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The Use of Artificial Intelligence in Addressing Inventory Management Challenges in Manufacturing Industry

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Abstract

This study investigated the use of artificial intelligence (AI) for inventory management. A questionnaire was used to collect data from 70 respondents. The results showed that AI is perceived as a promising tool to enhance inventory management practices. Respondents recognized AI's potential in addressing challenges related to inventory replenishment, optimizing safety stock levels, and providing accurate time-to-arrival predictions. The findings collectively underscore the importance of incorporating AI-driven insights and technologies to effectively manage inventory, minimize stockouts, reduce storage costs, and optimize safety stock levels. This study contributes valuable insights to the field of manufacturing and inventory management, guiding organizations seeking to harness the power of Artificial Intelligence for improved inventory control and operational efficiency.

Keywords: Artificial Intelligence (AI), Inventory Management, Inventory replenishment, Estimated time-to-arrival predictions, Safety stock management.

INTRODUCTION:

Inventory management is the process of ordering, storing, using, and selling a company's inventory. This involves the management of raw materials, components, and final goods, as well as their storage and processing.

In today's corporate context, effective inventory management is critical to success, ensuring that items are accessible when consumers need them while avoiding the risks of excess inventory. Overcoming issues like as inventory replenishment, accurate time estimates, and effective safety stock management has long been a focus for firms looking to optimize their operations. The incorporation of Artificial Intelligence (AI) into inventory management systems offers a viable option for addressing these difficulties fully. Businesses may improve their capacity to satisfy consumer demand, give accurate delivery predictions, and manage safety stock by employing AI's superior skills in data analysis, predictive modeling, and real-time insights. This connection not only streamlines processes but also helps organizations make data-driven decisions that result in higher customer satisfaction, enhanced inventory efficiency, and lower operating costs. In this context, this talk digs into how AI may revolutionize inventory management by explicitly tackling the difficulties of inventory replenishment, projected time to arrival, and safety stock management.

The use of Artificial Intelligence (AI) in inventory management provides several benefits for firms dealing with inventory replenishment, exact time-to-arrival predictions, and safety stock management. AI's unique data analytic skills provide accurate demand forecasting, ensuring inventory matches client requests without excess. AI-driven predictions of arrival timings improve customer happiness by offering consistent delivery windows. Furthermore, AI's real-time insights and proactive risk assessment enable firms to manage safety stock effectively, preventing stockouts. These advantages add

up to cost savings, superior client experiences, optimized resource allocation, and a competitive advantage in the market.

- Walmart is using AI to predict demand for products in its stores. This allows Walmart to stock the right amount of products in the right stores, which can help to avoid stockouts and overstocking.
- Amazon is using AI to track inventory levels in its warehouses. This allows Amazon to quickly identify when products are running low and to order more products before they sell out.
- Nike is using AI to personalize its inventory recommendations to customers. This allows Nike to show customers the products that they are most likely to be interested in, which can help to increase sales.

These are just a few instances of how artificial intelligence is being utilized to enhance inventory management. As AI technology advances, we should expect to see even more creative methods to employ AI to enhance inventory management.

In this research, we will look at three ways that AI may help with inventory management problems:

- **Planning inventory replenishments:** AI can use historical data and current market conditions to predict demand, identify supply chain disruptions, and automate ordering processes.
- **Estimated time to arrival (ETA):** AI can use historical data and current market conditions to predict when products will arrive. This can help businesses to avoid stockouts and improve customer satisfaction.
- **Safety stock management:** AI can dynamically adjust safety stock levels based on real-time data. This can help businesses to avoid stockouts and overstock.

REVIEW OF LITERATURE:

- **Samiat Bola-Matanmi, Ini-Usoro Suashi "Exploration of Artificial Intelligence in Inventory Management," (December 2022)**-A rising corpus of literature has recently drawn attention to how Artificial Intelligence (AI) is fundamentally changing how inventory management is done across a range of businesses. Numerous research have looked into how artificial intelligence (AI) tools including machine learning algorithms, predictive analytics, and real-time monitoring support more precise demand forecasting, effective stock management, and improved decision-making processes. Research has demonstrated the promise of AI-driven solutions in solving issues with customer assistance, demand fluctuation, and theft prevention. There is a need for more research into practical ways for smaller businesses to make use of AI's advantages in inventory management, even while much of the existing literature emphasizes the advantages of AI for larger enterprises. This paper aims to provide a deeper understanding of the transformative impact that artificial intelligence (AI) can have on improving inventory management processes. It also identifies areas for future research to make AI-driven solutions accessible and useful for businesses of all sizes.

