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INTERNET OF THINGS (IOT) –BUZZWORD FOR BUSINESS OPERATIONS

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Abstract
The high volatile business is really uncertain and quite competitive in nature. Every company wants to survive and continue to strive for higher market share. Companies are continuously trying to meet the expectations of the customers. Customers' needs and wants are fast changing. Companies are investing heavily in creating Information Technology support and platform so as to facilitate the businesses.Thus, the domain of business is continuously changing day by day with the innovations in technology specially the Information and communication technology (ICT). Lot of interactions, transactions, operations occurs in business and due to that the businesses need different data on variety of situations-related to point of sales, users' feedback, type of use of product, product movement and so on. Data are most important for the business managers so as to take a lot of decision related to business. The Information and communication technology revolutionized the scenario with lot of innovations. Internet of things (IoT), which means to connect the product and devices on the network of network for better access of real time data, have come up with lot of staffs. The products developed with the most innovative ways integrate with all sorts of sensing devices which captures all sorts of data. The Internet of things (IoT) provides better leverage to the firm in business.

Introduction
Current domain of business operation is continuously changing due to competition and also due to innovations. The contribution for this change is the growing application and integration of Information and communication technology (ICT). The way and process of doing business has changed dramatically from the days of bricks and mortar to a most sophisticated ways of doing business through Internet and e-commercemode. Today the business managers and customers have wide range of information and data about various processes and events.The products and applications are much more advanced today. Typically due to the continuous development the modern products and gadgets are made with sensing devices embedded in them. The sensing devices capture all the real time information and data and perform accordingly. Most of the cases the devices are connected to the Internet so as to send data and receive data. Managing of the products and devices from remote location was the main concern even few years back. The tracking and managing of the products now-a-days is easier for the business managers and users of the product. The Internet of things (IoT) tries to connect different devices and subsequently connect to the Internet for better management.

Internet of things (IOT)
The Internet of things (IoT) connects and links smart technologically upgraded devices with the Internet and thus share data and information for better actions. Internet of things ensures better life of the products and performances. Cisco estimated that IoT will consist of 50 billion devices connected to Internet by 2020.
Interpreting in other way IoT are basically the networks of smart devices, gadgets, products embedded with software, circuits, network, sensors which enables to connect and shares real time data.Thus IoT is the combination of sensors and connectivity. A simple product has got its value by the way it functions and performs, but when the same is embedded with software, circuits, network, sensors which enables to connect and shares real time data the product acquire much more value to the users. Most of the customers want to remain connected with the Internet in 24x7x365 with their devices like smart phones, Laptops and tablets – thus IoT is all about to connect anything and communicating in an intelligent way.
Due to the developments in IoT, more devices are coming to the market with embedded sensors and the devices are gaining capability to communicate. This ensures better business processes, reduces cost and risk and subsequently in a position to create new business models.

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TABLE 1. TOP 10 STRATEGIC TECHNOLOGY TRENDS FOR 2015

Major Focus	Rank	Technology
Merging the real world and the virtual world	1	Computing Everywhere
	2	The Internet of things
	3	3D Printing
Intelligence Everywhere	4	Advanced, Pervasive and Invisible Analytics
	5	Context Rich Systems
	6	Smart Machines
The new IT reality emerges	7	Cloud / Client Computing
	8	Software Defined Applications and Infrastructure
	9	Web-scale IT
	10	Risk Based Security and Self Protection

Source: Gartner Symposium IT XPO 2014

It is clearly observed from the above table and also from the Gartner Symposium IT expo 2014 that the IoT is the leading technology in the current year.The study of Chui, Loffler and Roberts in 2010 highlighted that IoT has created six distinct types of application- these are tracking behavior, enhanced situational analysis, sensor-driven decision analytics, process optimization, optimized resource consumption and complex autonomous system.

TABLE 2 WORLD INTERNET USAGE AND POPULATION STATISTICS JUNE 30, 2015

World Regions	Internet Users Dec. 31, 2000	Internet Users Latest Data	Population (2015 Est.)
Africa	4,514,400	313,257,074	1,158,355,663
Asia	114,304,000	1,563,208,143	4,032,466,882
Europe	105,096,093	604,122,380	821,555,904
Middle East	3,284,800	115,823,882	236,137,235
North America	108,096,800	313,862,863	357,172,209
Latin America / Caribbean	18,068,919	333,115,908	617,776,105
Oceania/Australia	7,620,480	27,100,334	37,157,120
World Total	360,985,492	3,270,490,584	7,260,621,118

