

Industry 4.0 – The Fourth Industrial Revolution

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Abstract: Industry 4.0 is a new interdisciplinary field combining cyber-physical systems, the Internet of Things and Services and smart factories. It is promising to provide a new way of value creation in both physical and networked worlds. This helps in conceptualizing smart factories and thus creating jobs for the less educated people. This paper briefs about basis of Industry 4.0, the fourth industrial revolution and how this creates an impact on making the smart factories.

Keywords: Artificial Intelligence (AI), Automation system, Industry 4.0, Internet of Things (IoT), smart factories.

1) INTRODUCTION

Industry 4.0 refers to the next leap in the industrial manufacturing that is being enabled through synergies that arise from the possible combinations of technological breakthroughs we've achieved in the last two decades. It has also been linked to the idea of forth industrial revolution. This revolution is a kin to the first leap that manufacturing took through the advent of steam engine in the 18th century, or the second big chance that was brought about by electric power. After the last major overhaul that industry went through as a result of computerization and digitization of industrial systems. We are now at the cusp of something even stronger.

Over the last couple of decades, there have been multiple technological advancements across some exciting fields that have immense potential to alter the way we live and work. These areas include Artificial Intelligence, Advanced Robotics, Business Intelligence powered by big data analytics, Nanotechnology, 3-D technology, Man-machine interfaces or augmented reality and of course the Internet of Things. Interconnectivity of these technologies and their system is being enabled through high processing power coupled with growing transmission speeds and network

capacities. As each of these fields has individually evolved to solve specific problems, they have also concurrently been maturing over time to create possibilities for next level of growth and advancement by interacting with and supplementing each other.

We are looking at the future where the manufacturing facilities are automated, self-sustaining and do not need manual intervention at all, while being large scale and cost efficient at the same time. This can be visualised with an example of interconnected robotics system carrying on the manufacturing processes, efficiently transmitting designs to the physical world through 3-D printing while being aware of their counterpart system or associated processes through sensing data in real time. This data should be available through interconnectivity and access to the cloud and will help the system in solving problems through analysis and pattern recognition which self-learning machines can then use to identify anomalies and successively improve.

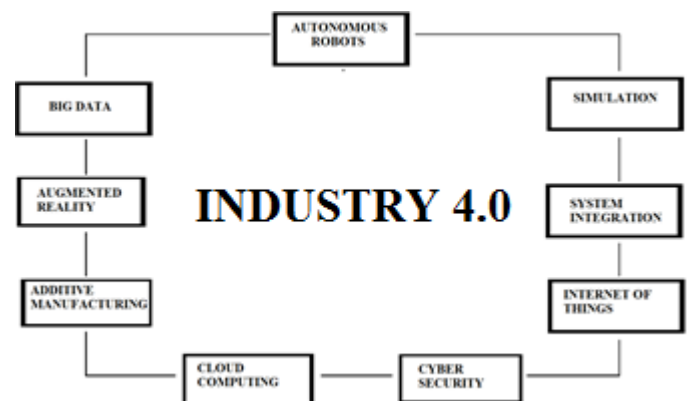


Figure 1: The various components of Industry 4.0.

2) EXSITING SYSTEM AND LIMITATIONS

The first industrial revolution was between 18th to 19th century in Europe and America. The development of Steam Engines, the iron and the textile industry played a major role in the first industrial revolution.

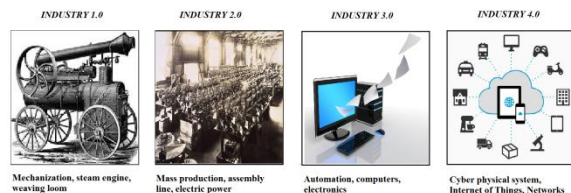


Figure 2: The industrial revolutions so far and their significance.

The second industrial revolution took place from 1870 to 1914. During this phase there was a growth in the pre-existing industries and expansion of the new ones making mass production easier using electric power. The major technological advances in the second industrial revolution include telephone, light bulb, phonograph and the internal combustion engine.

