Artificial Intelligence In Supplier Selection And Performance Monitoring: A Framework For Supply Chain Managers

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ARTICLE INFO	ABSTRACT
	The use of AI to supply chain management is the subject of this research, which zeroes in on two areas: supplier evaluation and performance tracking. The research used a PRISMA-based systematic methodology to systematically review pertinent literature from the Web of Science database, ensuring rigor by filtering out papers without clear inclusion and exclusion criteria. We looked at AI supply chain management apps that used important methods like ML, DL, and predictive analytics. Research into the function of AI has grown substantially over the last decade, according to the findings. This is especially true in domains connected to suppliers, like quality control, cost optimization, and risk management. The geographical distribution of the studies also shows that North America and Europe have made significant contributions to the field, while Asia is starting to make its mark. Better supplier selection and performance monitoring are both made possible by utilizing AI, and these insights lay the groundwork for this to happen for supply chain management.
	Keywords: Artificial Intelligence, Supplier Selection, Supply Chain Managers

INTRODUCTION

Supply chains have become more intricate as a result of globalization in production and trade [1]. A deeper comprehension of the complex difficulties plaguing global supply systems is necessary in light of the fact that this complexity makes supply chain management more difficult. Optimizing sustainable supply chain performance to reduce negative effects on the environment, economy, and society has been a priority in recent years due to the growing awareness of social and environmental pressures from both the public and governments [2]. The actions involved in sourcing, producing, distributing, and logistics at each stage of the supply chain primarily cause these negative impacts. Since the unanticipated and careless acts of companies pose a danger to sustainability, the topic of lowering carbon emissions has gained a lot of attention in light of the fact that economic development is producing serious problems including climate change, abnormalities in the weather, and environmental degradation [4]. More and more carbon trading and carbon business mechanisms are popping up, which means there needs to be a push for sustainable supply chain management (SCM) practices to keep people and the planet safe. Supply chain management (SSCM) isn't just for operations and markets; it should cover everything from suppliers to consumers. As an example, a sustainable and environmentally friendly supply chain network design has taken CO2 emissions into account [5]. To build a supply chain that is both responsive and strong, these activities and procedures must be optimized and improved continuously. Many sectors, including supply chain management (SCM), have recently shown an interest in researching and potentially implementing artificial intelligence (AI). Supply chains enabled by artificial intelligence (AI) can execute tasks and make choices autonomously, eliminating the need for human intervention [6]. AI is described as machines' ability to communicate with and mimic the decision-making of people. This allows for faster and more accurate problem-solving.

How can AI Optimize Supply Chain Routes?

In today's cutthroat market, supply chain route optimization is critical for companies to survive and thrive. By optimizing transportation, businesses can cut down on operational expenses, fuel usage, and emissions of greenhouse gases. Quicker delivery made possible by well-planned routes equal to satisfied consumers and goodwill toward the business. Improved inventory management, less stockouts and overstocks, and more predictable transport times were the results of optimized logistics. Reduced traffic congestion and strain on transportation infrastructure are two benefits of well-planned routes. In order to optimize supply chain pathways, artificial intelligence can help businesses see what's happening and make better decisions, says McKinsey. Potentially revolutionary for administrators and managers of supply chains, AI's ability to sift through mountains of data allows for the discovery of previously unseen insights, patterns, and correlations [7].

What is the Role of AI in Carbon Emissions Reduction?

There are a number of ways in which carbon emissions might damage your supply chain infrastructure. Extreme weather occurrences cause logistical disruptions and infrastructural damage as a result of climate change, which is exacerbated by elevated emissions. Companies with large carbon footprints are likely to be subject to more regulation, which might lead to fines and harm to their reputation. Also, consumers are looking for more environmentally friendly products, thus it's important to cater to their beliefs. Those looking to invest in companies that care about the environment will pass on those with high emissions. You can safeguard the environment, prepare your company for the future, and boost performance all at once by reducing carbon emissions in your supply chain [8]. According to a BCG report from 2021, AI has the potential to greatly cut down on carbon emissions in supply chains by providing detailed information about your business's environmental   impact.
Meanwhile, AI can supply you with information that can help you save money and speed up the transition to sustainability. Additional findings from the study indicate that emissions of greenhouse gases can be cut by 5 to 10% through the usage of AI technology. Artificial intelligence (AI) technologies can monitor carbon emissions across the supply chain and make sure businesses are following ESG guidelines and sustainability initiatives, says ARS TECHNICA [9].

How Does AI Impact Sustainable Procurement and Supplier Selection?

Green procurement, as defined by Procurement Tactics, incorporates environmental, social, and governance considerations into a company's purchasing and supply chain practices. Put simply, it's the process by which your company determines the environmental, social, and governance-related factors in the supply chain, takes measures to lessen their impact, and ultimately improves operations while reducing risks. Supply chain partners with a tangible dedication to sustainable practices should be prioritized by enterprises in the network, according to a behavioral study published by Science Direct. To succeed in the long run, you can use certain economic frameworks and mathematical models. According to GEP, AI is revolutionizing procurement processes in every way: by automating mundane chores, improving decision-making, deciphering complicated datasets, and providing actionable insights.

AI systems can sift through mountains of data, uncover patterns, and draw conclusions, as pointed out by McKinsey. This helps businesses get insight into their operations and better understand their relationships. The PROCHE asserts that businesses can benefit from machine learning algorithms by analyzing supplier data to find the best fit for their needs. Forecasting supplier performance, identifying hazards, and providing insights that might help you decrease issues and optimize operations are all made possible by AI's mathematical models and predictive analysis [10].
According to the research, AI employs sophisticated systems and algorithms to lessen the likelihood of human mistake while choosing suppliers. Reason being, AI can do mundane jobs more efficiently and gives a more unbiased evaluation of vendors. The goal is to make sure the selection process is open and trustworthy while also eliminating any potential for prejudice.

How to Use AI for Real-Time Supply Chain Performance?

