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EMERGING TRENDS IN SCIENCE AND TECHNOLOGY (ETIST-2021)

27th October 2021

Jointly Organized by

Department of Biological Science, Physical Science and Computational Science

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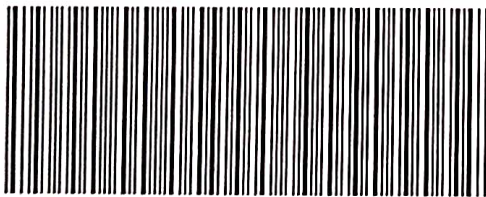
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Industrial Internet of Things (IIoT) and Industry 4.0

A. Gomathi

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Abstract:

Fourth Industrial Revolution is noted as Industry 4.0. It is essential to understand the potential of this fourth industrial revolution because its range is much broader, involving all industries and sectors. This brings hi-tech innovation in the field of various industries. Using this innovation, it links cyber physical system in which smart machines can exchange real-time information for decision – making through industrial internet of things. (IIoT).

The Industrial Internet of Things (IIoT) opens up a wide range of opportunities. IIoT used across several industries such as manufacturing, logistics, oil and gas, transportation, energy /utilities, mining and metals, aviation and other industrial sectors. IIoT helps to create a more holistic and better connected ecosystem for a company that focuses on manufacturing and supply chain management. IIoT provides the opportunity to utilize the power of smart machines and real – time analysis to take advantage of the data that machines have produced in industrial settings for years. The main aim of this paper is to brief about the emerging technologies involved in Industry 4.0 and the role of Industrial Internet of Things (IIoT) for smart factories.

Keywords: Industrial Internet of Things (IIoT), Industry 4.0, Smart factory, etc.,

I. Introduction

Technology plays an important role in many areas of our live. In the Internet of Things (IoT) make all things at our home, cars, cities, and industries smart. The industrial Internet of Things (IIoT) connects people, products, and processes to power digital transformation. Using industrial IoT platforms, companies connect, monitor, analyze, and act on data in new ways¹. The future of IIoT is tightly coupled with a trend known as Industry 4.0. The global market of Industrial Internet of Things (IIoT) is presumed to annually increase by 8.06% from the year 2018-2023, across the various industries such as manufacturing, oil & gas, healthcare, transportation, logistics, and mining⁷.

II. Objective of the Study

The main aim of this paper is

- To brief about the concept of IoT, Industrial IoT and Industry 4.0
- To concise the emerging technologies involved in industry 4.0 and
- To explain the role of industrial internet of things (IIoT) for smart factories.

III. Concept of IoT, Industrial IoT and Industry 4.0

i) *Internet of Things (IoT)*

IoT stands for Internet of Things, a concept that refers to connections between physical objects like sensors or machines and the Internet⁶. It also refers to a system of interrelated, internet-connected objects that are able to collect and transfer data over a wireless network without human intervention⁹.

ii) *Industrial Internet of Things (IIoT)*

The term industrial IOT evolved when IT is integrated with industrial automation and control system⁵. Industrial 'things' denotes the Internet enabled devices like PLCs, IPCs, Human Machine Interfaces (HMI), robots, vision cameras and sensors³.

Industrial Internet of Things (IIoT) refers to the use of IoT concepts in industrial production. The Industrial Internet of Things (IIoT) usually refers to interconnected sensors, controllers, and other devices networked together in an industrial setting. This connectivity allows for remote access and monitoring, but more importantly, it allows for data acquisition and collection, exchange and analysis of different data sources³.

IIoT devices will play a major role in digital transformations, especially as organizations attempt to digitize their production lines and supply chains. Additionally, big data analytics will evolve to incorporate IIoT data. This will make it possible for organizations to detect changing conditions in real time and respond accordingly⁴.

iii) *Industrial Internet of Things (IIoT) Platform Vendors:*

There are several vendors with IIoT platforms, including⁷:

ABB Ability, Aveva Wonderware, Axzon, Cisco IoT, Fanuc Field System, Linx Global Manufacturing, MindSphere by Siemens, Plataine, Predix by GE

Difference between IoT and IIoT:

Although IoT and IIoT have many technologies in common, including cloud platforms, sensors, connectivity, machine-to-machine communications and data analytics, they are used for different purposes. IoT applications connect devices across multiple verticals, including agriculture, healthcare, enterprise, consumer and utilities, as well as government and cities. IIoT applications, on the other hand, connect machines and devices in such industries as oil and gas, utilities and manufacturing. IoT devices include smart appliances, fitness bands and other applications that generally don't create emergency situations if something goes amiss. System failures and downtime in IIoT deployments can result in high-risk situations, or even life-threatening ones⁴.

