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BUILDING SUPPLY CHAIN RESILIENCE THROUGH ARTIFICIAL INTELLIGENCE: TRANSFORMING TOWARDS A DIGITAL SUPPLY CHAIN

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ABSTRACT

Purpose

This paper discusses how Artificial Intelligence (AI) can be used to improve the resilience of the supply chain and help the supply chain change to digital supply chains. It will determine the patterns of adoption, its use, obstacles, and how AI will influence the competitiveness and sustainability of organizations in the long term.

Design/Methodology/Approach

The quantitative research design was employed, with the help of a structured questionnaire, provided to 300 supply chain professionals working in various industries, such as manufacturing, logistics, retail and technology. The data were examined based on descriptive statistics, reliability testing, correlation analysis, regression, and ANOVA to determine the patterns of adoption, the contribution of resilience, and differences by organizational levels.

Findings

The findings suggest that although the use of AI is currently average, it is highly perceived by professionals that AI could contribute to enhancing the resilience and increasing visibility and improving decisions. The regression analysis revealed the most important contributors included visibility and predictive decision-making, which then came to be risk mitigation. It was common knowledge that there are barriers to AI implementation like high implementation costs, lack of skills, and organizational resistance, but this did not discourage hopefulness over the long-term benefits of AI.

Practical Implications

The study provides useful recommendations to managers, policy-makers and technology suppliers. It revolves around incremental adoption strategies, human capital development investments, enabling

policy frameworks, and development of easily accessible and programmable AI solutions to industry needs.

Originality/Value

The study contributes to the growing trend in the literature on AI-based supply chain by positioning AI as a resiliency enabler and not necessarily an efficiency tool. It bridges the knowledge gap between the theoretical possibilities and the implementation challenges in real life, and gives an insight into how to create intelligent, adaptive, and future-ready supply networks.

Keywords: Supply Chain Resilience, Artificial Intelligence, Digital Supply Chains, Predictive Analytics, Risk Mitigation, Technology Adoption

INTRODUCTION

The international economy is based on supply chains since it is the critical infrastructures that enable both the transfer of goods, services and information of the industries and the borders. The supply chain in the globalized competitive world of the present-day era must be effective, responsive, and dependable to meet the demands of the dynamic markets (Modgil et al., 2022). Due to globalization, technology development, and a shifting consumer needs, the supply chain management has grown increasingly more complicated; in recent decades, supply chain management has become more complex (Beta et al., 2025). In the meantime, the crises occurring in the world economy (financial crises, trade wars, pandemics, and environmental crises) have demonstrated the weaknesses of the traditional supply chain models (Afshar and Shah, 2025). These hiccups have led to the necessity to build resilience, capacity by the supply chains to predict and absorb, adapt and recover, to disturbances and be a continuity and create sustained value (Alim et al., 2025).

It is not a good quality anymore to be strong, but a tactic necessity. As uncertainty and disruption are starting to become the norm rather than the exceptions, conventional risk management tools that principally involved forecasting and contingency planning are no longer adequate. The companies need to pursue active strategies that will not only provide resilience to the risks, but will augment the flexibility and effectiveness of the company to respond to unforeseen variables (Hasan et al., 2025). The modern technologies usage in this regard has taken a disruptive course to the resilience. Among other technologies, Artificial Intelligence is one of the most promising technologies that can transform the supply chain management and maintenance (Fauz et al., 2025).

Artificial Intelligence has several computational processes that can be applied to make machines mimic human intelligence in learning, reasoning and in decision making. Through the prism of the supply chain management, AI may provide a chance to crunch extensive amounts of data, uncover underlying trends, generate predictive value, and make real-time judgments (Riad et al., 2024). Unlike conventional information systems, the AI tools are not merely descriptive analytics since they may include prescriptive and predictive capabilities, which may help organizations to be proactive rather than reactive (Wu et al., 2024). This is a crucial technological change to establish resiliency as it provides organizations the ability to anticipate disruptions, automate resource distribution and improve supply chains cooperation (Zamani et al., 2023).

Among the things that make AI a potentially promising technology in supply chains, one must mention the fact that AI can help to remove some of the most urgent problems that corporations possess. One of the problems is

the volatility of demand. The fact that consumers preferences are dynamic and the markets are subject to sudden changes means that the supply chains are usually unable to monitor the demand in real-time regarding manufacturing and distributing (Rane et al., 2024). It can be optimized with the assistance of machine learning and big data analytics, which can assist in reducing the accuracy of forecasts and preventing stockouts, overproduction, and waste with the assistance of AI algorithms (Ahmed et al., 2023). In a similar vein, AI can equally be applied to more advanced based inventory systems which will be founded on automated replenishment and optimization systems which will create a balance between cost effectiveness and service reliability. The risks should also be controlled through the traceability and transparency that AI encourages to create a more transparent value chain and increase trust in the stakeholders by meeting the requirements and compliance (Dey et al., 2024).

