



### A Study on Impact of Automation on Supply Chain Management

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#### Abstract

Automation has revolutionized supply chain management by introducing significant advancements and transformations in various aspects of the process. This study aims to explore the impact of automation in supply chain management across different industries. It examines the benefits, challenges, and implications of automation adoption, including increased operational efficiency, enhanced accuracy, reduced costs, and improved customer satisfaction. The study utilizes a comprehensive research methodology, including literature review, case studies, and data analysis, to provide insights into the current state of automation in supply chain management. The findings emphasize the importance of strategic planning, technology integration, and organizational readiness to maximize the benefits of automation while addressing potential drawbacks and risks. The current study's investigation of the objectives is based on descriptive analysis with primary data. The primary data was gathered using a well-structured questionnaire. The primary

data was gathered using a well-structured questionnaire. Convenience sampling is used for sample survey. Data was taken thorough questionnaires from 207 employees. In conclusion, this research highlights the significant impact of automation technologies on supply chain management procedures, emphasizing the importance of adopting automation to optimize operations and enhance overall performance.

**Keywords:** Automation, Artificial Intelligence, Robotics, Supply Chain Management, Level of Automation, Emerging Technology, Customer Satisfaction

#### Introduction

Supply chain automation is aided by low-code automation software, which combines many apps and systems inside a business to optimize workflows. By removing gaps between several processes, this integration improves efficiency and visibility. Businesses may detect and resolve bottlenecks in real time by automating procedures, which lowers risk and saves money across the supply chain. Furthermore, automation optimizes the supply chain management process by delivering current applications and smooth workflows that improve the overall experience for stakeholders and employees. The use of digital technology to improve the efficacy and efficiency of supply chain activities is known as supply chain automation. The strategy entails the amalgamation of diverse applications and systems to establish an uninterrupted transmission of data and procedures across the supply chain



network. However, choosing the right technology for a given application and making sure that the necessary organizational architecture, culture, and management practices are in place are crucial to the effectiveness of these developments.

Information, communication, and automation technologies have greatly sped up the identification, data collection, processing, analysis, and transmission procedures in the logistics sector without sacrificing the necessary standards of accuracy and dependability. Technology is a key tool for boosting corporate competitiveness and performance since it makes the logistics system more effective overall, which is essential for supply chains to succeed. India has been a little slow to adopt these new technology in logistics, even though many wealthy nations have done so.

Usually, cutting-edge technologies like artificial intelligence, machine learning, robotic process automation, and digital process automation are integrated. Automation of digital processes with artificial intelligence. The truth is that supply chains in the modern day are not adapted for digitalization. Spreadsheets, PDFs, and emails are frequently exchanged throughout crucial business activities, and ERP systems are insufficiently nimble or flexible to accommodate the way the company operates. This implies that workers perform a great deal of labour that could be delegated to others or made simpler. Better yet, executives may manage this activity with the visibility they need to identify risks and inefficiencies by using bespoke low-code apps.

The use of technology to manage supply chain processes without direct human participation is known as supply chain automation. Automation can take many different shapes and uses a wide range of technology. For instance, manufacturing facilities can automate physical labour on the shop floor by utilizing both IoT devices and physical machines. For instance, companies may make more goods faster and with constant quality by automating manufacturing production operations. The "Amazon effect," which has driven customers to anticipate quick delivery, frequently puts more pressure on retailers handling the front end of the supply chain when it comes to last-mile deliveries. In order to compete with these other merchants, automation helps expedite the delivery process.

Automation can also help improve supply chain agility. When a company sets up automated alerts to monitor demand signals from customers, it gains a chance to help teams adapt faster. For example, the procurement team can start ordering products and materials sooner to prevent shortages. Companies can also develop more resilient supply chains by automating notifications when suppliers may run behind schedule or lack manufacturing capacity. In these situations, the purchasing company can find alternate, temporary suppliers or choose to purchase premium freight. Automation lowers costs without forcing you to sacrifice quality. It can reduce returns, inventory losses, and scrap. It can also help you get more out of your existing workforce by offloading many of the more basic, routine work to bots, freeing up human resources to focus on more strategic tasks. Automation helps



with last-mile delivery, which raises customer satisfaction. Your systems can utilize business logic to reroute delivery vehicles and determine who is closest to the delivery location if someone is running late for a delivery. Automation can help you better schedule drivers, keep track of which trucks are available for long-term deliveries, and send them directions to warehouses and pickup locations when it comes to long-haul transportation.

