The Internet of Things (IoT) has been quickly gaining currency. It describes a world that is rapidly moving towards a point where ‘things’ such as household appliances, machines, humans, animals and plants are connected and can be tracked. For example, there are projects that link cows to the Internet, making data such as where they are grazing, any erratic behavior by them, the perfect time to inseminate them, whether they have picked up an infection etc. available. Early insight into their behavior and illness helps reduce rearing costs and also improves the milk output.

Sensors attached to everyday objects, along with networking capability, are providing them with digital intelligence and making them ‘smart’. IoT refers to this seamless integration of the physical and digital worlds. Rightly used IoT can lead to safer cities, targeted healthcare, better governance and superior products and services.

The basic enablers of IoT are intelligent devices, sensors, all with near ubiquitous connectivity to other proximal devices and also to much larger compute capacity in the Cloud.

When these enablers are leveraged to enhance productivity, efficiency, flexibility and safety in Industrial environments and for the efficient operation of complex machinery, we use the term ‘Industrial Internet’. The fundamentals are the same, but the application domain is different. The problems solved are typically more complex. They demand sophisticated algorithms for optimization and learning. And they demand that vast amounts of data be processed in near real time.

Industrial Internet will make business more robust, responsive and resilient and most importantly will drive innovation in new ways

Given the potential benefits, the Industrial Internet is on everyone’s future strategy list. The reason is apparent: data from turbines and plants, public transportation and energy distribution grids, supply chains and hospital equipment will bring a bigger shift in industrial environments than data from social interaction and other sources.
The Industrial Internet will make business more robust, responsive and resilient. Most importantly, it will drive innovation in ways that were not possible before.

The key reasons for the interest and momentum for the Industrial Internet is the fact that:

• Sensors have become cheap
• Networks over which data is shared have become ubiquitous and dependable
• Computation costs are much lower today than they were a few years ago
• Ways to analyze structured and unstructured data have improved
• Actuation techniques are now widely available

Businesses are able to sense that the IoT can change the way industrial services are delivered and managed. Some examples that are changing business, thanks to the Industrial Internet, are already around us.

• **Preventive and Assisted Maintenance:**
  Aircraft companies have been using sensors on their aircraft to understand the state of the machines, the problem impacting them, the exact need for maintenance, the spares required and the kind of skills required before an aircraft lands. This is helping them reduce on-ground downtime. Similar initiatives are in place for automobiles and plant machinery.

• **Continued and Effective Tracking:**
  Transporters in the food industry that traverse thousands of miles have started using sensors that can track the route taken and also the temperature and humidity inside the trucks during transportation, allowing easy identification and segregation of potentially affected food items.

• **Remote Sensing and Corrective Actions:**
  Mining companies are supplying
miners with jackets that can sense temperature, pressure, toxic environments, etc. and ensure that accurate evacuation decisions are taken quickly. There are oil rigs and pipe lines, where human inspection is not possible which use cameras mounted on drones to identify faults and help take appropriate measures for repairs.

**Efficient Resource Monitoring and Management:** Smart Energy Meters, which can send the meter readings directly to billing centers, without manual intervention, are becoming common. Smart Grids, which manage and optimize energy generation, distribution and consumption, are under active consideration in many countries.

**Future Factories:** Some factories are now manned by robotic arms that are interconnected and centrally controlled. These help streamline operations faster than traditional assembly lines. Future factories where equipment and even raw materials can interact with each other leading to much improved efficiencies and optimizations are already being talked about.

**Customized Products:** Industrial Internet based factories coupled with new manufacturing techniques like 3D printing can lead to customers being able to influence the look, feel and functionality of the products they purchase.

**Product as a Service:** Wide deployment of sensors in all products and preventive maintenance, that is becoming a norm, to reduce down time, will potentially lead to somewhat blurring of boundaries between products and services and open up opportunities for customers/consumers to buy “guaranteed service” as against products. It is possible that some of the product companies will/may be forced to, transform themselves into “service” companies offering ‘Product as a Service’.

### Overcoming the Challenges

While the Industrial Internet holds the promise of huge improvements in operational efficiencies and productivity, without new additional revenue streams it will probably be slow to take off. Humongous amount of data that will get collected will require the companies to come up with better and quicker ways of analyzing so much data and derive actionable insights from it.

Many also worry that data privacy will be highly compromised and no one will know who is watching, whom and when. There is also a lack of clarity on data ownership. For example, sensors inside a car motor may deliver useful data, but whom does the data belong to? Is it the car owner, the motor manufacturer, or the car manufacturer?

Security also becomes a big concern area with so many things connected.

The Industrial Internet will also change the type and nature of the skills required. There will be a significant need for reskilling of the workforce. For example, we will need fewer people who do manual reading of meters and more of who manage the data in the utilities industry.

Interoperability also remains a big concern area. Platforms and APIs created will need to be homogenous for things to communicate.

On the technical side also, there are many challenges still to be tackled. One of the bigger battles is on the energy front. How much energy is consumed and how it can be sourced is a key consideration in many design/architecture considerations. It is
not practical or easy to replace batteries or energy sources frequently on equipment and sensors placed at remote locations and often the design tradeoffs are based on how much energy is needed to store, analyze or transmit data.

The rapid obsolescence of technology presents another big dilemma for industry.

**Early adoption is necessary**

At the moment, the question foremost in every business strategy discussion is: How cheap or expensive is it to become part of the Industrial Internet? Adopting strategies aligned with the development of the Industrial Internet continue to be viewed as a cost item. Retrofitting legacy equipment with sensors takes time and is often not possible in every instance. This is also a major stumbling block for most businesses.

It is easy to see why the Industrial Internet is going to drive a big shift in the way production and maintenance is managed in an industrial environment. But can the challenges and hurdles be overcome? The answer is a simple “yes” – we will have to find a way to get past these, just for the potential the Industrial Internet opens up. Hence it is imperative that organizations create early teams to examine and make recommendations for preparing and re-skilling the business to reap the opportunities of the Industrial Internet.

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