Industry 4.0 – An Overview:

The fourth industrial revolution, Industry 4.0 is poised to happen on a global scale, taking the automation of manufacturing processes to a new level by linking the cyber & physical, incorporating AI and enabling customized and flexible mass production technologies. Cyber Physical System (CPS) refers to a platform comprising of a mechanical system that is controlled by computer algorithms, and tightly integrated with Internet and to its networked users.

Industry 4.0 creates a "smart factory" within which the cyber-physical systems monitor physical processes, create a virtual copy of the physical world and make decentralized decisions. Over the Internet of Things, cyber-physical systems communicate and cooperate with each other and with humans in real time.

Industrial Internet of Things (IIoT) and Industry 4.0

Industry 4.0, also sometimes referred to as IIoT or smart manufacturing, marries physical production and operations with smart digital technology, machine learning, and big data⁶. While every company and organization operating today is different, they all face a common challenge—the need for connectedness and access to real-time insights across processes, partners, products, and people⁶.

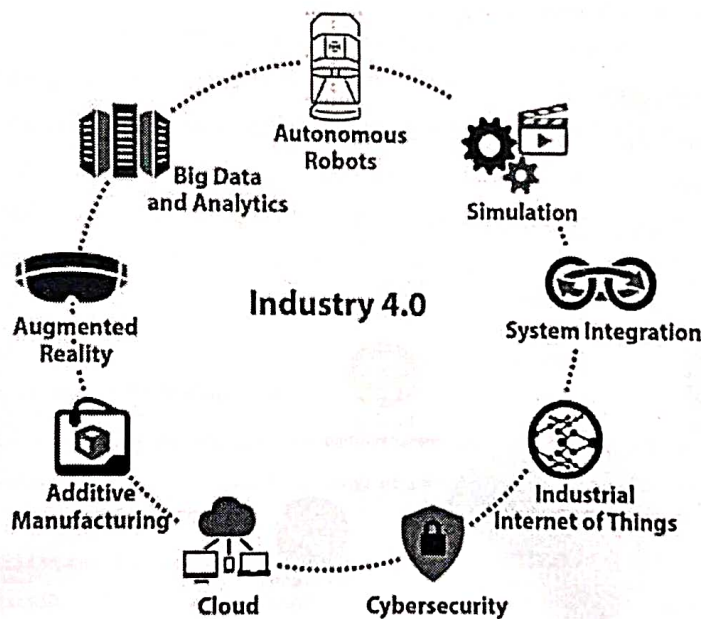
Industry 4.0 enables minimizing wasteful processes and actions and optimizing use of energy and other inputs. This is achieved based on capturing data, its analysis and using the analysis to improve functioning of machines, factories and systems. It is used to create a more holistic and better connected ecosystem for companies that focus on manufacturing and supply chain management⁶. It spans the entire product life cycle and supply chain—design, sales, inventory, scheduling, quality, engineering, and customer and field service⁶.

The need of industry 4.0 is to convert the regular machines to self-aware and self-learning machines to improve their overall performance and maintenance management with the surrounding interaction².

IV. Emerging Technologies involved in Industry 4.0:

Technologies coupled to Industry 4.0 can lead to entirely new services and products. The use of portable devices and sensors, robotics, and analysis will allow improvements in products in numerous ways, from creating tests and prototypes to the integration of connectivity to previously disconnected products.