The third industrial revolution started from 1980 till date. This phase was termed as the digitizing era. This marks the advancement of technology from the analog electronic and mechanical devices to the digital technology being used today. The advancements in this era include personal computers, the Internet, and Information and Communication Technology (ICT).

The limitations of the existing system are that this doesn't help in machine-to-machine communication and transfer of data between the two devices cannot happen in real time.

3) PROPOSED SYSTEM

The digital transformation in the industry sector will see a rapid growth in the development of smart factories which adopt digital technologies like IoT, Big Data & Analytics and AI. While these technologies may involve some modern technology and designing aspects by the manufacturers, there are some applications which are cost effective, provide a good Return on Investment (ROI) and have many business benefits like:

- **Reduced operational costs:** With IoT, most of the devices can be enriched with embedded computing and connected using standard technologies. This helps the devices connected to communicate with each other and thus improving the efficiency and better workforce planning.

- **Lower maintenance costs:** Smarter Predictive Maintenance is possible with the increased connectivity of machines and by applying intelligent prediction algorithms. Thus, resulting in reduced machine downtime and lower maintenance costs.
- **Improved decision making:** The industrial software platforms will connect the entire value streams to enable the suppliers, the manufacturers and their clients to communicate effectively, make quicker and more accurate decisions about which products to manufacture and how to manage the teams.
- **Higher customer satisfaction:** By gathering the significant information about the client's inclinations in view of their genuine requests one can alter the creation plans, showcasing materials and deals system to represent this progressively. On the off chance if the items are to be customised at purpose, which is now a manual procedure, a stage can naturally accomplish this.
- **Continuous Improvement:** The most focused makers ceaselessly enhance their generation and business procedures to enhance the quality and profitability in their offices. As of now this is to a great extent a manual procedure. Computerised innovations can be utilized as a device to enhance persistent change exercise, make them more effective and give custom fitted reports to all levels of administration.

4) CHALLENGES

Every new trending technology has to face a set of challenges in order to be accepted and adopted by the society. Likewise, even the fourth industrial revolution, Industry 4.0, has the following challenges to overcome.

- Reliability and stability needed for critical machine to machine (M2M) communication, including very short and stable latency times.
- It security issues, which are greatly aggravated by the inherent need to open up those previously closed production shops.
- Need to avoid any IT snags, as these would cause expensive production outages.
- Need to maintain the integrity of production processes.
- Need to protect industrial knowhow.

- Lack of adequate skill sets to expedite the march towards the fourth industrial revolution.
- Loss of many jobs to automatic processes and IT-controlled processes, especially for lower educated parts of society.

- Threat of redundancy of the corporate IT department.

5) ADVANTAGES

Adapting the new trending technology not only allows the exchanging the data between two devices easier and faster but also has various other advantages. The following are the advantages of this trending technology.

- Customised and quick solutions.
- More transparency and efficiency by providing real time information.
- Increased efficiency and competitiveness through a targeted planning for the processes.
- Higher productivity through a reduced set-up period, reducing errors and downtime.
- Realization of personalised products at the same cost of mass production.
- Competitiveness of the product reached through the expansion of features arising from the IoT.

6) CONCLUSION

With the current technology we are using, which doesn't allow easy exchange of data between two devices, and also M2M communication, it's a long process to record data of every single device and then analyse. Moving towards the fourth industrial revolution all these can be overcome and thus gives a lot of scope in the field of research.

Industry 4.0 demands a powerful platform for storing, sorting and retrieving huge amounts of detailed data and reporting. This involves Cloud technology and its ability to house large volumes of data with multiple access points for enhanced communication. As Industry 4.0 is considered and the evolution of "the smart city", it now makes sense as to how IoT and its reliance on the communication between the machines and the systems is a key advantage of leveraging Industry 4.0.

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