The other aspect of resilience is response to the disruption. The COVID-19 pandemic crisis had demonstrated that supply chains could just collapse and impose a shortage, delays and losses (Modgil et al., 2022). The AI-based risk assessment model and predictive analytics are founded on the predictive analytics, which is used to forecast the potential disruption of logistics, supplier stability, geopolitical instability, and other parts of organizations. These teachings can be implemented to proactive sourcing, rerouting and contingency planning of the logistics that will mitigate the effect of the shocks and will accelerate the recovery (Afshar and Shah, 2025). Moreover, AI can be used to automatize such processes as filling orders, purchase, and customer service since it guarantees that the needed operations are carried out even in case human intervention is constrained (Naz et al., 2022).

In addition to reducing the risk, AI leads to innovation and sustainable competitiveness. Supplies are no longer considered as cost centers but rather as a strategic asset that generates value and differentiation (Khan et al., 2025). AI-based solutions also allow companies to create more intelligent and flexible networks that can change according to consumer needs, regulatory standards, and sustainability demands (Ahmed and Museera, 2024). As an example, AI can plan transportation routes to reduce the carbon footprint, build the circular supply chain, and assist in sustainability in procurement practices (Ali, 2025). Not only do they make supply chains more resilient but also focused on higher goals of corporate responsibility and environmental stewardship (Atif, 2024).

The challenges of digital transformation of supply chains with the help of AI are not in vain. Some of the most notable hindrances to adoption in organizations are cost of implementation, lack of talent, data protection, and organizational cultures which resist change (Guo et al., 2025). Particularly, small and medium-sized businesses might not have the financial and technical capacity to implement AI in their business. Also, there are ethical issues like the bias of algorithms and transparency that should be considered in order to make the use of AI responsible and fair (Noura et al., 2025). Nevertheless, the risks of the use of AI in developing resilient, digital supply chains cannot be compared to the long-term advantages, which is why the research and practice in this field are a necessary direction (Rana and Daultani, 2023).

The application of AI in supply chain resilience is not restricted to the organizational level but it applies to the national and global economies. The digitalization of supply chains via AI emerges as a strategic issue, as nations strive to maintain access to essential materials, become less reliant on international systems that might

be disrupted at any time, and enhance their competitiveness in an increasingly digital economy (Wong et al., 2024). Countries that manage to use AI to achieve supply chain resiliency will most likely have a competitive advantage in international trade, increase food and energy security, and guarantee economic stability during disruption (Majeed et al., 2025). Thus, it is not only relevant to individual businesses, but also to more macroeconomic and societal health that AI can help with resilience (Roman et al., 2025).

The incentive to research the convergence of AI and supply chain resilience is informed by the urgent need to explore the issue under consideration especially after the transition to digital supply chains. Though numerous studies have been carried out to determine the applications of AI in the logistics, procurement, and demand forecasting, not as many have specifically addressed the application of AI in enhancing resilience to disruptions. The given gap will be addressed with the proposed study which will research the possibilities of the AI adoption altering the supply chain practices, risk mitigation, and sustainable development opportunities. The analysis of the adoption trends, perceived benefits, barriers, and outcomes provides the research with valuable insights that can be applied to guide the organizations to adopt AI as a strategic tool to seek resilience.

The practical implications of the findings of this study are implications to managers, policy makers and technology providers. The research presents part of the intelligence that the managers can offer in regards to how AI can be incorporated in strategic functions in the domains of risk management and competitiveness. It also gives a focus on the supportive structures, incentives, and capacity building programs that would be able to permeate widely through policy formulators. It highlights the necessity of technology providers to design available, scalable and ethical AI solutions, responsive to the supply chain needs. All these lessons can create resilience to and future-proof supply chains, which will be able to survive in an uncertain world.

Lastly, AI-driven supply chain resilience is not merely connected to weathering shocks, but it is the ability to develop intelligent and responsive resiliency in supply chains that can withstand unexpectedness. The digital supply chain of tomorrow will emerge as a place where agility, transparency, and collaboration start to dominate and the integration of AI technologies without a glitch will be the facilitator. The paper at hand is a step towards the exploration of the possibility of such transformation as well as of what ought to be done to do away with the obstacles to the development of which we are now in the present day. In doing so it also emphasizes that resiliency is not an endpoint but a process that must be novel and flexible and anticipating of a new world environment.

Literature Review

Concept of Supply Chain Resilience

The resilience of a supply chain is a term that can be used to refer to the capacity of a supply chain to foresee, respond and recuperate to a supply chain disruption without compromising its continuity and competitiveness. It entails the flexibility, redundancy and dynamism of structures and processes which enable companies to absorb shock and recoil within a short period (Ali et al., 2017). The concept of resilience is presently considered one of the central concerns of current research of the supply chain because nowadays, natural disasters, pandemics, geopolitical tensions, and economic shifts are making the global networks less predictable (Singh et al., 2019). Conventional supply chains that were typically efficiency-focused and aimed at minimizing the cost have since become susceptible to such

shocks, and resiliency has emerged as a strategy requirement (Mandal, 2014).

Digital Transformation in Supply Chains

A promise has been the emergence of digital supply chains, which have emerged in reaction to the increased complexity and changeability. Digitalization assumes enhanced technologies, such as big data analysis, blockchain, the Internet of Things (IoT), cloud, and Artificial Intelligence to enhance visibility, coordination, and agility (Gezgin et al., 20147). A digital supply chain supports real-time information flows, predictive information, along with automatic decision-making; which are all resilience-enhancing (Tavana et al., 2022). It is no longer a technological revolution but a literal rethink of supply chain processes, organization and even strategy to come out triumphant in a digital economy (Ning and Yao, 2023). The digital transformation helps organizations to predict the disruptors more effectively and adapt to the market dynamics and makes sure that they have a competitive edge (Ali et al., 2024).

