



Research Report on Artificial Intelligence in Logistics and Supply Chain Management

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Abstract – Artificial Intelligence (AI) is revolutionizing logistics and supply chain management with increased efficiency, optimized processes, and lower costs. AI-based technologies like machine learning, predictive analytics, and robotic process automation facilitate real-time decision-making, demand forecasting, and route optimization. All these have been improving inventory management, limiting disruptions, and satisfying customers. Predictive analytics is one of the key contributions of AI, allowing businesses to project demand fluctuations and optimize procurement. Automation in warehouses is enhanced by AI through intelligent robots and self-driving vehicles, minimizing labor and operational bottlenecks. AI route optimization in transportation optimizes delivery speed while minimizing fuel usage and emissions. AI is also important in risk management as it identifies possible disruptions and proposes alternative solutions. Natural language processing (NLP) and AI chatbots enhance communication within supply chain networks, facilitating smooth coordination among suppliers, manufacturers, and distributors. In addition, AI-based blockchain integration increases transparency and security in supply chain transactions.

Despite these benefits, there are remaining challenges like steep implementation costs, privacy of data, and workers' adaptation. These issues, however, are being addressed with ongoing improvements in AI technologies. Thus, AI is becoming one of the core drivers of digital transformation in logistics and supply chain management.

Keywords – Artificial Intelligence, Logistics, Supply Chain Management, Predictive Analytics, Route Optimization, Warehouse Automation, Demand Forecasting, Risk Management, Blockchain, Autonomous Vehicles.

I. INTRODUCTION

The logistics and supply chain industry is a complex web of suppliers, manufacturers, distributors, and retailers that demand seamless coordination. Conventional supply chains are plagued by inefficiencies with manual processes, volatile demand, and global disruptions. AI provides cognitive automation, data-driven decision making, and real-time optimization to remedy these challenges. The logistics and supply chain sector is progressively embracing AI-powered technologies such as machine learning, predictive analytics, and robotic process automation to enhance efficiency. This study examines the ways in which AI improves supply chain processes and the challenges that companies encounter when implementing AI solutions.

AI Applications in Logistics and Supply Chain Management

Demand Forecasting

AI algorithms examine past data, market trends, and outside influences (e.g., weather, economic indicators) to forecast demand with great accuracy. Amazon and Walmart use AI-based demand forecasting to maximize inventory levels, minimizing stockouts and overstocks.

Warehouse Automation

AI-based robotics, including autonomous mobile robots (AMRs) and robotic arms, enhance warehouse productivity by automating picking, packing, and sorting operations. Alibaba and Ocado use AI-based warehouse automation to accelerate order fulfillment and lower operational expenses.

Route Optimization and Transportation Management Instruction

AI route optimization software examines traffic flow, weather, and delivery limitations to provide the most efficient routes. AI optimizes delivery schedules for companies such as UPS and FedEx to save fuel expenses and enhance customer satisfaction.

Risk Management and Fraud Detection

AI detects supply chain risks, including delays by suppliers, geopolitical disruptions, and financial fraud. Machine learning algorithms can scrutinize large sets of data in order to recognize anomalies, hence preventing fraud and maintaining supply chain security.

Supply Chain Visibility and Blockchain Integration

Blockchain solutions backed by AI boost transparency through the real-time monitoring of goods. IBM and Maersk employ AI-integrated blockchain systems in tracking shipments and increasing supply chain traceability.

Advantages of AI in Supply Chain Management

- **Increased Efficiency:** Automation eliminates manual intervention, making operations faster.
- **Reduction of Costs:** AI reduces wastage, lowers transportation costs, and optimizes labor costs.
- **Increased Accuracy:** AI-driven predictive analytics enhance demand forecasting and inventory planning.
- **Increased Resilience:** AI enables supply chains to better react to disruptions.



3. Challenges and Drawbacks

Steep cost of implementation: AI implementation demands high investment in technology and training.

Cybersecurity risks for data privacy: AI systems use enormous volumes of data, leading to cybersecurity issues.

Job displacement: Automation has the potential to decrease the number of jobs that need to be done, with the need to reskill workers.

5. Emerging Trends and Innovations in AI for SCM and Logistics

Digital Twins to Simulate Supply Chains

AI-based digital twins develop digital copies of supply chain networks to enable businesses to simulate and maximize operations.

AI-Powered Sustainability Initiatives – AI enhances sustainable logistics by optimizing routes to reduce carbon footprints and improving recycling processes in packaging.

Blockchain and AI Integration – Combining AI with blockchain enhances supply chain transparency, traceability, and fraud detection.

