Advancements in Logistics and SCM with regard to 'Industry 5.0'

Dr.RAMACHANDRA C G

Research Scholar, School of Management Studies,

Vels Institute of Science, Technology & Advanced Studies, Chennai

Dr.WINSTON DUNN

Associate Professor& Research Supervisor, School of Management Studies,

Vels Institute of Science, Technology & Advanced Studies, Chennai

Abstract:

The first Industrial revolution (Industry 1.0) dates back to the year 1760 where water and steam were used to make manufacturing processes easy. Later with the advancements, machine power was introduced to assist man power. The introduction of Industry 4.0 was in 2011 and Industry 5.0 has come into place within the period of less than 10 years. This paper aims to focus on the developing of Industrial Revolution from "Industry 4.0" to "Industry 5.0" and the tremendous improvements causing major impacts in the manufacturing sector. It also aims to showcase that Industry 5.0 is not totally about robot and machines, but how human and machines work together to achieve greater results. This will bring a major impact on the economy and also on the environment resulting in less wastage of time, money and effort. The paper also focuses on the application of Industry 5.0 in the field of Logistics and Supply Chain Management which can bring significant solutions that can improve the performance of the entire supply chain.

Keywords:

Industry 5.0, SCM, Industrial Revolution, Automation, Cobots, IOT.

Definition of Industry 5.0:

European Economic and Social committee defines Industry 5.0 as, **'Focused on combining human being's creativity and craftsmanship with the speed, productivity and consistency of robots'.**

Michael Rada (Rada 2015; Rada 2017) states that Industry 5.0 is **'to utilise efficiently workforce of machines and people, in synergy with the environment. It goes back from a virtual environment to a real one.'**

Introduction:

In early decades, the goods were manufactured at small shops and later they were moved to large scale industries. People also moved from smaller cities to bigger cities and this created need for more demand which in turn created the need for more space, increase in human resources to tackle the demand. This brought to the introduction of Industrial revolution in the field of manufacturing to help human hands. In case of large scale manufacturing units the need for machine were needed to help human get the tasks done.

The Industrial Revolution has its own generations:

Industry 1.0: The Industrial revolution

This paved way for many new innovations and advancement in technology. At first, steam and coal were used in machines that made manufacturing more feasible and introduction of machines in manufacturing units came into place.

Industry 2.0: Technological Revolution

The technological revolution came into existence after 1840[4]. This became the second industrial revolution introducing electric based technology that made production faster and paved way for sophisticated machines.

Industry 3.0: Digital Revolution

It was in the 1950's were the third revolution begun with the advent of computers. There were very large with simple functionality and provided large computing powers. Those were the base for the advancement in computers we have now.

Industry 4.0: The Automation Revolution

The term Industry 4.0 was coined in the year 2011 by Hannover Trade Fair in Germany by Bosch [4]. At this stage of revolution the machines were able to operate by themselves with the help of Internet of Things (IoT).

Industry 5.0: Personalization

This is the next revolution that manufacturers are looking forward and this in particular is not all about robots and machines, instead it brings the concept of how human mind and machine can work together. But many companies are still incorporating Industry 4.0 while the next revolution is already emerged. Many manufacturers have voiced out their opinions that cyber machinery and cognitive computing will neglect human factors and will be machine based on the whole.

With the introduction of Industry 5.0, men will be at work handling lighter tasks that need thinking and machines will do the strenuous work. The revolution could be of more advantage as the resources used will be from renewable energy eliminating waste. Industry 5.0 is an evolutionary, necessity and advancements that builds on concept, and practices based and practised in Industry 4.0. As far as Industry 4.0 is considered, the main focuses of the revolution were on Supply chain Management, Manufacturing and Production. Later the applications of the sensors were able to be applied in field of retail and service industry like restaurants. Presently, the priority has shifted from producing or making things to making use of Big Data, improving software and productive use of network platform.

