



Harnessing Technology for Sustainability: The Future of Green Supply Chain Management

Submitted by

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BBABatch - (2023- 26) Roll No.: 2302010488 System ID:2023381144

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<https://doi.org/10.55041/ijst.v2i4.192>

Cite this Article: Akhtar, M. M. (2026). Harnessing Technology for Sustainability: The Future of Green Supply Chain Management. International Journal of Science, Strategic Management and Technology, 02(04). <https://doi.org/10.55041/ijst.v2i4.192>

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ABSTRACT

This study examines the role of **Artificial Intelligence (AI), Internet of Things (IoT), and Blockchain** in enhancing sustainability within Green Supply Chain Management (GSCM). The main objective is to analyse how these technologies improve efficiency, reduce environmental impact, and support better decision-making in supply chain operations.

The research is based on both primary and secondary data. Primary data was collected through a structured questionnaire from **120 respondents**, while secondary data was gathered from research papers, journals, and online sources.

The findings indicate that all three technologies have a positive impact on sustainability. Among them, AI is perceived as the most effective due to its ability to improve forecasting and optimise operations. IoT helps in real-time monitoring and resource management, while Blockchain enhances transparency and trust within the supply chain.

Statistical analysis, including descriptive statistics and t-test, confirms that the impact of these technologies is significantly higher than neutral expectations. However, challenges such as high implementation costs, technical complexity, and resistance to change still exist.

The study concludes that the integration of AI, IoT, and Blockchain can significantly improve sustainable supply chain performance, making businesses more efficient and environmentally responsible.

1.INTRODUCTION

Businesses are starting to realise their environmental responsibilities. Green Supply Chain Management (GSCM) has become an essential component of sustainable operations in any business. Eco-Friendly practices throughout supply chain processes, minimizing emissions, waste reduction, and optimal utilization of resource are incorporated under GSCM.

There are many advantages of implementing GSCM, but it is often faced with many challenges such as insufficient resource management, transparency is often lacking, and operational costs being very high. The solutions are being offered by advanced technologies namely Artificial Intelligence (AI), Internet of Things (IoT), and blockchain. AI helps in enabling predictive analytics and making good decisions, IoT helps in facilitating real-time monitoring and collection of data, and blockchain helps in ensuring secure and transparent data exchanges.

This report explores the role of these technologies in the advancement of GSCM, their synergistic potential, and the challenges in efficiently integrating them. This study aims to provide valuable insights for businesses who are seeking to achieve their sustainability goals by aligning their operations.

2.LITERATURE REVIEW

Advancements in technologies have influenced the GSCM development tremendously, as AI, IoT, and blockchain have emerged as the most important enablers of sustainable practices. These technologies have proved their effectiveness in addressing challenges such as reduction of waste, optimization of resources, and stakeholder collaboration.

The below mentioned research papers are the recent studies highlighting the role of AI, IoT, and blockchain in addressing critical challenges in GSCM.

>KEY FINDINGS AND GAPS-

AUTHOR(S)	YEAR	TITLE	KEY FINDINGS	GAPS IDENTIFIED
Ahmad et al.	2023	Application of IoT in Sustainable Supply Chain Management	IoT significantly enhances operational efficiency and reduces costs.	What are the long-term impacts of IoT on sustainability?
Nguyen et al.	2022	An IoT-Based Framework for Sustainable Supply Chain Management	Proposed a framework for enhancing sustainability through IoT integration	How can we find more real-world examples to support this framework?
Olan et al.	2022	Artificial Intelligence in Supply Chain Management: A Review	Highlights AI's critical role in improving resilience and sustainability.	What empirical data is needed to demonstrate AI's effectiveness?
AUTHOR(S)	YEAR	TITLE	KEYFINDINGS	GAPS IDENTIFIED