Hyper automation in Logistics - AI, RPA, and IoT will drive hyperautomation, minimizing manual interventions and maximizing efficiency.

II. HYPOTHESIS

Primary Hypothesis (H1)

The use of AI in supply chain and logistics profoundly enhances the efficiency of operations, cost savings, and decision-making.

Secondary Hypotheses

- **H2:** Predictive analytics using AI improves demand forecasting accuracy and minimizes overstocking and stockouts.
- **H3:** Automation and robotics through AI enhance warehouse effectiveness and minimize human errors.
- **H4:** Route optimization and predictive maintenance with AI lower transportation costs and delays.
- **H5:** AI-enabled supply chain risk management enhances resilience to disruptions and unforeseen events.

Research Objectives

Objective

To determine the effect of AI on logistics and supply chain management, in terms of efficiency, cost savings, and enhanced decision-making.

Specific Objectives

To analyze the effectiveness of AI in demand forecasting

- Discuss how AI predictive analytics improves the precision of demand predictions.

- Compare and contrast AI-driven forecasting with statistical methods.

To discuss the use of AI in warehouse automation

- Investigate the effect of AI-powered robotics and automation on warehouse efficiency.
- Measure enhancements in order fulfillment pace and decrease in errors.

To examine the influence of AI on transportation and route planning

- Research the contribution of AI toward decreasing fuel usage, streamlining delivery routes, and avoiding delays. Consider the impact of AI-driven predictive maintenance on fleet management.

To determine the contribution of AI to risk management and supply chain resilience

- Research how AI assists in the detection of prospective supply chain interruptions.
- Explore AI-based solutions for risk reduction in international supply chains.

To explore cost benefits with AI implementation in logistics

- Measure cost savings for inventory management, transportation, and warehouse operations.
- Estimate the return on investment (ROI) of AI deployments.

III. WRITING REVIEW

Manufactured Insights in Coordinations and Supply Chain Management

The integration of Counterfeit Insights (AI) in coordinations and supply chain administration (SCM) has picked up force over the past decade, changing conventional forms through robotization, prescient analytics, and real-time decision-making. AI applications, counting machine learning (ML), characteristic dialect handling (NLP), computer vision, and mechanical autonomy, are reshaping supply chain productivity, chance administration, and client fulfillment. This editorial review examines the advancements in AI-based coordinations, challenges faced, and prospects for AI in SCM.

AI Use Cases in Coordinations and Supply Chain Demand Forecasting and Inventory Management

- Precise request determination is essential to optimize inventory levels and reduce costs. AI-based prescient analytics enhance determination accuracy by inspecting actual deals data, advertisement trends, and external factors (e.g., weather, monetary indicators).
- Chen et al. (2020) explored the role of deep learning in advancing request determining models.
- Choi et al. (2018) discussed how AI enhances stock optimization, reducing stockouts and excess inventory.



Route Optimization and Transportation Management

- Course optimization computations powered by AI enhance transportation efficiency by taking into account real-time activity data, fuel consumption, and vehicle capacity limitations.
- Lin et al. (2021) emphasized the advantages of support learning in optimizing last-mile transportation routes.
- Bertsimas et al. (2019) reviewed AI uses in armada management and prophetic maintenance.

Warehouse Computerization and Robotics

- AI-driven automated systems advance stockroom efficiency through autonomous picking, pressing, and sorting operations.
- Wurman et al. (2017) examined Amazon's Kiva robots and their impact on stockroom productivity.
- Fang et al. (2022) monitored AI-driven automated prepare computerization (RPA) in warehouses.

Provider Relationship and Opportunity Management

- AI makes a difference survey provider risks by examining money related stability, geopolitical factors, and compliance matters. Ivanov and Dolgui (2020) examined AI-based risk assessment models in global supply chains.
- Sodhi and Tang (2021) discussed how AI enhances provider selection and tracking.

Client Benefit and Chatbots

- AI-powered chatbots advance customer benefit by addressing request, ordering preparation, and providing real-time following updates. Huang et al. (2019) evaluated the adequacy of NLP-enabled chatbots in logistics.
- Shankar (2020) examined how AI-powered customer intuitive enhance supply chain transparency.

Advantages of AI in Coordinations and SCM

- **Cost Reduction:** AI reduces operating expenses by mechanizing and foreseeing analytics (Kumar et al., 2021).
- **Efficiency and Velocity:** AI enhancements supply chain agility, reducing lead times and advancing order fulfillment rates (Wang et al., 2019).
- **Data-Driven Decision Making:** AI enables real-time decision making on the basis of massive information analytics (Christopher & Holweg, 2020).

