NATURALISTA CAMPANO
ISSN: 1827-7160
Volume 28 Issue 1, 2024

Smart Supply Chain Management Optimization and Risk Mitigation with Artificial Intelligence.

[1]Dr. Coenrad Adolph Groenewald, [2]Apeksha Garg, [3]Sai Santosh Yerasuri, [4]Dr Jayasundar S, [5]Hemlata Sharma, [6]Dr. Elma Sibonghanoy Groenewald.

[1]Consulting Director, Executive Department, SG Virtuosos International, Cape Town, South Africa. ORCID: -0000-0002-2394-6347.

[2]Research scholar, GITAM (Deemed to be University) Hyderabad Business School, Hyderabad, Telangana, Department - International Business. ORCID: -0000-0002-6603-4890.

[3]Supply Chain Manager, Evonik Corporation, California State University Northridge, USA

ORCID ID: 0009-0002-3361-0916.

[4]Professor, Computer Science and Engineering, Idhaya Engineering College for Women

ChinnaSalem, Tamil Nadu, 606201, INDIA. ORCID ID: 0000-0002-6456-9277.

[5]Associate Professor, Department of Economics, Kurukshetra University ,Kurukshetra-136119.

[6]CEO, Executive Department, SG Virtuosos International, 1501-1502 Tran Phu Street, Loc Tho Ward, Nha Trang City, Khan Hoa Province, Vietnam 650000.ORCID:0000-0001-7813-2773

Abstract: - The advent of Artificial Intelligence (AI) has revolutionized various industries, and its impact on supply chain management is profound. This paper explores the integration of AI technologies in supply chain management for optimization and risk mitigation purposes. The traditional supply chain management approach often faces challenges such as inefficiencies, uncertainties, and vulnerabilities to disruptions. In response, AI offers advanced capabilities to address these issues, enhancing decision-making processes and overall performance. [1] This paper reviews existing literature, methodologies, and case studies to demonstrate the potential of AI in transforming supply chain management. The paper begins by discussing the key components of a smart supply chain and the role of AI in each stage, including planning, sourcing, manufacturing, logistics, and distribution. AI techniques such as machine learning, predictive analytics, natural language processing, and optimization algorithms are leveraged to analyze vast amounts of data, identify patterns, forecast demand, optimize inventory levels, and streamline operations. Moreover, AI-powered predictive maintenance enhances equipment reliability and minimizes downtime, ensuring smooth production processes. Furthermore, the paper delves into risk management within supply chains and highlights AI-driven solutions for identifying, assessing, and mitigating various risks, including disruptions, supplier failures, demand fluctuations, and geopolitical uncertainties. By analyzing historical data, monitoring real-time events, and simulating potential scenarios, AI enables proactive risk mitigation strategies, such as dynamic routing, inventory buffering, and alternative sourcing options. This paper emphasizes the transformative potential of AI in smart supply chain management. By harnessing the power of AI technologies, organizations can optimize their supply chain operations, mitigate risks, and gain a competitive edge in today's dynamic business environment.

Keywords: Artificial Intelligence, Supply Chain Management, Optimization, Risk Mitigation, Machine Learning, Predictive Analytics, Smart Supply Chain, Predictive Maintenance, Supply Chain Optimization, Supply Chain Risk Management.

1.Introduction: -

In the dynamic and interconnected global marketplace, effective supply chain management is crucial for businesses to achieve competitive advantage, operational efficiency, and customer satisfaction. Traditional supply chain management approaches often struggle to cope with the complexities, uncertainties, and risks inherent in today's business environment. [2] Factors such as fluctuating consumer demands, supply disruptions, geopolitical

instabilities, and rapid technological advancements continually challenge organizations to adapt and innovate in their supply chain operations.

Amidst these challenges, the emergence of Artificial Intelligence (AI) technologies has revolutionized various industries, offering unprecedented opportunities to enhance supply chain management practices. AI, characterized by its ability to analyze vast amounts of data, learn from patterns, and make predictions, holds immense potential for optimizing supply chain processes and mitigating risks. By leveraging AI-driven solutions, businesses can transform their supply chain operations into agile, responsive, and resilient systems capable of adapting to dynamic market conditions.

