Government Polytechnic Jalgaon

शासकीय तंत्रनिकेतन, जळगांव

Academic Year (2020-21)
Emerging Trends in Electronics
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MAHARASHTRA STATE BOARD OF TECHNICAL EDUCATION

GOVERNMENT POLYTECHNIC, JALGAON (0018/1567)

Program Name and Code   : ELECTRONICS &TELE-COMMUNICATION

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A MICRO PROJECT
On

To study and prepare a detail report on Digital factory I4.0 standards.

Submitted on ___/___/2021 by the group of 4 students.

Sr. No.	Roll No.	Name of student	Enrollment No.	Seat no.
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MAHARASHTRA STATE BOARD OF TECHNICAL EDUCATION

Certificate

This is to certify that Master Mr/Ms. **Prathamesh, Mandar, Mohish, Mohit** Roll No.**11, 23, 24, 25** Of **6th** Semester of Diploma in **E&TC.** Of Institute, **Government Polytechnic, Jalgaon (Code:0018/1567)** has completed the **Micro Project** satisfactorily in the **Subject** Emerging trends in electronics for the Academic Year 2020- 2021 as prescribed in the curriculum.

Place**: Jalgaon**   Enrollment No:-
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Seal of
Institution

3

TITLE

To study and prepare a detail report on Digital factory I4.0 standards.

Submitted By-:

1. Prathamesh Saraf (11)
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1. Rationale

Every technological area is developing at an exponential rate. New applications are coming up and it is mandatory for all technologists to be well versed in these developments to survive and provide satisfactory and quality services to the society and industry. This course aims to prepare the diploma graduates to be conversant with such emerging trends. The main areas in which such developments are encompass Smart systems, Digital Factory and Communication. The course gives an introduction of these areas and helps the students to apply emerging trends.

2. Aims / Benefits of this Micro-Project :

1. The aim of the micro project is to understand a ongoing 4th industrial revolution on automation of traditional manufacturing and industrial practices .
2. to find out the various standard compliance with industry 4.0 .
3. to find out the challanges related to i4.0 implementation

3. Course Outcomes Addressed :

- Suggest the relevant components for the emerging applications.
- Suggest the different electronic systems for smart world.
- Suggest the relevant IoT technologies for Digital Factory.

4. Introduction of industry 4.0

Industry 4.0 refers to a new phase in the Industrial Revolution that focuses heavily on interconnectivity, automation, machine learning, and real-time data. 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 data to create a more holistic and better connected ecosystem for companies that focus on manufacturing and supply chain management. 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 people.

5. Evolution of Industry from 1.0 to 4.0

Before digging too much deeper into the what, why, and how of Industry 4.0, it's beneficial to first understand how exactly manufacturing has evolved since the 1800s. There are four distinct industrial revolutions that the world either has experienced or continues to experience today.

The First Industrial Revolution

The first industrial revolution happened between the late 1700s and early 1800s. During this period of time, manufacturing evolved from focusing on manual labor performed by people and aided by work animals to a more optimized form of labor performed by people through the use of water and steam-powered engines and other types of machine tools.

The Second Industrial Revolution

In the early part of the 20th century, the world entered a second industrial revolution with the introduction of steel and use of electricity in factories. The introduction of electricity enabled manufacturers to increase efficiency and helped make factory machinery more mobile. It was during this phase that mass production concepts like the assembly line were introduced as a way to boost productivity.

The Third Industrial Revolution

Starting in the late 1950s, a third industrial revolution slowly began to emerge, as manufacturers began incorporating more electronic—and eventually computer—technology into their factories. During this period, manufacturers began experiencing a shift that put less emphasis on analog and mechanical technology and more on digital technology and automation software.

The Fourth Industrial Revolution, or Industry 4.0

In the past few decades, a fourth industrial revolution has emerged, known as Industry 4.0. Industry 4.0 takes the emphasis on digital technology from recent decades to a whole new level with the help of interconnectivity through the Internet of Things (IoT), access to real-time data, and the introduction of cyber-physical systems. Industry 4.0 offers a more comprehensive, interlinked, and holistic approach to manufacturing. It connects physical with digital, and allows for better collaboration and access across departments, partners, vendors, product, and people. Industry 4.0 empowers business owners to better control and understand every aspect of their operation, and allows them to leverage instant data to boost productivity, improve processes, and drive growth.