Source: http://www.internetworldstats.com/stats3.htm

The statistics shows that the Internet users in Asia are 1,563,208,143 as per June 30, 2015.
Atzori, Lera and Morabito during 2010 addressed the Internet of things. They also focused on integration of several technologies and communication solutions. Identification and tracking technologies, wired and wireless sensors, enhanced communication protocols etc were the major focus.
Greengard in 2015 described the Internet of things with smart phones, cloud computing, RFID technology, sensors etc. Further he highlighted the Industrial Internet and machine to machine communication, the basis for smart manufacturing and end to end supply chain visibility, the growing array of smart consumer devices and services etc.
Xia, Yang, Wang and Vinel in 2012 highlighted IoT as networked interconnection of everyday objects. They also mentioned the opportunities for IoT in today's business.

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Kortuem, Kawsar, Fitton and Sundramoorthy in 2009 expressed that the combination of Internet and emerging technologies like near-field communications, real life localization and embedded sensors transform the everyday objects into smart objects that can share data and receive the same.

Business application of IoT:

There are several points and devices need to connected in the business process in order to gain maximum benefits from IoT.

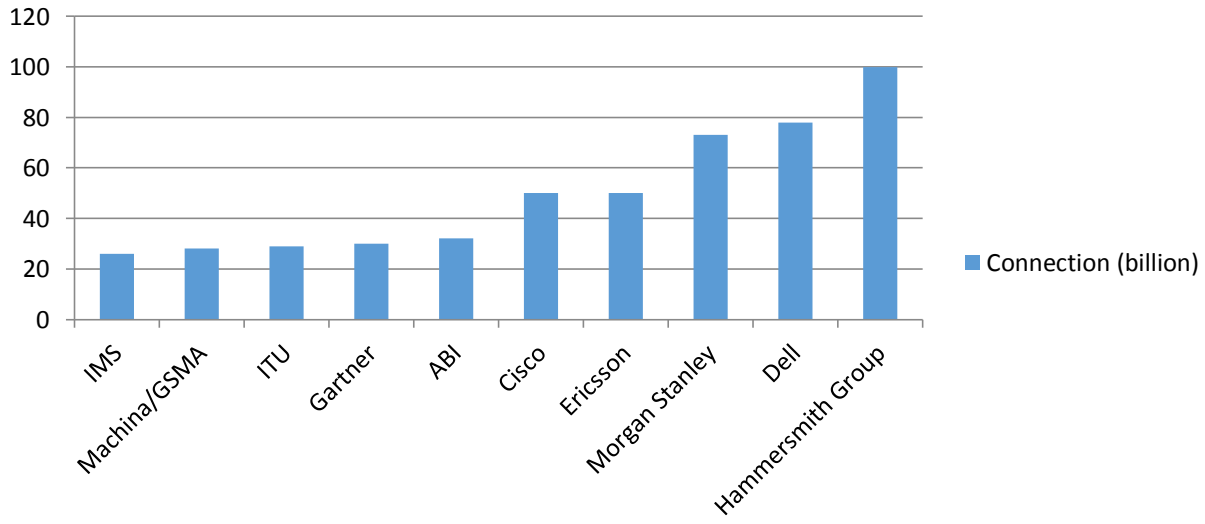
Technology	Range of Applications
IOT	Transportation
	Logistics & Supply Chain
	Industrial & Manufacturing
	Security & Surveillance
	Medical & Healthcare

Figure1. Business Applications forIoT

The above components shares lot of data related to business and day to day activities on a real time basis. The Transportation link provides enough data and receives data on different processes and thus ensures better service. The logistics and supply chain in real sense captures data, track product movements and update the status of the product in the supply chain network. These are possible due to the Internet of things. The part of Industrial and Manufacturing ensures better life of the equipment and machines by generating signals for preventive and predictive maintenance for equipment and machines. While with security & surveillance system capturing and sharing data, video and images becomes easier. In the medical and health section the capturing of data and sharing it also improve the medical services.

Figure 2 explains the projections of the connected devices for 2020. The projection of was done by different companies about the devices. The uses of the connected devices are now a days increasing. The study of Cisco on global mobile data traffic and estimated that 11.20 EB for the year 2017, which is shown in Figure 3.