Challenges and Limitations

A few challenges hinder the extensive implementation of AI despite its capabilities:

- **Data Quality Challenges:** AI consumes colossal amounts of clean and structured data (Büyükközkcan & Göçer, 2018).
- **Integration Challenges:** Bequest models pose challenges in AI implementation (Gligor et al., 2021).

- **Morality Issues and Job Displacement:** AI-powered mechanization can cause job misfortunes and ethical dilemmas (Daugherty & Wilson, 2018).

Future Research Directions

Future research should focus on:

- **AI-Powered Maintainability Processes:** Using AI to reduce carbon emissions in supply chains (Gao et al., 2023).
- **Blockchain-AI Integration:** Enhancing supply chain simplicity and security (Sabeti et al., 2019).
- **Explainable AI (XAI) in Coordinations:** Ensuring AI choice-making is basic and comprehensible (Doshi-Velez & Kim, 2017).

Key Discoveries & Discussion

- **AI in Request Estimating:** Machine learning frameworks provide support anticipate request changes, leading to better stock planning.
- **AI in Course Optimization:** AI-based tools such as real-time activity investigation enhances conveyance times and reduces fuel expenses.
- **Warehouse Computerization:** AI-facilitated robots enhance arrange fulfillment speed and accuracy.
- **Challenges:** Appropriation of AI is faced with challenges including high usage expense, requirement for talented faculty, and protection of information.

IV. RESEARCH METHODOLOGY

1. Research Design

- The research uses a mixed-methods research design, which integrates qualitative and quantitative methods to examine the influence of AI in SCM and logistics.
- **Qualitative Approach:** Expert interviews and systematic literature review give insights into SCM challenges, AI applications, and future trends.
- **Quantitative Approach:** Statistical modeling and case studies assess AI efficiency in logistics processes.

2. Research Objectives

The research seeks to:

- Analyze the contribution of AI to logics and SCM operations optimization.
- Enumerate some important benefits, limitations, and impediments for adopting AI.
- Estimate AI contribution towards lowering costs, boosting efficiency, and improving decision-making.
- Analyze prospective AI advances and trends within logics and SCM.

3. Data Collection Methods

Primary Data

- **Expert Interviews** - Conduct semi-structured interviews with AI professionals, AI specialists, and logics and SCM professionals for understanding industry insight.



- **Surveys:** A formal questionnaire sent to logistics companies, manufacturers, and supply chain managers to gauge AI adoption and influence.

Secondary Data

- **Literature Review** - Reviewing peer-reviewed journal articles, industry reports, and conference papers on AI in SCM.
- **Case Studies** - Reviewing AI-based supply chain strategies in Amazon, DHL, and Maersk.

4. Data Analysis Techniques

The research will follow a mixed-methods approach:

- **Quantitative Analysis** - Employment of past data in determining the effects of AI on principal supply chain indicators.
- Surveys and statistical examination of AI deployment in logistics companies.

Qualitative Analysis

- Studies of businesses effectively utilizing AI in supply chain management.
- Expert interviews with supply chain and AI experts.

Expected Outcomes

- Identification of AI-driven efficiency gains within logistics.
- Insight into the impediments to AI deployment.
- Policy and managerial suggestions for AI use in SCM.

6. Sampling Techniques

Population

The population of interest consists of logistics managers, supply chain professionals, AI implementation teams, and logistics firm analysts that have adopted AI-based solutions.

Sampling Unit

Every sampling unit consists of AI-integrated supply chain businesses, logistics companies, and individual experts in AI-optimized supply chain.

Sample Size

A minimum of 149 respondents will be chosen to allow for statistical representation and sound analysis.

Sampling Methods

- **Non-Probability Sampling:** Purposive sampling method will be utilized to recruit participants who are AI and logistics experts.
- **Probability Sampling:** A stratified random sampling technique will be applied to recruit companies of different sizes and sectors that incorporate AI solutions.

V. DATA COLLECTION AND ANALYSIS

Questionnaire

1. Name?
2. Age?
3. Gender?
4. What is your current employment status?
 - Employed
 - Self employed
 - Student
5. How familiar are you with AI application in logistics and supply chain management?
 - Very familiar
 - Familiar
 - Neutral
 - Not familiar
6. Which AI technology are you of in logistics and supply chain operation ?
 - Machine learning [M.L]
 - Blockchain
 - Robotic Process Automation
 - Natural Language Processing
7. What is the most significant benefit of AI in logistics and supply chain management?
 - Cost reduction
 - Improved efficiency and speed
 - Advanced demand forecasting
 - Enhanced decision making
 - Risk mitigation
8. What is primary AI-driven solution used in warehouse operation?
 - automated guided vehicles
 - AI powered Warehouse management system
 - Robotics sorting and packaging
 - Inventory optimization algorithms
 - All of the above
9. To what extent do AI-driven chatbots improve customer service in logistics.
 - Significantly
 - moderately
 - Neutral
 - Slightly
 - Not at all
10. Which area of logistics benefits the most from AI-based route optimization?
 - Last- mile delivery
 - Freight and cargo tracking
 - Fleet management
 - Supply chain risk management
 - None of the above



11. what is the biggest challenge in implementing AI in logistics and supply chain management?