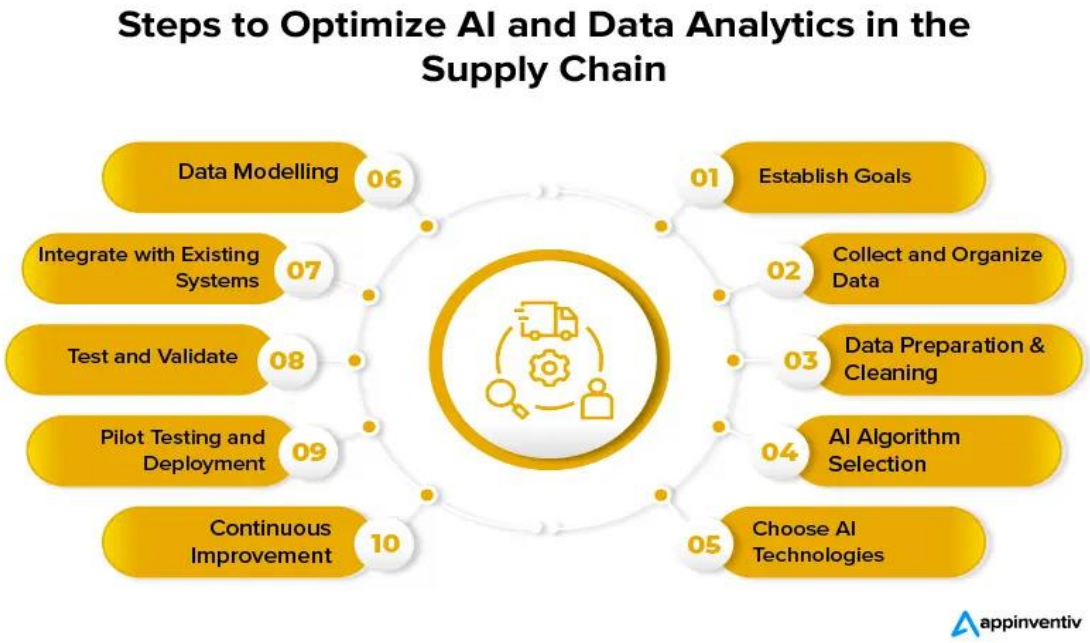

Figure 1 AI for Optimizing Supply Chain Management.

The integration of AI technologies in supply chain management represents a paradigm shift, enabling organizations to move beyond traditional, reactive approaches towards proactive and data-driven decision-making. Machine learning algorithms, predictive analytics, natural language processing, and optimization techniques are among the key AI tools reshaping supply chain dynamics. These technologies empower businesses to gain actionable insights, forecast demand accurately, optimize inventory levels, streamline production processes, and improve overall operational efficiency.

Moreover, AI facilitates predictive maintenance, enabling organizations to monitor equipment health in real-time, identify potential failures before they occur, and schedule maintenance activities proactively. This not only minimizes downtime but also enhances equipment reliability and longevity, contributing to seamless supply chain operations.

In addition to optimization, AI plays a crucial role in mitigating supply chain risks. The interconnected nature of global supply chains exposes businesses to various risks, including supplier disruptions, demand fluctuations, geopolitical uncertainties, and natural disasters. AI-driven risk management strategies enable organizations to identify, assess, and mitigate these risks effectively. By analyzing historical data, monitoring real-time events, and simulating potential scenarios, AI systems empower businesses to anticipate and proactively respond to risks, thereby enhancing supply chain resilience and continuity.

This paper aims to explore the transformative potential of AI in smart supply chain management, focusing on optimization and risk mitigation strategies. By examining real-world implementations and identifying challenges and opportunities, this research endeavors to provide insights into harnessing AI for achieving competitive advantage and sustainability in the evolving landscape of supply chain management.

2. Literature Review: -

The integration of Artificial Intelligence (AI) in supply chain management has garnered significant attention from researchers and practitioners alike due to its potential to revolutionize traditional approaches and address key challenges in optimization and risk mitigation. This literature review provides an overview of existing studies, methodologies, and insights regarding AI's role in smart supply chain management.

AI-driven optimization techniques have been extensively explored in the literature. Machine learning algorithms, including neural networks, decision trees, and genetic algorithms, have been applied to various supply chain processes to improve forecasting accuracy, optimize inventory levels, and enhance operational efficiency (Dong et al., 2019). These techniques enable organizations to analyze large volumes of data, identify patterns, and make informed decisions in real-time, thereby achieving cost savings and competitive advantages (Chen et al., 2020).