### Review Of Literature

**(Malik, 2022)**Conducted a study on role of data management and automation in the impact of industry. Theories on the factors that affect the adoption and use of new technologies in the industry are examined. The TOE framework describes the interplay between the technological, organizational, and societal factors influencing a company's decision to embrace and use new technologies. Targeted employees are textile industry of Pakistan and Sample source are SECP-listed textile companies and Sample size are 351 and Method of survey is Email, Online, telephonic Statistical tools use to analysis MS Excel, Spss 21, Amos 24 Statistical technique CFA, SEM, Cronbach's alpha. First SEM study on Industry 4.0 in Pakistan examines DM and AL's influence on SC performance. Results show effective DM significantly aids Industry 4.0 adoption ( $b=0.485$ ,  $p<0.001$ ), while automation positively impacts it ( $b=0.755$ ). However, Industry 4.0's implementation negatively affects SC performance ( $b=-0.236$ , significant), confirming the hypothesis.

**(Attaran, 2020)**Conducted an analysis on digital technology enablers and their implications. Continuing growth of the rural areas and pressure to serve regions that have not been served before, growing demand for logistics workers due to the e-commerce revolution and its need for more parcel shipments. Companies globally seek supply chain enhancements for cost reduction, margin improvement, and customer responsiveness, relying on technology. Emerging digital solutions like real-time inventory management and advanced analytics offer benefits including transparency, flexibility, and cost reduction. However, digitization faces barriers, necessitating disciplined planning and committed leadership for successful implementation.

**(Mathews & Eipe, 2020)**Conducted a study on process automation and latest technological implications for supply chain management. And the objectives are to give a brief perspective of what Industry 4.0 is and to make a framework of Logistics 4.0. Effective material and production network management is crucial for small-scale ventures, impacting efficiency and cost reduction. Implementing an efficient supply management system is vital for avoiding delays, losses, and cost overruns. Standardization and integration of decision tools enhance material procurement, ensuring timely availability and quality. Further research is needed for a comprehensive, integrated framework.

**( SARAC, ABSI , & PERES, 2009)**Conducted a study on literature



review on the impact of RFID technologies on supply chain management. The first analytical modelling approach on inventory inaccuracy due to transaction errors was presented by Iglehart and Morey. They study a single-item, periodic review inventory system with a reorder point up-to-level replenishment policy (s, S). Survey highlights RFID benefits in supply chains: cost reduction, inventory accuracy, and bullwhip effect mitigation. Analysed models, simulations, case studies demonstrate efficiency gains. Limited real-world adoption due to high costs. Research suggests expanding models to multiple products, actors. Emphasizes criticality of choosing suitable RFID technology for maximal benefit.

**(Flechsig, 2021)** Undertook research on the impact of intelligent process automation on purchasing and supply management – initial insights from a multiple case study. The qualitative multiple case study addresses a research gap on IPA, offering valuable insights into its impact on PSM. This approach, aligned with Eisenhardt and Graebner (2007) and Yin (2018), facilitates in-depth analysis within real-world contexts, building on existing case study research methodologies (Hartley and Sawaya 2019; Viale and Zouari 2020; Viehha user 2020). The research process, as outlined by Stuart et al. (2002), included defining research questions, designing the study, case selection, and data collection and analysis. The findings provide comprehensive insights and reveal suitable operational and strategic application areas as well as several

benefits related to IT systems and data, operational efficiency, process quality, and employee satisfaction.

**(Andiyappilla, 2021)** Conducted a study on an analysis of the impact of automation on supply chain performance in logistics companies. In a construction supply chain, there is a need to develop a new supply chain management methodology that allows all participating project teams to communicate and interact with each other dynamically. This paper presented coherent results showing that the framework of agent-based SCM will help to enhance system performance and efficiency with reducing related costs. Since the AEC industry still performs supply chain management without systematic understanding of material related properties and processes, it is also necessary to investigate them further to develop full-fledged agent-based SCM system. The study results promote stronger attention on the strategic viewpoint of the supply chain mechanism as a competitive tool.

**(Laxmi & Mishra, 2018)** Conducted study on automation in supply chain management system using internet of things (IOT). This study brings the need of supply chain management (SCM) in transportation. IoT is a network of physical objects to exchange data with the manufacturer or the user used for integration, sensing and communication. Prototype SCM automation system integrates Arduino for position tracking and Raspberry Pi for RFID shipment tracking, using a software framework.