Application of Industry 5.0 in Supply Chain Process:

Traditional supply chain has gone through so many changes with the introduction of sensors which has made communication so effective and better. Decision making has become simpler and not so time consuming due to the advancements and the extent of automation that can be done in the areas of supply chain. The level of competition that has risen up due to the automation has resulted in huge opportunities which have paved way for cost reduction and improvement in efficiency. It has also shapes the multiple chains in the supply chain and has ensured integration of internal and external players like the customers and suppliers. IT is an integral part of IOT and IOT has taken supply chain management to a great level. Supply chain should be proper and perfect in order to gain competitiveness in the market. Nowadays customer require real – time information and updates about their orders and on the other side due to various events there will be turbulence in the markets which may reflect the market growth.

If the industry needs to make good strategic decisions out of the volatile market they need to have real- time analytics from the operational data to improve performance. These real- time analytics can be made more effective through analytical minds and with the help of machines where accurate data can be derived and put into use. Increased visibility throughout the supply chain will bring in customer satisfaction. This visibility can be achieved only through improved and advanced industrial revolution like “Industry 5.0”. Cognitive data should be put from insight to action to in order to achieve greater visibility, provide actionable insights with proper items and not to forget the past results for better performance. Data Analytics places a major vital role for the industries to meet their organizational objectives.

Application of Industry 5.0 in Manufacturing:

Federation of Robotics reports that in 2020, there will be more than three million industrial robots used worldwide [5]. With the level of atomization and digitalization, the machines have started working profusely and can communicate with their operators efficiently. The machines are mainly used for monotonous tasks that needs to repeatedly continuous which a human hand may not be able to perform and this reduces errors, labour costs and mainly cost of machines are starting to fall. With the help of structured data like phone numbers and postcodes with the combination of AI, Natural language processing and SQL can help managing inventory and generating invoice making it easy for the manufacturers by eliminating errors and increasing the speed of operations. With the help of big data, cyber- physical systems, Internet of Things and cloud computing can help to create a 3D visual of the product before putting it into manufacturing. At present even the small and medium scale industries has started using robots where before only the large manufacturing units were using them.

Due to the technological advancements, the contribution towards the expansion of global workforce will go up to 4% by 2030 with the population of 1.3 billion people [6]. This will enable the supply chain management industries scale up more quickly and easily due to the increasing innovations at the R&D, with great level of sales and marketing knowledge, distribution and will also lower down the cost for the value brought and delivered. The concepts that were introduced by Industry 4.0 helped manufacturers to increase efficiency and reduced costs like: 1. Production costs by 10-30% 2. Logistics costs by 10-30% 3. Quality Management costs by 10-20% [B].

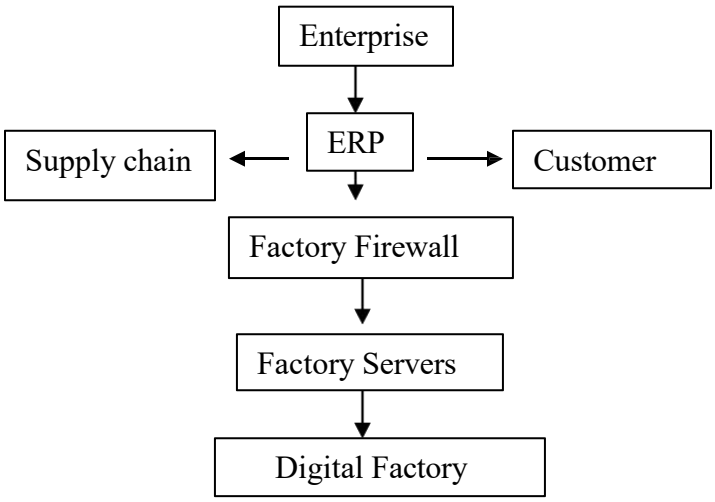


Figure 1: Manufacturing 5.0 [12]

Automation in Warehouse:

The previous automation was all about speed and how quick a job can be done, but the current automation is all about how smart the machines can operate to report a good performance. Since Industry 5.0 is about human and robots working together, the automation can be great help in the field of packaging, loading and unloading. The robots will be designed in such way, where robots are programmed on how to do and what to do and will help human perform their jobs in the most effective and less time consuming manner. The automation will also help the employee to determine if the machine is in fault or if a conveyer or bearing is about to fail. These problems can be solved when the sensor monitors the condition and collect data and software that optimize operation and not the way it is performed.

