

## Influence and impact of Trends and Revolution of Industry 4.0 in the global Industry and Market scenario

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### Abstract

*It is a study, analysis and implementation of latest trends and revolution in the field of Industry 4.0 in the global market scenario. The study involves the impact and influence of Industry 4.0 concept and principle. It is an understanding of the concept and implementation of same by the industry, organization and management of industry to improve processes of manufacturing stages and development of the product in the era of internet for a faster growth of industry, market and society for the sake of human kind being requirements and demand solution. A detailed investigation carried out to know the theme of the Industry 4.0 with the ease of manufacturing and within the comfort level of the manufacturers and the end users of the society human kinds.*

**Keywords:** Industry 4.0 (I 4.0), Internet of People (IoP), cyber physical system (CPS), Information Technology (IT), machine to machine (M2M).

### 1. Introduction:

The name "Industry 4.0", short forms as I 4.0 or I 4 promotes the computerized manufacturing system and has been originated from the high-tech strategy of the German government project. In 2011 Industry 4.0 was resuscitated at the Hannover Fair and presented a set of industry 4.0 implementation recommendations to the German federation government in October 2012. The final report on Industry 4.0 was presented in 8<sup>th</sup>. April 2013. Such imitativeness at work was headed by Siegfried Dais (Robert Bosch GmbH) and Henning Kagermann (German Academy of Science and Engineering). The advanced revolutionary concept and principles of Industry 4.0 has been adopted by various companies. By implementing the revolutionary concept of Industry 4.0 the few companies has been re-branded their trademark. For example the aerospace parts manufacturer "Meggitt PLC" has been rebranded as "M4".

Industry 4.0 is known as fourth industrial revolution and is the latest trend of art, in the field of automation and data exchanging in manufacturing technologies. Such revolution in the field of industrial engineering includes involvement of internet, cognitive computing, cloud computing, cyber- physical systems etc. Due to revolution of industry 4.0, the conventional factories are turned down to "smart factory". The aid of internet facility in the cyber physical system is an instant real time medium of communication in between organization, participants in value chain and with the end user customers and clients. The Fig. 1 illustrates the development towards Industry 4.0.

Industrial engineering is the actual true engineering where the industrial realistic problems of man, material and machineries are being deal with care and priority to deliver an affordable solution in time or prior time. This is the field of engineering in which any branches of engineers are getting involved with the industrial problems and can find best practices of working solution. It deals with the concept of developing techniques, methods, solutions to address the industrial production line work progress with optimum

utilization of time and raw materials. Industrial engineers are responsible about planning of plant and product developments, product design flexibility and feasibility, installation of plants of any field, raw material input to the plant, conversion of raw materials into semi-finished or finished product, maintenance of plant and machineries, plant and machineries health checking and periodic inspection of production and any production delay or decay in production, maintaining ethics of business and industry, solving common people needs etc. An industrial engineer always dares to deal with product design and development, finding solution for failures of machineries and human attitude, failure analysis, problem identification and problem solutions after analyzing the problem and discussing with the experts.

It is a versatile branch of mature engineering, which can interfere in industrial issues in any field of engineering like mechanical, electrical, production, civil, chemical, marine, aviation, agricultural, social networking etc. Such initiative of involving in problem identification, analyzing and solution finding is being supported by the experts of particular domain person. An industrial engineer plays a role of mediator between the industrial management person, shop floor personnel, and even in between social agricultural people and government personnel etc. Very smartly an industrial engineer plays a role of technocrat as well as bureaucrat to solve the industrial problems and social human beings day to day problems of barren land, agricultural issues, and waste disposal issues etc. with passions and diplomatically. The Fig. 2 illustrates the tools and tackles involvement and responsible in Industry 4.0 generation for smooth and easier process and production. It involves cloud computing, internet and wi-fi assistance, mobile communication in all the sections starting from raw materials supply, transportation, production, computational monitoring, digitization, customized product development, warehousing, delivery of finished or semi-finished product, vendor communication etc.