Designed for proof of concept, it suggests scalability to industry-standard embedded systems and cloud analytics. Future work entails developing a customized data analytics engine for SCM.

**(Latasha, Sekar, & Erick, 2013)** Carried out investigation into evaluating the impacts of automation on disrupting the counterfeit drug supply chain. In this paper the main objective is to show theoretically that RFID usage to track and trace pharmaceuticals directly from the raw materials point of origin, throughout the supply chain to the end user is very effective and efficient in the war on counterfeit drugs. Counterfeit drugs affect over a billion people yearly. Integrating intelligence into medicine supply chains via RFID ensures authenticity, safety, and accountability, albeit with initial investment. Despite technological imperfections, RFID offers crucial transparency and traceability for global supply chains, vital in combating counterfeit drugs and safeguarding healthcare integrity and human well-being.

**(Dr. R. K. Tailor, Ms. Sofia Khan, Dr. Hayri Uygun , & Dr. Rashmi Gujrati, 2022)** Conducted study on application of robotic process automation (RPA) for supply chain management, smart transportation and logistics. This paper is explaining the application of Robotic Process Automation (RPA) for Supply Chain Management, Transportation, and Logistics of smart cities. RPA minimizes manual errors, enhancing customer satisfaction by providing accurate and

timely information. Improved communication and personalized service lead to customer retention. In transportation and logistics, RPA streamlines processes, boosts accuracy, and meets rising customer expectations, facilitating business growth.

**(Chaudhari, 2019)** Conducted a study on impact of automation technology on logistics and supply chain management. The main objective of the paper is to determine the automation technology used in logistics and supply chain management including new technology like automation with automatic identification of materials and items. The study is based on critical evaluation and analysis of basically Primary Data. Questionnaire is used mainly to analyse the Opinion of the industrial personnel. Researchers' selected small scale and large scale Industries from Jalgaon district in Maharashtra state of India as pilot study for this research paper. The paper also discusses the impact of the automation technology and challenge to implementing automation technology on logistics and supply chain management.

**(Ghadge, 2020)** Undertook research on the impact of industry 4.0 implementation on supply chains. The study discussed several implementation challenges and proposed a framework for an effective adaption and transition of Industry 4.0 concept into supply chains. The exploratory study followed a two-stage research approach. Firstly, a comprehensive literature review was



conducted to identify driving forces and barriers of Industry 4.0 in the supply chain context. Secondary data sources were utilized to examine Industry 4.0 implementation in supply chains. The study is expected to benefit supply chain managers in understanding the challenges for implementing Industry 4.0 in their network. Industry 4.0 is predicted to bring new challenges and opportunities for future supply chains. The study discussed several implementation challenges and proposed a framework for an effective adaptation and transition of Industry 4.0 concept into supply chains.

### Objectives

#### Primary objective:

A Study on Impact of Automation in Supply Chain Management

#### Secondary objective:

- To understand the customer experience and satisfaction levels influenced by automation advancements in supply chain management.
- To study about the adoption rate of automation technologies in supply chain management.
- To investigate the effects of automation on efficiency and productivity within supply chain operations.
- To examine the integration challenges of automation technologies within existing supply chain frameworks.
- To evaluate the potential risks and benefits associated with

automation deployment in supply chain management.

### Scope Of Study:

- To analyse the automation technologies used in supply chain operations.
- To analyse the potential benefits and challenges of automating tasks.
- To study how automation affects supply chain operations' cost-effectiveness, accuracy, and efficiency.
- To study on how supply chain job positions and labour dynamics are affected by automation.
- To investigate how automation might improve the robustness, visibility, and transparency of the supply chain.
- To study the sustainability and environmental effects of supply chain automation
- To identify the best methods and approaches for managing and implementing automation projects in supply chains.

### Limitations Of The Study:

- Lack of Long-Term Data: The absence of long-term data may make it more difficult to conduct a complete analysis of the long-term implications of automation on supply chains.
- Technological Advancements: Some conclusions may become fast out of date due to the rapid



improvements in automation technology.

- External variables: Supply chains may have unpredictable effects from automation due to unanticipated external variables like changes in regulations or the economy.
- Timescale: The study's timescale can underestimate or miss new trends by failing to account for long-term consequences or upcoming advancements in automation technology.
- Comparative analysis: Understanding the relative efficacy of automation in supply chain management may be limited in the absence of comparative study with other scenarios or tactics.