6. Industry 4.0 protocols -:

Here are some protocols those are compliance with industry 4.0 standards this all the protocols are going to fulfil the requirement of industry 4.0

- **Enterprise Resource Planning (ERP):** Business process management tools that can be used to manage information across an organization.
- **IoT:** IoT stands for Internet of Things, a concept that refers to connections between physical objects like sensors or machines and the Internet.
- **IIoT:** IIoT stands for the Industrial Internet of Things, a concept that refers to the connections between people, data, and machines as they relate to manufacturing.
- **Big data:** Big data refers to large sets of structured or unstructured data that can be compiled, stored, organized, and analyzed to reveal patterns, trends, associations, and opportunities.
- **Artificial intelligence (AI):** Artificial intelligence is a concept that refers to a computer's ability to perform tasks and make decisions that would historically require some level of human intelligence.
- **M2M:** This stands for machine-to-machine, and refers to the communication that happens between two separate machines through wireless or wired networks.
- **Digitization:** Digitization refers to the process of collecting and converting different types of information into a digital format.
- **Smart factory:** A smart factory is one that invests in and leverages Industry 4.0 technology, solutions, and approaches.
- **Machine learning:** Machine learning refers to the ability that computers have to learn and improve on their own through artificial intelligence—without being explicitly told or programmed to do so.
- **Cloud computing:** Cloud computing refers to the practice of using interconnected remote servers hosted on the Internet to store, manage, and process information.
- **Real-time data processing:** Real-time data processing refers to the abilities of computer systems and machines to continuously and automatically process data and provide real-time or near-time outputs and insights.
- **Ecosystem:** An ecosystem, in terms of manufacturing, refers to the potential connectedness of your entire operation—inventory and planning, financials, customer relationships, supply chain management, and manufacturing execution.
- **Cyber-physical systems (CPS):** Cyber-physical systems, also sometimes known as cyber manufacturing, refers to an Industry 4.0-enabled manufacturing environment that offers real-time data collection, analysis, and transparency across every aspect of a manufacturing operation.

7. Smart Manufacturing Use Cases

Here are three use cases that can help you understand the value of Industry 4.0 in a manufacturing operation:

- **1. Supply chain management and optimization**—Industry 4.0 solutions give businesses greater insight, control, and data visibility across their entire supply chain. By leveraging supply chain management capabilities, companies can deliver products and services to market faster, cheaper, and with better quality to gain an advantage over less-efficient competitors.
- **2. Predictive maintenance/analytics**—Industry 4.0 solutions give manufacturers the ability to predict when potential problems are going to arise before they actually happen. Without IoT systems in place at your factory, preventive maintenance happens based on routine or time. In other words, it's a manual task. With IoT systems in place, preventive maintenance is much more automated and streamlined. Systems can sense when problems are arising or machinery needs to be fixed, and can empower you to solve potential issues before they become bigger problems. Predictive analytics allow companies to not just ask reactive questions like, "what has happened?," or "why did it happen?," but also proactive questions