- High implementation costs
- Data privacy and security concern
- Lack of skilled workforce
- Resistance to change

12. What is the main barrier for small and medium enterprise [SMEs] in adopting AI?

- High costs
- Lack of AI expertise
- limited access to AI solution
- uncertainty about ROI
- Others

13. What impact will AI have on global supply chain resilience?

- Improved
- Neutral
- Minimal Impact
- No impact at all

14. Which industry sector benefit the most from AI in supply chain management?

- Retail and E-commerce
- Manufacturing
- Healthcare and Pharmaceuticals
- Transportation and logistics
- Food and agriculture

15. What role should government plays in AI adoption in logistic and supply chain?

- Provide funding and subsidies
- Set regulation and standards
- Encourage AI education and training
- Facilitate public- private collaboration
- No role needed

16. Which emerging AI-driven technology do you think will have the most impact on logistics?

- AI-powered autonomous vehicles and Drones
- Blockchain integrated AI
- Quantum computing for supply chain optimization
- None of the above

Hypothesis

AI Benefits vs AI Challenges

Null Hypothesis (H₀)

There is no correlation between perceived AI benefits and AI challenges in logistics and supply chain management.

Alternative Hypothesis (H₁)

There is a correlation between perceived AI benefits and AI challenges in logistics and supply chain management.

Employment Status vs AI Technology Awareness

Null Hypothesis (H₀):

Employment status does not have any impact on AI technology awareness in logistics and supply chain management.

Alternative Hypothesis (H₁):

Work status significantly affects awareness of AI technology among logistics and supply chain management.

Conduct two Chi-Square tests:

- Employment Status and AI Technology Awareness – This will check if awareness of AI technology in logistics is based on employment status.
- AI Benefits vs AI Challenges – This will examine whether the benefits perceived of AI in logistics are connected to the challenges in using it.

Now calculate the Chi-Square statistics and report the findings in a tabular form.

Chi-Square Test Results

Employment Status vs AI Technology Awareness

- Chi-Square Statistic: 9.10
- P-Value: 0.168
- Degrees of Freedom: 6
- Observed Table:

Employment Status	Blockchain	Machine Learning (ML)	Natural Language Processing	Robotic Process Automation
Employed	12	14	7	9
Self-Employed	10	11	8	22
Student	15	11	14	13

Meaning

Because the p-value (0.168) is larger than 0.05, we cannot reject the null hypothesis. This indicates that there is no statistically significant correlation between employment status and recognition of AI technologies in logistics.

AI Benefits vs AI Challenges

- Chi-Square Statistic: 13.43
- P-Value: 0.339
- Degrees of Freedom: 12
- Observed Table:



AI Benefit	Data Privacy & Security	High Implementation Costs	Lack of Skilled Workforce	Resistance to Change
Advanced Demand Forecasting	20	9	6	4
Cost Reduction	8	7	4	6
Enhanced Decision Making	6	8	6	4
Improved Efficiency & Speed	13	9	12	3
Risk Mitigation	5	6	5	6

Interpretation

Because the p-value (0.339) is higher than 0.05, we do not reject the null hypothesis. This indicates that there is no statistically significant difference between perceived benefits and challenges of AI in logistics.

Analysis of Chi-Square Tests

Job Status vs Awareness of AI Technology

Important Observations

- Students are more aware of Blockchain (15 responses) and Natural Language Processing (14 responses) than employed or self-employed persons.
- Self-employed persons express maximum inclination towards Robotic Process Automation (22 responses), which may suggest concentration on automation for efficiency.
- Machine Learning (ML) is relatively well-spread throughout all employment classes, indicating there is a collective comprehension of the significance of machine learning in logistics.

Possible Implications

- Why students prefer Blockchain might reflect curriculum focus on employing it for supply chain transparency.
- Greater adoption of Robotic Process Automation by independent workers might be indicative of more dependency on automating to offset operational expenses.

Benefits of AI compared to Challenges to AI
Notable Findings

- Data Privacy & Security Issues are the largest concern (listed most in multiple benefit categories).
- Sophisticated Demand Forecasting is the greatest benefit, yet also linked by respondents with data privacy issues and exorbitant installation costs.

