

The Impact of “Industry 4.0” on Supply Chain Management & Its Implementation in Manufacturing Industries

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Abstract:

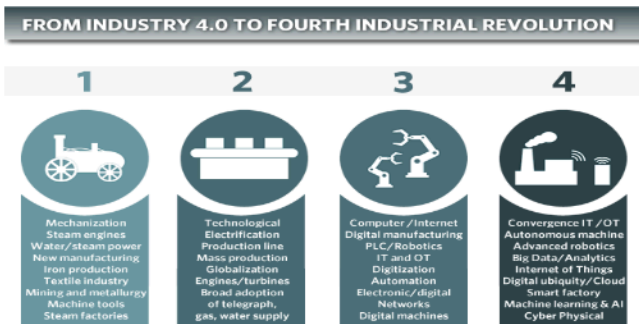
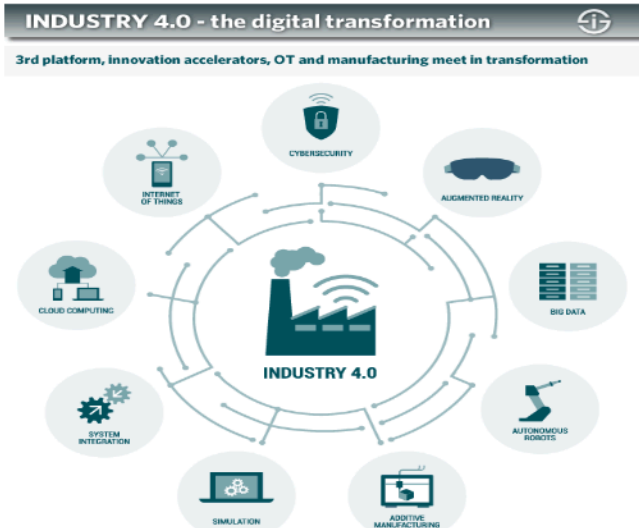
The term -“Industry 4.0” is a digital transformation, revolution or a process of redefining the traditional production and manufacturing processes. This revolution formulated into the 4th Industrial Revolution. “Industry 4.0” is related to IoT (Internet of Things), CPS (Cyber Physical System), ICT (Information & Communication Technology), EA (Enterprise Architecture) and EI (Enterprise Integration). Fourth Industrial Revolution impacted the Supply Chain Management. The biggest challenge the companies facing today is not the globalization or need of stakeholder or any other, but it is the integration of supply chains from vendors through manufacturers till satisfying customers. “Industry 4.0” highlights on the digitalization, automation and efficient working. Redefining or revolution in the production process involves digitalization and automation of the process. The research paper is based on the secondary data. It will study the advantages to the manufacturing industries by the implementation of “Industry 4.0”. The implementation of “Industry 4.0” varies widely depending upon the country, sector and also an distinct company.

Keywords: “Industry 4.0”, Supply Chain Management, IoT, CPS, ICT, EA, EI.

1. INTRODUCTION

Industrial Revolution term significantly implies the major changes and developments that had taken place in the world of manufacturing and technology. The development of Industrial ages started late 18th century, termed as Industry 1.0, which was the beginning of the revolution. Mechanical production systems like steam and power machines were first introduced in this century. The introduction of machines not only increased the production efficiency and sales but also assisted the small businesses by allocating a small amount of customers to large firms with the managers, owners and employees of the firm. The 2nd Revolution, termed as Industry 2.0 hosted the development of electrical energy based machines. In this era, management program evolved from industry culture that was introduced in Industry 1.0. The program enhanced the efficiency of the manufacturing processes. Some of the manufacturing techniques like division of labour, JIT manufacturing, & lean manufacturing lead to improved quality and output.

“Industry 4.0” was basically established from an intention to make the German manufacturing industry more competitive. ‘Industrie 4.0’ was a globally adopted term referring to discrete process manufacturing industrial transformation.



machine communication) and IOT (Internet of things) are usually used to improve the mechanization and computerization, along with better communication and self-regulated production systems and machines which can evaluate and detect the issues involved without the requirement of human interference.