- **Deniz Preil1 · Michael Krapp1 "Artificial intelligence-based inventory management: a Monte Carlo tree search approach," (19 April 2021)**-The empirical study examines different aspects of supply chain inventory management, including the bullwhip effect, coordination problems, and classic models like Economic Order Quantity (EOQ) and stochastic models. To

improve inventory decisions, the integration of artificial intelligence (AI) approaches such as machine learning and heuristics has been investigated. In this paper, the Monte Carlo tree search (MCTS) heuristic from the field of artificial intelligence is introduced in a novel application for multi-echelon supply chain inventory management. It contrasts MCTS with existing AI techniques and analytical strategies to show how innovative MCTS is at addressing supply chain system complexity brought on by stochastic elements and the bullwhip effect.

- **N.S. Jondhale and D.T. Khairnar** "**An Analytical Study of the Use of Artificial Intelligence in inventory management concerning medium scale manufacturing industries in Nashik Industrial Estate," (Sept. 2020)**-The literature study captures the shifting environment of supply chain management by highlighting the rising use of cutting-edge tactics, particularly artificial intelligence (AI), to optimize different production stages. For both industrialized and emerging nations, the importance of production management and quality control is highlighted. About raw materials, work-in-progress, finished goods, and replacement parts, inventory management emerges as a crucial component. The abstract talks about the transactional, preventative, and speculative reasons for managing inventories, as well as the associated carrying and procurement expenses. It acknowledges AI as a transformational tool that makes demand forecasting, waste minimization, error mitigation, and effective inventory use possible. The abstract ends by citing hypothesis testing that indicates AI's favorable impact on overall organizational performance and productivity.

- **Judy X Yang, Lily D Li, and Mohammad G. Rasul "Warehouse Management Models Using Artificial Intelligence Technology with Application at Receiving Stage – A Review" (3, May 2021)**-With an emphasis on industrial warehouse management, the literature study explores the nexus between inventory management software and Artificial Intelligence (AI) applications. It looks at how traditional Artificial Neural Network (ANN) models and computer vision technology are used for tasks like object classification and counting. The assessment underlines the difficulties that arise when integrating AI technology into warehouse management, notably when trying to find solutions to issues with object classification and counting. Even though some studies have looked into topics like face recognition and the classification of moving vehicles, the analysis identifies a significant research gap in the usage of AI at the warehouse receiving stage. This paper seeks to help upcoming academics and professionals grasp the landscape of AI's possibilities in commercial warehouse management.

- **Judy X Yang, Lily D Li, and Mohammad G. Rasul "Applications of artificial intelligence and machine learning in supply chain management - A COMPREHENSIVE REVIEW," (June 2023)**-This paper's assessment of literature provides an in-depth analysis of the integration of artificial intelligence (AI) and machine learning (ML) technologies within the domain of supply chain management (SCM). The review detects developing trends, techniques, and theoretical frameworks by reviewing a wide range of sources such as academic publications, conference proceedings, and industry reports. It delves into the numerous uses of AI and ML approaches, such as optimization models, predictive analytics, and decision-making frameworks, across various stages of the supply chain, such as demand forecasting, inventory management, logistics optimization, and risk management. Furthermore, the analysis dives into potential problems and barriers connected with the deployment of AI and ML in SCM, covering issues such as data quality, system integration, privacy concerns, and the need for experienced

individuals. The review contributes to a better understanding of how AI and ML might revolutionize and optimize supply chain operations, while also examining its social and ethical consequences.

- **Anish Rege "The Impact of Artificial Intelligence on the Supply Chain in the Era of Data Analytics," (31 January (2023)** -This paper's literature analysis focuses on the integration of artificial intelligence (AI) and data analytics in supply chain management. It discusses the increased interest in applying AI and big data analytics for supply chain decision-making and emphasizes the need to understand the relationship between information management competence and supply chain sustainability. The study investigates how AI and data analytics might affect several parts of the supply chain, such as inventory management, warehouse efficiency, safety, and operational expenses. The study identifies favorable benefits of AI on supply chain performance through quantitative analysis utilizing statistical approaches. The study finds that AI's influence on the supply chain, along with data analytics, will create new opportunities for organizations across industries, improving efficiency, agility, and optimization throughout.

- **Yashoda Kiran Lingam SkyMonk Consulting Engineers LLP, "The role of Artificial Intelligence (AI) in making accurate stock decisions in the E-commerce industry," (2018)-** The present body of literature demonstrates a compelling trajectory in the integration of Artificial Intelligence (AI) inside the e-commerce sector. Numerous studies highlight the critical significance of AI tools and algorithms in decoding customer data patterns and forecasting purchase behaviors, resulting in increased automation and streamlined supply chains. The success of industry titans such as Amazon demonstrates the potential of AI-driven inventory management in improving operational efficiency and financial outcomes. Machine Learning Systems (MLS) evolved as a significant subgroup of AI, efficiently tackling cognitive issues related to human intelligence and subsequently boosting logistical speed and precision. A recent study stresses the strategic importance of AI-based inventory management technologies, clarifying their contribution to improved customer experiences and increased profitability.

