



A study on impact of Industry 4.0 in India

Sagar B S¹, Praveen D Jadhav²

Student, Department of Mechanical Engineering, Dayananda Sagar College of Engineering, Bengaluru, India¹

Assistant Professor, Dept of Mechanical Engineering, Dayananda Sagar College of Engineering, Bengaluru, India²

Abstract: In current situation, all industries are trying to stretch their arms all over the globe to become a strong competitor in industrial world. Industry 4.0 involves a wide set of technologies that provides a good platform for innovation and creative solutions. In order to implement such condition, it requires the utilization of advanced prediction tools that involves the conversion of data into information in a systematic process to explain uncertainties. This technology is an opportunity to change the economic rules of the industry. As we know India is in its verge of development. It is very important to understand India's thrust towards "Make in India". Thus it is important for an India to adopt industry 4.0 technology and to get adapted to the same. This in turn contributes in the development of Indian economy. This paper addresses the impact of industry 4.0 technology in India.

Keywords: Industry 4.0, Internet of things, Cyber physical system.

I INTRODUCTION

Along with the profit, industries also care about customer satisfaction, product quality and its customization and also cost of production. Thick digital transformation is on the way, behind the scenes of world's leading industries. They are intensifying their product portfolio with digital functionalities and also investing in data analytics to drive innovation and significant improvements in efficiency as a basement capability. India and china are competing for lion's share in global manufacturing, from past 20 years. Although India have infrastructural issues, bureaucratic wattle and also inconvenient supply of resources, India supplies abundant skilled labours and some of large manufacturers like Havells, Godrej and Bosch hold their units in India. India has a huge task in its dream of being the world's preferred manufacturing destination in future. The fourth industrial revolution is on its way, and there is no stepping back. Industry 4.0 will be a challenge and may also have the answers for India's continued advantage in the global manufacturing process. This is the era of advanced manufacturing, composite materials, quantum engineering, 3D printing and robotics.

II DEFINITION OF INDUSTRY 4.0 AND ITS HISTORY

Industry 4.0 defines the system of production processes depends on the autonomously communicating devices with each other and technology along the value chain: a model of future 'smart' factory which makes decentralized decisions based on self-organization mechanisms, create a virtual copy of the physical world. In industry 4.0 computer-driven systems monitor physical processes. It also referred as fourth industrial revolution. The concept of Industry 4.0 is widely used across Europe, particularly in German's manufacturing sector.

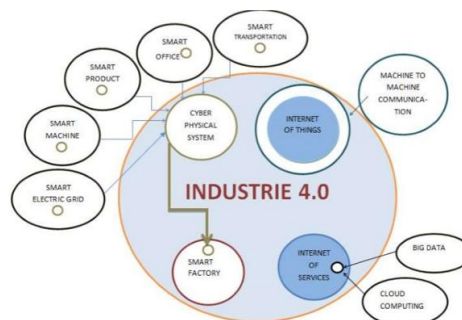


Figure 1: Basic components of Industry 4.0 [7]

III HISTORY

At Hanover fair conducted in January 2011, Germany government introduced a new concept as one of its "strategic initiatives" termed as the Industry 4.0 that is adopted as a part of the High Tech strategy 2020 action plan. Siegfried



Dais of Robert Bosch GmbH and Henning Kagermann of acatech, the communication Promoter group of the Industry-Science research Alliance and a team co-chaired by other members explained and proposed this concept in January 2011. It is a vision, an idea which was firstly explained by industry 4.0 working group [7].

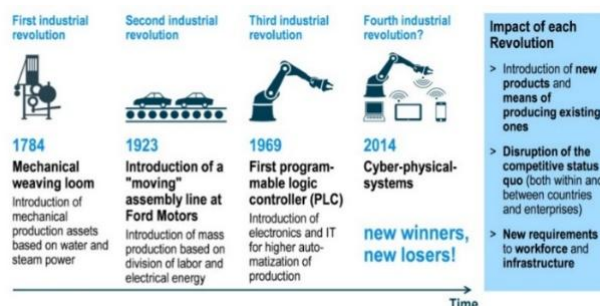


Figure 2: Industrial revolution [4]

IV LITERATURE REVIEW

[8]. Industry 4.0 smart manufacturing for future, William MacDougall, Germany trade and Invest (GTAI) 10117, order no 20750

From book this we came know that in Germany, lot of prominent institutions, research and trade actors have joined their hands to work together in order to realize close vision of Industry 4.0. Some of them are

- I. Acatech -National Academy of Science and Engineering, it depicts interests of the German scientific and technological groups at home and abroad.
- II. DFKI – German Research Centre for Artificial Intelligence, Germany’s leading research centre.
- III. Fraunhofer-Gesellschaft – Research organization that maintains 66 institutes and independent research units.
- IV. Smart factory – It is the first European vendor independent demonstration factory for industrial application of state of the art communication and information technologies.
- V. FESTO – Major supplier of automation technology for process and factory automation.