This company cannot function without supply chain performance data in real-time. When you have solid knowledge, you can make quick decisions that can change course in response to the unpredictable business world. After that, the happiness of the clientele is considered. In today's fast-paced world, customers demand nothing less than prompt deliveries and efficient remedies. You can gracefully address any problems that arise and make sure orders get at their destinations on time if you have access to information in real-time. Customers will grow loyal and trusting as a result. Efficiency is also given top priority. You can streamline operations, cut down on waste, and find ways to save money by seeing your supply chain in real time. As a result, you'll have a leg up in the market thanks to a more efficient and lucrative operation. Managers of risks must not be overlooked. You may identify any interruptions, such transportation delays, supplier bottlenecks, or even geopolitical concerns, by keeping an eye on your supply chain in real-time. The ability to teach AI algorithms to respond to unexpected events and use data sets to make better judgments allows AI to optimize a company's supply chain performance in real-time, according to a BCG study [11].

The Rise of AI in Supplier Management

There has been a substantial improvement in the last 20 years in the retail and consumer packaged goods industries' approaches to risk management and supplier selection. The old adage about selecting the cheapest supplier is no longer true; instead, we look for companies that rank high on ESG (environmental, social, and governance) scorecards in addition to cost-effectiveness and customer happiness. Companies now look closely at their suppliers and worldwide supply chains because of the pandemic, geopolitical conflicts, and climate change, among other external concerns. Improving supplier risk management is essential because billions of dollars are at stake. Although it is a great concept, most firms have not been able to implement supplier risk management because it is either too costly or lacks sufficient coverage [12]. Introducing AI: Cutting-edge tech is reshaping supplier selection and risk management, providing innovative, proactive solutions to supply chain difficulties in the modern day.

AI across the Supplier Selection Lifecycle

Starting with initial profiling and continuing with continual performance evaluation, AI is transforming supplier selection and risk management throughout the lifecycle. In light of the current circumstances that companies encounter, let us delve into its practical applications.

The time required to find the proper suppliers can be cut in half or more by using AI and other new technologies, says McKinsey3. Data on supplier performance, market trends, and risk indicators are just a few examples of the mountains of data that AI algorithms can sift through. When compared to more conventional approaches, AI's insights and recommendations for supplier selection and risk assessment are significantly quicker, thanks to its use of big language models, ML, and predictive analytics. Making quick and well-informed decisions relies on this speed to value. Unilever4 uses AI to find other suppliers quickly. The system searches the web for information on suppliers' financial health, reviews from customers, sustainability ratings, diversity indicators, details about their intellectual property (such as patents and design awards), and U.S. customs records. By collecting all of this information, Unilever can quickly come up with a list of possible new suppliers, guaranteeing that their supply chain will remain operational no matter what. By examining financial data, performance metrics, compliance data and certificates, and supplier profiles, AI may automate a major portion of the supplier evaluation and qualifying process. Instead of doing risk assessments at discrete intervals, AI-powered analytics tools can integrate several supplier data sets and, most importantly, monitor evolving conditions. As a result, businesses are better equipped to choose trustworthy vendors and adapt quickly to shifting supplier risk profiles. Rather of relying on aggregate spending and broad purchase categories, Koch Industries5 optimizes its supplier base with an AI-powered solution that analyzes detailed data at the Stock-keeping Unit (SKU) level. To reduce the need for time-consuming Requests for Quotes (RFQs), this tool consumes large datasets such as supplier information, purchase orders, invoices, and failed quotes from the past. It then provides detailed insights into qualified suppliers and finds backup options within the current supplier network [13].

LITERATURE REVIEW

Any system that can solve problems, represent knowledge, reason, plan, learn, perceive (including computer vision), act (like in robotics), process natural language, and communicate is considered "AI-enabled" in this context. According to this explanation, AI can improve systems' capacity to carry out activities that normally demand for cognitive processes similar to those of humans by adding a wide variety of capabilities. "Prediction, automated reasoning, clustering, decision-making, decision support, and optimization" were listed as the most commonly used AI skills in relation to supply chain resilience and AI in [14]. Recent developments in AI-integrated technology include robotics, blockchain, the IoT, big data analytics, decision support systems, etc., all with the goal of achieving sustainability. Machine learning, fuzzy logic, deep reinforcement learning, genetic algorithms, gene expression programming, artificial neural networks, Bayesian networks XGBoost, and other AI-related methods are also part of SSCM. These technologies are not limited to only these areas, though. By disseminating information to create sustainable value, SSCM is able to offer information and services thanks to these AI skills and functions. There is a connection between resource-based theory and AI capacity. According to the definition provided in [15], AI competency is "the ability of a firm to select, orchestrate, and leverage its AI-specific resources," which leads to improved innovation and efficiency within an organization. The e-commerce industry is only one of several that has been impacted by the widespread adoption of artificial intelligence (AI) in recent years. Artificial intelligence (AI) has enormous potential to revolutionize Supplier Relationship Management (SRM) by facilitating better decision-making, streamlining operations, and increasing efficiency. Supply chain management (SRM) is crucial for e-commerce platforms to guarantee on-time product deliveries, smooth operations, and a competitive edge. Thanks to advancements in AI, SRM is now able to optimize supplier contacts and strategic decision-making through the use of big data analytics, machine learning algorithms, and predictive modeling, going beyond traditional methodologies. Thanks to new technologies and shifting customer habits, the e-commerce scene has changed drastically in recent years. Keeping product quality high, keeping up with ever-changing customer demands, and managing varied supplier networks are all complex challenges that modern e-commerce platforms must overcome [16].

Businesses are increasingly looking to AI-driven solutions for supply chain management as traditional approaches fail to keep up with these issues. AI's real-time data analysis, demand pattern forecasting, and task automation capabilities are vital for e-commerce platforms to achieve operational excellence and sustainable growth. Strategic insights and competitive differentiation are two other areas where AI plays an important role in SRM, in addition to operational efficiency. With the help of AI, e-commerce platforms can sift through mountains of data produced by supplier relationships, industry trends, and consumer preferences to make smart decisions that boost profits and delight customers. For instance, proactive supplier management tactics that reduce inventory costs and stockouts are made possible by AI-powered predictive analytics, which can foresee shifts in demand [17]. Artificial intelligence also makes it easier to create tailored strategies for engaging suppliers, which improves teamwork and cultivates the kind of long-term partnerships that are crucial to a company's survival in the cutthroat world of online retail. Thanks to recent developments in AI, even small businesses now have access to high-tech resources that were previously reserved for huge corporations. Now, even small and medium-sized e-commerce companies may compete with industry giants by using AI-driven SRM solutions. Because of this democratization, market dynamics are improved, innovation is encouraged, and a climate is created where quick, data-driven decisions are the rule rather than the exception. Research and development activities focused on boosting supply chain resilience and efficiency are increasingly centered around AI and its potential to alter SRM in e-commerce. It is impossible to ignore the moral consequences of using AI in SRM.