Figure 2. Industry Estimates for connected devices (billion) in 2020



Source: Adapted from web source, http://www.ironpaper.com/webintel/articles/internet-things-market-statistics-2015

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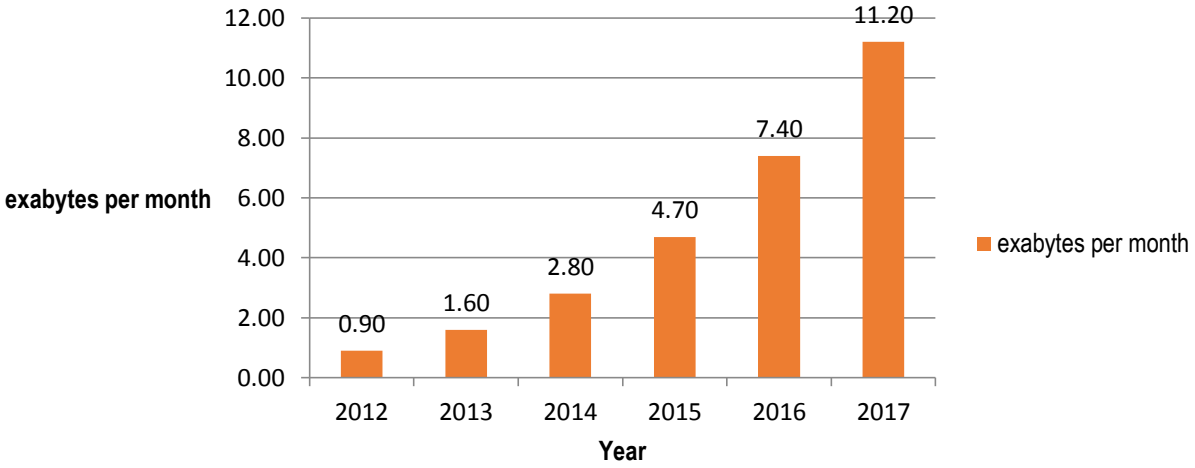
Figure 3. Mobile Data Traffic Projection



Source: Cisco Global Mobile Data Traffic Forecast 2012-2017

Frame work of IoT:

The components that appear in IoT are people, process, devices and data. Users or the people interact with the devices like micro oven, tab, refrigerator etc for time to time activity, thus update the actions and this is the People to machine (P2M) interaction. In case of the interaction between devices with the network for receiving the data and to update the data the form is called Machine to Machine (M2M) mode. The update of data and information sometimes exchange between user to user and it is called people to people (P2P) mode. In all these modes there involves exchange of data on real time basis.

Technology	Range of functions
IOT	Any time-Any Context
	Any Place
	Any Business
	Any Network
	Any data-Any Device

Figure 4.Frame Work of IoT

IoT can offer wide range of services like it can connect any data from any sensor enabled devices, can connect any network, can serve any business function, can perform operation in any place and perform operations at any time and with any context.

Drivers of IoT

As the role of data cannot be underestimated in today's business, what matters more for the businesses is to pin point the basic drivers of IoT in business. Business in their operations mayidentify few important drives of IoT and these are:

1. Real Time analysis and predictions about customers' choices, buying behavior, inventory positions etc.
2. Increase Logistics and Supply Chain efficiencies in delivering, procuring, tracking of products.
3. Aggregation of Information to predict better decisions in business.
4. Rapidly increasing consumer data (for example mobile) obtained through variety of sources.

The above mentioned points have given boost to the businesses to move towards the IoT. IoT is really of strategic importance to the business firms.

Proposed optimization technique model for IoT process in business

An organization deploys its monetary resources to create better connectivity of its processes and products on a real time basis. While doing so the objective of the organization remains always on the cost minimization. In typical manufacturing supply chain the Internet of things (IoT) platform generally creates products with sensing devices embedded in it and also update and receives lot of data. The following optimization technique model may be proposed to understand the cost optimization problem.

Minimize Z= C X

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Subject to, AX=b
X>=0

The above model is expressed in general LP problem using matrix notation. Here, X is an n-vector representing the variables like transportation cost, logistics cost, maintenance cost and manufacturing cost. A is an (m x n) matrix representing the constraint coefficients, b is the column vector representing the right hand side and C is an n-vector representing the objective function coefficient.

Conclusion

The high volatile business is really uncertain and quite competitive in nature. Thus, the domain of business is continuously changing day by day with the innovations in technology specially the Information and communication technology (ICT). Lot of interactions, transactions, operations occurs in business and due to that the businesses need different data on variety of situations-related to point of sales, users' feedback, type of use of product, product movement and so on. The Internet of things helps the organization, people and society at a large extent. Through the process all sort of real time data are shared. The major issue is the security and protection of the devices that participate in the Internet of things (IoT) platform. While lots of researches are going on at Industry level, Academic level and Industry-Academic level together. The tracking and managing of the products now-a-days is easier for the business managers and users of the product. The Internet of things (IoT) tries to connect different devices and subsequently connect to the Internet for better management.

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