“Industry 4.0” can be referred to smart working of machineries and methods for industry with the help of information. “Industry 4.0” can be defined as “The latest trend of mechanization and exchange of data in industrial technologies, which also include cyber-physical systems, the IoT, cloud & cognitive computing and creating the smart factory”.

1.2 Industry 4.0 in Manufacturing Industry

Industry 4.0 provides a way for Indian manufacturing industries to bring together various innovative technologies, such as the IoT, AI, robotics, Big data and advanced algorithms, and 3D printing for changing the manufacturing industries scenario. The manufacturing industries which have already implemented “Industry 4.0” or any other smart manufacturing processes at initial stage are bagging the benefits like increase in productivity, enhanced efficiencies and reduced costs.

2. LITERATURE REVIEW

T. Stock, G. Seliger (2016) in their research paper Opportunities of the Sustainable Manufacturing in “Industry 4.0” studied the value created by “Industry 4.0” in the manufacturing sector. The research paper states how the concept of “Industry 4.0” implemented in manufacturing industry can help achieving the continuously increasing and changing demands of the customers. The paper presented the recent development in research and the different opportunities that are available in manufacturing sector.

Guillherme Luz Tortorella & Diego Fettermann (2017) in their research paper Implementation of “Industry 4.0” & lean manufacturing in Brazil manufacturing companies studied how the adoption of the “Industry 4.0” can increase the productivity and improve the product quality. The paper examines the lean manufacturing and “Industry 4.0” implementation in the manufacturing sector of Brazil companies. The paper concluded that the implementation of “Industry 4.0” has resulted in improved performance.

Julian Marius Müller et al (2018) in their paper What Drive the Implementation of “Industry 4.0”? The Role of the Opportunities & the Challenges in the Context of Sustainability stated the impact of implementation of “Industry 4.0” in industry sectors. The study examines the opportunities and challenges that are related to the implementation of “Industry 4.0” in various manufacturing companies. The paper concluded that the implementation of “Industry 4.0” depends upon the

The term - "Industrie 4.0", condensed to "I4.0" or simply 'I4', was dreamt in 2011 by German government to promote the computerization in manufacturing sector. In 2011, at Hanover Fair, the term - "Industrie 4.0" was widely introduced. In October 2012, the Working Group members implemented “Industry 4.0” before German Federal Government. These members are known as the fathers of “Industry 4.0”. The “Industry 4.0” members & partners were the motivating force behind “Industry 4.0”. On 8 April 2013, the Working Group Members presented the final report.

“Industry 4.0” is the subdivision of the “4th industrial revolution”. The terms “Industry 4.0” and “fourth industrial revolution” is used interchangeably, but the factories which implemented “Industry 4.0” resulted in wireless connections. The sensors used can visualize the production line and take the decision on its own. “Industry 4.0” is the development in manufacturing sector in terms of automation and also exchange of data. It includes CPS (cyber physical system), IoT (Internet of Things) and IIOT (Industrial IoT), cloud computing, AI (artificial Intelligence).

1.1 Industry 4.0

“Industry 4.0” is a continuous process of mechanization or computerization which uses the modern and smart technology for the traditional processes of manufacturing and industry practices. Integration of M2M (Machine-to-

characteristics of the respective companies and also the perception regarding the opportunities and challenges involved in implementation of “Industry 4.0” depends upon the past experiences.

Jo Wessel Strandhagen et al (2016) in their research paper. The fit of “Industry 4.0” applications in the manufacturing logistics: “a multiple case study” studied the various technologies of “Industry 4.0” that are applicable to the manufacturing sectors. The findings of the study stated that the application of “Industry 4.0” depends upon the production environment. The study also concluded that the manufacturing units with low degree of repetitive production process see less potential in implementation of “Industry 4.0”.

Md. Abdul Moktaadir et al (2018) in their paper – “Assessing challenge for implementing “Industry 4.0””: Implications for process safety & environmental protection studied the challenges that are faced by the companies for the implementation of “Industry 4.0”. The study exhibited that the lack of technological infrastructure is the most persistent factor that hinders the implementation of “Industry 4.0” while the factor which have a smaller amount of effect on implementation of “Industry 4.0” is the side –effects on environment.