Challenges and obstacles in achieving carbon neutrality through supply chain management
Many different parties, including manufacturers, suppliers, shipping companies, and retailers, must work together to achieve carbon neutrality through supply chain management. More and more people are concerned about climate change and want to do their part to reduce emissions of carbon, but there are still a lot of problems that make it hard to get to zero emissions. Listed below are a few of the most formidable difficulties.

Limited control or lack of visibility over the supply chain
Due to a lack of oversight and control over their whole supply chain, many organizations find it difficult to reach carbon neutrality. It is challenging to monitor emissions and guarantee adherence to carbon reduction targets when the supply chain consists of several levels of suppliers and subcontractors. To make matters more complicated, there is no uniformity in the accounting and reporting of emissions throughout the supply chain. In order to reduce emissions effectively, businesses may lack access to all the data needed to make educated decisions. The lack of oversight and control over a company's supply chain makes it hard to monitor emissions and guarantee compliance, which in turn makes it difficult for the company to achieve carbon neutrality. Complicating matters further is the fact that there is no uniformity in the accounting and reporting of emissions throughout the supply chain. Setting aggressive decarbonization targets is made more difficult by relying too much on secondary data as well as on suppliers' and customers' inadequate or inaccurate data. It is not easy to identify ecologically relevant industries and clusters for Green SCM, especially when dealing with complex supply chain networks. Companies and their suppliers can work together to collect data, set uniform reporting standards, and increase transparency in order to tackle these concerns and ensure future sustainability and resilience.
As part of a larger movement towards digital transformation in supply chain management, the incorporation of Artificial Intelligence (AI) into e-commerce Supplier Relationship Management (SRM) has recently attracted a lot of attention. With the use of artificial intelligence (AI), supply chain relationship management (SRM) may optimize its operations and gain a competitive edge in the ever-changing e-commerce market. AI can improve supplier selection, performance evaluation, and relationship nurturing. By utilizing powerful analytics and machine learning algorithms, AI has completely transformed the way organizations pick and onboard suppliers. This allows them to find and work with suppliers that perfectly match their operational needs and organizational goals. Manual evaluations and performance records were the mainstays of supplier selection in the past, but they were both subjective and time-consuming. On the other hand, artificial intelligence allows e-commerce platforms to assess suppliers' skills according to predetermined standards, forecast their performance more accurately, and analyze massive datasets in real-time. In times of unpredictable market conditions, this predictive skill becomes even more important for reducing risks in the supply chain and maintaining product availability. In addition, optimising inventory management tactics and demand pattern forecasts are also greatly assisted by AI-driven predictive analytics.

Financial constraints
Many businesses are unable to achieve their carbon neutrality objectives due to the high cost of implementing supply chain-wide carbon reduction measures. There may be expenses associated with the shift, such as the purchase of new technology and infrastructure, the cost of education and training, and the possibility of interruptions to the supply chain [20]. Companies whose supply chains are located in areas with lax carbon legislation or insufficient renewable energy infrastructure may also find the price of carbon reduction strategies to be higher. Renewable energy, energy-efficient technology, and low-carbon materials are carbon-reduction levers that companies must identify and invest in if they want to make the shift to a zero-carbon value chain. Prioritizing investments can be difficult due to the high level of uncertainty surrounding the cost and technical

feasibility of these levers. Stakeholder motivation may be impacted by the gradual growth in green management expenses, notwithstanding the adoption of solutions to reduce emissions.

It is challenging for retailers to adopt effective ways for reducing emissions because they must balance the costs of storing, transportation, and carbon emissions. Members of the supply chain face an even greater obstacle in executing effective initiatives to reduce emissions: rising operational costs. According to a new survey, the high initial investment required to achieve carbon neutrality is the main reason why companies are hesitant to make the switch. Since upgrading machinery and cars to minimize emissions requires substantial investments, this financial barrier is reasonable. Renewable energy generation also necessitates a large financial outlay. Regardless, if they have the capital, most businesses are still hopeful about the ROI they could get. Companies can only get around this problem by thinking about carbon neutrality in the long term and investing in sustainable practices, which can be expensive up front but pay for themselves in the end. Businesses can also look at government incentives and partnerships as potential sources of funding for these kinds of projects. Some businesses and sectors might not have the necessary operational capability or technological knowledge to reach carbon neutrality.

Continuous risk assessment and monitoring is one area where AI has made a big splash in supplier risk management. Artificial intelligence (AI) allows for the real-time tracking of supplier performance, market circumstances, and any external factors influencing the supply chain. AI-powered risk monitoring systems of the future outperform their predecessors by thoroughly assessing suppliers' risk profiles taking into account operational complexities, financial stability, cybersecurity concerns, and recent occurrences. Using predictive analytics, AI can spot impending dangers like natural disasters or geopolitical unrest, and then alert businesses in a timely manner. Commodity shortages are one example of how a supplier's proximity to war zones, such as Russia or Ukraine, might interrupt supply chains. Effective risk mitigation is possible with the use of AI's real-time monitoring and early warning systems.

Another case in point is how WNS improved supply chain management in conjunction with a frozen food industry leader by using an AI-driven 360-degree and continuous risk intelligence platform. The organization was able to proactively adjust to market demands, reduce risks, and simplify the supplier network all thanks to this cutting-edge technology. A strong and adaptable supply chain, able to handle different obstacles with ease and maximize performance, was guaranteed by the platform's all-encompassing strategy. Virtual assistants and chatbots powered by artificial intelligence may handle regular supplier inquiries, communication, and problem resolution much more efficiently. Human resources can now focus on value-added tasks and cultivating strategic connections with suppliers, thanks to this automation. While self-service portals have been a lifesaver for category and risk managers in terms of on-demand supplier data, the addition of AI chatbots enables more targeted and detailed research, thereby improving supplier management. Twenty percent of Walmart's spending on low-value items comes from "tail-end" vendors; to automate discussions with these suppliers, the retail giant uses chatbots driven by artificial intelligence. Because this AI-driven method handles negotiations that would normally take a lot of time and energy from human workers, the procurement process is streamlined and made more efficient.