like, "what is going to happen," and, "what can we do to prevent it from happening?" These type of analytics can enable manufacturers to pivot from preventive maintenance to predictive maintenance.
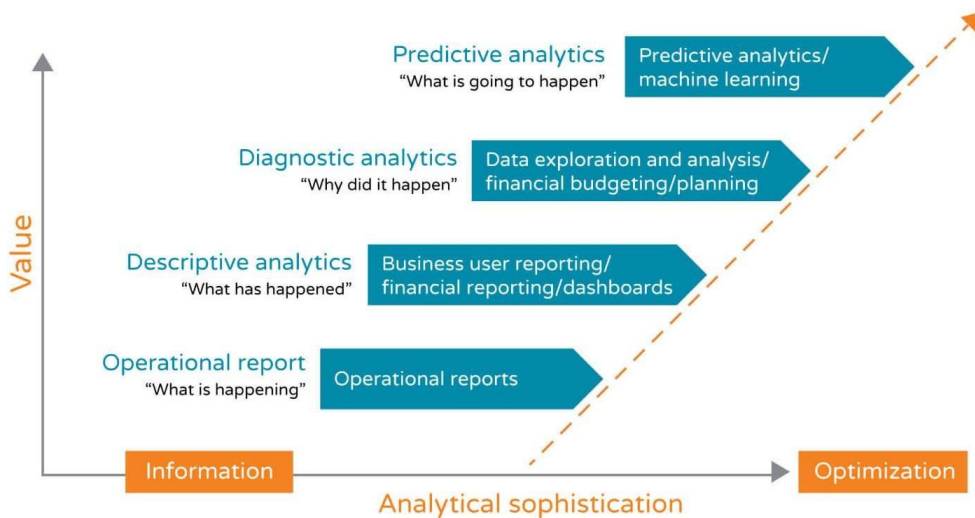
- **3. Asset tracking and optimization**—Industry 4.0 solutions help manufacturers become more efficient with assets at each stage of the supply chain, allowing them to keep a better pulse on inventory, quality, and optimization opportunities relating to logistics. With IoT in place at a factory, employees can get better visibility into their assets worldwide. Standard asset management tasks such as asset transfers, disposals, reclassifications, and adjustments can be streamlined and managed centrally and in real time.

The point of reviewing these use cases is to help you imagine and start thinking about how smart manufacturing could be integrated into your own organization. How do you actually decide if Industry 4.0 is right for you?

8. Digital factory Industrial 4.0 technologies -:

"Industry 4.0" is an abstract and complex term consisting of many components when looking closely into our society and current digital trends. To understand how extensive these components are, here are some contributing digital technologies as examples:

•Mobile devices
•Internet of Things (IoT) platforms
•Location detection technologies
•Advanced human-machine interfaces
•Authentication and fraud detection
•3D printing
•Smart sensors
•Big data analytics and advanced algorithms
•Multilevel customer interaction and customer profilingAugmented reality/ wearables
•Fog, Edge and Cloud computing
•Data visualization and triggered "real-time" training

Mainly these technologies can be summarized into four major components, defining the term "Industry

4.0" or "smart factory":
•**Cyber-physical systems**
•**IoT**
•**Cloud computing**
•**Cognitive computing**

With the help of cyber-physical systems that monitor physical processes, a virtual copy of the physical world can be designed. Thus, these systems have the ability of making decentralized decisions on their own and reach a high degree of autonomy (for more information, see "Industry 4.0 characteristics). As a result, Industry 4.0 networks a wide range of new technologies to create value.Industry 4.0 Drivers What all these components have in common, is that Data and Analytics are their core capabilities. "Industry 4.0" is driven by:

1. Digitization and integration of vertical and horizontal value chains:

Vertically, Industry 4.0 integrates processes across the entire organization for example processes in product development, manufacturing, logistics and service whereas horizontally, Industry 4.0 includes internal operations from suppliers to customers plus all key value chain partners.

2. Digitization of product and service offerings:

Integrating new methods of data collection and analysis for example through the expansion of existing products or creation of new digitised products, helps companies to generate data on product use and thus, to refine products in order to meet best the customers' needs.

Industry Review -:

The latest source of data comes from the market-driven practice of business and the initiatives taken to build up the standards and protocols of the fourth industrial revolution, which is perhaps one of the most valuable sources for study. Since this is a relatively new topic, there are few conclusions, but rather a number of speculations. Analyzing what has been applied in practice, facilitates the understanding for several people and illustrates situations of correctness and errors, emphasizing difficulties and limitations of technologies, people and machines to reach the highest level of industry 4.0.