Figure 3: Future urban production at WITTENSTEIN’s facility in Fellbach [8]

- [11].<http://www.thehindu.com/business/india-must-try-to-profit-from-industry-40/article8253770.ece> FEB 18 2016.

In this blog it was stated that in India, PM aims to harness foreign direct investment into Indian manufacturing through his ‘Make in India’ campaign, thereby increasing the sector’s contribution to Indian GDP from 16 to 25 percent.

- [12]. Industry 4.0: IISc building India’s 1st smart factory in Bangalore Chethan Kumar| TNN Jul 29, 2016 <http://timesofindia.indiatimes.com/city/bengaluru/Industry-4-0-IISc-building-Indias-1st-smart-factory-in-Bengaluru/articleshow/53441112.cms> India’s very own smart factory, the first one, is making progress at the Indian Institute of Science’s (IISc) and Centre for Product Design and Manufacturing (CPDM) with a seed funding from The Boeing Company, is being set up in Bangalore.

- [10]. Bosch smart manufacturing forum 2016 post event report, LinkedIn
Recently, Bosch Smart Manufacturing Forum 2016 facilitated a platform for industry leaders and technology practitioners to meet discuss and network on smart manufacturing in the Indian context on 20th, 21st July 2016 in Chennai and Ahmadabad respectively.



Bosch Rexroth: Industrie 4.0 assembly line in use

A new assembly line for producing electro-hydraulic valves for tractors semi-automatically allows the Bosch Rexroth plant in Hornburg to produce individualised products flexibly and efficiently. With the practical application of Industrie 4.0 concepts in-house, Bosch Rexroth gains experience for their further development.



Figure 4: BOSCH's smart factory

V CURRENT STATE OF ART IN INDIA

Since 1970 Industries in India and all over the world have adapted automation and robotic technologies that are driven by electronics and information technology. Present technology consist the automation of isolated machines. General adoption of information and communication technology by manufacturing industry is now leading for deterrent approaches to production development and to the whole logistic chain. As we know increase in population is paving the way for increase in productivity and quality with limited time period.

Identification of potential problems

By studying current industrial technology some of issues or problems were found. These can be categorized into five groups. They are as follows

A. MANAGER AND OPERATORS INTERACTION

At present industries, managers design logistic schedules and operators control machines to check whether they are performing the tasks which are assigned to them. Even though expert managers and operators are deciding these tasks, there is a lack of significant factor: health condition of the machine

B. MACHINE FLEET

Exposure of identical machines for different tasks in completely different working condition is very common. Most prognostic methods are designed to encourage limited number machines and better working condition. The advantage of identical machines is not being used properly in the present health and prognostic management methods by the worthwhile knowledge gathered from different situations, as a fleet.

C. PRODUCT AND PROCESS QUALITY

Final product of an industry gives the scrutiny on machine condition through backward reasoning algorithm. Production scheduling can be improved by the feedback provided by the product quality to system management. Because of the absence of such feedback loop more researches should be done on this.

D. BIG DATA AND CLOUD

Achievement of self-learning and self-aware machines is critical for data distribution and management in big data environment. Research has to be done in the efficient implementation of current data management technologies by adapting prognostics and health management algorithms.

E. SENSOR AND CONTROLLER NETWORK

Sensors act as the gateway of the machine as it senses its surrounding physical environment. Yet they pass wrong and inaccurate readings to decision making algorithms due to its degradation or failure, which leads to the incorrect outputs.

- Indian firms have a deep challenge. Even though India has become a destination for outsourced analytics for European and North American companies, they have not utilized locally available expertise.
- India also lags in promoting a strong digital culture, operational disruption from cyber security breaches and clear digital operation vision from leadership.
- Currently, India (27%) drop behind the global average (33%) and Asia-Pacific (36%) in terms of level of digitization.
- By analyzing the current technology and its limitation and the problems associated with them some of the industries have come forward and adopted industry 4.0 technology in order to be a strong competitor in the global market. Industry 4.0 is the one which can take the India to its next level in its development. India should benefit from it.



VI INDUSTRY 4.0- OPTIMAL SOLUTION

- Internet and mobile phones as a new transforming technology succeeded because they were followed by a societal transformation and not because they were new. Internet as a technology did not invent Social networks, but social networks formulated thanks to the Internet, and also enabled it to develop further. In the same way rules of the industry players will be changed by bringing new functionalities through Industry 4.0. The development in different industries will proceed at different rates.