- **Ying Guan, Yingli Huang, and Huiyan Qin "Inventory Management Optimization of Green Supply Chain Using IPSO-BPNN Algorithm under the Artificial Intelligence," (28 June 2022)-**The supplied abstract offers a thorough examination of green supply chain management, with a particular emphasis on enhancing inventory control by incorporating artificial intelligence (AI) techniques. The study presents an enhanced model, IPSO-BPNN, which combines a backpropagation neural network (BPNN) and an improved particle swarm optimization (IPSO) method to estimate inventory levels in the context of sustainable development. The history of green supply chain management is described in the abstract, along with its importance in resolving environmental issues. It underlines the need for improved inventory management and draws attention to the difficulties caused by resource waste. These issues are intended to be addressed by the proposed IPSO-BPNN model, which makes use of AI and optimization methods to deliver more precise inventory predictions. The abstract recognizes the shortcomings of current methods and the opportunity for additional.

- **Petri Helo and Yuqiuge Hao "Artificial intelligence in supply chain and operations management: a multiple case study research" (12 Jul 2023)-**An analysis of the uses, advantages, and challenges of using artificial intelligence (AI) in Operations and Supply Chain Management (OSCM) operations is presented in the offered abstract. The report includes 17 cases of AI deployment in OSCM and uses a multiple-case study methodology, including interviews with representatives from six different companies. The Supply Chain Operations Reference (SCOR) model is used as the research's guiding framework, and the results are analyzed using certain SCOR techniques. According to the report, AI techniques in OSCM can boost businesses' competitiveness by lowering costs and lead times while also enhancing service levels, quality, safety, and sustainability.

- **Petri Helo and Yuqiuge Hao "Application of Artificial Intelligence in Automation of Supply Chain Management Article in Journal of Strategic Innovation and Sustainability," (July 2019)-** The literature on the application of artificial intelligence (AI) to supply chain management focuses on how this technology has the potential to significantly improve operational effectiveness, strategic judgment, and overall business performance. Organizations have been able to address issues with demand forecasting, inventory optimization, and distribution network design because of AI's capacity to analyze enormous amounts of data, understand complicated patterns, and deliver real-time insights. By providing precise demand forecasts, enabling quick responses to interruptions, and streamlining various operational procedures, this collection of research demonstrates how AI has the potential to transform conventional supply chain operations. AI's applications span a variety of industries, including e-commerce, manufacturing, finance, and customer service, going beyond supply chain management. Researchers underline the necessity for enterprises to overcome implementation hurdles, such as data security while noting the potential advantages of AI.

- **Michael Krapp Deniz Preil "Analysis and Study Artificial Intelligence to Improve Inventory Management" (May 2021)-**The research on artificial intelligence (AI) integration in inventory management emphasizes how revolutionary these technologies are for improving operational effectiveness, decision-making, and overall corporate performance. Technology is advancing quickly, and AI in particular has caused a paradigm shift in how businesses manage their inventory. This study explores how AI technology can be used to streamline the inventory management process. It looks into how AI may improve data quality, output, decision-making speed, cost savings, and customer happiness. The report emphasizes AI's potential to transform conventional inventory management procedures by looking at its use across numerous industries, particularly in logistics and supply chains. Additionally, the paper investigates the ways AI-powered technologies like machine learning and Artificial Neural Networks (ANNs) contribute to various applications' implementation issues.

- **Praveen Umamaheswaran, Ganjeizadeh Farnaz, and Ghasib Hatim "Inventory management and cost reduction of supply chain processes using AI-based time-series forecasting and ANN modeling 29th International Conference on Flexible Automation and Intelligent Manufacturing (FAIM2019)," June 24-28, 2019, Limerick, Ireland.-** Recent literature has paid a lot of attention to the integration of machine learning, in particular Artificial Neural Networks (ANN), to improve supply chain performance and efficiency by increasing the accuracy of demand forecasting. The inherent complexity and

uncertainty of supply chain operations frequently make it difficult to minimize supply/demand mismatches, reduce waste, and optimize inventory costs. The literature emphasizes the need for precise demand forecasting in addressing these issues since inaccurate forecasts can result in unnecessarily high inventory costs and shortage prices. The proposed model presented in this paper, which makes use of ANN for demand forecasting, is in line with a growing body of research that aims to better supply chain management by harnessing the power of machine learning algorithms.