9.   Industry 4.0 Architecture Proposed

Based on the protocols and standards raised, it is possible to suggest a proposal of information architecture to represent the new generation of the industry. Following the idea of the OPC UA structure and combining with the communication protocols MQTT, AMQP, CoAP is presented below the proposed architecture.
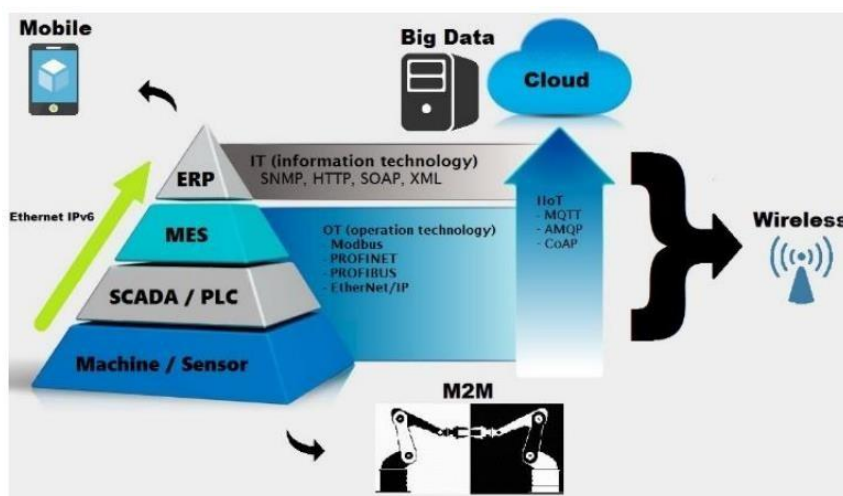

Figure 3 - Architecture Proposed

The entire architecture also follows the IEC TC 65 standard in terms of security of the communication networks, energy efficiency of the installations, process control, among others. The requirements used to analyze are distributed among the architecture. The IoT and IIoT are around all the architecture structure. The Cyber-Physical Systems are present together with ERP system, allowing to follow all the process by a monitor. Interoperability is guaranteed with the use of the chosen open protocols. As a set, the organization that start to use this architecture proposed will be able to be an Smart Factory, offering smart products and smart services.

10. Benefits of Adopting an Industry 4.0 Model

Industry 4.0 spans the entire product life cycle and supply chain— design, sales, inventory, scheduling, quality, engineering, and customer and field service. Everyone shares informed, up-to-date, relevant views of production and business processes—and much richer and more timely analytics.

Here is a quick, non-exhaustive list of some of the benefits of adopting an Industry 4.0 model for your business:

- **It makes you more competitive, especially against disruptors like Amazon.** As companies like Amazon continue to optimize logistics and supply chain management, you need to be investing in technology and solutions that help you improve and optimize your own operation. To stay competitive, you have to have the systems and processes in place to allow you to provide the same level of service (or better) to your customers and clients that they could be getting from a company like Amazon.
- **It makes you more attractive to the younger workforce.** Companies that invest in modern, innovative Industry 4.0 technologies are better positioned to attract and retain new workers.
- **It makes your team stronger and more collaborative.** Companies that invest in Industry 4.0 solutions can 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 you to address potential issues before they become big problems.** Predictive analytics, real-time data, internet-connected machinery, and automation can all help you be more proactive when it comes to addressing and solving potential maintenance and supply chain management issues.
- **It allows you to trim costs, boost profits, and fuel growth.** Industry 4.0 technology helps you manage and optimize all aspects of your manufacturing processes and supply chain. It gives you access to the real-time data and insights you need to make smarter, faster decisions about your business, which can ultimately boost the efficiency and profitability of your entire operation.

11. Applications of Industry 4.0: 7 Real-World Examples of Digital Manufacturing in Action

1. Industrial Internet of Things

At the heart of Industry 4.0 is the Internet of Things (IoT). Put simply, IoT refers to a network of physical devices that are digitally interconnected, facilitating the communication and exchange of data through the Internet. These smart devices could be anything from smartphones and household appliances to cars and even buildings.

Industrial IoT is a subset of the Internet of Things, where various sensors, Radio Frequency Identification (RFID) tags, software and electronics are integrated with industrial machines and systems to collect real-time data about their condition and performance.

IIoT has many use cases, with asset management and tracking being one of the major applications of the technology today. For example, IIoT can be used is to prevent the overstocking or understocking of inventory. One way to achieve this is to use shelf-fitted sensors and weighing devices to broadcast inventory information to your warehouse management system. Putting such a system in place allows warehouse managers to monitor inventory levels, thereby gaining real-time visibility and control over the inventory.

