

# Effects of Industry 4.0 on Manufacturing Facilities and Supply Chain Management

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**Abstract** - "Industry 4.0" is an industrial revolution that prioritises data-driven processes, digital transformations, and the free flow of information. The end aim is a more productive system by decreasing the time it takes to respond to client needs or unanticipated occurrences through the implementation of a smart industrial plant. The use of this concept will result in more efficient production and distribution. There may be a need for more research into a novel and potentially crucial topic: the impact of Industry 4.0 on supply chain management [SCM]. Recent literature on "business 4.0" has been the subject of a number of systematic reviews. The importance of this to SCM, however, is being overlooked. In this work, we give a systematic analysis and synthesis of the current literature on Industry 4.0 in SCM, highlighting several exciting discoveries that may be valuable in both academia and industry, especially for top-level executives. Alpha versus validating, quality versus quantity, and management level versus process/technology level are the three categories derived from the papers' contents in this study. Further, three distinct topic clusters, including existing limitations, problems, and future analytical directions, were derived supported the subject Modelling approach.

**Key Words** Industry 4.0, Supply Chain Management, Supply Chain, Smart Factory.

## 1.INTRODUCTION

Over the last decades, Data Technology systems have undergone a major revolutionary progress that has after compact each side of standard of living. One among the foremost radical changes is that the shift from computers to good devices utilizing the infrastructure services supported cloud computing. This new starting of the Internet era, marked by Associate in Nursing integrated computer-based automation and present computing systems, is furthermore Being connected to the wireless network by the net .These recent developments have enabled not solely the virtually endless prospects of interconnecting kinsfolk and machines in a very cyber-physical system context using data obtained from totally different sources however conjointly direct communications between machines. The implementation of this sort of network at intervals the assembly and operations surroundings is termed "Industry 4.0". The introduction of Industry 4.0 into producing has several impacts on the total

provide chain. Collaboration between suppliers, makers and customers is crucial to extend the transparency of all the steps from once the order is sent till the end-of-life of the merchandise. Moreover, because of the introduction of medical aid and automation of processes, the Supply chain management structure so as to know the Opportunities and presumably threats from the introduction of those new technologies, it's thus necessary to analyze the impact of Industry 4.0 on the availability chain as a full.

## 1.1 OBJECTIVES AND BENEFITS OF INDUSTRY 4.0

The purpose of "industry 4.0" is to help traditional manufacturing companies become more innovative and digitally competitive. Business digitalization opens up a new frontier in the development of information and communication technology by letting all production processes contribute data that can be used for electronic management. The most glaring is the transition from traditional goods to services, or more precisely, the improvement of the goods themselves through the incorporation of services. This is made possible by the widespread usage of wireless connections across departments within the same firm or even between competing manufacturers, which in turn generates data that is used to continuously feed new services. Companies who adopt the Industry 4.0 transformation will reap a number of competitive benefits, including the following. o It allows you to have a greater capacity for continual adaptation to the demand, as well as the opportunity to serve the customer in a more tailored manner owing to the abundance of data available, which in turn increases your chances of better apprehending their needs. It helps you save time and money by streamlining the design, manufacturing, and selling of your products in an iterative fashion. The addition of services to material goods is one of the most common advantages. A great deal of data is traded between various external and internal components, allowing for the creation of new services. Another area where Industry 4.0 offers benefits is in the decision-making process, since it uses existing information to evaluate potential outcomes. o One of the most important benefits is the rise in asset convenience, which allows businesses to capitalize on the information they get about their own assets to improve their upkeep and, in turn, extend their lifespan. In broad strokes, the widespread adoption and implementation of Industry 4.0 has helped

businesses increase their efficiency and competitiveness, strengthening their foothold in the market.

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## 1.2 Scope

The opportunity to learn about emerging topics such as the Internet of Things (IoT), Cyber physical systems (CPS), huge knowledge conceptions (MGC), and smart factories (Smart factory) is provided through this research. The primary objective is to investigate the effects of the fourth industrial revolution, often known as industry 4.0, on supply chain administration. The goal of the research is to find out what information and technology are necessary to implement Industry 4.0 in every given business.