Artificial Intelligence in Supply Chain Management

One of the technologies that have set a game changer in the supply chain management is the Artificial Intelligence. It can also be used in forecasting demand, optimizing inventories and procurement, logistics and supplier relationship management and customer service. Artificial intelligence has the ability to make predictions by quantifying the data, which is highly precise compared to the traditional analytical software, by processing large volumes of data in different formats (Toorajipour et al., 2021). Technology based on artificial intelligence, including machine learning models, natural language processing, and robotics processes automation is transforming the character of supply chains operations (Yuan et al., 2024).AI will also be directly related to efficiency and resiliency, as it will help in making decisions precise, quicker, and scalable.

AI for Demand Forecasting and Inventory Management

Demand forecasting is one of the most appropriate AI applications within supply chains. Accurate forecasts are needed in matching production, distribution and inventory to market requirement. AI models are trained to operate based on the historical data, consumer behavior, and external factors of generating the appropriate demand forecasts as directed by machine learning algorithms (Kumar et al., 2024). This will minimize stock outs and overstocking and costs. In the same way, AI can be utilized to manage inventory and automate replenishment, efficiently manage stocks, and detect slow-selling or out-of-date products (Verma, 2024) This will cause supply chains to be more responsive to demand swings and less prone to change.

AI for Risk Management and Disruption Recovery

Risk management is an essential element of resilience, and the AI provides highly powerful tools of risk identification, assessment, and mitigation. It is possible to predict any potential interruptions in the domain of supplier reliability, transportation disruption, regulatory changes, or geopolitical risks with predictive analytics (Munawar et al., 2022). Disruption scenarios could be replicated with AI systems and allow managers to test contingencies plans and select the most effective ones. At the same time, AI may contribute to saving time in the course of the crisis by providing real-time decision-making, logistics redirection, and resource redistribution to provide continuity (Gupta et al., 2021). These applications are specifically necessary in the industries where supply chains are globally disrupted regularly.

AI and Supply Chain Visibility

The visibility is a component of strong supply chains that enables organizations to track the

goods, track performance, and find issues across the network. The AI increases visibility by interpreting data of the IoT devices, sensors and tracking systems to deliver real-time delivery and inventory and supplier information (Zheng and Brintrup, 2025). High-level visualization dashboards enable the managers to identify anomalies, track compliance, and act in advance against arising risks (Ahmad, 2024) This high-level visibility also builds resiliency throughout the supply chain.

Barriers to AI Adoption in Supply Chains

Although it was potential, there are significant obstacles to utilizing AI in supply chains. Implementation costs are high and this is enough to scare firms off, especially the small and medium-sized enterprises, into investing in AI solutions (Shahzabi et al., 2024). One other reason that discourages adoption is the absence of a competent talent that can enable and transform AI technologies. Data quality issues, security and privacy issues are also important areas of concern (Wang et al., 2024). The absence of integration is also deferred because of the organizational resistance to change through a perception of job loss or distrust in AI. Algorithms Ethical issues, including bias and openness further complicate it (Butt and Alghababsheh, 2025). Such obstacles cannot be overlooked during the discovery of maximum opportunities of AI in the development of resilient supply chains.

The Future of AI-Enabled Digital Supply Chains

The intersection of AI and the digital transformation is oriented towards the creation of intelligent, flexible and sustainable supply chains. The AI will also converge into supply chains as time goes to ensure efficiency and resiliency to keep the businesses on track and within the expectation without collapsing in the mind of the customer (Grover, 2025).The AI-innovations will also assist in aligning the supply chains to the sustainability objectives by utilizing the energy optimally, reducing the emissions, and enabling the development of a circular economy (Kilari, 2025). Well-planned AI will not merely make organizations resilient, but it will generate competitive advantage in the global market place in the long term.

Major Objectives of the Study

- To determine the present level of awareness and use of Artificial Intelligence (AI) in supply chain management.
- To determine and assess the perceived efficacy of particular applications of AI in major supply chain functions.
- To examine the perceived effects of AI implementation on the important dimensions of supply chain resilience.
- To determine and prioritize the key obstacles and issues that prevent the mass implementation of AI in supply chains.
- To explore the future perspective of professionals on the strategic significance of AI to the generation of long-term competitive advantage in digital supply chains.
- To create strategic suggestions that can be employed by supply chain managers and executives to achieve successful AI integration to become more resilient.

Methodology

The present research utilized a quantitative research design to examine how Artificial Intelligence (AI) can improve supply chain resilience and facilitate the shift to digital supply chains. The structured close ended questionnaire was formulated on the basis of the existing literature and testing of it was done by the use of an expert review to make sure that it is understandable, relevant in terms of content, and does not contradict the research aims. There were six sections that formed the instrument, namely demographic information, awareness and adoption of AI, AI applications in supply chain operations, the role of AI in resilience, barriers to adoption, and future perspective of AI in digital supply chains. The

answers to the multi-item scales were also assessed on a five-item Likert scale that ranged between Strongly Disagree (1) and Strongly Agree (5).