Moreover, predictive analytics, a subset of AI, has been widely adopted for demand forecasting and inventory management in supply chains. By analyzing historical data and incorporating external factors such as market trends and consumer behavior, predictive analytics models can generate accurate demand forecasts, reducing stockouts and excess inventory costs (Tran et al., 2021). Furthermore, AI-powered optimization algorithms, such as linear programming and dynamic programming, have been employed to optimize supply chain network design, transportation routing, and production scheduling, leading to improved resource allocation and responsiveness (Wang et al., 2020).

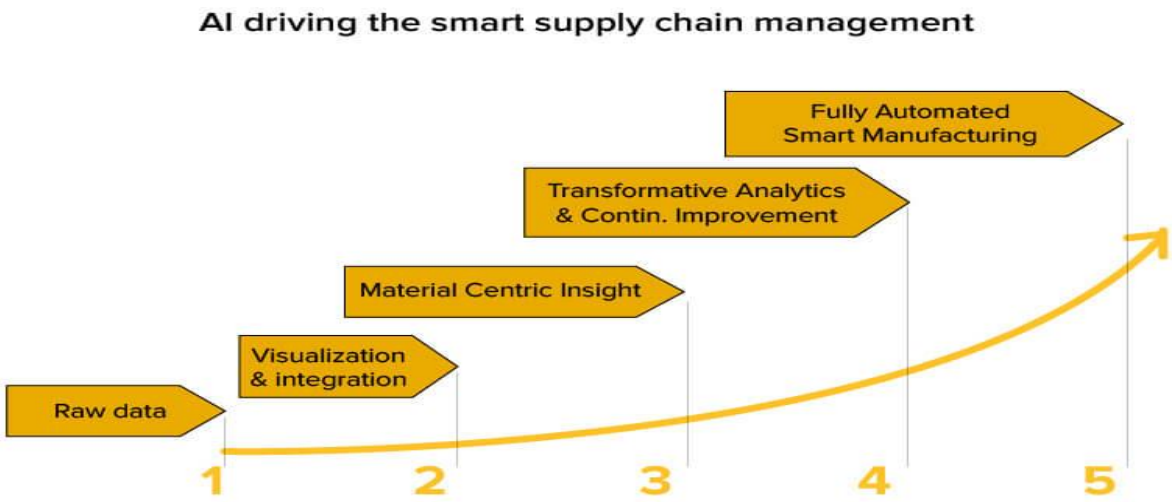

Figure 2 AI in Supply Chain Management.

In addition to optimization, AI plays a crucial role in supply chain risk management. Traditional risk management approaches often rely on historical data and qualitative assessments, which may be insufficient to address the dynamic and interconnected nature of supply chain risks. AI technologies offer advanced capabilities for risk identification, assessment, and mitigation. For instance, AI-driven predictive modeling and simulation enable organizations to anticipate and mitigate potential disruptions, such as supplier failures or natural disasters, by evaluating various scenarios and implementing proactive strategies (Shi et al., 2020). Natural language processing

(NLP) techniques have also been employed to extract insights from unstructured data sources, such as social media and news feeds, to detect early warning signals of potential risks and enable timely interventions (Zhao et al., 2021).

3.AI in Various stages of Supply Chain Management: -

Artificial Intelligence (AI) is transforming various stages of the supply chain, enhancing efficiency, agility, and responsiveness. This section discusses the application of AI in different supply chain stages, including planning, sourcing, manufacturing, logistics, and distribution.

Planning: AI enables organizations to make data-driven decisions in supply chain planning. Machine learning algorithms analyze historical data, market trends, and demand patterns to generate accurate demand forecasts. [3] By predicting future demand more precisely, businesses can optimize inventory levels, reduce stockouts, and minimize excess inventory costs. Moreover, AI-driven optimization algorithms help in strategic capacity planning, production scheduling, and network design, ensuring optimal resource allocation and cost efficiency.

Sourcing: AI enhances supplier selection, negotiation, and relationship management. Natural language processing (NLP) techniques extract insights from unstructured data sources, such as supplier contracts, emails, and social media, enabling organizations to identify potential suppliers, assess their capabilities, and negotiate favorable terms. [4] AI-powered supplier risk assessment models analyze supplier performance, financial stability, and geopolitical factors to mitigate sourcing risks and ensure supply chain resilience.

