

INDUSTRY 4.0 IN MANUFACTURING SECTOR: A REVIEW

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ABSTRACT-

The human did always continue progress since it born. This progress will never stop until earth or human species end. Today we are leaving in an information world there every human is more connected, more informed. The concept industry 4.0 will bring more progress for human kind. This paper has a purpose to review how industry 4.0 and its components who effectively affect the manufacturing sector, the paper also review the additive manufacturing who enable industry 4.0 in real time.

The key finding /conclusion base mark is here that major work is case or concept base so there would be required research for specific topic related. The paper will help to understand better the industry 4.0 and its component such IIoT, CPS, big data and additive manufacturing. This literature review has been written after reviewing various research papers.

KEY WORDS- CPS, IIoT, BIG DATA, INDUSTRY4.0.

I. INTRODUCTION

Welcome to the new world of innovation, integration These innovations always increase productivity of human as well as machines. From the first industrial revolution to 3rd industrial revolution the productivity always increases. In this list the industry 4.0 will play a very significant role. In this new world of

industry 4.0 where we will have smart machine. This machine will be self-aware who take can decision according to the situation^[01] Machine will be communicate machine to machine and machine to human, machine to system^[02].

The industry 4.0 this term first represented by the German academy of sciences and engineering ^[03] .The industry 4.0 is a fourth revolution of industry ^[04]. The first industry revolution driven majorly by steam engines the second industrial revolution driven by electricity ,third by the IT and programmable logic controllers, The fourth industrial revolution will drive by data, better connectivity, cyber physical system^[05].The industrial revolutions progress shown in figure 1.0. The fourth industrial revolution changed the way to produce goods and services. The manufacturing system will be collaborated with it infrastructure. The whole manufacturing system will integrate and also possible fully mass customisation of the products ^[06]. In industry 4.0 where we will have smart factories, smart services, smart products.

In industry 4.0 we have lot of data which generated by machines, human, environmental. This data named as big data ^[01].The industry 4.0 will be data driven industry. We have lot of data with the help of this data we can take smart decision and also with the help of it we can operate predictive

maintenance [01]. Our manufacturing system will be more near to the customers. Whole system works together in industry 4.0 to increase the productivity, efficiency of the factory. In industry 4.0 we have CPS, IIoT, big data with the help of these new features the manufacturing segment has a new era of innovations. The machines will be self-aware; smart where machines will be connected to each other via internet [14]. Every machine will have identity in industry 4.0[06]. The industry 4.0 will bring lot of changes in business modal. The industry 4.0 will provide the best allocation of minimum resources. We will have better use of our human resources allocation and make businesses more profitable. In industry 4.0 human and machine will be interact.[03] Rapid development of CPS and IIoT will soon changes the whole picture. With the help of industry 4.0 the industries provides its customers better services and better products which are never imagined before. The ever changing demand of product will be possible to calculate very efficiently. The industry has too changed according to the environment. The industry 4.0 will bring lot of new innovation in the industries. This new innovation will bring better product with low prices [05]. The better and powerful algorithm will handle and control the physical operation. The industry 4.0 will bring new opportunity at all for everybody.

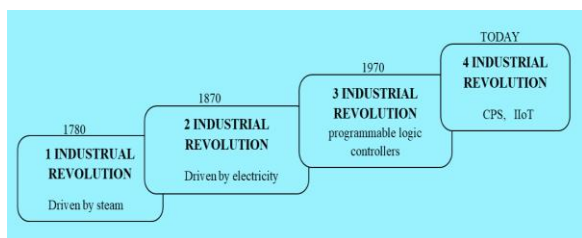


Figure 1.0 the industrial progress throughout

II.METHODOLOGY

The literature review is an essential part of any research. The literature reviews fill the gap of the knowledge/data which is cover by the various papers. The literature review connects new dots from various resources. The paper

from various general like IEEE, Science general, IJBMI, JIBM like that provide us well understanding about the concept.