## 2 Methodologies

Examining the many publications containing data about Industry 4.0 is a crucial part of the first step of study. The contents of each document will be revealed in the following step. Examined and sorted the study into manageable categories based on subjects, keywords, and research techniques. The effects of Industry 4.0 on the many cogs in the supply chain, including technical progress and its implementation, are examined. Industry 4.0, offer chain management, and the effect of Industry 4.0 on offer chain management were analysed using a variety of online resources, including Google Scholar, IEEE Xplore, ProQuest, and Emerald.

Companies now operate in a hostile business climate due to factors such as rising global rivalry, market fragmentation, shorter product lifecycles, fast evolving technology, and ever-increasing client demands [1][2]. Scientists are constantly on the lookout for novel approaches to solving these issues. Maintaining responsiveness and competitiveness in such unstable situations is a major accomplishment for supply chain management (SCM) [3]. By encouraging communication and cooperation amongst all parties involved in a supply chain, SCM may boost an organization's efficiency. By connecting a company's suppliers with its consumers, it has introduced a novel approach to conducting business and altered the company's overall culture. Integrating the supply chain is often cited as a key to better results [4]. With the advent of global competition in the 1990s, and the liberalisation of the Indian economy, domestic manufacturers in India were forced to adapt to global standards in supply chain management (SCM) [5]. In order to succeed in today's cutthroat business climate, Indian companies are adopting SCM strategies [6]. From a small business's point of view, the supply chain management (SCM) definition by Thakkar et al., (2008) [7] reads as follows: "Supply chain to SMEs is a set of business activities including purchase from open/spot the marketplace, manufacturing or processing of subcomponents/subassembly within the plant and shipment to large enterprises using hired transportation to enhance

value of end product and in turn ensure longterm regular purchase order." Both emerging and established nations rely heavily on small and medium-sized enterprises (SMEs) for job creation, economic growth, and regional development. In various countries, SMEs may be defined in a variety of ways. According to the Micro, Small & Medium Enterprises Development Act, notification no. S.O. 1642(E) dated September 30, 2006, small businesses in India are those with a total investment of between Rs. 25 lakh and Rs. 5 crore, while medium-sized businesses have an investment of between Rs. 5 crore and Rs. 10 crore. [10]. Small and medium-sized enterprises (SMEs) account for 40% of all jobs, 45% of all industrial output, and 40% of all exports, while contributing 17% to GDP [11]. Supplying, distributing, or producing for LEs, SMEs have been shown to be an integral element of the supply chain [12].[13]. Despite a lack of resources (financial, human, and technological) [14], SMEs are better able to begin and implement company-wide reforms due to a flatter organisational structure and fewer managerial layers [15]. Small and medium-sized enterprises (SMEs) have the capability and resilience to deal with environmental concerns and strengthen their position in the worldwide market because of their ability to make rapid adjustments [16]. Still, compared to large firms [17], failure rates of SMEs are said to be higher [18]. This is because SMEs are more likely to be dependent on a smaller number of customers [18], have a smaller market share [19], have trouble increasing product/service prices [18][20], be slow to adopt new technologies [17], lack strategic planning [21], have less available infrastructure [22], and have an inefficient supply chain [7]. Therefore, if SMEs wish to survive and thrive, they need to strategically manage all available resources [23], formulate a strategy, and organise all procedures [24]. Advantages of large companies over small and medium-sized businesses include economies of scale [25], strong brand awareness, influential customers, and abundant resources [26]. There is evidence in the literature to suggest that large companies have realised the benefits of SCM, but that small and medium-sized enterprises (SMEs) have yet to catch up [36, 37]. SCM provides remarkable changes in business processes and aids in the achievement of better product/service quality, cost reduction, and efficiency. While there is a wealth of information available on the subject, little has been written about how small and medium-sized enterprises (SMEs) differ from large enterprises (LEs) in their implementation of SCM practises, or how SMEs can benefit from the lessons learned from the experiences of their large counterparts..