The questionnaire was sent to 300 supply chain practitioners in manufacturing, logistics, retail industry, technology and other related industries in Pakistan. Stratified sampling method was employed in order to get proper representation of various job positions, industry segments, and levels of organization. Among the mailed surveys, 300 valid answers were retained, which is enough to do a trustworthy statistical analysis, as well as to increase the generalizability of the results.

The SPSS 28.0 was used to process and analyze the data. Frequencies and percentages were used as descriptive statistics to describe the adoption patterns, perceived benefits, and obstacles to AI integration. Cronbach alpha was used to conduct reliability analysis and all the multi-item scales pass the threshold of 0.70, an indicator of high internal consistency. To determine the correlation, we have used correlation analysis to determine the relationships between resilience, awareness, future outlook, and AI applications. In order to determine the most important predictors of supply chain resilience among AI implementations, the regression analysis was applied, and ANOVA was utilized to check the perceptual differences between different job positions and industry sectors.

The ethics that were adhered to during the research were carefully taken care of. The participation was voluntary and the respondents were informed on the aim of the study before the data collection process. The anonymity and confidentiality were ensured because no personal identifiers were collected and all the responses were not used beyond academia.

This stringent research approach has enabled the research to attain reliability, validity and ethical integrity to bring forth significant findings on the role of AI adoption in supply chain resilience and digital transformation.

Table 1: Reliability Analysis of the Instrument

Section	Number of Items	Cronbach's Alpha (α)	Interpretation
Awareness and Adoption of AI in Supply Chains	3	0.84	High internal consistency
AI Applications in Supply Chain Operations	5	0.91	Excellent internal consistency
AI and Supply Chain Resilience	3	0.88	High internal consistency
Challenges and Barriers to AI Adoption	4	0.79	Acceptable reliability
Future Outlook	3	0.89	High internal consistency
Overall Scale	18	0.92	Excellent internal consistency

This reliability analysis proves that the survey tool that the present study was conducted with is statistically valid and internally consistent (Butt, 2021). The Cronbachs Alpha of 0.92 is a high indicator of internal consistency and it implies that tool under question is very reliable when it comes to the measurement of the

perceptions of AI in the supply chain management.

At the subscale level, AI Applications in Supply Chain Operations (a = 0.91) and Future Outlook section (a = 0.89) are both very strong in reliability which ensures that these constructs are always measured. In the same manner, Awareness and Adoption (a = 0.84) and AI and Supply Chain Resilience (a = 0.88) also exhibit high reliability, which confirms that items in the sections are always able to reflect on perceptions of respondents.

The Challenges and Barriers section (a = 0.79) is slightly lower but still, it is not out of the acceptable limit, which means that, though there is variation in the perception of the respondents concerning the barriers, the items in the Challenges and Barriers section are still reliable enough to be analyzed.

In general, findings verify that the instrument is sound and suitable to elicit the understanding of AI adoption, applications, resilience, challenges, and future perspectives in the supply chain settings.

Demographic Information

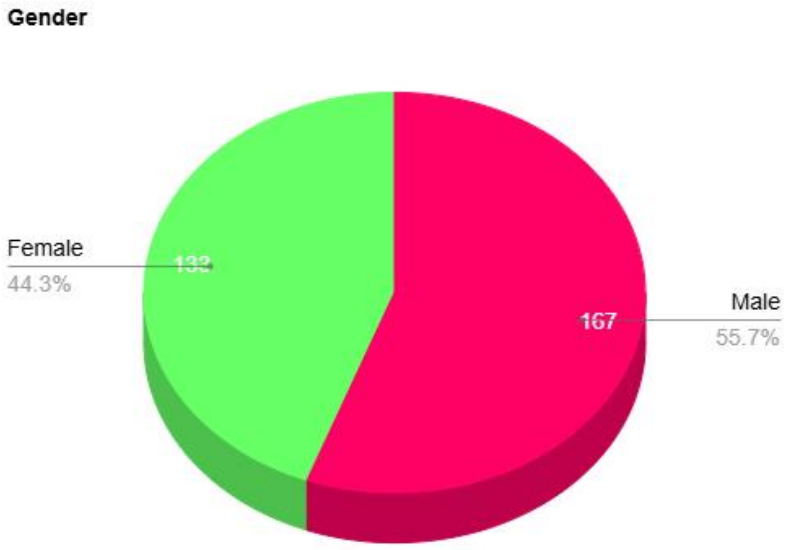


Figure No. 1 Gender distribution of the respondents

The gender distribution shows a relatively balanced representation of participants. Male respondents constitute 167 (55.7%), while female respondents account for 133 (44.3%) of the total sample. Although men slightly outnumber women, the distribution is fairly even, ensuring that the perspectives of both genders are well represented. This balance strengthens the reliability of the findings by reducing potential gender bias in the study outcomes.