Let's take a look at how BJC HealthCare uses an integrated inventory management solution to achieve cost-savings in its supply chain.

Spotlight: BJC HealthCare adopts IoT for inventory and supply chain management
BJC HealthCare is a healthcare service provider that operates 15 hospitals in Missouri and Illinois.

The company deploys radio frequency identification (RFID) technology to track and manage thousands of medical supplies. RFID technology uses radio waves to read and capture information stored on a tag attached to an object, such as healthcare supplies. Previously, the process of tracking inventory involved a lot of manual labour. However, monitoring inventory manually can be a challenge, since hospitals purchase a variety of products from suppliers and store a lot of items on site for specific procedures. In some cases, products' expiration dates will need to be closely monitored, while the loss of stock can lead to a lot of time spent on conducting inventory checks. For these reasons, BJC decided to implement RFID tagging technology in 2015. Since implementing the technology, BJC has been able to reduce the amount of stock kept onsite at each facility by 23 per cent. The company predicts that it will see ongoing savings of roughly $5 million annually, once RFID tagging is fully implemented this year. As this example demonstrates, IIoT can significantly improve operations, increase efficiency, reduce costs and provide valuable real-time visibility across the supply chain.

2. Big Data and Analytics

Big Data refers to the large and complex data sets generated by IoT devices. This data comes from a wide range of cloud and enterprise applications, websites, computers, sensors, cameras and much more

— all coming in different formats and protocols. In the manufacturing industry, there are many different types of data to take into consideration, including the data coming from production equipment fitted with sensors and databases from ERP, CRM and MES systems. But how can manufacturers convert the data collected into actionable business insights and tangible benefits? With data analysis. When it comes to data, the use of data analytics is essential to convert data to information that can deliver actionable insights. Machine learning models and data visualisation can aid data analytics processes. Broadly speaking, machine learning techniques apply powerful computational algorithms to process massive data sets, while data visualisation tools enable manufacturers to more easily comprehend the story the data tells. Ultimately, by taking previously isolated data sets, collecting and analysing them, companies are now able to find new ways to optimise the processes that have the greatest effect on yield.

Spotlight: Big Data decision-making at Bosch Automotive factory in China

Combining IIoT and Big Data is a recipe Bosch is using to drive the digital transformation of its [Bosch Automotive Diesel System factory](#) in Wuxi, China. The company connects its machinery to monitor the overall production process at the core of its plant. This is achieved by embedding sensors into the factory's machines which are then used to collect data about the machines' conditions and cycle time. Once collected, advanced data analytics tools process the data in real time and alert workers when any bottlenecks in the production operations have been identified. Taking this approach helps to predict equipment failures, enabling the factory to schedule maintenance operations well before any failures occur. As a result, the factory is able to keep its machinery running and operating for longer stretches of time. The company states that using data analysis in this way has contributed to more than 10% output increase in certain areas, whilst improving delivery and customer satisfaction. Ultimately, a greater insight into the plant's operations supports better and faster decision-making throughout the entire organisation, enabling it to reduce equipment downtime and optimise production processes.

3. Cloud computing

For decades, manufacturers have been collecting and storing data with the goal of improving operations. However, with the advent of IoT and Industry 4.0, the reality is that data is being generated at a staggering speed and at high volumes, making it impossible to handle manually. This creates a need for an infrastructure that can store and manage this data more efficiently. This is where cloud computing comes in. Cloud computing offers a platform for users to store and process vast amounts of data on remote servers. It enables organisations to use computer resources without having to develop a computing infrastructure on premise. The term cloud computing refers to information being stored in the "cloud", accessed remotely via the Internet. In itself, cloud computing is not a solution on its own, but enables the implementation of other solutions that once required heavy computing power. The capability of cloud computing to provide scalable computing resources and storage space enables companies to capture and apply business intelligence through the use of big data analytics, helping them to consolidate and streamline manufacturing and business operations. Manufacturers' global spending on cloud computing platforms is predicted to reach $9.2 billion in 2021, according to IDC. A key factor behind this adoption is the benefit of being able to centralise operations, eliminating so that information can be shared across an entire organisation. According to one IDC survey, Quality Control, Computer-Aided Engineering and Manufacturing Execution Systems (MES) are the three most widely adopted systems in the cloud. Clearly, cloud computing is transforming virtually every facet of manufacturing, from workflow management to production operations – and even product qualification.