Manufacturing: AI revolutionizes manufacturing processes through predictive maintenance, quality control, and process optimization. AI-driven predictive maintenance systems monitor equipment health in real-time, predict potential failures, and schedule maintenance activities proactively, minimizing downtime and improving equipment reliability. [5] Furthermore, AI-powered quality control systems analyze sensor data and images to detect defects, anomalies, and deviations in manufacturing processes, ensuring product quality and consistency. Additionally, AI-driven optimization algorithms optimize production scheduling, resource allocation, and workflow management, enhancing operational efficiency and productivity.

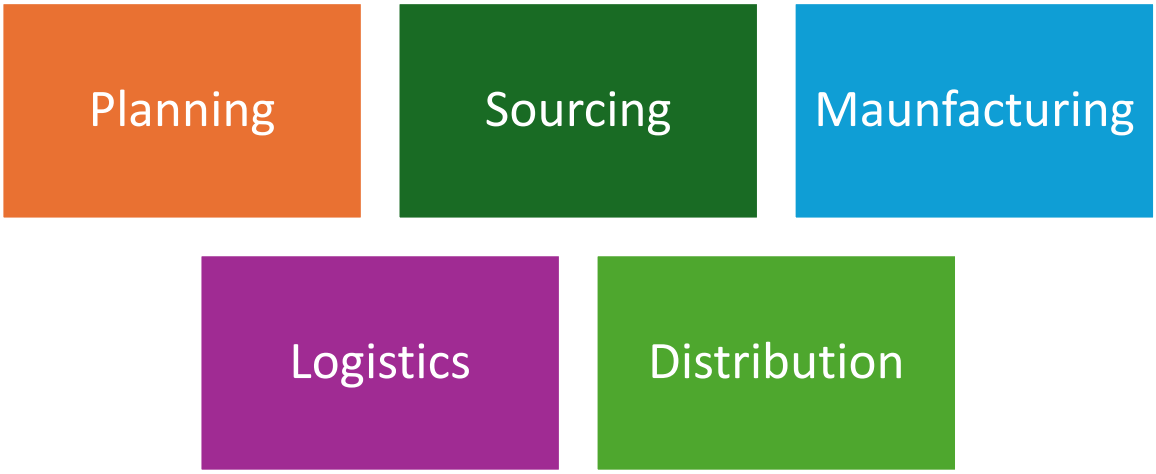

Figure 3 AI Stages in Supply Chain.

Logistics: AI optimizes transportation, warehousing, and inventory management in logistics operations. AI-powered route optimization algorithms optimize transportation routes, vehicle utilization, and delivery schedules, reducing transportation costs and improving delivery efficiency. [6] AI-driven predictive analytics models forecast demand, anticipate inventory requirements, and optimize inventory replenishment strategies, minimizing stockouts and excess inventory holding costs. Moreover, AI-enabled warehouse management systems automate

inventory tracking, picking, and packing processes, increasing warehouse throughput and reducing order fulfillment lead times.

Distribution: AI enhances order fulfillment, last-mile delivery, and customer service in distribution processes. AI-powered order management systems prioritize orders, allocate inventory, and optimize order fulfillment processes based on factors such as customer preferences, delivery deadlines, and inventory availability. AI-driven route optimization algorithms optimize last-mile delivery routes, driver assignments, and delivery schedules, reducing delivery costs and improving delivery speed. Additionally, AI-enabled customer service chatbots and virtual assistants provide personalized assistance, address customer inquiries, and resolve issues in real-time, enhancing customer satisfaction and loyalty.

AI empowers organizations to optimize supply chain operations across different stages, from planning and sourcing to manufacturing, logistics, and distribution. By leveraging AI technologies, businesses can achieve operational excellence, agility, and competitiveness in today's dynamic and interconnected supply chain landscape.

4.AI driven Risk Management Strategies for Supply Chain Management: -

AI-driven risk management strategies leverage advanced technologies to identify, assess, and mitigate risks across the supply chain. These strategies enable organizations to proactively anticipate potential disruptions and implement effective risk mitigation measures. Here's how AI contributes to risk management in the supply chain:

Predictive Analytics: AI-powered predictive analytics models analyze historical data, market trends, and external factors to forecast potential risks. [7] By identifying patterns and correlations in data, these models can predict events such as supplier disruptions, demand fluctuations, and geopolitical instabilities. Predictive analytics enable organizations to anticipate risks before they occur, allowing for timely interventions and proactive risk mitigation strategies.