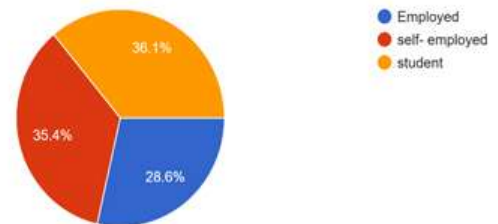
- Enhanced Efficiency & Speed is related to Insufficient Skilled Talent, demonstrating that although AI improves efficiency, firms might not have the necessary talent to properly apply it.
- Cost Savings as an advantage is often associated with Resistance to Change, which means that cost-saving AI solutions may be met with resistance within organizations.

Possible Insights

- Businesses and individuals see AI's efficiency potential, but the greatest obstacles are privacy issues and implementation costs.
- The shortage of skilled workforce is a consistent theme—meaning more AI training programs in logistics are needed.
- Resistance to change remains a significant issue for cost-cutting AI solutions, suggesting a potential requirement for improved change management practices.

4. What is your current employment status ?

147 responses

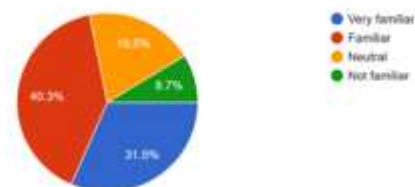


This is a survey with 147 participants. The chart is divided into three sections:

- **Employed:** The blue bar showing 28.6% of the answers.
- **Self-Employed:** Symbolized by the red part, consisting of 35.4% of the answers.
- **Student:** Symbolized by the orange segment, which accounted for 36.1% of the answers.

5. How familiar are you with AI application in logistics and supply chain management ?

149 responses



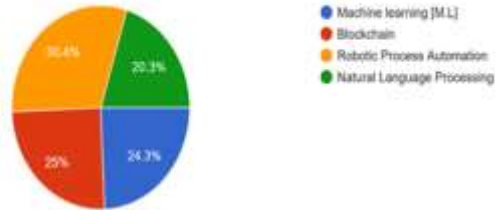
This is survey of 149 participants. The chart is divided into four quadrants corresponding to four different levels of familiarity:

- **Very familiar:** Represented by the blue segment, making up 31.5% of the responses.
- **Familiar:** Captured in the red portion, making up 40.3% of the answers.
- **Neutral:** Symbolized by the orange slice, where 19.5% of the answers lay.



- **Not familiar:** Shown by the green section, accounting for 8.7% of the answers.

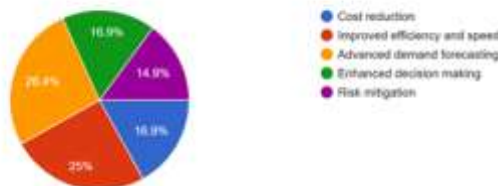
6. Which AI technology are you of in logistics and supply chain operation ?
148 responses



This is a survey with 148 participants. The pie chart consists of four slices, each representing a different AI technology:

- **Machine Learning [M.L.]:** The blue segment, which accounted for 24.3% of the answers.
- **Blockchain:** Emphasized through the red slice, accounting for 25% of the responses.
- **Robotic Process Automation:** Symbolized by the orange slice, accounting for 30.4% of the answers.
- **Natural Language Processing:** Represented by the green segment, 20.3% of the responses.

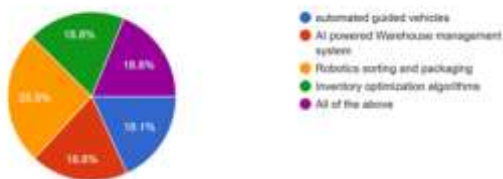
7. What is the most significant benefit of AI in logistics and supply chain management ?
148 responses



From a poll with 148 participants. The chart is split into five sections, each of a different advantage:

- **Cost Reduction:** Symbolized by the blue slice, consisting of 16.9% of the answers.
- **Improved Efficiency and Speed:** Symbolized by the red slice, consisting of 25% of the answers.
- **Advanced Demand Forecasting:** Symbolized by the orange segment, accounting for 26.4% of the answers.
- **Enhanced Decision Making:** Symbolized by the green segment, accounting for 16.9% of the answers.
- **Risk Mitigation:** Symbolized by the purple segment, accounting for 14.9% of the answers.