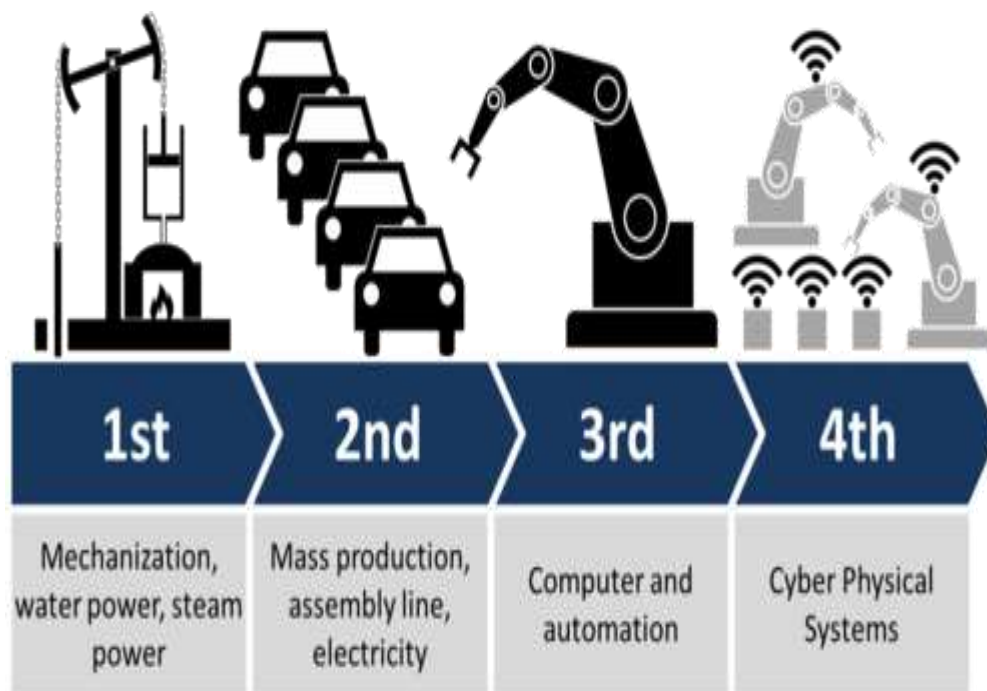


Fig.1: Industrial revolutions towards fourth generation of Industry 4.0.



Fig.2: Industry 4.0 utilization of tools and tackles.

## 2. Design Principles:

Basically four design principles are considered in the field of Industry 4.0. Based on these four design principles the techniques, methods and implementation of advancement in engineering has been improved day by day. The principles and ethics support the companies to identify the problems and solutions of problems in the trend of art of improvement and utilization of internet in design, production, project implementation, maintenance activities etc. The principles are explained as –

### **Interconnection:**

It is the ability of the devices, machines, sensors and people to get connected, attached and communicated seamless way with each other via the aid of internet of Things (IOT) or the Internet of People (IoP).

### **Information Transparency:**

Information transparency involves interconnection of operators and management to collect data and information at all points of manufacturing process, aiding in smooth functioning in dependable chain line operations, identification of areas of innovation and improvement required for better product design and for better human comfort and life style.

**Technical Assistance:**

It is the easiest way to get benefit by audio / video visualization technique system to solve and rectify the problems by spending less amount of time in decision making. It also involves conducting tricky task in exhaustive situation and unsafe situation of workers and co-workers.

**Decentralized Decisions:**

Due to the influence of cyber physical system decisions or critical decisions can be taken care by the process in charge personnel in corrective way because of autonomy and flexibility at task performance. In case of some exceptional and drastic change in task or decision making, it is required to approach higher authority or management of the Industry personnel.

**3. Constraints:**

The revolution in I 4.0 is having few unavoidable constraints, which are required to consider and work out during implementation and after implementation. With such constraints and challenges we need to go ahead with I 4.0 very smartly to sustain in the market. The present constraints to implement Industry 4.0 are as –

**IT (Information Technology) snags:** IT plays an important role in Industry 4.0. Minor lagging in IT support can cause expensive production loss, which in turn delays to fulfill customer demand and requirements.

**Lack of skilled personnel:** As the I 4.0 uses the continuous internet and IT support, so continuous skilled personnel requirements is one of the issue. Due to unavailability and lack of skilled personnel in any stage hampers in delivering the aim and motto of I 4.0.

**Reliability of machines:** Availability, reliability and stability of the machines comes in picture while implementing I 4.0. In case of critical machines availability, standby spare machines are required to be maintaining to avoid production losses. Maintaining the machine health, spare parts, spare machines causes in increase in financial budget. It also includes machine to machine (M2M) communication and response instant to have availability of machines to avoid production losses.

**Redundancy of IT:** An IT support is must and continuous requirement. This IT support gets interrupted due to piracy of software. Reliable corporate IT expert is becomes necessary to provide instant IT support in case of hacking and other application software related issues.