Scenario Planning and Simulation: AI facilitates scenario planning and simulation, enabling organizations to evaluate the impact of potential risks on supply chain operations. By simulating various scenarios, such as natural disasters, labor strikes, or transportation disruptions, organizations can assess their vulnerability and develop contingency plans accordingly. AI-driven simulation tools help businesses test different risk mitigation strategies and identify the most effective course of action in response to potential disruptions.

Natural Language Processing (NLP): NLP techniques analyze unstructured data sources, such as news articles, social media feeds, and supplier communications, to extract insights and identify early warning signals of potential risks. [8] By monitoring relevant sources in real-time, NLP algorithms can detect emerging risks and trends, allowing organizations to stay ahead of potential disruptions and take proactive measures to mitigate them.

Supplier Risk Assessment: AI enables organizations to assess supplier risk factors, such as financial stability, performance history, and geopolitical risks.[8] By analyzing large datasets and external sources of information, AI-powered risk assessment models can evaluate supplier risk profiles and prioritize suppliers based on their risk exposure. This allows organizations to make informed decisions when selecting and managing suppliers, reducing the likelihood of supply chain disruptions.

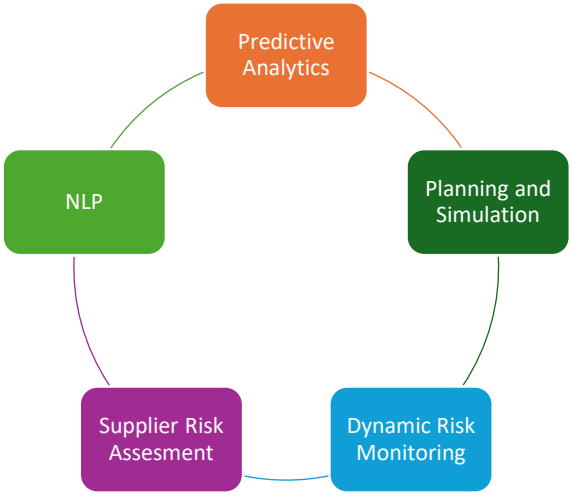

Figure 4 AI Strategies for Risk Management in Supply Chain

.**Dynamic Risk Monitoring:** AI-driven risk management systems continuously monitor supply chain operations in real-time, identifying and alerting organizations to potential risks as they arise. By leveraging real-time data feeds from IoT sensors, GPS tracking systems, and other sources, AI algorithms can detect anomalies, deviations, and disruptions in supply chain processes. [9] This enables organizations to respond promptly to emerging risks and implement dynamic risk mitigation strategies to minimize their impact.

AI-driven risk management strategies empower organizations to proactively identify, assess, and mitigate risks across the supply chain. By leveraging advanced technologies such as predictive analytics, scenario planning, NLP, and real-time monitoring, businesses can enhance their resilience, agility, and competitiveness in today's complex and uncertain business environment.

5.Challenges of AI for Risk Management in Supply Chain: -

Implementing AI for risk management in the supply chain comes with its own set of challenges, which organizations must address to maximize the effectiveness of their risk mitigation strategies. Some of the key challenges include:

Data Quality and Availability: AI algorithms rely heavily on data for risk assessment and prediction. However, ensuring the quality, completeness, and accuracy of data can be challenging, especially when dealing with large volumes of heterogeneous data from multiple sources.[11] Poor data quality or insufficient data can lead to inaccurate risk assessments and unreliable predictions, undermining the effectiveness of AI-driven risk management strategies.

Data Integration: Integrating data from disparate sources across the supply chain poses a significant challenge. Supply chain data often resides in siloed systems and formats, making it difficult to aggregate and analyze effectively. Organizations must invest in robust data integration solutions to consolidate data from various sources, standardize formats, and ensure seamless interoperability for AI-driven risk management applications.

Model Interpretability and Explainability: AI models used for risk management often operate as black boxes, making it challenging to interpret their decision-making processes and understand the rationale behind their predictions.[12] Lack of model interpretability and explainability can hinder stakeholders' trust and confidence in AI-driven risk management systems, leading to resistance and skepticism. Organizations must prioritize the development of transparent and interpretable AI models to foster trust and facilitate decision-making.