4. Advanced Robotics

While robotics have been used in manufacturing for decades, Industry 4.0 has given new life to this technology. With recent advancements in technology, a new generation of advanced robotics is emerging, capable of performing difficult and delicate tasks. Powered by cutting-edge software and sensors, they can recognise, analyse and act upon information they receive from the environment, and even collaborate and learn from humans. One area of robotics gaining significant traction is collaborative robots ("cobots"), designed to work safely around people, freeing workers from repetitive and dangerous tasks.

Spotlight: Fetch Robotics help DHL improve warehouse operations

California-based Fetch Robotics has developed collaborative Autonomous Mobile Robots (AMRs) for locating, tracking, and moving inventory in warehouse and logistics facilities. A DHL distribution centre in the Netherlands is using Fetch AMRs to perform pick and place operations. At DHL, AMRs autonomously move across the facility alongside the workers, automatically learning and sharing the most efficient travel routes. Using self-driving robots in this way can help reduce order cycle time by up to 50% and provide up to twice the picking productivity gain, according to the company. As robots become more autonomous, flexible and cooperative, they will be able to tackle even more complex

assignments, relieving the workers from monotonous tasks and increasing productivity on the factory floor.

5. Additive Manufacturing
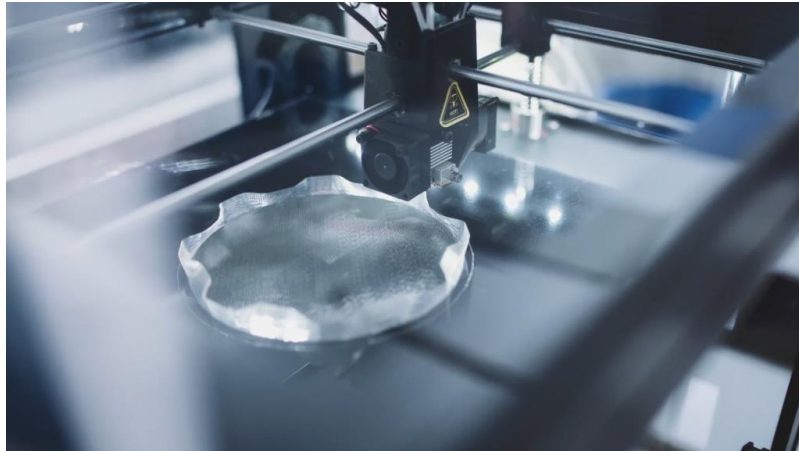
Alongside robotics and intelligent systems, additive manufacturing, or 3D printing, is a key technology driving Industry 4.0. Additive manufacturing works by using digital 3D models to create parts with a 3D printer layer by layer. Within the context of Industry 4.0, 3D printing is emerging as a valuable digital manufacturing technology. Once solely a rapid prototyping technology, today AM offers a huge scope of possibilities for manufacturing from tooling to mass customisation across virtually all industries. It enables parts to be stored as design files in virtual inventories, so that they can be produced on-demand and closer to the point of need — a model known as distributed manufacturing. Such a decentralised approach to manufacturing can reduce transportation distances, and hence costs, as well as simplify inventory management by storing digital files instead of physical parts.

Spotlight: Fast Radius' digital additive manufacturing solutions to enable new business models
There is a multitude of examples of additive manufacturing being put to great use, but a key example is, perhaps, Fast Radius.