Automation in Trucking:

Automation and self driving trucks can be expected to be seen in near future and companies like Uber, Waymo are already in the process of testing autonomous trucks on roads and it will not be a surprise for customer to get their products delivered without drivers. Executive Martin Daum from Dailmer expressed that the major step towards their goal is to bring Level 4 trucks in the public and to ensure the delivery of safe and reliable trucks which could benefit customers, economies and society. [9].

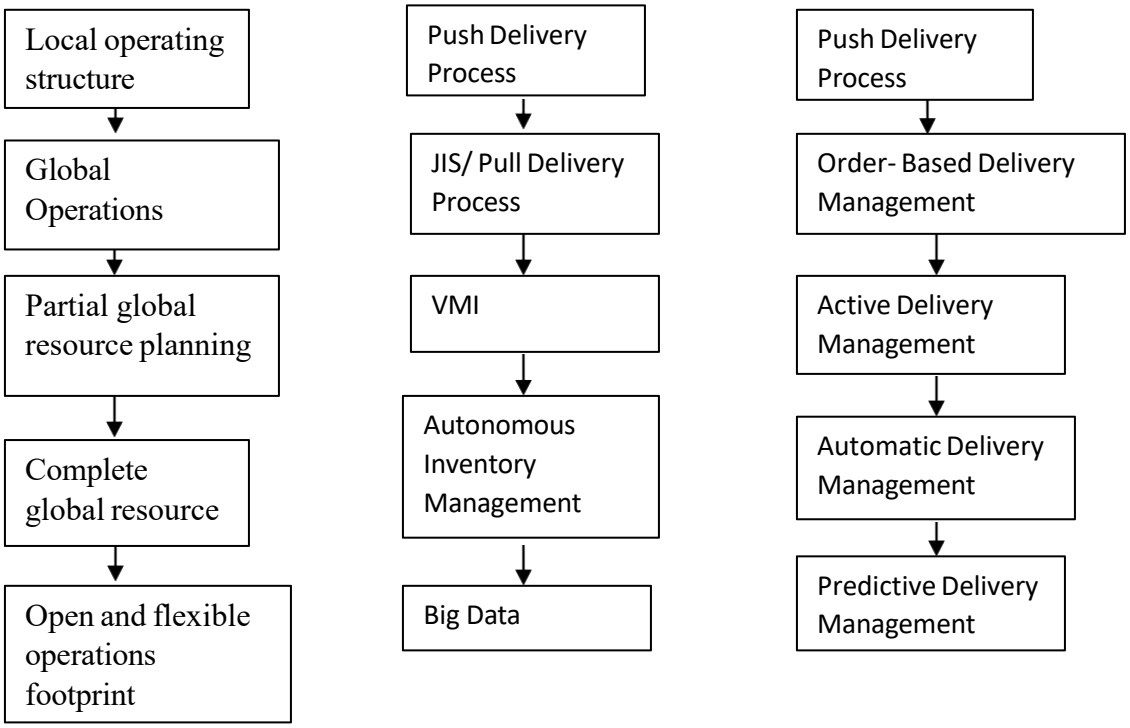
Jason Gillespie, the supply chain director of continuous development of DHL said that the technology is fully capable where in these vehicles there are no pilots or drivers to operate the steering, the accelerator or the brakes and these are kept for the sake of it [9].

Application of Industry 5.0 in Logistics:

In the past years, the idea of tracking using GPS was not in place due to cost constraints and availability of technology was limited. The technology in recent times is rapidly evolving and solutions to the futuristic problems are already on its way. The logistics industry is always dominated by the ability of large connections the industry can create and also brings a perfect combination of modes that will always stand ahead of other industries. Connections can also be increased by the customers, partners and employees who drove good performance. The connections that were made physically in person and the capability of the industry will not be impacted by Industry 5.0 and will continue to remain the backbone of their performance and the relationship with their partners, customers and employees will not fade away. This revolution will bring a vast change and will reduce the distance between the digital and human world.