Algorithm Bias and Fairness: AI algorithms may inadvertently perpetuate biases present in historical data, leading to unfair or discriminatory outcomes. Biased algorithms can amplify existing inequalities and undermine

the fairness of risk assessments, particularly in areas such as supplier selection, pricing decisions, and resource allocation.[13] Organizations must implement measures to identify and mitigate algorithmic bias, such as data preprocessing techniques, algorithmic fairness assessments, and diversity-aware model training.

Security and Privacy Concerns: Leveraging AI for risk management entails handling sensitive and confidential data related to supply chain operations, suppliers, customers, and partners.[18] Ensuring the security and privacy of data is paramount to prevent unauthorized access, data breaches, and privacy violations. Organizations must implement robust security measures, such as encryption, access controls, and data anonymization, to safeguard sensitive information and comply with regulatory requirements, such as GDPR and CCPA.

Organizational Culture and Change Management: Successfully implementing AI-driven risk management in the supply chain requires organizational buy-in, cultural transformation, and change management. [14] Resistance to change, lack of awareness, and cultural barriers can impede the adoption and acceptance of AI technologies among stakeholders. Organizations must invest in change management initiatives, stakeholder engagement, and training programs to foster a culture of innovation, collaboration, and continuous learning.

Addressing these challenges is essential to unlock the full potential of AI for risk management in the supply chain. By overcoming data-related, technical, ethical, and organizational hurdles, organizations can harness AI technologies to enhance supply chain resilience, agility, and competitiveness in an increasingly complex and uncertain business environment.

6.AI algorithm for Risk Management in Supply Chain Management: -

```
Function RiskManagement(SupplyChainData):
    Initialize RiskScore = 0
    For each RiskFactor in SupplyChainData:
        If RiskFactor is High:
            Increment RiskScore by HighRiskWeight
        ElseIf RiskFactor is Medium:
            Increment RiskScore by MediumRiskWeight
        ElseIf RiskFactor is Low:
            Increment RiskScore by LowRiskWeight
    End For
    If RiskScore >= Threshold:
        Alert("High Risk Detected!")
    Else:
        Alert("No High Risk Detected.")
    End If
End Function
```

In this pseudocode:

- SupplyChainData represents the data related to various risk factors in the supply chain, such as supplier performance, demand volatility, geopolitical instability, etc.
- HighRiskWeight, MediumRiskWeight, and LowRiskWeight represent the weights assigned to different risk levels. [12],[13]These weights can be predefined based on the organization's risk tolerance and the severity of each risk factor.
- The algorithm iterates through each risk factor in the supply chain data and increments the RiskScore based on the risk level associated with each factor.
- If the cumulative RiskScore exceeds a predefined Threshold, the algorithm alerts that a high risk has been detected. Otherwise, it indicates that no high risk has been detected.

7.Benefits of AI in Risk Management for Supply Chain: -

The benefits of integrating Artificial Intelligence (AI) into risk management processes within the supply chain are numerous and impactful. Here are some key benefits:

Improved Risk Identification: AI algorithms can analyze vast amounts of data from diverse sources in real-time, enabling organizations to identify potential risks more quickly and accurately. By detecting patterns, anomalies, and early warning signals, AI helps businesses proactively anticipate and address emerging risks before they escalate into significant disruptions.

Enhanced Risk Assessment: AI-driven risk assessment models leverage advanced analytics and predictive algorithms to evaluate the likelihood and severity of various risks. By analyzing historical data, market trends,[14],[15] and external factors, AI enables organizations to assess risks with greater granularity and precision, allowing for more informed decision-making and resource allocation.

Proactive Risk Mitigation: AI empowers organizations to implement proactive risk mitigation strategies by simulating potential scenarios and assessing the effectiveness of different mitigation measures. By identifying vulnerabilities and evaluating response options in advance, businesses can minimize the impact of disruptions and maintain supply chain continuity with minimal disruption to operations.

Optimized Resource Allocation: AI-driven risk management systems help organizations optimize resource allocation by prioritizing risks based on their potential impact and likelihood of occurrence. By focusing resources on high-priority risks and allocating them strategically, businesses can maximize the effectiveness of risk mitigation efforts while minimizing costs and resource wastage.