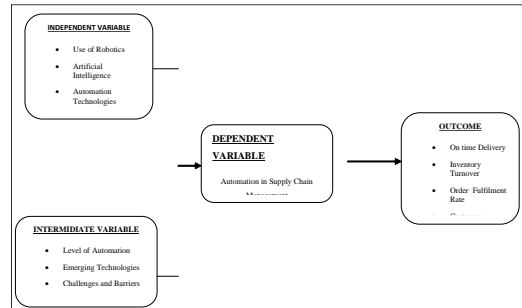
### Research Methodology

Research methodology is the process used to gather data and information in order to make judgments. It might involve surveys, gatherings, studies, and other methods that make use of long-term data collection. The current study's investigation of the objectives is based on descriptive analysis with primary data. The primary data was gathered using a well-structured questionnaire.

### Research Design:

Specifying parameters for data collection and analysis in a way that attempts to give the research goal significance and a scientific approach is known as a research design. Stated differently, the research process is referred to by the research design.

Descriptive research design was chosen for this investigation. To determine the properties of the variable that serves as the study's subject, a descriptive research design is used.



### Null Hypothesis:

- There is no significant difference between the factors of Automation towards Supply Chain Management.

### Alternate Hypothesis:

- There is a significant difference between the factors of Automation towards Supply Chain Management.

### Sampling Method:

- Convenience sampling is used for sample survey.

### Sample Size :

- The sample size of this study is confined to 207 members.

### Tools For Data Collection:

- **Primary data:** The primary data is collected by a questionnaire and circulated among the 207 members to collect information.
- **Secondary data:** The secondary data has been collected from: Reviews of books, journals,



online database on other web resources.

### Statistical Tools:

- An organized survey has been set up to get the significant data from the respondents. Data have been analyzed using the statistical tool – ONE WAY ANOVA AND REGRESSION.

### Data Analysis And Interpretation

#### Regression:

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.580 <sup>a</sup>	.336	.326	2.78989

a. Predictors: (Constant), AUTOMATIONTECHNOLOGIES, USEOFROBOTIES, ARTIFICIALINTELLIGENCE

Model	Variables Entered	Variables Removed	Method
1	AUTOMATIONTECHNOLOGIES, USEOFROBOTIES, ARTIFICIALINTELLIGENCE <sup>b</sup>		Enter

a. Dependent Variable: AUTOMATIONINSUPPLYCHAINMANAGEMENT

b. All requested variables entered.

Model	Sum of Squares	df	Mean Square	F	Sig.
1	Regression 800.341	3	266.780	34.275	.000 <sup>b</sup>
	Residual 1580.046	203	7.783		
	Total 2380.386	206			

a. Dependent Variable: AUTOMATIONINSUPPLYCHAINMANAGEMENT

b. Predictors: (Constant), AUTOMATIONTECHNOLOGIES, USEOFROBOTIES, ARTIFICIALINTELLIGENCE

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
1	(Constant) 5.782	.911		6.349	.000
	USEOFROBOTIES .551	.126	.255	4.374	.000
	ARTIFICIALINTELLIGENCE .547	.133	.253	4.123	.000
	AUTOMATIONTECHNOLOGIES .688	.128	.328	5.384	.000

a. Dependent Variable: AUTOMATIONINSUPPLYCHAINMANAGEMENT

#### Interpretation:

As p value of automation technologies are less than 0.05, we reject null hypothesis. Therefore, there is an influence of automation technologies on supply chain management.

As F value is 34.275, which is greater than 1.96, it shows that the influence of automation technologies on supply chain management is stronger

Value of R square is 0.336 means that 33.6 % of variance on supply chain management is explained by the estimated SRP which uses automation technologies.