After the introduction of Industry 4.0 the road map of i] supply chain logistics, ii] inbound and iii] outbound logistics were [13]:

i] Supply chain logistics ii] Inbound logistics iii] Outbound Logistics



Industry 5.0 when compared with Industry 4.0 [11]:

Industry 5.0	**Industry 4.0**
Focus on delivering customer experiences	Focus on connecting machines
Hyper customization	Mass customization
Responsive and Distributed supply chain	Intelligent supply chain
Experience Activated (Interactive) Products	Smart Products
Return of manpower to factories	Manpower made to stay away from factories

Industry 4.0 and India:

According to the analysis made by McKinsey which the most prestigious American worldwide management consulting firm, [14]" If Indian companies adopt Industry 4.0 across functions such as manufacturing, supply chain, logistics and procurement , they can enhance their operating profits by 40% at less than 10% of the planned capital expenditure"[14].

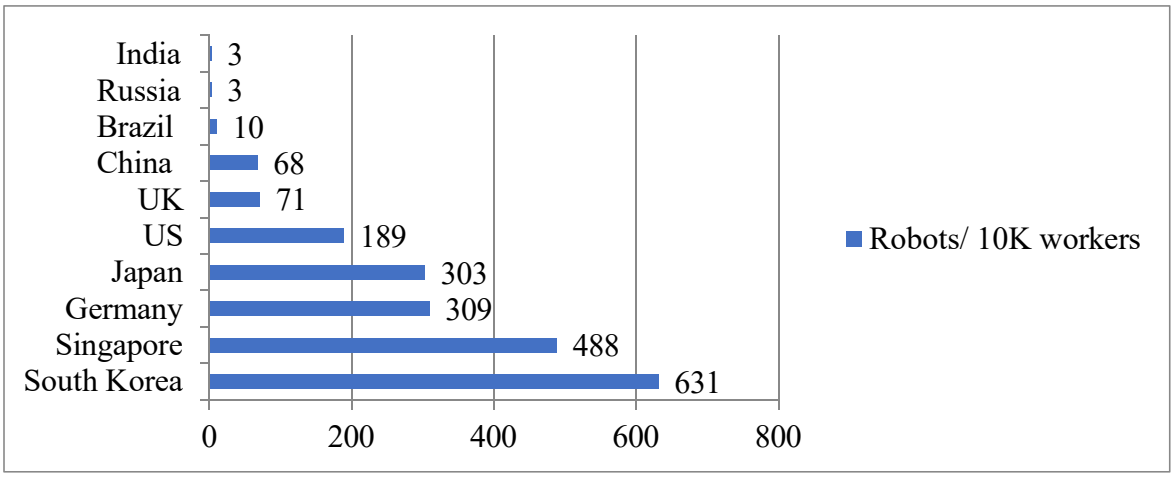


Figure 2: Usage of Industry 4.0 with respect to countries [14]

Despite, India being the six largest manufacturing companies, the robot density is one of the lowest with 3 robots per 10,000 workers [14].

Conclusion:

Advancements of machines and robots are for maximizing profits and minimizing costs with quality and standards. With Industry 4.0, difficult and burdensome tasks were done by the robots and all were connected digitally for effective communication. As far industry 5.0 is concerned robots with highly intellectual workforce will be combined to produce greatest results and with human touch. On the other side, Industry 5.0 will create jobs for people on the programming, automation, research in the fields of robotics and AI.

It will also reduce major human injuries, less time consuming, errors will be reduced to a great extent, will be environmental friendly and will bring place for major innovation with regard to automation and robots. This revolution will not only help manufacturers but also other industries including healthcare, retail and other business team all along the supply chain. All that industry 4.0 was planning to achieve in 2010's will be achieved through industry 5.0, where the interaction between human, robots and computer will be more meaningful.

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