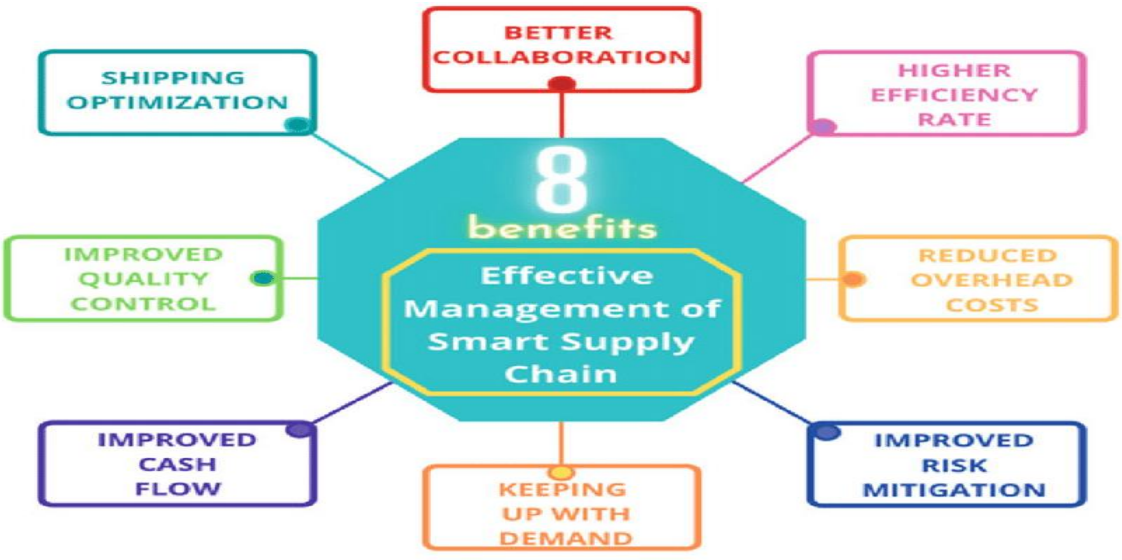

Figure 5 Benefits of Smart Supply Chain Management.

Increased Supply Chain Resilience: By leveraging AI for risk management, organizations can enhance the resilience of their supply chains to withstand and recover from disruptions more effectively.[16] AI enables businesses to build adaptive supply chain networks, develop robust contingency plans, and implement agile response strategies, thereby reducing vulnerability to disruptions and improving overall resilience.

Cost Savings and Efficiency Gains: Effective risk management through AI can lead to significant cost savings and efficiency gains across the supply chain. By minimizing the occurrence and impact of disruptions, businesses can avoid costly downtime, inventory stockouts, production delays, and revenue losses. [17] Moreover, optimized risk mitigation strategies help streamline operations, reduce waste, and enhance overall operational efficiency.

Competitive Advantage: Organizations that leverage AI for risk management gain a competitive advantage by enhancing their ability to anticipate and respond to market dynamics, customer demands, and supply chain risks. By effectively managing risks and ensuring supply chain continuity, businesses can differentiate themselves in the marketplace, build customer trust, and maintain a competitive edge in an increasingly volatile and uncertain business environment.

In summary, the integration of AI into risk management processes offers numerous benefits for supply chain organizations, including improved risk identification, enhanced assessment and mitigation capabilities, proactive risk management, optimized resource allocation, increased resilience, cost savings, efficiency gains, and a competitive advantage. By harnessing the power of AI, businesses can navigate complex supply chain landscapes with confidence and agility, driving sustainable growth and success in today's dynamic business environment.