- In the same way India needs to take few steps to ensure a manufacturing success story in Industry 4.0

i. It has to improve its fledging internet of things(IOT) industry:

As the growth of industry 4.0 is based on the growth of IOT market, it is necessary to work on seamless data integration. In order to create a smart Factory all heterogeneous devices have to be networked and connected together in the industrial automation system through IOT. Even though Indian IOT is emerging now it is the crucial part of digital India to transform India into a digital knowledge driven economy.

ii. To develop a robust data security environment:

Practical application of smart factory is impossible without a robust security infrastructure. Security services industry has to be developed in order to manage advanced targeted cyber-security threats and attacks and also strict government rules and regulations are to be made for data security and protection

iii. Skill development

It is the right time for the India to improve its skill in some the areas in which it has not done well so far, like advanced automation, automation bionics, industrial ICT, cognitive robots and etc., and also it has to take care of safety related abilities as Industry 4.0 involves Human machine cooperation and engagement. An instructive approach from corporations helps India in its preparation for leadership in Industry 4.0

Advantages

- Leads to innovation
- Effective globalization
- Optimum utilization of resources
- Smooth product flow
- Efficient continuous real time tracking
- Efficient energy consumption
- Autonomous controlling
- Greater flexibility meeting high level last minute changes
- Detailed end to end product transparency in real time
- Secure and reliable backup system for every step in cloud storage

Challenges in Industry 4.0

- Training
- Type of process and work organization
- Lack of research and specialist staff
- Supplier of mechatronic system and machineries
- Strong network infrastructure
- Highly efficient cyber security
- Effective plant layout

VII CONCLUSION

India is a population of 1.2 billion people and its resources are stretched to say the least. However, India has to rework the way it has historically dealt with issues; the world around it is changing. As we discussed earlier fourth industrial revolution is on its way to occupy the world and likely provides large opportunities. Through Industry 4.0 it is feasible to create prolonged ecosystem with qualified employees and to bear on India's edge in manufacturing and can orchestrate to large scale customization. Although it is very tough to manage the process centrally, if players in the system apply right levers there will be reinforced effects. Thus it is imperative to communicate the ideas that players in government and corporate sector will profit most, if an initiative of Industry 4.0 goes together. By adopting Industry 4.0, we will have a major competitive advantage over global competitors in economy. But first and foremost we need to have the essence of speed in order to capture this opportunity and to achieve our goal.



REFERENCES

- [1] Service innovation and smart analytics for Industry 4.0 and big data environment Jay Lee*, Hung-An Kao, Shanhu Yang NSF I/UCRC Center for Intelligent Maintenance Systems (IMS), University of Cincinnati, Cincinnati, OH 45221-0072, USA
- [2] Industry 4.0 Implies Lean Manufacturing: Research Activities in Industry 4.0 Function as Enablers for Lean Manufacturing, Adam Sander, CholaElangeswaran, Jens Wulfsberg, Helmut-Schmidt-University, Institute of Production Engineering (Germany), JIEM, 2016 – 9(3): 811-833 – Online ISSN: 2013-0953 – Print ISSN: 2013-8423
- [3] Deloitte Switzerland, © 2015 Deloitte AG. All rights reserved, Designed and published by the creative studio at Zurich. 45774A
- [4] Next Gen Manufacturing: Industry 4.0, a look at changing landscapes in manufacturing, Dr. WilfriedAulbur, Harshavardhansingh 26 September 2014. Published by Confederation of Indian Industry (CII)
- [5] Forthcoming in Galgóczi, B. (Ed.) (2017). Post-FDI development strategy for middle-income EU economies, Brussels: ETUI, Andrea Szalavetz: Industry 4.0 in 'factory economies'
- [6] How Virtualization, Decentralization and Network Building Change the Manufacturing Landscape: An Industry 4.0 Perspective, MalteBrettel, NiklasFriederichsen, Michael Keller, Marius Rosenberg, World Academy of Science, Engineering and Technology International Journal of Mechanical, Aerospace, Industrial, Mechatronic and Manufacturing Engineering Vol:8, No:1, 2014
- [7] Industry 4.0: An Overview Lalitrajpurohit, Dr. Prof. Arvind Kumar Verma, International Journal of Advance Engineering and Research Development Volume 3, Issue 3, March -2016, Scientific Journal of Impact Factor (SJIF): 4.14 e-ISSN (O): 2348-4470 p-ISSN (P): 2348-6406
- [8] Industry 4.0 smart manufacturing for future, William MacDougall, Germany trade and Invest (GTAI) 10117, order no 20750
- [9] Industry 4.0: Building the digital enterprise India highlights, ©2016 price water house coopers private limited, CIN U74140WB1983PTC036093, PD/JUNE 2016-6549
- [10] Bosch smart manufacturing forum 2016 post event report, LinkedIn.
- [11] Industry 4.0: IISc building India's 1st smart factory in Bangalore Chethan Kumar| TNN |Jul 29, 2016 <http://timesofindia.indiatimes.com/city/bengaluru/Industry-4-0-IISc-building-Indias-1st-smart-factory-in-Bengaluru/articleshow/53441112.cms>
- [12] Industries 4.0 in practice-solutions for industrial applications, HartmurtRauen, Germany.