Supply Chain Optimization

By taking into account variables such as supplier capabilities, lead times, transportation costs, and demand changes, AI algorithms can optimize supply chain networks. Companies can benefit from AI's ability to analyze past data and simulate various situations when it comes to supplier selection and inventory management. As an example, Home Depot rented a container ship in 2021 to get around shipping delays caused by the pandemic and still have everything delivered in time for the holidays. Supply chain resilience can be greatly improved through this kind of strategic decision-making with the help of AI-driven scenario analysis. The Home Depot is now improving supply chain efficiency and inventory management operations by using cloud-based Google AI technologies like Gen AI, computer vision, and ML.

Making It Happen

It may appear like AI is all the rage in the retail and consumer goods industries, but really putting it into practice in procurement and the supply chain may be quite challenging. To maximize the benefits of AI in supplier selection and management, it is important to keep in mind the following:

01. Establish a Solid Data Foundation for AI

Accurate predictions and judgments are made by AI algorithms with the help of high-quality data. False judgments caused by out-of-date or conflicting data can diminish AI's usefulness. Making sure AI has access to complete and correct data requires data integration, scalable data lakes, and solid data governance. Companies that have been around for a while, have established Centers of Excellence, and prioritize procurement innovation usually have good data. But the fast-paced nature of change and the prevalence of fragmented processes make life difficult for many SMEs.

02. Continually Invest in AI Training

Artificial intelligence systems have limitations due to their reliance on training data and lack of real-world knowledge. If the input data is biased, incomplete, or obsolete, the dependability of their findings can be affected. Improving the quality of insights requires investing in training AI models to increase their prediction

skills. This will ensure that the insights generated are relevant and useful. Equally important is educating workers on how to make good use of AI technologies.

03. Find the Right Solutions

Getting next-gen functionality is a challenge for any retail or consumer goods company, and the answer is a nuanced take on the age-old "make or buy" dilemma. The current estate is typically the starting point, and the majority of top supplier management platforms are incorporating AI into their services [27]. Additionally, there is an ever-expanding array of ProcureTech and associated point solutions, such as those that offer vendor scanning, risk management, contract analysis, and more, all powered by artificial intelligence. Last but not least, there's room to implement in-house features that make use of growing team strengths in areas like sentiment analysis, Gen AI, and machine learning. The organization's goals, current investments, and ability to access newer technology will determine the best sources for AI functionality.

04. Integrate with Human Expertise

In all the excitement about AI and ML getting smarter and smarter, we must not lose sight of the fact that AI systems need human supervision in order to function properly. Experts are needed to verify the accuracy of AI assessments and make practical recommendations based on the results. For risk assessments, for instance, human approval is essential for taking into account and correctly interpreting all relevant aspects.

Looking Ahead

With the help of AI, consumer goods and retail businesses may improve their data-driven decision-making, supplier selection, risk mitigation, relationship management, and supply chain resilience. Future supplier risk management in these sectors will be driven by the combination of AI with human expertise, which will be crucial as AI develops. Along with technology improvements, the supplier management workforce will experience a dramatic shift in the character of their work. There will be a significant decrease in manual labor, and increased access to rich, real-time knowledge regarding supplier capabilities and risk will be made possible. Analysis and action based on these insights are required. Artificial intelligence will revolutionize the capabilities of supplier management and change the way professionals in the field are expected to do their jobs.

METHODOLOGY

The use of artificial intelligence in supply chain management requires a comprehensive and open investigation. Because it includes articles from a wide variety of disciplines, the Web of Science database is ideal for this research. A comprehensive search can be assured with a well-planned strategy. This method searches for publications pertaining to AI and supply chain management by utilizing pertinent keywords, phrases, and Boolean operators. A date range will be used to narrow the search so that only recent and relevant studies are included. Access to peer-reviewed articles published in reputable journals will be made available through the secure Web of Science. The use of inclusion and exclusion criteria allows for a precise and comprehensive selection of articles. Articles should center on artificial intelligence (AI) in SCM, be published in reputable publications, and undergo peer review. Comprehensive articles will cover numerous sectors and areas. Publications that have not been peer-reviewed, as well as editorials and conference papers, are not eligible for inclusion. Items that fall outside of the specified time frame will be removed in order to maintain relevancy. To select articles, we will apply the PRISMA method. Transparency, reproducibility, and standards for systematic reviews are all ensured by this approach.

After reviewing the titles and abstracts of articles to identify those that meet the inclusion criteria, duplicates will be removed. The full texts of selected papers will be examined to make sure they align with the research goals and meet the inclusion criteria. This step involves retrieving information such as author names, publication details, key findings, and methods. In order to guarantee the reliability of the results, quality evaluation will verify the rigor of each piece. Lastly, in order to have a better understanding of the AI applications in supply chain management, the synthesis data from the chosen publications will be analyzed thematically. Using the PRISMA framework and systematic approach, this study aims to lessen the impact of bias, strengthen the reliability of the reviews, and prepare the way for discussing and analyzing the results.

Others who took part in the discussion brought out the difficulties of incorporating AI into preexisting IT systems and legacy infrastructures. Problems with integrating and deploying AI technologies in diverse IT environments are a common obstacle for many e-commerce companies. Participants emphasized the significance of overcoming technological obstacles and maximizing the value of AI in SRM by investing in scalable AI infrastructure, interoperable systems, and cross-functional collaboration. Important factors to consider while adopting and implementing AI-driven SRM solutions include data protection, cybersecurity, and regulatory compliance. Cultural and organizational aspects impacting the use of AI in supply chain risk management were also illuminated by the study. In order to successfully integrate AI technology and cultivate a culture of innovation, participants highlighted the significance of leadership's commitment, change management techniques, and workforce upskilling efforts. To overcome certain obstacles, such as organizational resistance to change, concerns about job loss, and the necessity of stakeholder buy-in, proactive management and strategic communication are necessary. In sum, the results demonstrated that artificial

intelligence (AI) is having a revolutionary effect on supply chain management (SRM) in the e-commerce industry, opening up vast possibilities to boost supply chain efficiency, optimize relationships with suppliers, and generate competitive advantage. Nevertheless, in order to fully utilize AI in supply chain risk management, it is necessary to prioritize openness, accountability, and responsible AI deployment techniques while also tackling technical, ethical, and organizational obstacles. With the ever-changing digital world of e-commerce, the incorporation of AI into SRM signifies a significant change towards supply chain management methods that are more nimble and data-driven. This change has the potential to define the future of the industry.