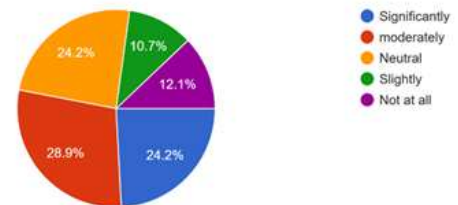
8. What is primary AI-driven solution used in warehouse operation ?
148 responses



From a 149-participant survey. The chart is segmented into five pieces, each segment representing a distinct AI-powered solution:

- **Automated Guided Vehicles:** Represented by the blue segment, at 18.1% of the answers.
- **AI Powered Warehouse Management System:** Represented by the red segment, at 18.8% of the answers.
- **Robotics Sorting and Packaging:** Embodied by the orange slice, accounting for 25.5% of the replies.
- **Inventory Optimization Algorithms:** Embodied by the green slice, accounting for 18.8% of the replies.
- **All of the Above:** Embodied by the purple slice, accounting for 18.8% of the replies.

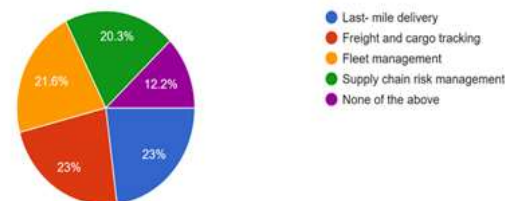
9. To what extent do AI-driven chatbots improve customer service in logistics.
149 responses



From a poll with 149 participants. The chart is split into five portions, each indicating a distinct degree of enhancement:

- **Significantly:** Indicated by the blue portion, making up 24.2% of the answers.
- **Moderately:** Indicated by the red portion, making up 28.9% of the answers.
- **Neutral:** Symbolized by the orange segment, accounting for 24.2% of the answers.
- **Slightly:** Symbolized by the green segment, accounting for 10.7% of the answers.
- **Not at all:** Symbolized by the purple segment, accounting for 12.1% of the answers.

10. Which area of logistics benefits the most from AI-based route optimization ?
148 responses



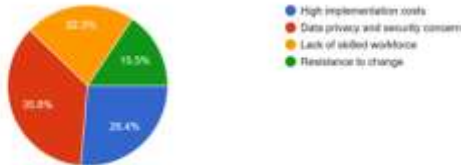
From a survey with 148 participants. The chart is separated into five pieces, each designating one of the domains of logistics:

- **Last-Mile Delivery:** Identified by the blue slice, which includes 23% of the answers.
- **Freight and Cargo Tracking:** Identified by the red slice, which includes 23% of the answers.
- **Fleet Management:** The orange segment, which accounted for 21.6% of the answers.



- **Supply Chain Risk Management:** The green segment, which accounted for 20.3% of the answers.
- **None of the Above:** The purple segment, which accounted for 12.2% of the answers.

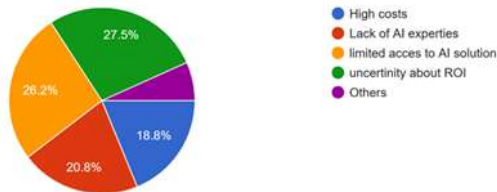
11. What is the biggest challenge in implementing AI in logistics and supply chain management ?
148 responses



From a survey of 148 people. The chart is divided into four quarters, each representing a different challenge:

- **High Implementation Costs:** Indicated by the blue section, which total 26.4% of the answers.
- **Data Privacy and Security Concern:** Symbolized by the red section, constituting 35.8% of the feedback.
- **Lack of Skilled Workforce:** Symbolized by the orange segment, which consisted of 22.3% of the answers.
- **Resistance to Change:** Captured in the green segment, and accounting for 15.5% of the answers.

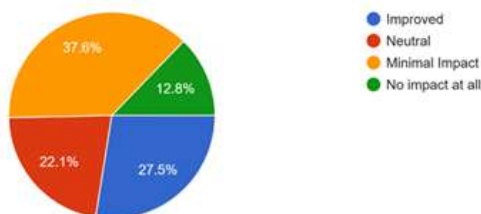
12. What is the main barrier for small and medium enterprise [SMEs] in adopting AI ?
149 responses



From a poll of 149 participants. The chart is cut into five portions, each depicting a different barrier:

- **High Costs:** Depicted by the blue portion, at 18.8% of the answers.
- **Lack of AI Expertise:** Depicted by the red portion, at 20.8% of the answers.
- **Limited Access to AI Solutions:** Expressed by the orange segment, amounting to 26.2% of the answers.
- **Uncertainty about ROI:** Expressed by the green segment, amounting to 27.5% of the answers.
- **Others:** Expressed by the purple segment (fairly small), reflecting other unknown hindrances.