The review structures down below here

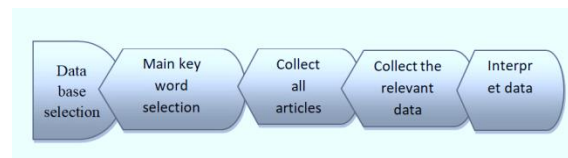


Figure2. Systematic literature review phases. As adapted from [08][07]

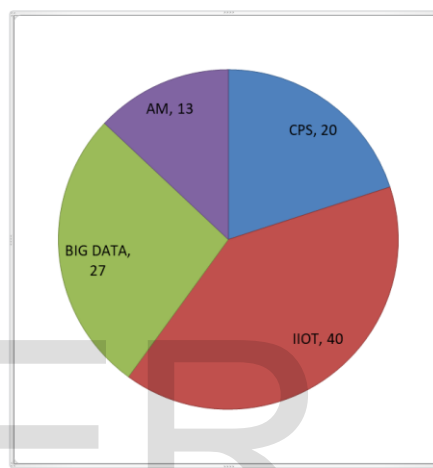


Figure 3.0 Usage of Industry 4.0 in manufacturing Sector (Percentage wise)

III. Cyber physical systems

The term “cyber-physical system” (CPS) was coined in 2006 by Helen Gill of the US National Science Foundation[09]. Cyber physical system is key components of industry 4.0. In cyber physical system the cyber system will interact will physical system take data, command from physical system and perform the operation in physical system. CPSs nowadays are the heart of industry 4.0. The CPSs can be defined as “the integrations of computation, networking, and physical processes. Embedded computers and networks monitor and control the physical processes, with feedback loops where physical processes affect computations and vice versa”[06]. Now in days the cyber physical system becomes more power full with higher super computing

power. Cyber physical system takes data with the help of sensors and with the help of actuator it performs the action in physical system.

In our real world there are there are there are already some CPS devices are available such as smart phone^[10]. In the manufacturing area in future there will be every machine will be equipped with CPS system. The CPS system is only possible when we have better sensors and better actuator who work together. In a system where CPS presence make system become smarter, Efficient, productive. The product, machine, employee all can connect with the help of CPS system. In CPS system there is the high computing power play a very significant role in performing action through actuators. Today sensors are very cheaply available and the computer algorithms also become more powerful day by day.

IV. IIoT- INDUSTRIAL INTERNETS OF THINGS

The Industrial Internet of Things (IIoT) has gained much attention in practice and research over the last years also it serves as a novel manufacturing paradigm ensuring flexibility and adaptability of production systems and value chains in order to maintain the future global competitiveness of manufacturing enterprises^[11]. IIoT^[12] will play huge role in system. In IIoT system the every machine will connect to each other^[13]. The whole system will be integrated. With the help of IIoT, every machine can communicate with whole system through internet and cloud system^[03]. Lot of data which generated by machine can be transfer to the system with the help of IIoT. The IIoT which play a master role to control the machine .With the help of IIoT the manufacturing floor will be connected with the top management of the company^[08]. The integration of system component such customers, suppliers, logistics, products, machines.The IIoT engage in real time^[11]. The mass customisation of the product is also

possible with the help of IIoT^[11]. Industrial internet of things will help us to minimise cost of product. In future projects emerged all over the world, e.g. the “HighTech Strategy 2020” in Germany or the “Industrial Internet Consortium” in the USA^[11]. These initiatives aim at developing and implementing the Industrial Internet of Things (IIoT), which is known as “Industry 4.0” in the German-speaking world, in order to maintain and strengthen the global competitiveness of the respective industrial locations^[11].

When the product connected with system we can measure its surrounding condition.We can use that data for further improvement in future. The manufacturing system will be more reliable, accurate, and self-aware. The IIoT provide perpetual connectivity with customer where we can monitor, maintain, monetize the product or service^[11]. When a product is sold by company we can still track it for future purpose. The IIoT help us to collect whole data which is generated and use this data for enterprise resource planning for the future. In this IIoT world every product and machine has personal IP address^[06]. This IP address show that the product or the machine is in which position or state.