Aditya et al.	2024	Integrating Blockchain, IoT, and AI in Supply Chain Management	Shows the synergy of these technologies for improved transparency.	What challenges do organizations face in implementation?
Rajeb et al.	2021	Big Data in the Food Supply Chain: A Literature Review	Discusses how big data analytics can boost efficiency in food supply chains.	How can big data insights be leveraged in other sectors?
Kim et al.	2023	AI and IoT in Sustainable Supply Chain Management	Explores how AI and IoT work together to enhance sustainability.	What socio-economic impacts should be considered?
Das et al.	2023	IoT Adoption in Supply Chain Management: A Review	Investigates the drivers of IoT adoption in supply chains.	What strategies can SMEs implement to adopt IoT effectively?
Mukherjee et al.	2023	AI-Driven Resilience Strategies for Supply Chain Management	Examines AI's contribution to resilience in supply chains.	What frameworks exist to measure the long-term benefits of AI?
Gupta et al.	2021	AI and Sustainable Supply Chain Management: A Review	Reviews how AI applications promote sustainability.	How can we validate the effectiveness of AI frameworks in real life?
AUTHOR(S)	YEAR	TITLE	KEYFINDINGS	GAPS IDENTIFIED
Zhang et al.	2022	Blockchain Technology in Sustainable Supply Chains	Analyses the role of blockchain in improving traceability.	What lessons can we learn from existing blockchain implementations?
Luthra et al.	2023	Adoption of AI Technologies in Green Supply Chain Management	Discusses barriers to AI adoption in green supply chains.	What strategies can organizations use to overcome barriers?

Pahl et al.	2023	Integrating AI with Sustainable Supply Chains: A Framework	Proposes a framework for incorporating AI into sustainable practices.	How can we test this framework across different industries?
Alizadeh et al.	2023	The Role of Smart Technologies in Sustainable SCM	Investigates how smart technologies contribute to sustainability.	What further evidence is needed to back up these findings?
Modgil et al.	2022	AI and Supply Chain Resilience: A Post-COVID19 Review	Discusses AI's role in enhancing resilience after COVID-19.	What insights can we gain from current AI applications?
Wang et al.	2024	Digital Twin Technology in Sustainable Supply Chains	Explores how digital twin technology can enhance sustainability.	What additional case studies can validate its effectiveness?

3.NEED FOR RESEARCH

Many organizations find it difficult to adopt these advanced technologies effectively, despite transitioning to sustainable supply chain practices being a major global priority.

Key Challenges in Adoption:

1. **High Implementation Costs:** The financial challenges associated with the implementation of AI, IoT, and blockchain technologies often deter small and medium enterprises (SMEs) from investing in solutions which are sustainable.
2. **Technical Complexity:** These technologies necessitate a well-built strong infrastructure and knowledge, which are not easily accessible to every organization.
3. **Resistance to Change:** Organizational cultures that are based on traditional and conventional practices frequently resist technological innovations, fearing potential risks and disruptions to established workforce.
4. **Lack of Standardized Frameworks:** The lack of standard protocols for the integration of these technologies into GSCM leads to ambiguity and inefficiencies.



Research Gaps:

- 1. Long-Term Impact Analysis:** There have been limited studies exploring the effects of these technologies on sustainability and efficiency in operation.
- 2. Sector-Specific Adaptations:** Research is essential to customize the technologies for challenges faced by various industries, such as retail, manufacturing and agriculture.
- 3. Scalability:** Current solutions largely focus on large-scale enterprises, which results in a lack of accessible and scalable technology models for small and medium-sized enterprises (SMEs).

This research addresses the gaps by exploring the potential of AI, IoT, and blockchain collectively, also providing practical recommendations, and identifying areas of future studies.

4. RESEARCH ORIGINALITY

This research distinguishes itself from others by emphasizing on the integrated application of AI, IoT, Blockchain within GSCM, while also offering a detailed and comprehensive analysis of their benefits combined and the challenges.