**4. Analytics and troubleshooters:**

Analytics and trouble shooters communication and involvement is continuous from the beginning of implementation of I 4.0. They plays the role to data analysis, cloud computing, cyber system updating, software and hardware issues solving and rectification etc. Also broadens their exerting to expedite defect detection in production failures, productivity, maintain quality of product and agility benefits.

Data analysis consists of 6Cs to maintain integrity of I 4.0 and cyber systems. Such as –

**Connection** – Connection of sensors and networks

**Cyber** - Cyber modeling and memory issues

**Cloud** - Cloud computing and providing data on demand

**Community** - Community sharing and collaborations of interfacing data and equipment

**Customization** – Customization product development and providing in personal customers and clients satisfaction

**Content / context** – content and context involves the deep meaning identification and correlation successfully with fruitful values

Data processing with advanced algorithms and tools with successful programming is an involvement of analytics. An advanced method of algorithms and programming helps to identify and address the visible and invisible issues of shop floor personnel and machines degradation, fatigue, wear and tear of parts and components.

#### 4. Results and Discussions:

Revolution in Industry 4.0 enhances the engineer's headache of prior product visualization, testing, analysis, customized product development, customer satisfaction in just in time service. It also boosts the company management to improve in revenue generation with global market target capturing by producing huge mass quantity of products and services. Newly introduced items and services to the customers bind the customers, clients, different sectors of organization towards the implemented quality and quantity production. The Fig. 3 shows the visualization of engineer to observe the actual precision product development of model item with the testing and prior failure analysis and load testing system. Actual fabrication of tweak products without the involvement of conventional technique of fabrication has been illustrated in Fig4. Such techniques of I 4.0 involvements reduces the production cost and delivers precision quality of product and atomization. The Fig. 5 illustrates the delicate items like integrated circuits (ICs), chips with the aid of Robot arm and internet facility. Digital factory smart manufacturing system reduces down the time delay and obtains precision products by the aid of Robot and internet assistance. The Fig. 6 shows the digital factory which has been operated by the aid of internet and digital tab instructions. The versatile field of applications of I 4.0 take over the market of dairy and firming sector to produce products smartly, scientifically. The Fig. 7 illustrates the involvement of I 4.0 in dairy firming sectors where the cattle are being taken care with the sophisticated equipment to provide healthy, clean environment and milking from the cattle based on the cattle willingness and also provides physical satisfaction by the aid of artificial equipment. The Fig. 8 illustrates the application of drone to spread fertilizers on the crops uniformly and without effecting the farmer's human hygiene and infections and diseases. The Fig. 9 shows the IoT smart industry Robot applications in farming, analyzing of crops and harvesting of crops. The Fig. 10. Illustrates the smart sensors involvement in irrigation to analyze the water content in the ground and in the growing foods, soil condition, weather condition, water and fertilizer deposition within the soil to provide mature, healthy food products from the harvesting fields.



Fig. 3: Manufacturers can test, correct and enhance minute details before proceeding to real-world manufacturing.



Fig. 4: Manufacturing of tweak products developed virtually.



Fig. 5: Delicate items manufacturing and handling.



Fig. 6: Digital factory, a smart manufacturing.



Fig. 7: Industry 4.0 application in the field of dairy farming.



Fig. 8: Industry 4.0 internet of things as aspirant firming with the aid of drone.



Fig. 9: IoT smart industry Robot 4.0 application in agricultural firming.





Fig. 10: Smart sensors involvement in irrigation sector.

## 5. Conclusion

The Industry 4.0 revolution enhances the industrial productivity, customer and people comfort in the fast life circle of human beings. Industry is to fulfill the human comfort zone requirement and demand with hand to mouth solution. It broadens the area of interest in almost all the fields starting from agricultural requirements, transportation, civil structures, aviation sectors, marine sectors, defense sector, communication sector, research and developments sectors, satellite launching etc. The global job issues are shortens towards educated and skilled personnel due to the development of advanced smart machineries, software. IT sector becomes in pick demand. One sort of narrow exposure of job opportunity arises, which is towards the skilled personnel. But from end user point of view a cheap, economic, available, affordable and instant supply of materials, items, and services became very much popular from easier human inter personal communication to business and production. It also entered the field of agriculture to enhance agricultural production and harvesting. A gateway and open door opportunity arise for the skilled, technocrats and skilled set up personnel has been arise due to the revolution in Industry 4.0.

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