Industry 4.0 involves the integration of some of the key emerging technologies



Source : Graphic inspired by Boston Consulting Group discussion on Industry 4.0

V. Role of Industrial Internet of Things (IIoT) for Smart Factories:

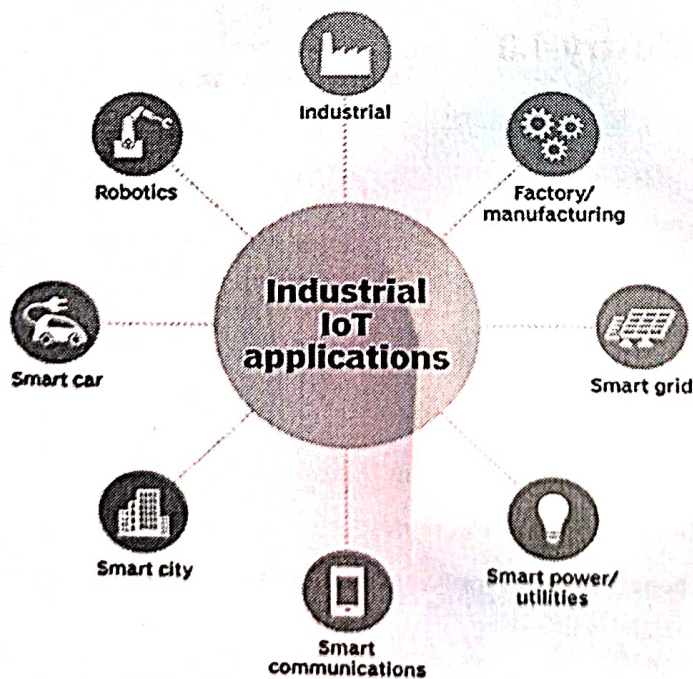
IIoT has enormous potential and benefits for improving productivity, reducing costs and increasing efficiency³.

- It makes the business more competitive, especially against disruptors like Amazon continue to optimize logistics and supply chain management.

- Companies that invest in modern, innovative Industry 4.0 technologies are better positioned to attract and retain new workers.
- It helps to increase efficiency, boost collaboration between departments, enable predictive and prescriptive analytics, and allow people including operators, managers, and executives to more fully leverage real-time data and intelligence to make better decisions while managing their day-to-day responsibilities.
- It allows companies to address potential issues before they become big problems.
- Predictive analytics, real-time data, internet-connected machinery, and automation can help to be more proactive when it comes to addressing and solving potential maintenance and supply chain management issues.
- It allows trimming costs, boost profits, and fuel growth.
- It accesses the real-time data and insights to make smarter, faster decisions about business, which can ultimately boost the efficiency and profitability of entire operation.

Application of Industrial Internet of Things (IIoT):

1. Smart factory applications and smart warehousing.
2. Predictive and remote maintenance.
3. Freight, goods and transportation monitoring.
4. Connected logistics.
5. Smart metering and smart grid.
6. Smart environment solutions.
7. Smart city applications.
8. Smart farming and livestock monitoring.



Source: IoT Agenda - TechTarget

Opportunities of Industrial Internet of Things (IIoT):

The Industrial Internet of Things (IIoT) opens up a wide range of opportunities for the manufacturing industry in particular⁷.

- Optimization of processes (e.g. through remote monitoring)
- Greater flexibility of production processes
- Increasing degree of automation
- Increased operational efficiency and lower failure rates
- Faster detection of productivity weaknesses and problems
- More accurate predictions of machine condition and more efficient maintenance
- Cost savings by avoiding unnecessary repairs
- Better availability and fewer machine failures
- Improved quality control and reduction of the error rate
- Improved transparency through worldwide access to machine data
- Improved technical customer service
- Development of trend-setting business areas and models (e.g. supplementary services such as remote troubleshooting or predictive maintenance)

VI. Conclusion:

The Industrial Internet of Things is undoubtedly playing a crucial role in organizations across different verticals undergoing significant digital transformation⁸. In Industrial IoT security must target three risk categories i.e. administrative and operational risks, technical risks and physical risks⁴. The main advantages of using IoT in industrial automation is to find bottlenecks in the process, reduce cycle times, prevent downtime and increase productivity. Although IIoT devices have been around for several years, real-world adoption is still in its infancy. This is sure to change as 5G becomes increasingly prevalent and more and more organizations begin to realize what IIoT can do for them.

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