In 2018, the World Economic Forum named Fast Radius' Chicago facility as one of nine top smart factories in the world. The contract manufacturer, which focuses on AM but also offers CNC machining and injection moulding, has production sites in Chicago, Singapore and at the UPS Worldport facility. This makes Fast Radius well-positioned to drive its vision of fast-turnaround and mass customisation of products with the help of advanced manufacturing technologies. A key factor behind Fast Radius' agility and flexibility is its proprietary technology platform. The platform can collect data and findings from every part design that is stored and manufactured in the Fast Radius virtual warehouse. The data helps teams to identify applications suitable for 3D printing and evaluate engineering and economic challenges of producing a component this way. Furthermore, the company offers supply chain optimisation through its virtual inventory. For example, Fast Radius created a virtual parts warehouse consisting of 3,000 items for a heavy equipment manufacturer. With the high costs involved in storing rarely ordered parts, this approach is an innovative solution for supply chain management.

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5. Digital Twins

The concept of a digital twin holds great promise for optimising the performance and maintenance of industrial systems. Global research firm, Gartner, predicts that by 2021, 50% of large industrial companies will be using digital twins to monitor and control their assets and processes.

A digital twin is a digital representation of a real-world product, machine, process, or system, that allows companies to better understand, analyse and optimise their processes through real-time simulation. While digital twins can be confused with simulation used in engineering, there is much more to this concept. This use of digital twins has long been an important tool in demanding aerospace, heavy machinery and automotive applications. Now, advances in computing technology, machine learning and sensors are expanding the concept of digital twinning across other industries.

Spotlight: Racing to win with digital twins
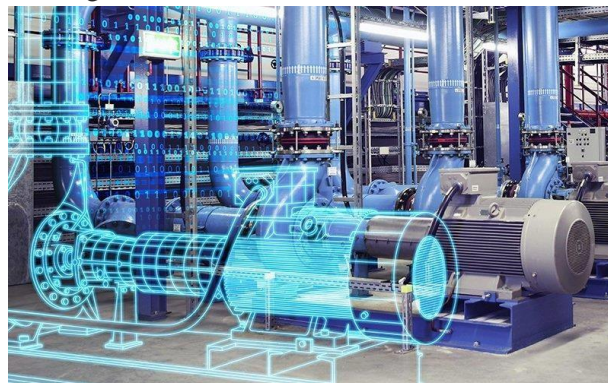
Motor racing teams face extremely challenging requirements when it comes to product development, and American pro racing squad Team Penske is no exception. In a bid to speed up the race car development process, Team Penske partnered with Siemens last year, gaining access to advanced digital design and simulation solutions – including digital twins. Having digital twins provides Team Penske engineers with a virtual test bed for innovating new parts, optimising car performance before they ever touch the physical car. A race car digital twin is based on sensors fitted onto a real car. These sensors collect data such as tire pressure, engine control and wind speed, which is then converted into a virtual car model. It's this model that allows engineers to test different design configurations, making effective, data-driven design changes at a very rapid pace.

6. Augmented reality

Despite its uptake in consumer applications, the manufacturing industry is just beginning to explore the benefits of Augmented Reality (AR) technology. And yet, there is a huge untapped potential for the technology, from helping with assembly processes to helping to maintain manufacturing equipment. Augmented reality bridges the gap between the digital and physical worlds by superimposing virtual images or data onto a physical object. For this, the technology uses AR-capable devices, such as smartphones, tablets and smart glasses.

Let's take a medical instance as an example — a surgeon using AR glasses during a surgical operation. The glasses could overlay data from patient's MRI and CT scans, such as nerves, major blood vessels and ducts, onto the patient, and highlight them in colour. This helps the surgeon to find the safest path into the region that needs invasion, minimising the risk of complications and improving surgeon's precision. In the context of manufacturing, AR could enable workers to speed up the assembly process and improve decision-making. For example, AR glasses could be used to project data, such as layouts, assembly guidelines, sites of possible malfunction, or a serial number of components, on the real part, facilitating faster and easier work procedures.

Spotlight: AR increases productivity at GE -: General Electric offers a glimpse at how [AR technology can empower manufacturing](). The company is currently piloting the use of AR glasses at its jet engine manufacturing facility in Cincinnati. Before using these smart glasses, jet engine makers often had to stop what they were doing in order to check their manuals and ensure tasks were being performed correctly. However, with AR glasses, they can now receive digitised instructions in their field of view. The mechanics can also access training videos or use voice commands to contact experts for immediate assistance. During the pilot, GE reports that the productivity of workers using smart wearables increased by up to 11%, compared to previously. Ultimately, this approach could offer a tremendous potential to minimise errors, cut down on costs and improve product quality.