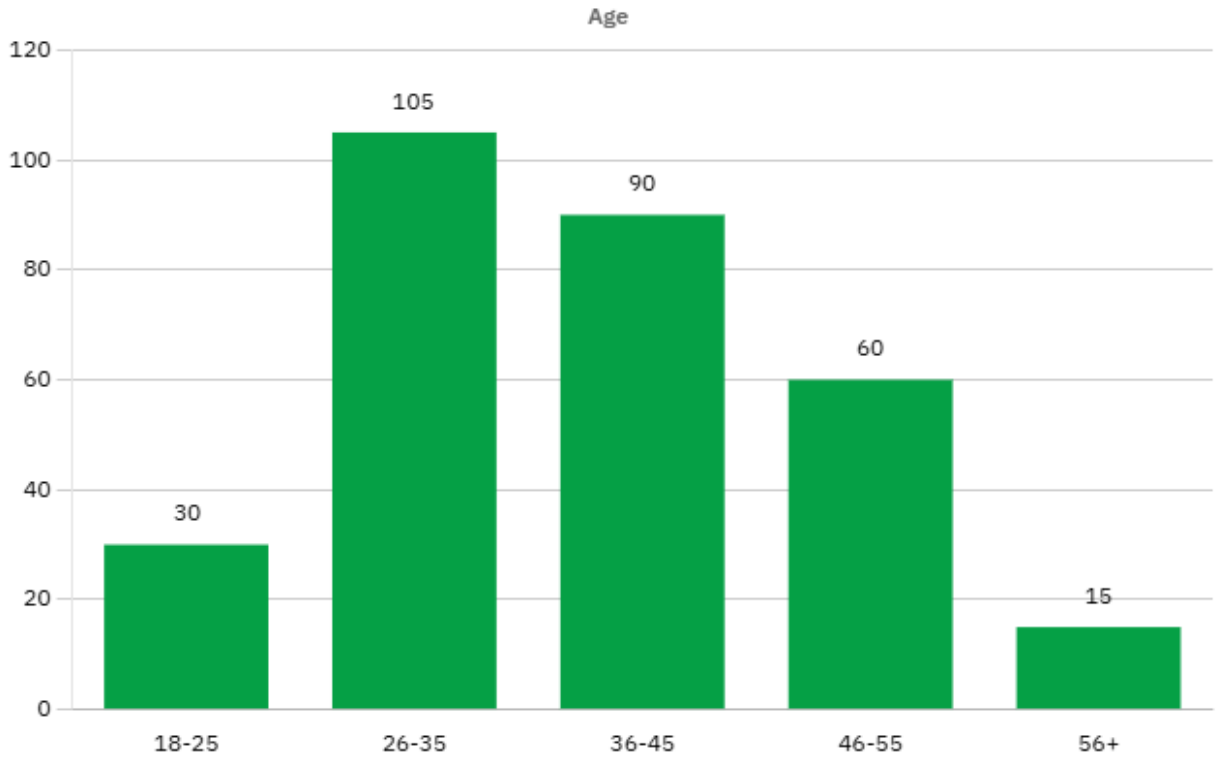


Figure No. 2 Age profile of the respondents

The age range shows that the sample is mainly composed of young and middle-career people. The most representative is 2635 years old (35.0%), and closely the persons between 3645 years (30.0%), indicating a high number of professionals in their productive working age. The age group between 46 and 55 years (20.0) and the youngest group (18 to 25 years 10.0) constitute the respondents. It is only a small proportion, 5.0 percent who are aged 56 years and above. This distribution suggests that the study captures perspectives mainly from active working-age adults, with limited input from older age groups.

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Figure No. 3 Job Position distribution of the respondents

The job position distribution shows that the majority of respondents occupy mid-level roles (40.0%), followed by a substantial proportion in senior-level positions (25.0%). The proportion of entry level workers is (20.0%) and executives are (15.0%). This is a composition that is well-balanced in terms of the input provided by both the management and senior professionals within the organizational hierarchies. It implies that the views that were realized during the study are built on both the operational and strategic views, which make the findings deeper and more legitimate.