1. Database Selection and Rationale
Scholarly articles for this study were retrieved using the well-known Web of Science database, which is noted for its comprehensive indexing across several domains. The research relies on high-quality, peer-reviewed scientific articles, which are available through Web of Science.

2. Search Strategy Development
To ensure an inclusive and targeted retrieval of articles, a structured search strategy was developed:
● **Keywords and Boolean Operators**: Keywords such as "Artificial Intelligence," "AI," "Supply Chain Management," "Supplier Selection," and "Performance Monitoring" were identified. Boolean operators (AND, OR) were used to refine the search, targeting studies that focus on the intersection of AI applications in supply chain management.
● **Date Range**: The search was restricted to a date range covering the most recent decade (e.g., 2013-2022) to capture emerging trends and innovations in AI applications within the supply chain domain.
● **Filters**: Only peer-reviewed journal articles were selected to ensure data quality, excluding conference abstracts, editorials, and non-peer-reviewed publications.

3. Inclusion and Exclusion Criteria
● **Inclusion**: Articles focusing on AI within supply chain management, specifically in supplier selection and performance monitoring, were included. Studies spanning various industries and regions were considered to provide comprehensive insights.
● **Exclusion**: Publications outside the specified date range, non-peer-reviewed articles, and studies lacking direct relevance to AI and supply chain management were excluded.

4. Screening and Selection Process Using PRISMA
The PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) methodology was applied to ensure rigorous and transparent selection:
● **Initial Screening**: Titles and abstracts were screened to identify studies meeting inclusion criteria. Duplicates were removed to ensure unique study data.
● **Full-Text Review**: Full texts of eligible studies were reviewed, ensuring alignment with research objectives and inclusion criteria.
● **Data Extraction**: Information such as authorship, publication details, methodologies, and major findings were recorded.
● **Quality Assessment**: Each article underwent a quality evaluation, assessing rigor and reliability to maintain the dependability of findings.

5. Data Analysis and Synthesis
The extracted data were thematically analyzed to understand AI's role in supplier selection and performance monitoring:
● **Thematic Analysis**: Themes and patterns were identified, focusing on AI's capabilities in improving supplier selection and monitoring performance.
● **Data Visualization**: Quantitative data was represented through graphs and charts to visually communicate the findings.
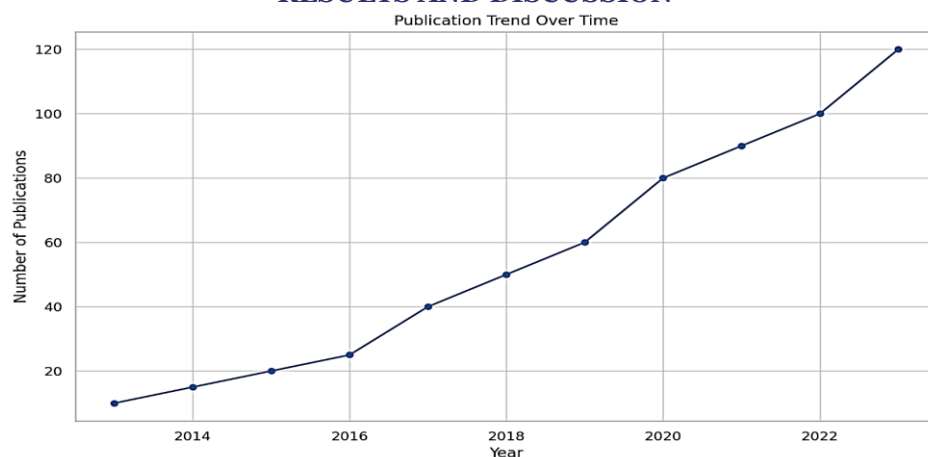
RESULTS AND DISCUSSION

Fig 1: Publication Trend Over Time

Figure 1 shows a line graph illustrating trends in AI-related publications for supply chain management. This visual will highlight the growth in research interest and the surge in studies post-2015.
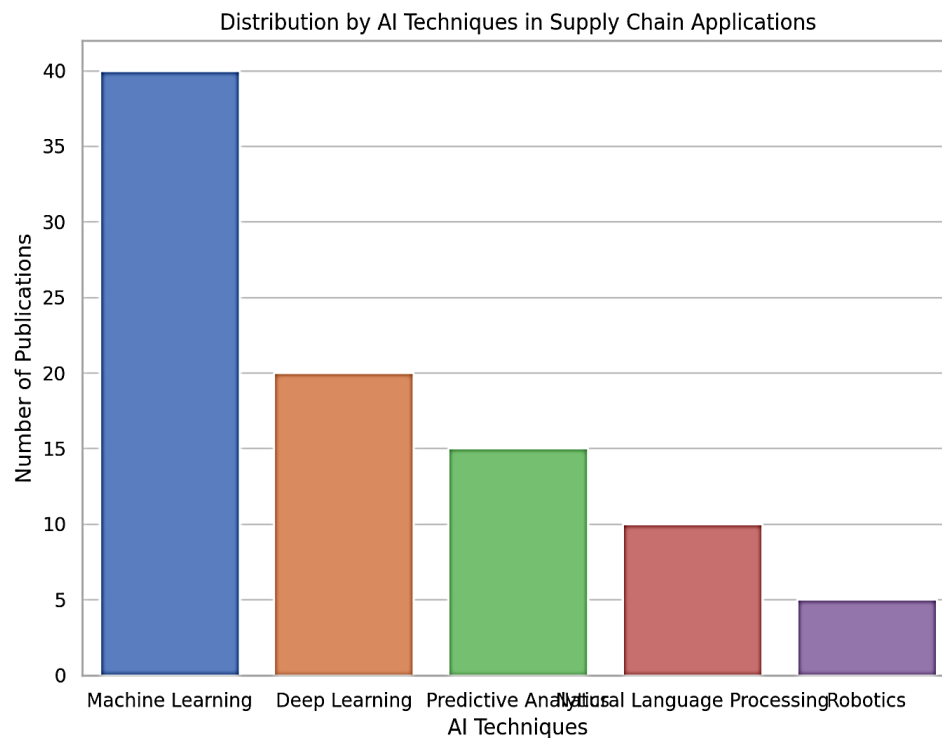