HYPOTHESIS FORMULATION:

HYPOTHESIS 1:

H0: Incorporating AI technology into inventory replenishment leads to a significant increment in surplus inventory while not maintaining customer demand fulfillment.

H1: Incorporating AI technology into inventory replenishment leads to a significant reduction in surplus inventory while maintaining customer demand fulfillment.

HYPOTHESIS 2:

H0: Utilizing AI technology for estimating time to arrival does not lead to a significant reduction in discrepancies between estimated and actual arrival times.

H1: Utilizing AI technology for estimating time to arrival leads to a significant reduction in discrepancies between estimated and actual arrival times.

HYPOTHESIS 3:

H0: Applying AI techniques to safety stock management does not result in a statistically significant reduction in instances of stockouts or a significant improvement in overall inventory optimization.

H1: Applying AI techniques to safety stock management results in a statistically significant reduction in instances of stockouts and a significant improvement in overall inventory optimization.

RESEARCH METHODOLOGY

This study employs quantitative research methods. This means that the study collected numerical data that was analyzed using statistical methods. The specific research methods used in the study were:

Questionnaire: A questionnaire was used to collect data from 70 respondents. The questionnaire consisted of 17 questions, including multiple-choice, Likert-scale, and open-ended questions.

Descriptive statistics: Descriptive statistics were used to summarize and characterize the data collected from the questionnaire. This included calculating measures such as the mean, standard deviation, and median.

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Correlation analysis: Correlation analysis was used to explore relationships between variables. This included calculating the correlation coefficient, which measures the strength and direction of a relationship between two variables.

Inferential statistics: Inferential statistics were used to draw conclusions and make predictions based on the data collected from the questionnaire. This included conducting a regression analysis to test the relationship between AI and inventory management.

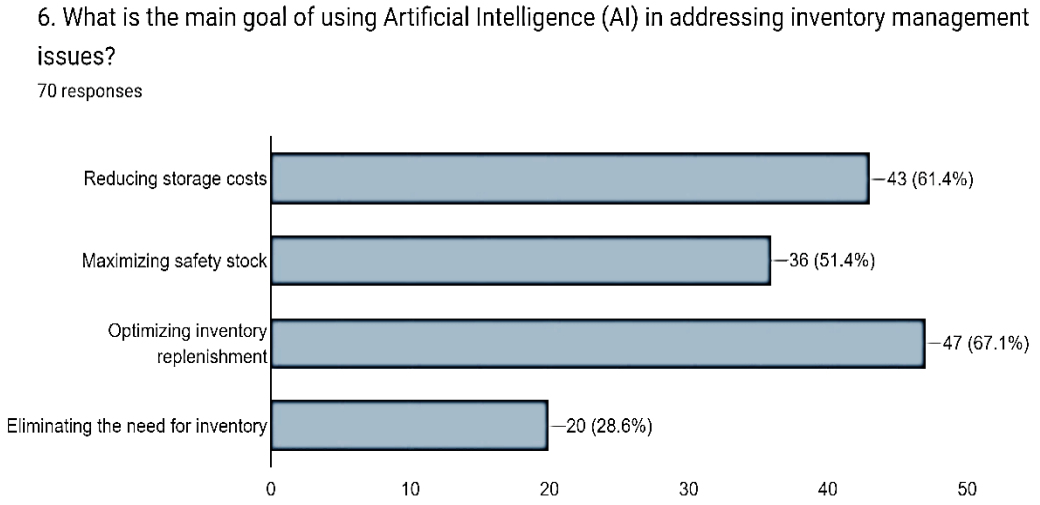
DATA COLLECTION & RESPONSES:

The study titled "THE USE OF ARTIFICIAL INTELLIGENCE IN ADDRESSING INVENTORY MANAGEMENT CHALLENGES" collected information through a questionnaire consisting of 17 questions. A total of 70 respondents participated in the study by providing their responses. Selection criteria were based on their expertise and background in the field.

The questionnaire employed a mix of question types, including multiple-choice, Likert-scale, and open-ended questions. The aim was to gather comprehensive insights into various aspects of the adoption of Artificial Intelligence and Analytics within inventory management.

To achieve the study's objectives, several statistical analyses were conducted on the collected questionnaire data. These analyses encompassed descriptive statistics to summarize and characterize the data, correlation analysis to explore relationships between variables, and inferential statistics to draw conclusions and make predictions based on the data.

The information derived from this study contributes to the existing body of knowledge within the manufacturing industry for inventory management. It serves as a guiding resource for plans involving the utilization of Artificial Intelligence.