Anova:

		Sum of Squares	df	Mean Square	F	Sig.
USEOFROBOTIES	Between Groups	33.156	2	6.578	7.097	.071
	Within Groups	476.505	204	2.336		
	Total	509.662	206			
ARTIFICIALINTELLIGENCE	Between Groups	10.256	2	5.128	2.098	.125
	Within Groups	498.700	204	2.445		
	Total	508.957	206			
AUTOMATIONTECHNOLOGIES	Between Groups	11.321	2	5.661	2.183	.115
	Within Groups	528.891	204	2.593		
	Total	540.213	206			
LEVELOFAUTOMATION	Between Groups	3.882	2	1.941	.862	.424
	Within Groups	459.374	204	2.252		
	Total	463.256	206			
EMERGINGTECHNOLOGIES	Between Groups	6.698	2	3.349	1.403	.248
	Within Groups	486.819	204	2.386		
	Total	493.517	206			
CHALLENGESANDBARRERS	Between Groups	6.575	2	3.288	1.596	.205
	Within Groups	420.295	204	2.060		
	Total	426.870	206			
ONTIMEDELIVERY	Between Groups	1.307	2	.654	.243	.784
	Within Groups	547.649	204	2.685		
	Total	548.957	206			
INVENTORYTURNOVER	Between Groups	3.340	2	1.670	.746	.476
	Within Groups	456.641	204	2.238		
	Total	459.981	206			
CUSTOMERSATISFACTION	Between Groups	4.778	2	2.389	2.040	.133
	Within Groups	238.874	204	1.171		
	Total	243.652	206			
ORDERFULFILMENTRATE	Between Groups	.574	2	.287	.251	.778
	Within Groups	233.146	204	1.143		
	Total	233.720	206			
COSTSAVING	Between Groups	4.147	2	2.073	.714	.491
	Within Groups	592.501	204	2.904		
	Total	596.647	206			
AUTOMATIONINSUPPLYCHAINMANAGEMENT	Between Groups	20.003	2	10.002	.864	.423
	Within Groups	2360.383	204	11.571		
	Total	2380.386	206			

#### Interpretation:

As the P value of all the factors of Automation in supply chain are greater than 0.05, we accept null hypothesis.

There is no significant difference between Experiences with respect to factor of Automation in supply chain.

#### Findings

- Majority (64.8%) of the respondents are male.





- Majority (59.9%) of the respondents belongs to the age group of 31 – 40.
- Majority (50.7%) of the respondents are PG Graduates.
- Majority (60%) of the respondents are experienced below 5 years.
- **ANOVA** - Since all the p values are greater than 0.05, we accept null hypothesis. (i.e.) There is no significant difference between Experiences with respect to factor of Automation in supply chain.

**Regression** - As p value of automation technologies are less than 0.05, we reject null hypothesis. Therefore, there is a influence of automation technologies on supply chain management. As F value is 34.275, which is greater than 1.96, it shows that the influence of automation technologies on supply chain management is stronger. Value of R square is 0.336 means that 33.6 % of variance on supply chain management is explained by the estimated SRP which uses automation technologies

### Suggestion

- The survey gathered responses from a total of 207 participants. The majority number of responders (64.8%) were men, suggesting a gender imbalance in the sample. Additionally, the age group of 31 to 40 category responses (59.9%) are higher, indicating a higher level of engagement from this age group in the poll.
- When considering the educational background of the respondents, it was found that the majority (50.7%) were PG Graduates. This suggests

that the sample was made up of people with different category of education, which might have allowed them to contribute their viewpoints and insights to the research to gain they knowledge of automation in supply chain management opinion.

- In terms of work experience, a significant majority (60%) of the respondents had less than 5 years of experience. This shows that the less than 5 years category employees viewpoints are more influencing and experiences of supply chain management professionals who are still in the early stages of their careers.
- The analysis of variance (ANOVA) was conducted to examine the relationship between experiences and the factor of automation in the supply chain. The result shows that all the p-values were greater than 0.05, we accepting of the null hypothesis. Therefore, the study suggests that there is no significant difference between experiences concerning the factor of automation in the supply chain.

To further investigate the influence of automation technologies on supply chain management, a regression analysis was performed. The p-values of automation technologies were found to be less than 0.05, indicating the rejection of the null hypothesis. This suggests that automation technologies indeed have an influence on supply chain management. Additionally, the F-value of 34.275, which is greater than 1.96, indicates a strong influence of automation technologies on supply chain



management. The value of R-square, at 0.336, suggests that 33.6% of the variance in supply chain management can be explained by the estimated SRP (Supply Chain Response Performance) model, which incorporates automation technologies

### Conclusion

To sum up, this research offers valuable perspectives on how automation technologies affect supply chain management. The results show that supply chain management procedures are significantly impacted by automation technology. Regression analysis results indicate that automation technologies account for a significant amount of supply chain management volatility. These results demonstrate how crucial it is to adopt automation technology in order to maximize supply chain operations and raise overall performance.

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