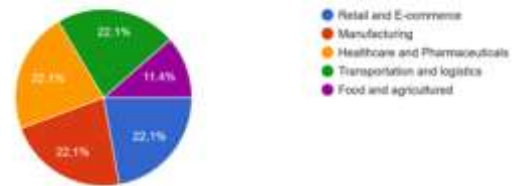
13. What impact will AI have on global supply chain resilience ?
149 responses



From a survey of 149 people. The chart is split into four sections, each one representing a different level of impact:

- **Improved:** Evidenced by the blue portion, which constitutes 27.5% of the responses.
- **Neutral:** As depicted by the red segment, making up 22.1% of the answers.
- **Minimal Impact:** Symbolized by the orange wedge, which accounted for 37.6% of the answers.
- **No Impact at All:** Symbolized by the green segment, making up 12.8% of the answers.

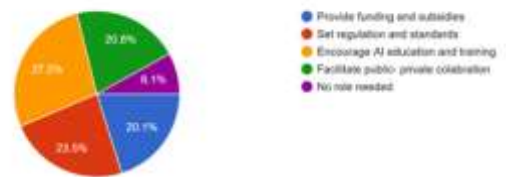
14. Which industry sector benefit the most from AI in supply chain management ?
149 responses



This is a pie chart representing the answers to the question "Which industry sector derives the most benefit from AI in supply chain management?" from a poll of 149 people. The pie is split into five slices, each covering one of the different industry sectors:

- **Retail and E-commerce:** Covered by the blue slice, accounting for 22.1% of the answers.
- **Manufacturing:** Covered by the red slice, accounting for 22.1% of the answers.
- **Healthcare and Pharmaceuticals:** Symbolized by the orange bar, having a share of 22.1% responses.
- **Transportation and Logistics:** Symbolized by the green bar, having a share of 22.1% responses.
- **Food and Agriculture:** Symbolized by the purple bar, with a share of 11.4% responses.

15. What role should Government plays in AI adoption in logistic and supply chain ?
149 responses



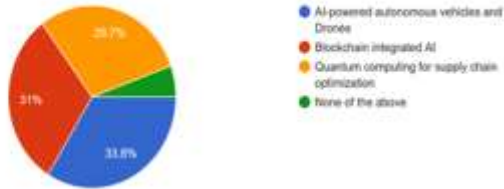
This is a survey with 149 responders. The chart is divided into five parts, each of them representing a different role:

- **Provide Funding and Subsidies:** Demonstrated by the blue part, consisting of 20.1% of the answers.
- **Set Regulation and Standards:** Demonstrated by the red part, consisting of 23.5% of the answers.
- **Encourage AI Education and Training:** Encompassed in the orange piece, representing 27.5% of the answers.
- **Facilitate Public-Private Collaboration:** Encompassed in the green piece, representing 20.8% of the answers.



- **No Role Needed:** Encompassed in the purple piece, representing 8.1% of the answers.

15. Which emerging AI-driven technology do you think will have the most impact on logistics?
145 responses



145-respondent survey. The chart is cut into four wedges, with each wedge representing a separate technology:

- **AI-powered Autonomous Vehicles and Drones:** Symbolized by the blue bar, which accounted for 33.8% of the answers.
- **Blockchain Integrated AI:** Symbolized by the red bar, making up 31% of the answers.
- **Quantum Computing for Supply Chain Optimization:** Symbolized by the orange segment, accounting for 29.7% of the answers.
- **None of the Above:** Reflected by the green segment, making up a minor fraction of the answers.

Key Findings and Results

Survey Analysis

Distribution of Employment Status

- Self-Employed (35.4%) is the biggest segment.
- Students (36.1%) outnumber Employed ones (28.6%) by a small margin.

Perception of AI in Logistics

- 71.8% (Familiar + Very Familiar) share positive perception.
- Only 8.7% claimed to be unfamiliar, reflecting high overall perception.

Most Well-Known AI Technologies

- Robotic Process Automation (30.4%) is most well-known.
- Blockchain (25%) and Machine Learning (24.3%) rank closely after it.

Key AI Advantages in Logistics

- Sophisticated Demand Forecasting (26.4%) is the most important advantage.
- Enhanced Efficiency and Velocity (25%) comes in second place.

Most Important AI Solutions in Warehouses

- Robotic Sorting & Packaging (25.5%) is the most applied solution.
- AI-driven Warehouse Management and Inventory Optimization (18.8%) are equally well-known.

Effect of AI-enabled Chatbots in Logistics

- 53.1% (Significantly + Moderately) (agree) that chatbots enhance customer care.
- Only 12.1% believe that chatbots do not have any effect.

Greatest Challenges in Implementation of AI

- Data Privacy & Security (35.8%) is the greatest challenge.
- High Implementation Costs (26.4%) are a close second.