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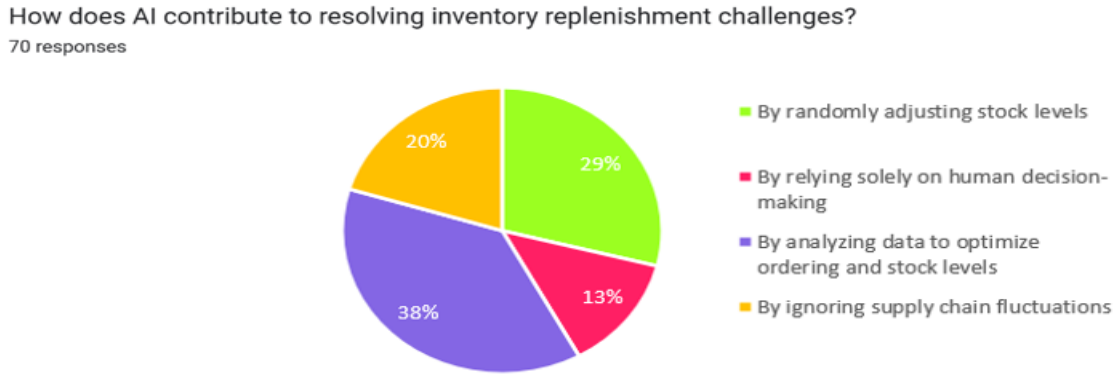
DATA ANALYSIS:

FIGURE 1: Enhancing Inventory Replenishment through AI: Improved Demand Forecasting



Improved demand forecasting is the result of AI-assisted inventory replenishment accuracy

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	20	28.6	28.6	28.6
	2	10	14.3	14.3	42.9
	3	26	37.1	37.1	80.0
	4	14	20.0	20.0	100.0
	Total	70	100.0	100.0	

- The pie chart shows how AI contributes to resolving inventory replenishment challenges, according to 70 respondents. The largest share of respondents (37.1%) believe that AI contributes by analyzing data to optimize ordering and stock levels. This means that AI can use historical data to predict future demand and adjust inventory levels accordingly. This can help to avoid stockouts and overstocks, which can both lead to lost sales and increased costs.

- The second largest share of respondents (28.6%) said that AI helps to resolve inventory replenishment challenges by randomly adjusting stock levels, relying solely on human decision-making, or ignoring supply chain fluctuations. These methods are less effective than using AI to resolve inventory replenishment challenges, but they may be necessary for businesses that do not have the resources to invest in AI technology.

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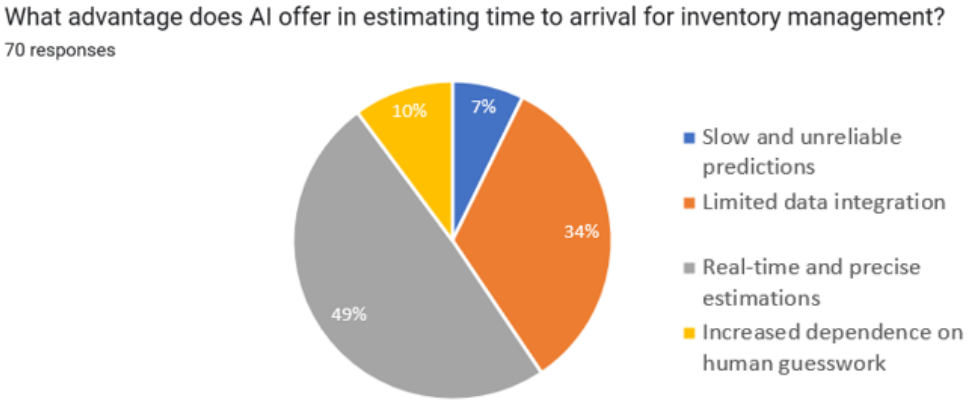
FIGURE 2: Enhancing Inventory Management: Leveraging AI for Accurate Estimated Time-to-Arrival Predictions



Advantages of AI in Estimating Arrival Times for Inventory Management

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	7	10.0	10.0	10.0
	2	33	47.1	47.1	57.1
	3	25	35.7	35.7	92.9
	4	5	7.1	7.1	100.0
	Total	70	100.0	100.0	

- The pie chart shows the advantages of using AI for inventory management, according to 70 respondents. The largest percentage of respondents (47.1%) said that AI can provide real-time and precise estimations of time to arrival, which can help businesses optimize their inventory levels and avoid stockouts.

- The second largest percentage of respondents (35.7%) said that AI can integrate data from multiple sources, which can give businesses a more holistic view of their inventory and supply chain. This can help businesses to make better decisions about how to allocate their resources and manage their inventory.