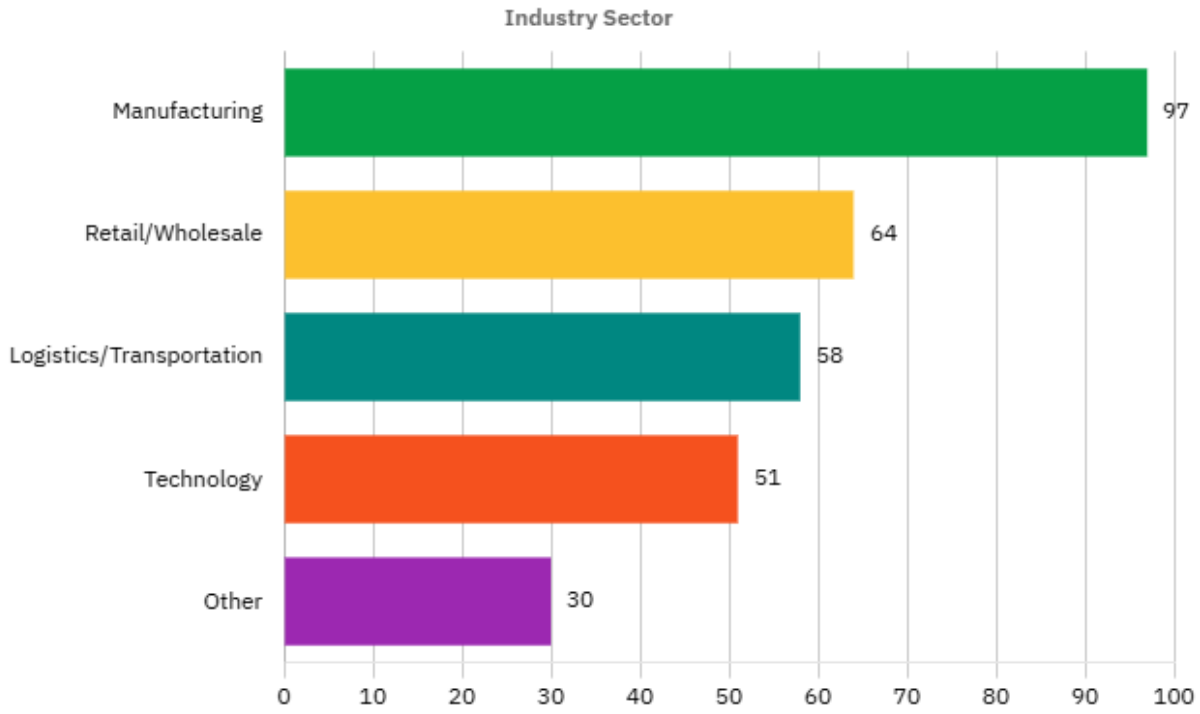


Figure No. 4 Industry sector of the respondents

The industry distribution indicates that the manufacturing sector is the most represented, with 97 respondents (32.3%), reflecting its dominant role in the sample. Retail/wholesale (21.3%) and logistics/transportation (19.3%) also make up significant portions, highlighting the relevance of AI in trade and supply chain–oriented industries. The technology sector accounts for 17.0%, ensuring perspectives from innovation-driven firms, while the other category (10.0%) contributes additional diversity. This spread shows that the study captures a broad cross-section of industries, with strong representation from both traditional sectors (manufacturing, retail, logistics) and modern, innovation-led sectors (technology). Such diversity enhances the generalizability of findings on AI adoption and its impact across different business domains.



Figure No. 5 Year of experience of the respondents

The data on work experience indicates a well-distributed sample across different career stages. The largest group consists of respondents with 7–10 years of experience (30.0%), followed by those with 4–6 years (25.0%). Respondents with 1–3 years and 10+ years of experience each account for 20.0%, while only a small fraction (5.0%) have less than one year of experience. This distribution suggests that the study captures insights from both early-career and highly experienced professionals, with a strong emphasis on mid-career individuals who are likely to have substantial practical exposure to workplace technologies such as AI.

Table 2: Descriptive Statistics for Key Constructs

Scores were calculated by averaging responses (Strongly Disagree=1 to Strongly Agree=5).

Construct	Mean Score (1-5)	Standard Deviation	Interpretation
Awareness and Adoption of AI in Supply Chains	3.45	0.89	Moderately Positive
AI Applications in Supply Chain Operations	3.60	0.95	Moderately Positive
AI and Supply Chain Resilience	3.75	0.82	Positive
Challenges and Barriers to AI Adoption	4.10	0.78	High Agreement on Barriers
Future Outlook	4.25	0.71	Very Positive

The descriptive statistics highlight overall favorable perceptions toward AI adoption in supply chains, though with notable variation across constructs. Awareness and Adoption (M = 3.45, SD = 0.89) and AI Applications in Operations (M = 3.60, SD = 0.95) indicate a

moderately positive stance, suggesting that while respondents recognize AI's potential, adoption is still developing and may face practical limitations.

A stronger response was observed for AI and Supply Chain Resilience (M = 3.75, SD = 0.82), reflecting a positive outlook on AI's role in enhancing flexibility, risk management, and continuity planning. At the same time, the highest mean score was reported for Future Outlook (M = 4.25, SD = 0.71), which indicates a very positive expectation of AI's role in shaping future supply chains.

Interestingly, the construct on Challenges and Barriers (M = 4.10, SD = 0.78) shows high agreement, demonstrating that while respondents are optimistic about AI, they are simultaneously very aware of the obstacles, including costs, infrastructure, skills, and policy gaps.

Overall, the results suggest that supply chain professionals hold a cautiously optimistic view of AI, with strong future expectations but persistent recognition of barriers that need to be addressed for widespread adoption.

Table 3: Inter-Correlations between Key Variables

Variable	1	2	3	4	5
Awareness and Adoption of AI in Supply Chains	1				
AI Applications in Supply Chain Operations	.68**	1			
AI and Supply Chain Resilience	.62**	.85**	1		
Challenges and Barriers to AI Adoption	-.15*	-.08	-.05	1	
Future Outlook	.55**	.72**	.78**	.10	1

*Note: *p < .05, *p < .01

The correlation analysis reveals meaningful relationships among the key variables. Awareness and Adoption of AI shows strong positive correlations with both AI Applications in Supply Chain Operations (r = .68, p < .01) and Supply Chain Resilience (r = .62, p < .01), indicating that higher awareness and adoption are closely linked with practical applications of AI and perceptions of improved resilience.

