

Industry 4.0 & IoT Cloud : A Glimpse

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Abstract - Digitization and intelligentization of manufacturing process is the need for today's industry. The manufacturing industries are currently changing from mass production to customized production. Industry 4.0 is bringing a new level of automation to manufacturing by allowing machines' processes to be reprogrammed with minimal input from humans. The Cloud is the fuel for Industrie 4.0 and the key element that makes it possible to develop a production strategy that is innovative, more effective and efficient by leveraging sensors, artificial intelligence and robotics. The objective of this article is to provide an overview of Industry 4.0 and how cloud opens the gateway for Industry 4.0 with its applications.

Keywords: Industry 4.0, Public Cloud, Cyber physical system, Internet of things, Industrial Internet of Things

Introduction : The Fourth Industrial Revolution or Industry 4.0 is an umbrella term that refers to changes happening in the industrial value chain process. Those changes are powered by emerging technologies, offering a better way to organize and manage all standard processes (prototyping, development, production, logistics, supply etc.) within the manufacturing industry. The terms "Smart Factory," "Smart Manufacturing," "Intelligent Factory" and "Factory of the Future" all describe a vision of what industrial production will look like in the future.

Building Blocks for Industry 4.0: The four main drivers of Industry 4.0 are Internet of Things (IoT), Industrial Internet of Things (IIoT), Cloud based manufacturing and smart manufacturing which helps in transforming the manufacturing process into fully digitized and intelligent. Cloud-computing is one of the most important building blocks of Industry 4.0. Manufacturing machines have always produced vast amounts of data, but previously there was no way of sending, receiving, storing or analysing it but using cloud technologies, every single operation performed by a piece of equipment connected to the internet, no matter where it's located, can be sent directly to the cloud.

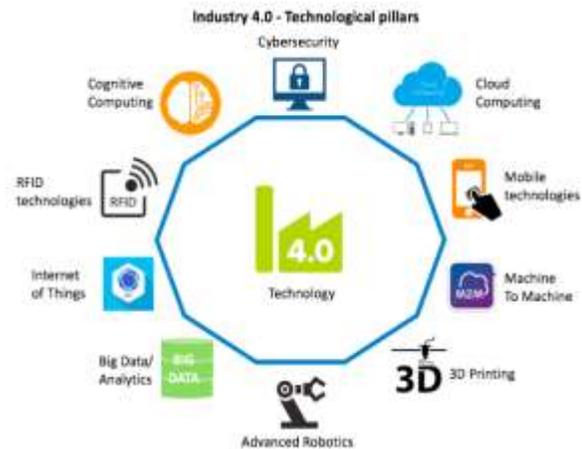


Fig 1: Industry 4.0 Technological Pillars

The nine pillars of Industry 4.0 will transform isolated and optimized cells production into a fully integrated, automated, and optimized production flow. This leads to greater efficiency and change in traditional production relationships among suppliers, producers, and customers as well as between human and machine

Industry 4.0 is enabled by technologies that integrate the digital and real worlds given below.

- **Cloud Platforms:** Data Processing & Storage
- **Internet of Things:** Industrial IoT devices
- **Big Data analytics & BI :** Algorithms, predictive models, workflows and dashboards
- **AI / ML and Cognitive systems :** Chabot's, Digital Assistances, Smart Speakers
- **Augmented Reality :** AR Smart glasses
- **Mobile Solutions:** Smartphones, tablets, wearable sensors
- **Advanced manufacturing technologies:** Robotics and 3D printing
- **Cybersecurity :** Need to protect critical industrial systems

Industry 4.0 Cloud-based solutions

Industrial IoT Cloud Platforms brings machines, services, analytics, and people together to improve the performance and productivity of industrial processes. A convergence of forward looking technologies including

robotics, AI, 3D printing and the IoT, all powered by the cloud and edge computing, is transforming the way we do business. These technologies have the potential to improve products, customize experiences, increase productivity, improve safety and reduce costs across many industries like manufacturing, retail, healthcare and any other industry domains. I can say Industry 4.0 and the cloud is a match made in heaven as all the key drivers like AI, IOT, Robotics, edge computing are powered by Cloud Platforms. As we are already using cloud-based solutions and analytics applications, so with Industry 4.0, more production-related undertakings will require increased data sharing across enterprise boundaries. Smart Factory is a key example of the Industry 4.0, where people, machines, resources and products are intelligently connected to fuel the exchange of information in real-time and with previously unimagined efficiency. In below figure, I have given a big picture view of how cloud drives the Industry 4.0.