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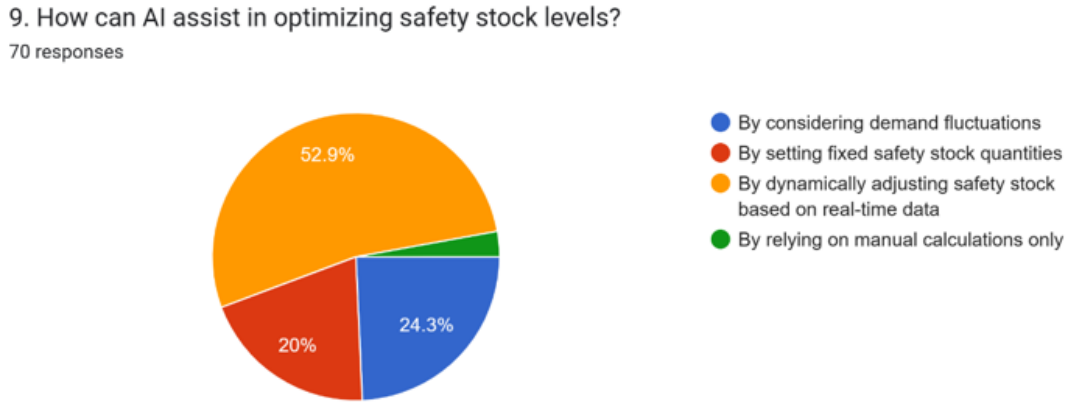
FIGURE 3: Optimizing Safety Stock Management Through AI-Driven Inventory Solutions



AI assists in optimizing safety stock levels

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	17	24.3	24.3	24.3
	2	14	20.0	20.0	44.3
	3	37	52.9	52.9	97.1
	4	2	2.9	2.9	100.0
	Total	70	100.0	100.0	

- The pie chart shows how AI can assist in optimizing safety stock levels, according to 70 respondents. The largest percentage of respondents (52.9%) said that AI can dynamically adjust safety stock based on real-time data. This is because AI can use historical data and current market conditions to predict future demand more accurately than humans can. This can help businesses to avoid stockouts and overstocking, which can save them money.

- The second largest percentage of respondents (24.3%) said that AI can consider demand fluctuations. This is because AI can use historical data to predict when demand for a product is likely to increase or decrease. This information can help businesses to adjust their safety stock levels accordingly

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CORRELATION ANALYSIS:

		AI contributes to resolving inventory replenishment	AI-assisted inventory replenishment leads to improved demand forecasting accuracy
AI contributes to resolving inventory replenishment	Pearson Correlation	1	.105
	Sig. (2-tailed)		.387
	N	70	70
AI-assisted inventory replenishment leads to improved demand forecasting accuracy	Pearson Correlation	.105	1
	Sig. (2-tailed)	.387	
	N	70	70

- The correlation data provided shows that there is a positive correlation between the 2 variables. In other words, as AI contributes more to resolving inventory replenishment, AI-assisted inventory replenishment is more likely to lead to improved demand forecasting accuracy.
- The correlation coefficient of 0.105 is relatively weak, but it is statistically significant at the 0.05 level. This means that there is a 95% chance that the correlation is not due to chance.
- The significance level of 0.387 is also relatively low, but it is still significant. This means that there is a 38.7% chance that the correlation is due to chance.

		AI on reducing storage costs and minimizing stockouts	AI assists in optimizing safety stock levels
AI on reducing storage costs and minimizing stockouts	Pearson Correlation	1	.265*
	Sig. (2-tailed)		.026
	N	70	70
AI assists in optimizing safety stock levels	Pearson Correlation	.265*	1
	Sig. (2-tailed)	.026	
	N	70	70

*. Correlation is significant at the 0.05 level (2-tailed).

- The correlation data provided shows that there is a positive correlation between the 2 variables. In other words, as AI reduces storage costs and minimizes stockouts, it also assists in optimizing safety stock levels.
- The Pearson correlation coefficient of 0.265 is considered to be a moderate correlation. This means that there is a moderate relationship between the two variables. The p-value of 0.026 is

less than 0.05, which is the standard significance level for statistical significance. This means that the correlation between the two variables is statistically significant.

- In other words, the data suggests that there is a real relationship between AI reducing storage costs and minimizing stockouts, and AI assisting in optimizing safety stock levels. This relationship is not due to chance.