3. OBJECTIVES

- 1) To study the various concepts of “Industry 4.0”.
- 2) To understand the implementation and benefits of “Industry 4.0” in manufacturing industries.

4. RESEARCH METHODOLOGY

The research study is conducted using secondary data through various journals and articles.

5. DRIVERS OF “INDUSTRY 4.0”

Customer satisfaction is a multifaceted ongoing process which needs alterations as the customers demand changes every time. Understanding needs of a customer is a great task. Companies now a days accomplish this task by creating a business model to provide their customers digitalized solutions that meet their need best. Some of the Data Analytics components are as follows:

- a) **Digitization and incorporation of value chains:** “Industry 4.0” integrates all the process that are involved in the entire organization. Processes like new product development, manufacturing and production, storage and service after sales and also incorporates maintaining the relationship between suppliers, distributors, customers and all the partners involved in value chain.
- b) **Digitization of products and services offerings:** Data analytics helps in collecting the data about the requirement of the customers need. This data helps

in developing a new product or restricting the existing product to meet the customer demand.

6. DESIGNING PRINCIPLES INVOLVED IN IMPLEMENTATION OF “INDUSTRY 4.0”

There are four basic principles involved in the implementation of “Industry 4.0” in organizations.

- a) **Interconnection:** The capability of the connection and communication of different machines, sensors, various devices, and people with one another via the IoT (Internet of Things), or the IoP (Internet of People). Inter-connectivity assists operators to accumulate plenty of data and information from all the facets in the manufacturing process. It helps in identifying the key areas which can be beneficial to improve performance.
- b) **Transparency in Information:** The transparency provided by the technology in “Industry 4.0” is inclusive of all the required for decisions.
- c) **Technical assistance:** The technical facility of “Industry 4.0” systems assist humans in making decision and solving the problems, and the also enabling the ability to help humans to deal with difficult or unsafe tasks.
- d) **Decentralized decisions:** The ability of to make decisions perform their tasks on their own as independently as possible. Only in the case where the goals are exceptions or conflicting, tasks are delegated to a higher level.

7. IMPLEMENTATION OF “INDUSTRY 4.0”

Adoption of “Industry 4.0”, today is not a choice but indispensable for every industry. “Industry4.0” can be implemented in following ways:

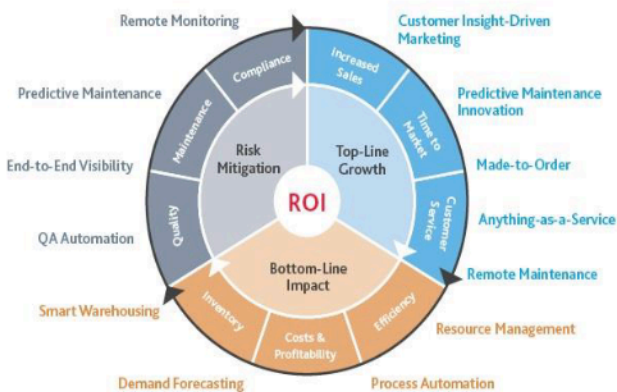
- a) **Flawless Plan:** The industries should have a clear and well defined plan to evaluate the gaps, determine the competences that are existing in the industry and also the ones that are required for the implementation of Industry 4.0.
- b) **Start with the smaller projects:** Committed cross-functional groups for various business, operations, and IT, should be formed and start with the projects. Scale-up the projects once it gets validated.
- c) **Skill development:** New technologies can be implemented easily, quickly and smoothly with the help of skilled and qualified staff. Emphasis has to be given on improving the skills of the existing workers as it may reduce cost as compared to hiring of new skilled workers.
- d) **Customer is the priority:** Meeting customer’s demand is the ultimate goal for any manufacturer. Effective alliance of the value chain among the

supply chain partners like R&D departments and customers will help in the implementation of Industry 4.0.

8. HOW DOES “INDUSTRY 4.0” CAN HELP IN VALUE CREATION?

Value can be created in number of ways. Incremental value is always available to the manufacturer which can be embedded in incremental improvements in the existing capabilities. This will start with a small improvement initiative in any of the functional area. Initial small changes will have tremendous effects throughout the organization. These improvements will ultimately be performed to achieve the vision and strategy to drive the ROI enterprise-wide.