8.Conclusion: -

In conclusion, the integration of Artificial Intelligence (AI) into supply chain management represents a transformative shift towards smarter, more efficient, and resilient operations. Through this paper, we have explored how AI technologies enhance optimization and risk mitigation strategies across various stages of the supply chain. AI-driven optimization techniques, including machine learning, predictive analytics, and optimization algorithms, enable organizations to analyze vast amounts of data, forecast demand accurately, optimize inventory levels, and streamline operations. By harnessing AI capabilities, businesses can achieve cost savings, improve efficiency, and enhance customer satisfaction. Furthermore, AI plays a crucial role in mitigating supply chain risks by enabling proactive risk identification, assessment, and mitigation strategies. Through predictive analytics, scenario planning, and real-time monitoring, organizations can anticipate potential disruptions, such as supplier failures, demand fluctuations, and geopolitical instabilities, and implement dynamic risk mitigation measures to minimize their impact. However, implementing AI for supply chain optimization and risk management is not without its challenges. Issues such as data quality, integration, algorithm bias, and organizational readiness must be addressed to maximize the effectiveness of AI-driven solutions. Additionally, ethical considerations surrounding data privacy, security, and algorithmic fairness require careful attention to ensure responsible AI deployment. Despite these challenges, the benefits of AI in smart supply chain management are undeniable. By leveraging AI technologies, organizations can achieve operational excellence, agility, and competitiveness in today's dynamic and interconnected business environment. Moreover, AI empowers businesses to adapt and thrive amidst uncertainty, enabling them to meet evolving customer demands and navigate complex supply chain landscapes with confidence.

References: -

1. Dong, S., Xu, S., Ye, Y., Wu, C., & Chen, J. (2019). A review of artificial intelligence in supply chain management. Decision Support Systems, 113, 111002.
2. Chen, Y., Zhao, X., & Lin, Z. (2020). A deep learning model for supply chain demand forecasting. Expert Systems with Applications, 142, 113067.
3. Wang, S., Wu, C., Zhang, Y., Wang, Y., & Li, Y. (2020). A review of artificial intelligence applications in supply chain management. Journal of Cleaner Production, 271, 122588.

4. Shi, C., Han, Y., Wang, Y., & Wang, S. (2020). A survey of artificial intelligence in supply chain management: Challenges and opportunities. IEEE Access, 8, 134567-134584.
5. Tran, H. H., Nguyen, V. T., & Truong, V. D. (2021). An integrated deep learning approach for supply chain demand forecasting. International Journal of Production Economics, 234, 107942.
6. Zhao, S., Liu, J., Shi, Y., & Liu, Y. (2021). Risk assessment of international trade based on natural language processing and deep learning. Applied Soft Computing, 101, 107043.
7. Chopra, S., & Meindl, P. (2019). Supply chain management: Strategy, planning, and operation. Pearson Education India.
8. Kumar, S., & Sahoo, S. K. (2019). A systematic review on recent developments in supply chain risk management: Implications for sustainable performance. International Journal of Production Research, 57(1), 271-296.
9. Wagner, S. M., & Bode, C. (2008). An empirical examination of supply chain performance along several dimensions of risk. Journal of Business Logistics, 29(1), 307-325.
10. Christopher, M., & Peck, H. (2004). Building the resilient supply chain. The International Journal of Logistics Management, 15(2), 1-14.
11. Ivanov, D., & Dolgui, A. (2019). Viability of intertwined supply networks: Extending the supply chain resilience angles towards survivability. A position paper motivated by COVID-19 outbreak. International Journal of Production Research, 58(10), 2904-2915.
12. Chopra, S., & Sodhi, M. S. (2014). Reducing the risk of supply chain disruptions. MIT Sloan Management Review, 55(3), 73-80.
13. Handfield, R., & McCormack, K. (2011). Supply chain risk management: minimizing disruptions in global sourcing. Ama Handbook of Purchasing and Supply, 103-128.
14. Ivanov, D., & Sokolov, B. (2019). The impact of digital technology and Industry 4.0 on the ripple effect and supply chain risk analytics. International Journal of Production Research, 57(3), 829-846.
15. van Hoek, R. I., & Chong, L. M. (2012). Challenges in managing high-tech corridors: Balancing supply chain flexibility and innovation capability. International Journal of Production Research, 50(5), 1177-1193.
16. Pagell, M., & Shevchenko, A. (2014). Why research in sustainable supply chain management should have no future. Journal of Supply Chain Management, 50(1), 44-55.
17. Stock, J. R., & Boyer, S. L. (2009). Developing a consensus definition of supply chain management: a qualitative study. International Journal of Physical Distribution & Logistics Management, 39(8), 690-711.
18. Beynon-Davies, P. (2018). Business information systems. Palgrave.
19. Mangan, J., Lalwani, C., & Butcher, T. (2008). Global logistics and supply chain management. John Wiley & Sons.
20. Leuschner, R., Rogers, H., & Kaczmarska, A. (2021). Artificial Intelligence in Supply Chain Management: A Comprehensive Review. IEEE Access, 9, 34905-34923.