The strongest correlation is between AI Applications and Supply Chain Resilience (r = .85, p < .01), suggesting that organizations actively using AI tools are significantly more likely to perceive enhanced resilience in their supply chains. Likewise, Future Outlook is positively correlated with Applications (r = .72, p < .01) and Resilience (r = .78, p < .01), highlighting that positive expectations about AI are strongly tied to its operational use and its perceived ability to strengthen supply chain systems.

Interestingly, Challenges and Barriers to AI Adoption exhibit weak or negative correlations with other variables. A small but significant negative relationship exists with Awareness and Adoption (r = –.15, p < .05), suggesting that higher awareness may help reduce perceived barriers. However, correlations with Applications (r = –.08) and Resilience (r = –.05) were not significant, implying that barriers are seen more as external constraints rather than direct inhibitors of perceived benefits.

Overall, the results confirm that AI awareness, application, and resilience are mutually reinforcing, while future optimism is strongly grounded in practical AI use. Barriers, although acknowledged, appear somewhat disconnected from these positive constructs, indicating that organizations recognize challenges but still maintain confidence in AI's transformative potential for supply chains.

Table 4: Regression Model Summary

Model	R	R^2	Adjusted R^2
1	.87	.76	.75

The regression model demonstrates a strong predictive relationship between the independent and dependent variables. The correlation coefficient (R = .87) indicates a very strong positive relationship, suggesting that the predictors collectively explain a substantial portion of the variance in the outcome.

The coefficient of determination (R^2 = .76) shows that 76% of the variance in the dependent variable is explained by the model, which reflects a high level of explanatory power.

The Adjusted R^2 = .75 further confirms this robustness, accounting for the number of predictors included and minimizing the risk of overestimation.

Overall, the model exhibits excellent explanatory strength, indicating that the chosen predictors are highly effective in explaining variations in the dependent variable—suggesting strong practical relevance for AI adoption and its impact on supply chain outcomes.

Table 5: Regression Coefficients

Predictor	B		t	p
(Constant)	0.45		3.12	.002
C1. Demand Forecasting	0.25	.18	3.85	<.001
C2. Inventory Management	0.18	.15	3.10	.002
C3. Visibility & Decision-Making	0.35	.32	6.12	<.001
C4. Risk Mitigation	0.30	.28	5.45	<.001
C5. Supplier Management	0.10	.08	1.75	.081

The regression coefficients highlight the relative contributions of different AI applications to supply chain outcomes. The constant term (B = 0.45, p = .002) is significant, establishing a positive baseline effect when predictors are excluded.

Visibility & Decision-Making (=.32, p <.001) became the most important and prominent predictor, which is understandable, as AI plays a crucial role in improving real-time insights and informed decision-making. The effect of Risk Mitigation (= -.28, p = 0.001) was also strong, which proved the significance of AI in eliminating uncertainties and disruptions.

Demand Forecasting (= -.18, p = -.001) and Inventory Management (= -.15, p = -.002): both of them made significant contributions, albeit with relatively lower standardized coefficients. These findings show that AI can be effectively applied to enhance the performance of the operations through accurate forecasting and effective socialization of inventory.

Supplier Management (2 = 0.08, p = 0.081) was not significant, to the contrary, which suggests that AI might be less potent in this area and/or less used in the studied organizations.

Overall, these results suggest that AI-based applications prove extremely effective in improving visibility, risk management, and

efficiency in supply chains but supplier management may require further development or even a supplement to achieve measurable benefits.

Table 6: ANOVA

Source	Sum of Squares	df	Mean Square	F	p
Between Groups	28.45	3	9.48	15.62	<.001
Within Groups	178.91	296	0.60		

The ANOVA findings indicate that there are statistically significant differences in perceptions on AI and supply chain resilience in the various job positions. The fact that the F-statistic ($F = 15.62$, $p < .001$) is not equal to one proves that the mean scores are not equal across groups, and one of the job positions treats AI as a contributor to resilience differently than other positions.

The between-groups variance (SS = 28.45) explains a significant percentage of total variance (207.36), where the within-groups variance (MS = 0.60) is not very large, indicating comparatively stable answers across job categories, though significant differences between jobs.

On the whole, the results suggest that their perceptions of AI and resilience depend on the position at work. As an example, mid-level and senior managers can find AI more essential to resiliency since they are the ones engaged in operational and level-strategic decision-making, whereas entry-level and executive respondents might have a different perspective on this matter.

Discussions

The results of this paper reveal the potential of Artificial Intelligence (AI) to transform supply chains and increase their resilience and persist in showing the challenges that hold back its large-scale usage. The descriptive findings showed moderate positive levels of awareness about the concept, and adoption rate with the professionals acknowledging the fact that AI can enhance forecasting, inventory management, and operational efficiency. Nevertheless, the higher consensus value on resilience and future perspective implies that stakeholders do not see AI as an active working tool but as an instrument that can enable them to stay competitive in the long term (Butt & Yazdani, 2023). This difference represents the current shift of the supply chains towards the digitalization phase, where the organizations are at the initial stages of the adoption but are nevertheless hopeful about the future.