INDUSTRY 4.0 VALUE CREATION



9. RECENT SCENARIO OF “INDUSTRY 4.0”

Manufacturers today, need to change from the current manual inputs to the technological stage which will generate workers of different skills that improve synergies. While number of organizations might be in dilemma about how “Industry 4.0” could impact their business, some industries have implemented it by understanding that smart machines can help them in preparing for their future and also can improve their business opportunities giving them a competitive advantage over their competitors. Some of the application are as follows:

- Identifying the opportunities:** Machines can collect a large volume of data as compared to humans and also can process the collected data to analyse and identify the pattern of the customer’s need that would be impossible for a human to do within a reasonable timeframe. “Industry 4.0” helps the manufactures to understand when and what to optimize in terms of production which will result in quick and efficient response to the customer’s needs.
- Enhancing logistics and supply chains:** A supply chain is an integration of all the partners involved in it. As the supply chain is a connection between all its

partners, any adjustment or new information can be easily accommodated in it.

- Robots:** Robotics make work easy, reduce cost and allow the better use of floor space.
- 3D Printing:** This technology is developed from being primarily used for prototyping to the actual production.
- IoT (Internet of Things) and the cloud:** IoT is characterised by the number of devices connected with each other. This not only helps in operations but also with the use of cloud, the data that is stored can be used for the optimization of the operations.

10. CONCLUSION

“Industry 4.0” is evolving concept and the complete picture of the concept may be clear only when we look 30 years back from now. The companies those who have adopted and implemented this concept can understand the potential of this concept. The same companies which have implemented “Industry 4.0” also have up skilled their workforce so that they can grab the new opportunities in the market. The successful implementation of “Industry 4.0” can help the companies to reduce the faults which normally occurs due to human errors as “Industry 4.0” is a wireless connection which the machine can visualize the production line and take decision by its own. Implementation of “Industry 4.0” benefits the manufacturing industries with enhanced productivity, improved flexibility and increased profitability. “Industry 4.0” also helps by making compliance easier, better customer experience and reduced costs.

REFERENCES

- A. Sander’s, C. Elangeswarran, and J. Wullfsberg, “Industry 4.0” “Implies Lean Manufacturing: Research Activities in “Industry 4.0””- Function as an Enablers for Lean Manufacturing’, J. Ind. Eng. Manag. 9(3) (2016) 23.
- D. Luckee, C. Constantiinescu, and E. Westkämper, ‘Smart Factory - A Step towards the Next Generation Manufacturing Sector and Technologies for the New Frontier’, London: Springer London, 2008, pp. 115–118.
- Guilherme Luz Tortorella & Diego Fettermann (2018) Implementation of “Industry 4.0” and lean production process in Brazilian manufacturing companies, International Journal of Production Research, 56:8, 2975-2987,
- Julian Marius Müller, Daniel Kiel and Kai-Ingo Voigt (2018) “What Drive the Implementation of “Industry 4.0”?” pp. 17-20.

- 5) M. Herman, T. Pentek, and B. Otto, Design Principles for Industries 4.0 Scenarios: A Literature Review, 2015.
- 6) M. Schröder, M. Indorf, and W. Kersten, “Industry 4.0” and its impact on supply chain risk management, pp. 15–18, 2014.
- 7) N. Banaitienee and A. Banaitiessas, “Risk Management in Construction’s Project, in Risk Management - Current Issues and Challenges”, InTech, 2012.”
- 8) Strandhagen, J.W., Alfnes, E., Strandhagen, J.O. *et al.* (2017). The fit of “Industry 4.0” applications in the manufacturing logistics: “a multiple case study”. *Adv. Manuf.* 5, 344–358
- 9) T. Niesen, et al., “Towards an Integrated Big Data Analysis Framework, Data Driven Risk Management in “Industry 4.0””, in 2016-49 Hawaii International Conference on System Science (HICSS), 2016, pp. 5065–5074.
- 10) T. Stock, G. Seliger (2016) Opportunities of the Sustainable Manufacturing in “Industry 4.0”, *Procedia CIRP* Volume 40, 2016, Pages 536-541