## 3 Conceptual Framework and Hypothesis Development

Statements of future outcomes that a business hopes to attain are known as "business objectives." Companies start out with specific goals in mind. Depending on your end goal, you should do one of several possible actions. Prioritising the company's goals will help determine where it should go in the future. A clearer picture of where an organisation is and what needs to be done to get it where it wants to go may be gleaned from a review of its goals. Quantitative, time-bound,

measurable, attainable, and comprehensible business goals are the most effective. Maximising customer satisfaction [38, 39], improving product quality, increasing ROI, maximising annual profit, increasing revenue, maximising ROE, maximising ROA, maximising shareholder value and discounted cash flow, giving back to the community, and so on have all been identified as important goals for businesses. [41]. Firms, both big and small, need to develop unique approaches to accomplishing their goals. To go from where the company is now to where it wants to be, it needs a strategy. Establishing a solid network of allies is crucial. Long-term, trustworthy partnerships between LEs and SMEs help both parties succeed in the face of fierce competition. Strategic partnerships require shared goals between large enterprises and small and medium-sized businesses. According to Chapman et al. (2006), SMEs play an important role in the supply chain, and the decisions taken by SMEs have a significant impact on the competitiveness of the whole supply chain. Small and medium-sized enterprises (SMEs) are more likely to have their business choices motivated by the values and preferences of the purchasing firm or the owner than large corporations are [46]. Despite the fact that small and medium-sized enterprises (SMEs) lack the internal resources of major organisations [49] in the areas of finance, technology, infrastructure, etc., SMEs' business objectives must be linked with those of their larger counterparts. As a result, the following speculation is put out.

An empirical testing strategy is used in the investigation. Reviewing pertinent literature and conducting interviews with industry experts helps set up the study's construct domain. Managers and academic specialists. A five-point Likert scale ranging from "strongly disagree" (1) to "strongly agree" (5) was used to gauge respondents' perceptions of all the questionnaire's components. The survey asks respondents seven questions about overall business goals, twenty-two about supply chain goals, nine about building trust between buyers and sellers, ten about the nature of the relationship between buyers and sellers, eight about the challenges of implementing SCM practises, eighteen about company culture, fifteen about outsourcing, and ten for benchmarking. The demographic profile of the organisations (including kind, size, number of workers, yearly sales turnover, etc.) is also included in the questionnaire. The survey was distributed to 425 Indian businesses across a variety of industries including automotive, manufacturing, electronics and telecommunications, chemicals and fertilisers, and fast moving consumer goods. Companies and organisations from the nonprofit, for-profit, and governmental sectors took part in the poll. The total number of useable replies from respondents was 54. Thirty-three answers were from LEs, whereas twenty-one came from SMEs. It was determined that 14.06% of people responded.

However, when compared to previous research, the response rate appears to be satisfactory. It was determined that 52% of respondents are upper-level managers, 32% are intermediate managers, and 16% are lower-level workers. Responses from participating businesses reflect how SCM methods are now being implemented and valued, according to the survey.

#### 4. Operations Management

Manufacturing the product per the design supplied by the respective department per the customer's specifications falls within the purview of Operations Management product specifications, appropriate retail distribution channels, innovative product packaging, and effective marketing strategies.

Supply Chain Management is developed to deal with duties that are conducted outside, such as organising the raw material and delivering goods to the market, whereas Operation Management focuses on internal processes.

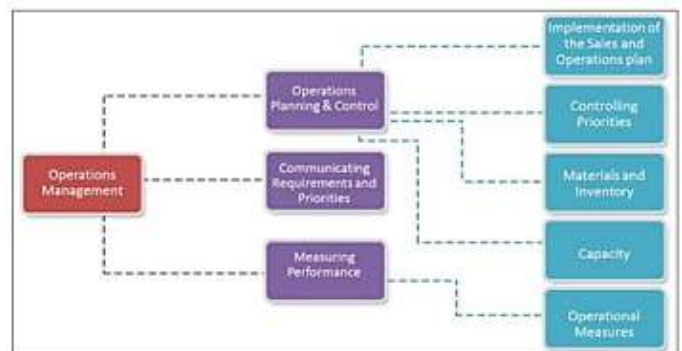


Fig -1: Operations Management

#### 5. Value chain management

The concept of value chain was introduced by Michael Porter. According to the Porter's statement value is the amount that customers are willing to pay for the respected product provided by firm. Michael Porter designed a value chain based on nine generic value added activities which works together to provide value to customers. The Supply Chain Management deals with the flow of products as well as services provided for the product and also take the charge of waste reduction which ultimately results in the efficiency improvement. The Value Chain Management keeps an eye on the customer demands and the cash flow. Customer's satisfaction by fulfilling the demands within the decided specific time is the top most priority of value chain.