Barriers to SME AI Adoption

- Uncertainty over ROI (27.5%) is the greatest concern.
- Limited Access to AI Solutions (26.2%) is also high.

AI Impact on Global Supply Chain Resilience

- 37.6% predict minimal impact, while 27.5% expect improvements.

Industries Most Benefiting from AI

- Retail, Manufacturing, Healthcare, and Logistics (22.1% each) benefit equally.

Government's Role in AI Adoption

- AI Education & Training (27.5%) is the most sought action.
- Regulation & Standards (23.5%) are also high.

Most Significant Emerging AI Technology

- AI-driven Autonomous Drones & Cars (33.8%) top the list.
- Blockchain-based AI (31%) is another formidable contestant.

Chi-Square Test Results

Job Status vs AI Technology Awareness

- Chi-Square Statistic: 9.10
- P-Value: 0.168 (> 0.05) → No significant association

Key Findings

- Students are well-aware of Blockchain & NLP.
- Self-Employed are concerned with Robotic Process Automation.
- Machine Learning awareness is spread equally across job statuses.

Benefits of AI vs Challenges of AI

- Chi-Square Statistic: 13.43
- P-Value: 0.339 (> 0.05) → No significant relationship

Key Findings

- Privacy & Security Concerns are the largest challenge among AI benefits.
- Advanced Demand Forecasting is the most well-known benefit but associated with high implementation costs.
- Efficiency gains are thwarted by a shortage of skilled workforce.
- Cost Reduction AI solutions are resisted to change.



Overall Insights

- AI adoption in logistics is widely recognized but challenged by cost, security, and talent issues.
- Self-employed professionals and students prioritize different AI technology.
- High expenditure and privacy are the biggest roadblocks.
- Most useful solutions have been identified in AI-driven forecasting and automation.
- The government involvement in AI teaching and regulation has been deemed valuable.

VII. CONCLUSION AND FUTURE SCOPE

The application of Artificial Intelligence (AI) in logistics and supply chain management has transformed the sector, providing greater efficiency, cost reductions, and improved decision-making power. AI-powered technologies such as machine learning, predictive analytics, and automation have made it possible for businesses to improve demand forecasting, inventory control, route planning, and real-time monitoring. All these innovations have greatly enhanced supply chain resilience, cutting delays, reducing wastage, and overall customer satisfaction.

One of the most important findings of this study is that AI improves operational effectiveness by automating routine tasks, enhancing precision, and detecting patterns that are not apparent through conventional means. Predictive analytics and AI-based insights enable companies to make informed decisions based on data, minimizing uncertainties and enhancing supply chain responsiveness. Moreover, AI-based robotics and automated warehouses have optimized logistics operations, minimizing reliance on human intervention and enhancing speed and precision.

Another important one is the application of AI towards sustainability in supply chains. With the increasing focus on environmental issues, AI solutions can assist in reducing carbon prints by streamlining routes, saving fuel, and facilitating effective resource management. With the capability of monitoring and predicting disruptions like natural disasters or shortage of supplies, companies can respond proactively to challenges, hence making supply chains more agile and resilient.

Although there are many advantages, adoption of AI in logistics and supply chain management has its drawbacks. Security and privacy of data are still important issues, since AI systems are dependent on large volumes of sensitive data. Moreover, adoption of AI involves huge technology and training costs for the workforce. Companies need to overcome these drawbacks to realize the full potential of AI and integrate it smoothly into current supply chain functions.

In the future, the prospect of AI in logistics and supply chain management looks bright. Edge computing, blockchain integration, and AI-based digital twins are among the emerging technologies that will improve supply chain visibility and efficiency even further. The application of AI-based drones and autonomous vehicles will revolutionize last-mile delivery by cutting transit times and costs. Further development of natural language processing (NLP) and AI-based chatbots will enhance customer service and communication with suppliers as well.

Future research should focus on developing more robust and scalable AI models that can handle real-time complexities in global supply chains. Studies on ethical AI deployment, minimizing biases in decision-making, and enhancing transparency will be crucial in ensuring responsible AI integration. Moreover, exploring AI's potential in addressing supply chain disruptions, particularly in the wake of global crises such as pandemics or geopolitical conflicts, can provide valuable insights for businesses and policymakers.

In summary, AI has revolutionized supply chain management and logistics, with limitless opportunities for resilience, sustainability, and efficiency. Yet, to maximize its benefits, organizations need to persist in innovating, funding research on AI, as well as overcoming challenges related to implementation. With the ongoing development of AI technology, its contribution to determining the future direction of supply chains will be vital, opening doors to intelligent, responsive, and sustainable logistics processes.

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