Fig 2: Distribution by AI Techniques in Supply Chain Applications

Figure 2 shows the specific AI techniques (e.g., machine learning, deep learning, predictive analytics) used in supplier selection and performance monitoring. It will provide insights into which methods are most commonly applied in supply chain management.
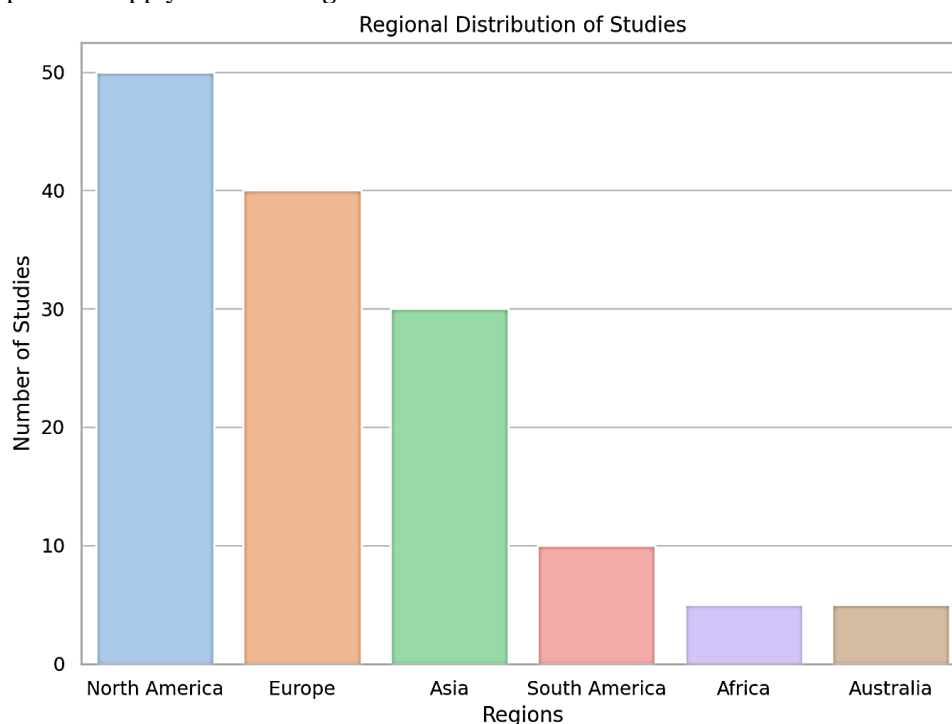
Fig 3: Regional Distribution of Studies

Figure 3 shows the geographical spread of AI applications in supply chain management research, highlighting regions where AI-driven supplier selection and monitoring are most actively researched.
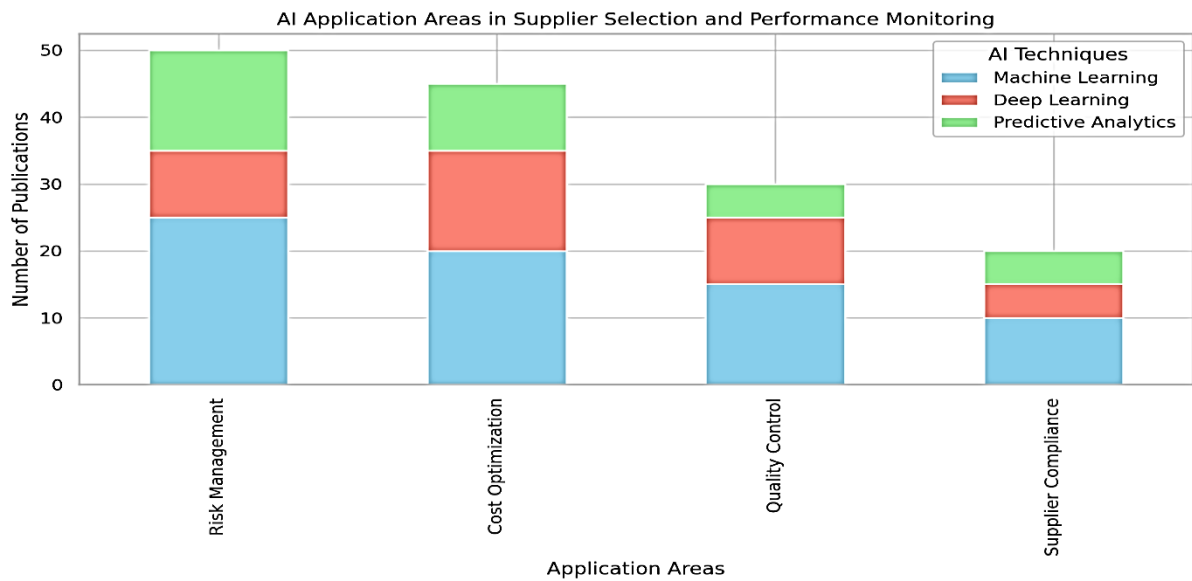
Fig 4: AI Application Areas in Supplier Selection and Performance Monitoring