Correlation analysis revealed that AI adoption is strongly correlated with AI applications and resilience, which helps to conclude that AI is not an efficiency-enhancing technology but a mechanism that creates resilience (Afshar and Shah, 2025). These connections between AI-driven applications and resilience confirm this premise that the ability to absorb the shock and adapt to disruption in a supply chain can be significantly enhanced by complex analytics, visibility, and automation (Alim et al., 2025). Similarly, the existence of the positive relationship between the future view and the applications and resilience implies that the optimism of the organizations is founded on the real facts regarding the benefits of AI and not theoretical assumptions (Majeed et al., 2025). Such observations are visible in the overall trend in the industry towards the use of AI as a crucial component of resilience plans.

The results of regression also proved that the largest contributions of AI would be in increasing the visibility and supporting the decision-making process, followed by risk mitigation. The findings indicate the necessity to adopt real-time intelligence and predictive

analytics to manage uncertainty. The other two contributed positively and their influence was not very high implying that the two organisations might have already achieved the base efficiencies in both of the above with the assistance of the traditional tools. The minor position of supplier management also illustrates a feature where AI applications are either underdeveloped or underutilized, which also reflects the prospects in future development.

The results of the ANOVA made it clear that the perception of AI differs according to the position in the workplace, and the surveyed middle-level and senior managers expressed more favorable attitudes toward the advantages of resilience in AI than the respondents in the entry-level or executive roles (Hasan et al., 2025). This variance represents the practical fact that those that are immediately involved with the operational and tactical decision-making processes will feel the effects of AI more directly, whereas executives can be more strategic or conservative.

Overall, this discussion affirms that the expectations about AI are still rather optimistic, yet the existence of obstacles to its implementation, such as high prices, lack of skills, and resistance in the organization, does not permit the extensive application of AI. The management of such problems requires a system-wide support in terms of policies, training, and ready AI solutions. It is noteworthy, that the result of the barriers gives the impression that the organizations view the barriers solely as the outside factors and not as the factors to suspect the transformative power of AI. This justifies the argument of necessity to eliminate adoption barriers that can result in substantial dividends in resilience, competitiveness and sustainability of supply chains.

Conclusion and Recommendations

The conclusion of the paper is that Artificial Intelligence is among the most important drivers of supply chain resiliency and one of the drivers of digital transformation of global business networks. In the results, the word AI just happened to be more than an efficiency-enhancing mechanism; it is an facilitator of flexibility, transparency and persistence. The results revealed that AI uses and resilience showed strong correlations and this means that firms that have adopted AI in the primary operations of the supply chain are better placed to respond to disruptive events and get back to the business earlier. In the meantime, the future-outlook scores are extremely high, which focuses on the trust of the professionals in AI as the capability to redesign the supply chains in the long-term even though the current level of adoption is quite moderate.

Nevertheless, the work has also revealed some of the long-term obstacles to the popularization of AI. Other barriers that have been highly noted among respondents include implementation costs, gaps in the infrastructure, absence of skilled professionals as well as resistance of the organization

Interestingly, these barriers did not strongly correlate with negative perceptions of AI's benefits, indicating that professionals distinguish between the potential of AI and the obstacles that delay its realization. This finding underscores that the challenge is less about acceptance and more about capacity building and resource mobilization.

In terms of practical contributions, the regression analysis emphasized the central role of visibility and decision-making enhancements, followed by risk mitigation, as the most impactful AI applications for building resilience. These insights are particularly relevant for organizations seeking to prioritize AI investments. Firms may achieve faster returns and greater resilience by focusing initially on technologies that improve transparency, monitoring, and predictive insights. In contrast, weaker results in supplier

management suggest an underdeveloped area where future research and innovation could create additional resilience benefits.

On the basis of this research, some recommendations are made that are multi-level. At the corporate level, the idea of a slow AI adoption should be implemented, in which it is advisable to start with the aspects that will generate the most advantages (demand forecasting, risk management) and proceed with more complex applications (supplier collaboration, etc.). To resolve this challenge of talent gap and reduce the resistance, then, it will be necessary to invest in work force training to ensure that the greatest adoption success is possible by cross functional teams that will integrate technical knowledge with supply chain knowledge.

Policy plays a great role in enabling environments by engaging the governments, as well as, the industrial associations. Financial incentives such as e.g. tax exemptions or subsidies can be used to finance the introduction of AI, especially to small and medium business. The other, no less important policies are the encouragement of data sharing, cybersecurity, and ethical applications of AI that make it trusted and more utilized. Schools ought to collaborate with business to develop AI-trained programs to ensure that there are frequent human capital flows.

Finally, the technology providers will have the findings as evidence as to why they must develop convenient, flexible, and easy to use solutions in AI to meet the unique concerns the different industries have. The solutions also need to promote transparency and fairness to overcome the ethical issues to boost the confidence between the organizations and stakeholders. In conclusion, it can be said that the path to the resilience based AI-powered digital supply chain is both a challenge and an opportunity. The organizational and policymakers can unlock the potential of AI to transform organizations by removing barriers to AI implementation, building stakeholder partnerships, and focusing on its most critical uses. This paper concurs with the fact that resilience is not just a survivability, but creation of intelligent, adaptive and sustainable supply networks which can survive within an uncertain environment.

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