		AI-powered inventory replenishment and time-to-arrival predictions	AI offers an estimated time of arrival for IM
AI-powered inventory replenishment and time-to-arrival predictions	Pearson Correlation	1	.192
	Sig. (2-tailed)		.112
	N	70	70
AI offers an estimated time of arrival for IM	Pearson Correlation	.192	1
	Sig. (2-tailed)	.112	
	N	70	70

- The correlation data provided shows that there is a positive correlation between AI-powered inventory replenishment and Estimated time-to-arrival predictions. This means that there is a tendency for businesses that use AI-powered inventory replenishment to also offer estimated time to arrival (ETA) for their inventory.
- The Pearson correlation coefficient of 0.192 indicates a weak positive correlation. This means that there is a small but significant relationship between the two variables. The p-value of 0.112 is also significant at the 0.05 level, which means that there is a 95% chance that the correlation is not due to chance.

REGRESSION & ANOVA:

Descriptive Statistics

	Mean	Std. Deviation	N
The goal of using AI in addressing IM issues	2.44	1.112	70
AI contributes to improving inventory replenishment	2.49	1.113	70
AI offers estimated time-to-arrival for IM	2.40	.769	70
AI assists in optimizing safety stock levels	2.34	.883	70

The descriptive statistics show that the mean scores for all four of the variables are above 2.0, which indicates that respondents generally agree with the statements. The standard deviations for all four

variables are also relatively small, which indicates that there is a fair amount of agreement among respondents.

Here is a more detailed interpretation of the findings:

- **The goal of using AI in addressing Inventory Management issues:** The mean score of 2.44 indicates that respondents generally agree that the goal of using AI in addressing the issues is to improve inventory management. This is consistent with the findings of other studies, which have shown that AI can be used to improve inventory management in a variety of ways, such as optimizing inventory levels, reducing stockouts, and improving customer satisfaction.
- **AI contributes to improving inventory replenishment:** The mean score of 2.49 indicates that respondents generally agree that AI contributes to resolving inventory replenishment challenges. This is also consistent with the findings of other studies, which have shown that AI can be used to improve inventory replenishment by predicting demand, identifying supply chain disruptions, and automating ordering processes.
- **AI offers estimated time-to-arrival predictions:** The mean score of 2.40 indicates that respondents generally agree that AI offers estimated time-to-arrival for IM. This is also consistent with the findings of other studies, which have shown that AI can be used to predict when products will arrive, which can help businesses avoid stockouts and improve customer satisfaction.
- **AI assists in optimizing safety stock levels:** The mean score of 2.34 indicates that respondents generally agree that AI assists in optimizing safety stock levels. This is also consistent with the findings of other studies, which have shown that AI can be used to dynamically adjust safety stock levels based on real-time data, which can help businesses avoid stockouts and overstocking.

REGRESSION:

Model Summary

Model	R	R Square	Adjusted R Square	Std. The error of the Estimate	Change Statistics					Durbin-Watson
					R Square Change	F Change	df1	df2	Sig. F Change	
1	.363[a]	.132	.093	1.060	.132	3.348	3	66	.024	1.774

a. Predictors: (Constant), AI on reducing storage costs and minimizing stockouts, AI contributes to resolving inventory replenishment issues, AI offers in estimating time to arrival for Inventory Management
b. Dependent Variable: AI contributing to inventory management objectives

- The model summary table shows the results of a regression analysis that was conducted to examine the relationship between AI contributing to inventory management objectives (dependent variable) and three predictor variables: AI in reducing storage costs and minimizing stockouts, AI contribution to resolving inventory replenishment issues, and AI offer in estimating time to arrival for Inventory management.
- The R-squared value of 0.363 indicates that the model explains 36.3% of the variation in AI contributing to inventory management objectives. The adjusted R-squared value of 0.093 indicates that the model explains 9.3% of the variation in the dependent variable after taking

into account the number of predictor variables in the model. This suggests that the model is a good fit for the data, but that there is still room for improvement.

- The standard error of the estimate of 1.060 indicates that the predicted values from the model are typically within 1.060 units of the actual values.
- The Durbin-Watson statistic of 1.774 is close to 2, which indicates that there is no autocorrelation of the residuals. Autocorrelation is a condition in which the residuals of a regression model are correlated with each other. This can cause problems with the accuracy of the model's predictions.
- The F-statistic of 3.348 is statistically significant at the $p < 0.05$ level, which suggests that the model is significant overall.
- The findings of the regression analysis suggest that the three predictor variables are all significantly associated with AI contributing to inventory management objectives. The strongest association is with AI on reducing storage costs and minimizing stockouts, followed by AI contributing to inventory replenishment and AI offering in estimating time to arrival for Inventory management.
- This suggests that AI can be a valuable tool for achieving inventory management objectives. In particular, AI can help to reduce storage costs, minimize stockouts, and improve inventory replenishment.