V. BIG DATA

The big data^[01] is big factor in industry 4.0 when we are able to integrated whole system.Nowadays, data is generated at unprecedented rates, mainly due to the advancements in cloud computing, internet, mobile devices and embedded sensors^[14]. This data we can store and we further proceed for the better solution for the problems. In our past on manufacturing floor there is a lot of data generated but this data cannot precede other business solution.Technological improvements in sensing and connectivity enable seamless aggregation of raw data from various production facilities^[01]. Big Data collection and usage could enable firms to design eco-products, use fewer raw materials, and recycle

more products^[08]. The whole data can use for resources planning of enterprise. The big data in manufacturing floor we generate through every machine, every equipment.

The Big Data solutions for high-performance processing of big data with large amounts in volume, variety, speed, variability, or veracity, etc. ^[15]. Combining the big data technology with analytics, the result is big data analytics which is able to create one of the most profound trends in manufacturing and management^[01]. The big data will help us to big data analytics reduce the production time ^[01]. The big data analytics help us to observe the product performance in real time. The big data will be creating more value for us. The big data also generated from consumer in real time. We will have data from both side from manufacturing and customer. The company management try to match the customer requirements with product. Customer base production will be possible in industry 4.0. The big data will help us too to do predictive maintenance of the machine^[01]. In production house we have in past experience based problem solving but now we have data, evidences base approach at all.

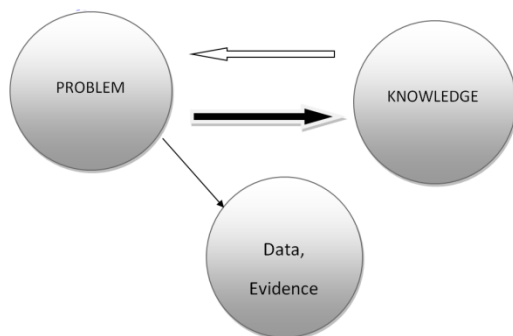


Figure 4.0 (The data or evidence base approach)

VI.ADDITIVE MANUFACTURING

The Additive manufacturing and industry 4.0 both can create an ultimate solution for consumer. Additive manufacturing (AM), also

referred to as 3D printing, is a layer-by-layer technique of producing three-dimensional (3D) objects directly from a digital model^[16]. The additive manufacturing provides very high quantity of customisation of products Additive manufacturing provides unique capabilities to produce customized, complex parts, shorten lead-time, reduce weight, improve sustainability efforts, and reduce material waste when compared to traditional manufacturing (TM) processes ^[16]. In industry 4.0 we will further improves over connectivity where we can produces product according to every customer. The customer and machine will be close together. In 3d printing with the help of IIoT, CPS the customer can design their own product and can place order in real time.

Conventional methods are expensive, time consuming, lot of tooling required .in 3d printing nothing required you just design a product and place an order. The order will be place in real time. The 3d printing and industry 4.0 where a customer's design their own product, customise product, select colour, size and shape also. In this new business world additive manufacturing have a very huge potential. In future with the help of IIoT and cyber physical system the machine which known as here 3d printer will be communicate with whole world or can be controlled by anywhere you have internet access. The FMS technology is a natural response to the world market evolution, which nowadays puts more attention to the concept of customizability. Indeed, companies have to adapt to the environment in which they operate, to be more flexible in their operations and to satisfy different market segments^[18].

VII. Conclusion

The industry 4.0 will bring new opportunity towards us. The businesses will be benefited with new innovations .every part of our life will see new changes. The customer will have new services, smart products. This paper show the importance of IIoT, CPS, big data and these factor how affect our manufacturing system .In addition here we talk about additive manufacturing in industry 4.0.

The IIoT and cyber physical system will affect our machines. This paper will provide better understanding of industry 4.0. This paper will help researchers to connect new dots. The industry 4.0 brings new sunshine for manufacturing sector. The three key factors CPS, IIoT, big data together help the manufacturer to produced product very efficiently and cost effectively.Industry 4.0 factory could result in decrease of production costs by 10-30%.

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