12. Future scope of industry 4.0

Industry 4.0 (or The Fourth Industrial Revolution) is a level up, a modern insurgency that connects people, processes and machines. It is a combination of IIoT (Industrial Internet of Things), cyber–physical systems and artificial intelligence, put together to ultimately make machines capable of making decisions with minimal human intervention. The Fourth Industrial Revolution will transform existing technologies and capabilities in the manufacturing and production industry. It is an amalgamation of traditional manufacturing practices and sophisticated technology; real-time visibility of the complete value chain, thus allowing for better decisions; and recalibration, which leads to greater efficiency and productivity.

These digital technologies enable the democratisation of data and allow insights at a wider level. This makes the implementation of Industry 4.0 and its tools easier. The 4.0 vision will not only make machines integrated, but will also establish a connect that will go beyond the manufacturing plant walls. This allows the customer to have an experience akin to what is witnessed while interacting with a B2C company, allowing complete visibility of the manufacturing process, even during transit of the shipment.

According to a PWC India study published in 2016, more than 80 percent of the manufacturing industry is expecting a greater than 10 percent improvement in efficiency, while over 60 percent of the surveyed respondents expect a 10 percent improvement in additional revenue. Industry 4.0 will also yield the benefit of a faster learning cycle and give an edge to Indian companies that are competing with legacy producers in Europe and the Americas, which have had a head start.

Though we know the benefits of 4.0, there will also be a set of challenges that the industry will face. Data has become a new currency for many companies. Huge amounts of data from sensors and equipment's have immense value but no value at all if data is inaccurate or not organised well. To unlock value from their assets, manufacturers will need to integrate their IT & OT and make data easily accessible but secure. They should be able to run AI-models that can predict or correlate, ultimately augmenting human decision-making. While companies remain reluctant to invest in new technologies, this revolution cannot be overlooked.

Right now, there is a need to upskill talent within factories rather than replace them. The most important action is to invest in capability building and cultural change. Upskilling in areas of analytics and digital technologies will prepare the workforce for the changing environment and also make them ready for future learning, thus keeping them relevant.

It is also essential to leverage these emerging technologies into the entire enterprise value chain and their external diffusion into inter-organisational supply-chain networks. This would be an effective use of AI and machine learning from real-time data acquired from across the value chain, thus providing intelligent insights that would prompt smarter decisions.

All of this is not possible without a robust ecosystem of partners, such as start-ups and tech providers, who would develop easy to access and affordable technology to enable this revolution. And academia, which can conduct research and development to further foster the advancement in technology.

The Industry 4.0 revolution is already underway. Organisations that do not embrace it are at a great risk of being disrupted. By 2023, the competitive advantage of business in all industries will be driven primarily by innovations developed in AI. The fourth industrial revolution will allow for new ways to design organisations to operate and it will also transform the way we work.

13. Who Is Industry 4.0 Right For?

How do you know when or if your business should invest in Industry 4.0?

If you're able to check off most of the items on this list, it's probably safe to start evaluating

Industry 4.0 technology and solution providers and allocating the resources needed for deployment:

- You're in a particularly competitive industry with a lot of tech-savvy players
- You're having a hard time recruiting to fill vacant jobs at your organization
- You want better visibility across your supply chain
- You want to identify and address issues before they become bigger problems
- You want to boost efficiency and profitability across your entire organization
- You want everyone on your team to have informed, up-to-date, relevant views of production and business processes
- You want richer and more timely analytics
- You need help digitizing and making sense of information
- You want to improve customer satisfaction and customer experience
- You want to improve product quality or keep product quality intact
- You want a more integrated enterprise resource planning system that spans not only inventory and planning, but also financials, customer relationships, supply chain management, and manufacturing execution
- You want a consistent and flexible view of production and business operations tailored to specific areas or users in your organization

14. Referances

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