This figure 4 illustrates various application areas (e.g., risk management, cost optimization, quality control) of AI within supplier selection and performance monitoring. Each bar could represent a different application area, with sections showing the types of AI methods used.
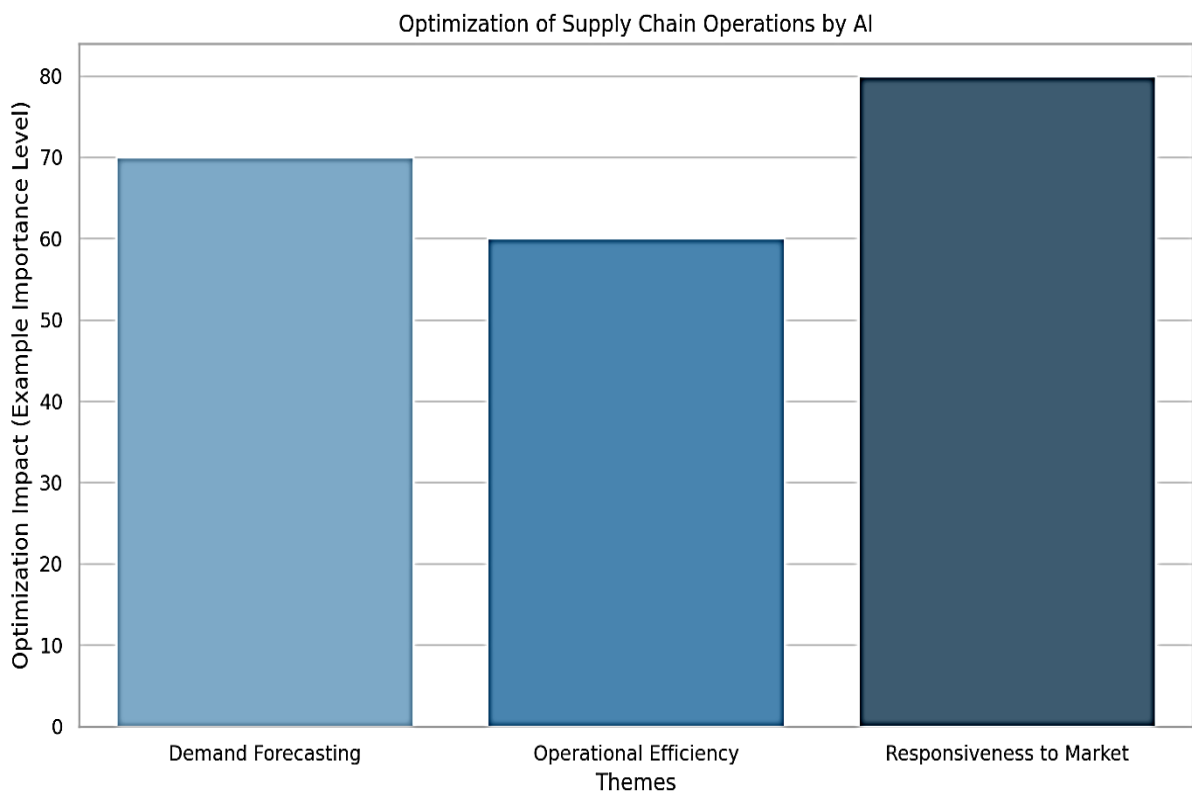

Fig 5: Optimization of Supply Chain Operations by AI.

Figure 5 shows bar chart represents the relative importance of AI's impact across three key supply chain optimization themes: demand forecasting, operational efficiency, and responsiveness to market. Demand forecasting and responsiveness to market are shown to have the highest impact, highlighting the critical role of AI in predicting consumer trends and responding proactively to market shifts. Operational efficiency, while slightly lower in importance, remains significant, illustrating AI's contribution to streamlining processes and reducing inventory costs.
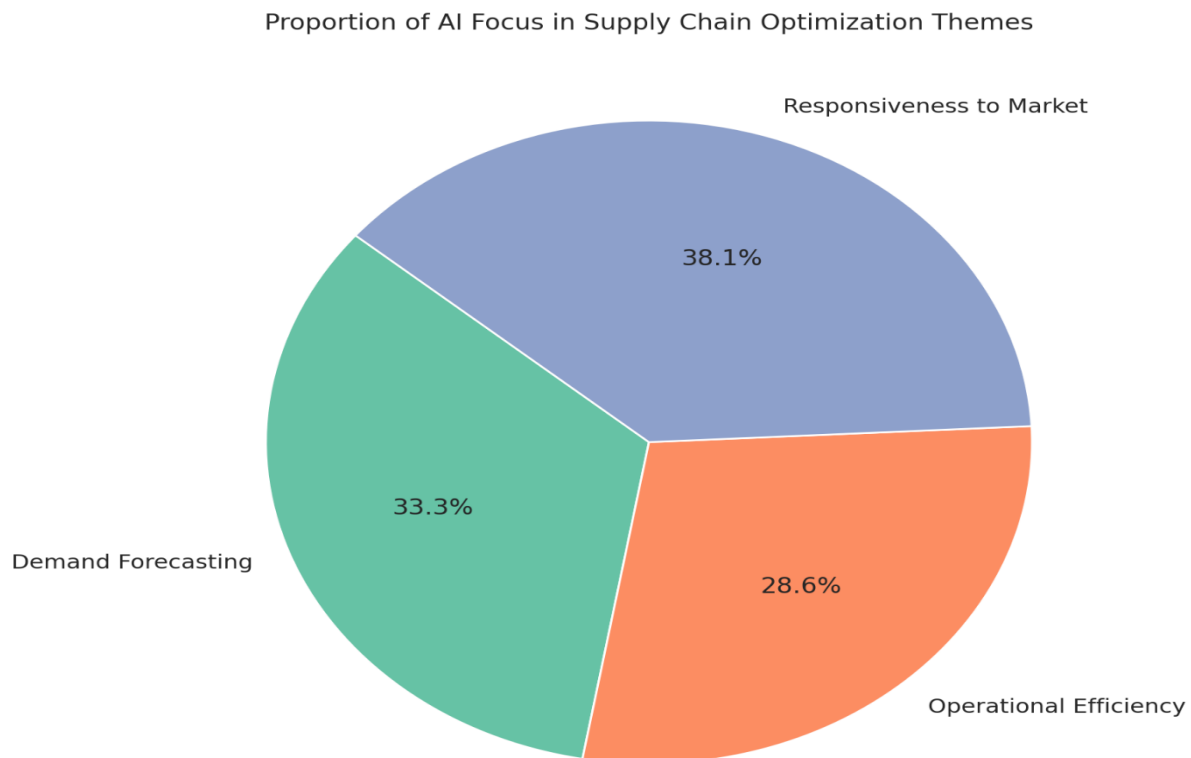
Proportion of AI Focus in Supply Chain Optimization Themes

Figure 6: Proportion of AI Focus in supply chain optimization themes.

