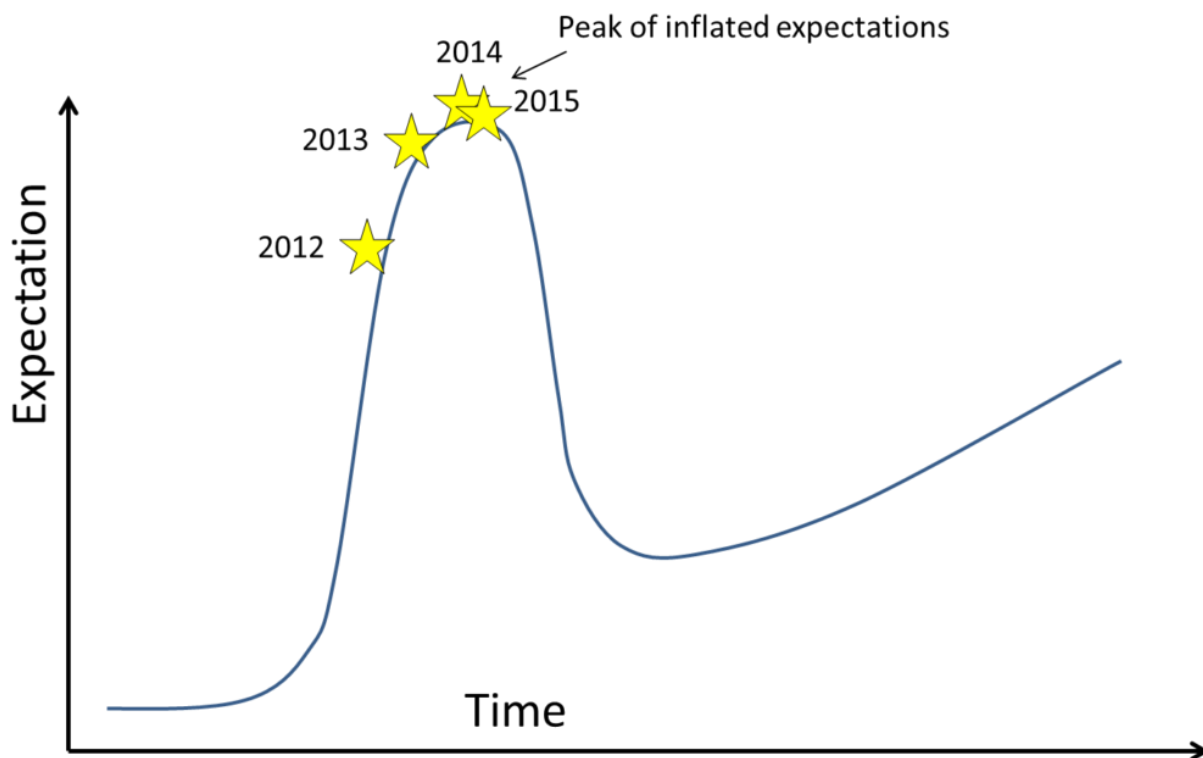


Figure : 7 Time Progression [06]

As to the market, we can say confidently that IoT is a technology of any industry. IoE technology is in particular applicable to some of the most vital fields, together with (1) manufacturing, (2) retail, (3) information, (4) finance & insurance, (5) healthcare.

IoE will generate more value of Stack to Public Sector.

Following are areas IoE influence more,[07]

Employee Productivity – it improves labor efficiency for new and current services

Cost Reduction – leading to reduced operational costs

Citizen experience– enhance the environment and generate better health outcomes

Increase Revenue– capability to meet expectation of Supply and demand additionally bettering compliance and monitoring.

VII.Conclusion

In this survey paper we introduced an exact description from Internet of Things (IoT) to Internet of Everything (IoE).The purpose of this survey has been accomplished by giving an adequate overview of the research trends in IoTand IoE.

The world is changing, and we need to change too. The two big things are always demand and supply. Demand is undergoing a paradigm shift from Information Technology to Human Technology, as we move from symbols to sensors. Supply is changing from a highly skilled numerate craft to hard science and engineering.

The Internet of Everything modifies only one thing, which is everything

Today, IoE is regarded a superset of IoT. Cisco, which at first instituted the term the Internet of Everything, accepts that this process brings individuals, information, and matters together to make equipped associations more and more pertinent and important. With this, the objective is to have "new capacities, extra extravagant encounters, and extraordinary economic open door for organizations, people, and nations.

The upcoming age of IoE assures a drastic change in the world with great impact on our way of living, managing our environment, solving problems and additionally delivers collectively people, data and techniques in new ways.

The Internet of Everything is going to advance in many fields together with the Security, which is expected to be of the best concern. IoE in future is anticipated to solve problems of privacy, security, hardware and software compatibility wired and wi-fi infrastructure, synchronization, data mining-analysis and others, earlier than widening its maintain on the world with new devices and units to simply work well globally

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