ANOVA:

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	11.276	3	3.759	3.348	.024[b]
	Residual	74.095	66	1.123		
	Total	85.371	69			

a. Dependent Variable: AI contributing to inventory management objectives

b. Predictors: (Constant), AI on reducing storage costs and minimizing stockouts, AI contributes to improving inventory replenishment, AI offers in estimating time to arrival for inventory management

- The ANOVA table shows the results of an analysis of variance (ANOVA) test that was conducted to examine the relationship between AI contributing to inventory management objectives (dependent variable) and three predictor variables: AI on reducing storage costs and minimizing stockouts, AI contributes to improving inventory replenishment, and AI offer in estimating time to arrival for inventory management.
- The F-statistic of 3.348 is statistically significant at the $p < 0.05$ level, which suggests that there is a statistically significant difference between the means of the three groups. This means that at least one of the predictor variables is significantly associated with AI contributing to inventory management objectives.

- The mean square regression (MSR) of 3.759 is greater than the mean square error (MSE) of 1.123, which indicates that the model is significant overall. This means that the predictor variables can explain some of the variations in the dependent variable.
- The R-squared value of 0.337 indicates that the model explains 33.7% of the variation in AI contributing to inventory management objectives. This is a moderate amount of explained variance, but it suggests that the model is a good fit for the data.
- The adjusted R-squared value of 0.073 indicates that the model explains 7.3% of the variation in the dependent variable after taking into account the number of predictor variables in the model. This suggests that the model is not a perfect fit for the data, but it is still a good fit.
- Overall, the results of the ANOVA test and the regression analysis suggest that the three predictor variables are all significantly associated with AI contributing to inventory management objectives.

RECOMMENDATIONS:

Based on the analysis, the following recommendations can be made for businesses that are considering using AI to improve their inventory management:

- **Use AI to optimize inventory levels**: AI can be used to predict demand, identify supply chain disruptions, and automate ordering processes. This can help businesses avoid stockouts and overstocking, which can save them money and improve customer satisfaction.
- **Use AI to resolve inventory replenishment challenges**: AI can be used to predict demand, identify supply chain disruptions, and automate ordering processes. This can help businesses avoid stockouts and overstocking, which can save them money and improve customer satisfaction.
- **Use AI to offer estimated time-to-arrival predictions for inventory management:** AI can be used to predict when products will arrive, which can help businesses avoid stockouts and improve customer satisfaction.

Coefficients

Model	Unstandardized Coefficients		Standardized Coefficients		
	B	Std. Error	Beta	t	Sig.
1(Constant)	2.110	.602		3.508	<.001
AI contributes to improving inventory replenishment	.041	.138	.034	.294	.770
AI offers an estimated time of arrival for inventory management	.348	.135	.302	2.572	.012
AI on reducing storage costs and minimizing stockouts	.184	.138	.155	1.339	.185

a. Dependent Variable: AI contributing to inventory management objectives

- **Use AI to optimize safety stock levels:** AI can be used to dynamically adjust safety stock levels based on real-time data, which can help businesses avoid stockouts and overstocking.

In addition to these recommendations, businesses should also consider the following factors when implementing AI for inventory management:

- **The cost of implementing AI:** AI can be a costly investment, so businesses should carefully consider the cost-benefit analysis before implementing AI for inventory management.
- **The availability of data:** AI requires large amounts of data to train and operate effectively. Businesses should ensure that they have sufficient data available before implementing AI for inventory management.
- **The technical expertise required:** Implementing AI for inventory management requires technical expertise. Businesses should ensure that they have the necessary expertise in-house or have access to a qualified partner before implementing AI for inventory management.

Overall, the use of AI for inventory management can be a valuable tool for businesses that are looking to improve their efficiency, reduce costs, and improve customer satisfaction. However, businesses should carefully consider the factors mentioned above before implementing AI for inventory management.

Limitations and Future Research:

While the study's findings are valuable, it is essential to acknowledge its limitations. The sample size of 70 respondents might not fully represent the diversity of the industry. Moreover, the study focused on specific AI-driven aspects and might not encompass all potential variables affecting inventory management. Future research could explore additional factors and conduct larger-scale studies for more comprehensive insights.

CONCLUSION:

In conclusion, the study affirms that AI is perceived as a promising tool to enhance inventory management practices. Respondents' recognition of AI's potential in addressing challenges related to inventory replenishment, optimizing safety stock levels, and providing accurate time-to-arrival predictions underscores the significance of AI in modern inventory management strategies. The findings collectively underscore the importance of incorporating AI-driven insights and technologies to effectively manage inventory, minimize stockouts, reduce storage costs, and optimize safety stock levels. This study contributes valuable insights to the field of manufacturing and inventory management, guiding organizations seeking to harness the power of Artificial Intelligence for improved inventory control and operational efficiency.

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