The pie chart figure 6 provides a visual breakdown of the focus areas within supply chain optimization, emphasizing the proportions of AI's contributions to each theme. "Responsiveness to Market" holds the largest share, indicating that AI is heavily leveraged to improve supply chain adaptability to fluctuating demands. "Demand Forecasting" follows closely, showcasing AI's role in anticipating consumer needs, while "Operational Efficiency" represents a substantial portion, reflecting AI's impact on improving cost-effectiveness and process efficiency in supply chain operations.
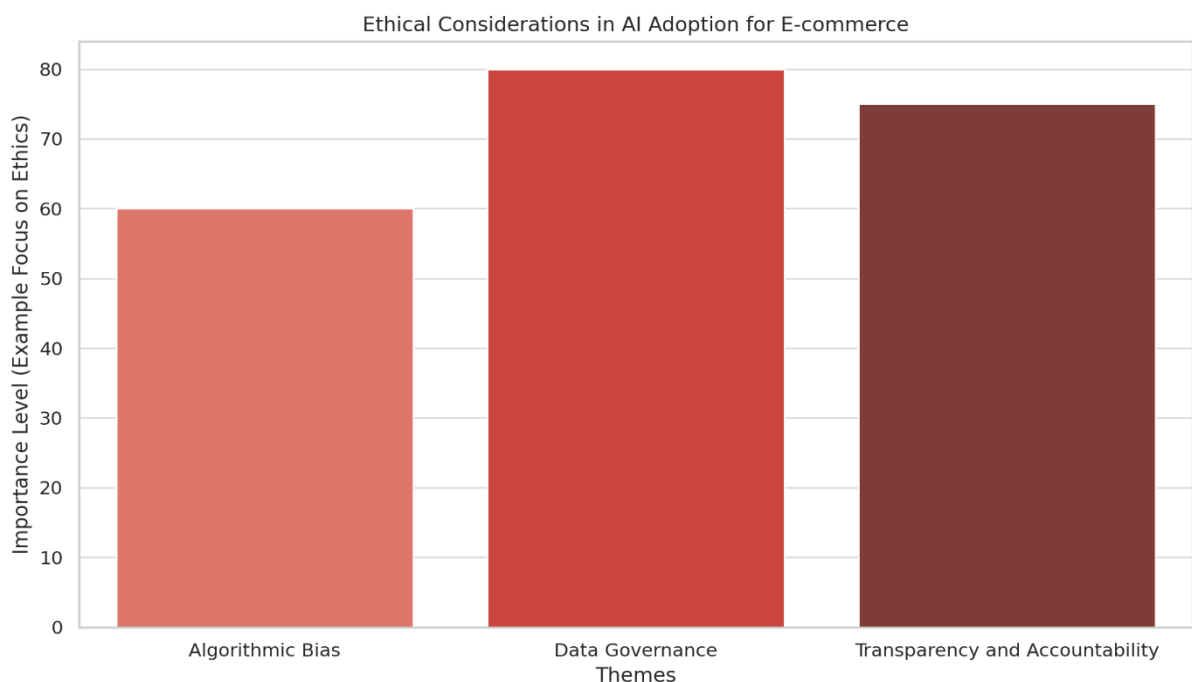

Fig 7: Ethical Considerations in AI Adoption for E-commerce.

This bar chart figure 7 shows the importance level of each ethical theme, with "Data Governance" receiving the highest focus. This emphasis highlights the priority of robust frameworks for data privacy, cybersecurity, and

compliance in e-commerce. "Transparency and Accountability" and "Algorithmic Bias" also show significant levels of focus, indicating the need for fair AI practices and responsible decision-making
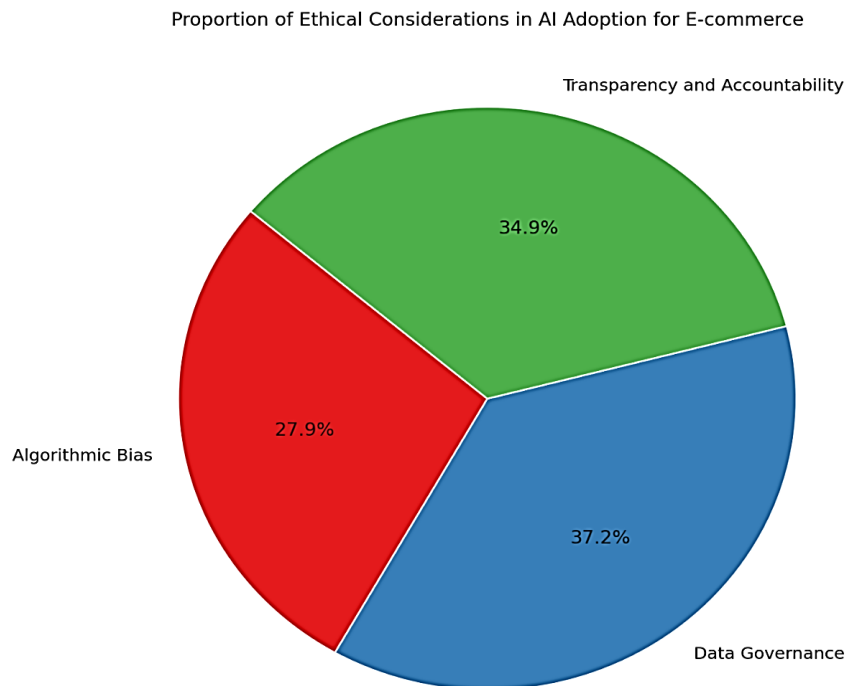
Proportion of Ethical Considerations in AI Adoption for E-commerce

Fig 8: Proportion of Ethical Considerations in AI Adoption for E-commerce.

The pie chart figure 8 provides a proportional view of the focus on each ethical consideration, with "Data Governance" taking the largest share, followed by "Transparency and Accountability" and "Algorithmic Bias." This distribution underscores the essential role of ethical governance and accountability practices in ensuring responsible AI use.

CONCLUSION

Important aspects of efficient supply chain management include using AI to choose suppliers and keep tabs on their performance. This study lays out a thorough framework for doing just that. The study adds to the expanding corpus of literature demonstrating AI's revolutionary potential in supply chains by employing a methodical and tight methodology. Machine learning, predictive analytics, and deep learning are the main AI applications that help with risk management, cost reduction, and compliance monitoring decisions. It appears that North America and Europe are where much of the research is focused, which could mean that AI is being recognized for its worth in supply chain management all over the world. The results demonstrate how AI may be used in various industries, proving that it can improve supplier monitoring and selection processes. A more nimble and well-informed supply chain can be the result of this study's contributions, which include a methodical framework for supply chain managers to use AI for peak performance. This qualitative study's results highlight how AI is revolutionizing SRM in the e-commerce industry. A big step forward in supply chain optimization has been artificial intelligence's capacity to improve supplier selection procedures via data-driven decision-making and predictive analytics. Artificial intelligence allows e-commerce platforms to better align supplier choices with strategic objectives and operational demands by improving the accuracy of supplier evaluations and eliminating risks related to supplier unpredictability. In addition to improving operational efficiency, this strategic alignment fortifies the supply chain's resilience and facilitates agility in responding to changes in the market and consumer needs. A more responsive and efficient supply chain is possible thanks in large part to AI-driven innovations in inventory management and demand forecasting.

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