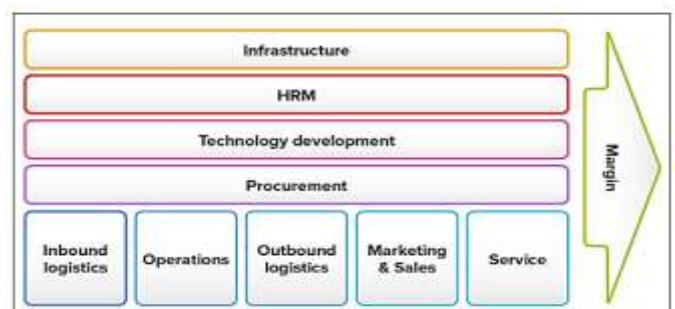


Fig -2: Generic value added activities by Michael Porter

Supply chain focuses on minimizing expenses and achieving strategic objectives, whereas value chain is more concerned



with things like advertising, product development, and customer service profitability, return on assets, return on investments, and profitability of services. Integrating Supply Chain Management with Value Chain Management is crucial for a company's success.

## 6. Logistics Management

Logistics refers to the overall process of managing how resources are obtained, stored, and sent to their final destination. Logistics management involves recognizing the prospective distributors and suppliers and calculates their accessibility and efficacy. The five types of Logistics Management are; procurement logistics, production logistics, sales logistics, recovery logistics, and recycling logistics. Logistics is a peculiar part of Supply Chain Management where the movement of product from origin to the destination is observed and controlled

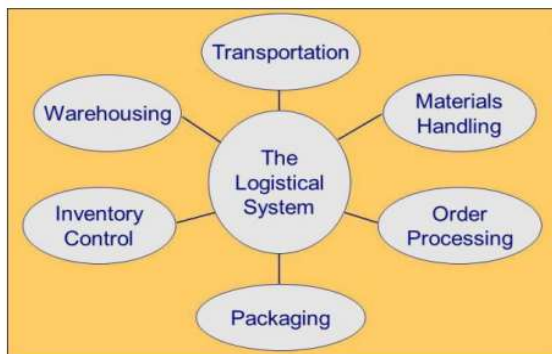


Fig -3: Logistical System

## 7. Impact of Industry 4.0 on Supply Chain Management

The fourth historic period came up with automation, robotics, Internet of Things (IoT), big data, machine learning, artificial intelligent, in addition as analytics and cloud system that changes the manner of doing business. There is conjointly an impression on offer chain trade is additionally undergoing a metamorphosis, adopting digitization, automation, and centralized business intelligence systems. The introduction of cyber-physical systems and therefore the net of Things (IoT) is ever-changing the pace of the transformation in supply chain management (SCM), there's development in offer chain is visible in each level- producing, acquisition, logistics, deposit, and fulfillment has created firms with integrated digital offer chain functions much more economical than their predecessors. While transitioning to a digitized, machine-driven and totally interconnected offer chain needs important efforts and long investments, the pay-offs area unit. Transfer offer chains online will facilitate enterprises reach ensuing level of operational effectiveness and notice important value reductions. Digital offer chain will lower operational prices by quite 30 %, cut back lost sales opportunities by quite s 60 %, and even cut back inventory needs by quite seventy percent, all whereas creating firms quicker, more agile, granular, accurate, and economical

## 8. CONCLUSIONS

The paper reviews relevant literature to investigate the impact of implementing Industry 4.0. From the higher than discussions, it will be terminated that Industry 4.0 will facilitate increase the productivity and fight of producing corporations. However, the high value of implementation, maintenance prices and, coaching prices square measure major barriers to the implementation of Industry 4.0. However, if the businesses will create the staff attentive to the advantages of digital technologies and will create them believe that the staff can use those technologies simply; It'll become easier for the organizations to implement Industry 4.0 with success

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