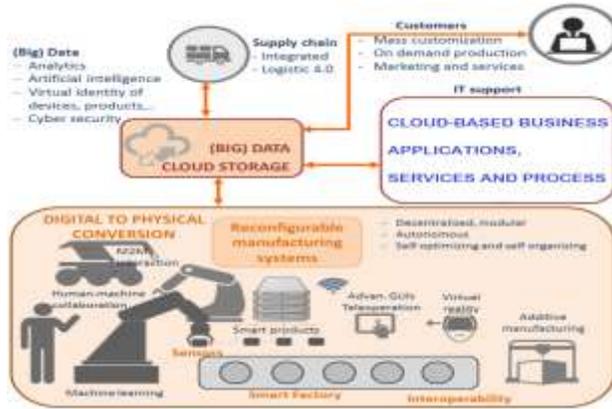


Fig 2. Industry 4.0 (Smart factory)

Table 1: Industry 4.0 Cloud based solutions :

Planning	Development	Marketing & Sales	Inventory Logistics	Production	Outbound Logistics	Maintenance & Services
Forecasting methods	Product lifecycle Mgt (PLM)	Customer intelligence	Track and Trace products	Operational intelligence	Distribution planning	Maintenance, Repair and Overhaul (MRO)
Collaborative work	Connected products	User consumer experience	Smart containers	Advanced process control	Inventory management	Enterprise Asset Management (EAM)
Demand management	3D product models	Digital marketing	Inventory management	Manufacturing Execution Systems	Warehouse management	Augmented reality
Integrated enterprise mgt	Remote monitoring	eCommerce solutions	Just-in-time (JIT) logistics	Smart tools and machines	Transport management	Predictive maintenance
Safety stock optimization	Process simulation	Point of sale (POS) analytics	Supplier collaboration	Predictive maintenance	Track and Trace products	Mobile workforce management

Design Principles

- **Interoperability:** The ability of machines, devices, sensors, and people to connect and communicate with each other via the Internet of Things (IoT)
- **Information Transparency:** The ability of information systems to create a virtual copy of the physical world by enriching digital plant models with sensor data.
- **Technical Assistance:** The ability of assistance systems to support humans by aggregating and visualizing information comprehensibly for making informed decisions and solving urgent problems on short notice.
- **Decentralized Decisions:** The ability of cyber-physical systems to make decisions on their own and to perform their tasks as autonomous as possible.

Business Benefits

Customer Experience: The deep information availability available with Industry 4.0 mean manufacturers can give customers better service.

Revenue gains :With better quality, lower costs, higher mix, and the ability to serve customers well, Industrie 4.0 puts manufacturers on a path to be a preferred supplier to current customers.

Human machine interface (HMI): With the Industry 4.0 adoption, machines and devices can be connected and these connected devices, sensor data provide the benefit of **HMI (Human machine interface)**. Both embedded and stand-alone HMIs help improve working and monitoring of factory plants as well as processes, driving a big change in the efficiency of the overall manufacturing unit.

Predictive Maintenance: Industry 4. Enables i.e. a machine should not be repaired too late (after it fails), nor too early (when it is still in a good condition). To increase productivity and reduce maintenance costs, sensors can be integrated with machines to constantly monitor the production machinery.

ImproveEfficiency: With fewer people and more automation, companies can make decisions more rapidly and keep efficiency high. Automation also tends to keep quality high, and that is an area that further boosts efficiency.

Conclusion

Digital technologies can dramatically improve productivity, growth and customer satisfaction. The ongoing wave of AI/ML and Industrial IoT technologies promises to transform the global industrial domains. The next industrial revolution will be built on a layer of smart and internet-enabled devices across the world.

worked multiple Digital Transformation Projects. Currently working on Emerging Technologies like Block chain, AI/ML, IoT, AR/VR, Big Data and DevOps Strategy, Architecture Design & Solutions.

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