Innovative Contributions:

- 1. Comprehensive Analysis:** The research diverges from previous studies that concentrate on individual technologies, this research investigates how AI, IoT, and blockchain can work collaboratively to further increase sustainability and operational efficiency.
- 2. Practical Applications:** This study connects the gap between theoretical frameworks and practical implementation by analysing real-world scenarios, offering businesses with actionable insights.
- 3. Solutions to Adoption Barriers:** This research suggests novel approaches to address financial, technical, and cultural, thereby increasing the accessibility of these technologies for various organizations of different sizes.
- 4. Focus on Sustainability:** This study highlights the environmental benefits of these technologies, in accordance with global sustainability initiatives and fostering a greener future.

The report's originality lies in its holistic approach, addressing the complexities of integrating technology while also providing a roadmap for future exploration and applications.

5. OBJECTIVES

The objective of the research has been listed below:

1. To evaluate the influence of AI, IoT, and Blockchain on sustainability and efficiency within supply chain management.

- Investigate how these technologies enhance resource utilization, boost productivity, and foster environmentally friendly practices in supply chains.

2. To assess the role of these technologies in decreasing carbon emissions, reducing resource waste, and improving logistics operations.

- Examine how AI-driven analytics, IoT-based monitoring, and Blockchain's transparency contribute to minimizing environmental impact and enhancing supply chain effectiveness.

3. To identify the challenges associated with the implementation of AI, IoT, and Blockchain in achieving supply chain sustainability, including technological, financial, and organizational hurdles.

- Highlight significant barriers such as high costs of implementation, insufficient expertise, concerns regarding data security, and organizational resistance to change.

6. RESEARCH MODEL

The research model presents the overall structure of how AI, IoT, and Blockchain collectively support sustainability in Green Supply Chain Management (GSCM). These technologies act as key enablers that improve visibility, reduce delays, support accurate decision-making, and help companies monitor their environmental performance more effectively. The model also considers that the successful impact of these technologies depends on the organization's ability to handle financial, technical, and cultural challenges.

Independent Variables:

- Artificial Intelligence (AI)
- Internet of Things (IoT)
- Blockchain Technology

Dependent Variable:

- Sustainable Supply Chain Performance

Moderating Factors:

- High implementation cost
- Technical complexity
- Organizational resistance

The model assumes that higher adoption of AI, IoT, and Blockchain will lead to better sustainability outcomes such as reduced waste, lower emissions, and improved transparency. However, the presence of challenges may strengthen or weaken this relationship. This model provides the foundation for developing the hypotheses and guiding the research analysis in the following sections.

7. HYPOTHESES

Based on the research model, the following hypotheses have been developed to examine how AI, IoT, and Blockchain influence the sustainability performance of supply chains. Each hypothesis includes a null assumption, which assumes no effect, and an alternative assumption, which suggests the expected relationship based on existing literature.

Hypothesis 1: Artificial Intelligence (AI)-

Null Hypothesis (H0):

Artificial Intelligence does not have any significant influence on improving sustainability in supply chain operations.

Alternative Hypothesis (H1):

Artificial Intelligence contributes to sustainability by improving planning accuracy, reducing operational waste, and supporting better decision-making across the supply chain.

Hypothesis 2: Internet of Things (IoT)-

Null Hypothesis (H0):

The Internet of Things does not contribute to sustainable supply chain practices.

Alternative Hypothesis (H1):

The Internet of Things enhances sustainability by enabling real-time monitoring, improving visibility across processes, and helping organizations utilise their resources more efficiently.



Hypothesis 3: Blockchain Technology-

Null Hypothesis (H0):

Blockchain technology does not improve transparency or sustainability in supply chain activities.

Alternative Hypothesis (H1):

Blockchain technology strengthens sustainability by providing transparent, traceable, and tamper-proof data flow between supply chain partners.

Hypothesis 4: Combined Impact of AI, IoT, and Blockchain-

Null Hypothesis (H0):

Using AI, IoT, and Blockchain together does not lead to any significant improvement in the overall sustainability performance of supply chains.

Alternative Hypothesis (H1):

The combined use of AI, IoT, and Blockchain leads to stronger sustainability outcomes, as these technologies complement one another and create more efficient, transparent, and environmentally responsible supply chain systems.

8.RESEARCH METHODOLOGY

The research methodology explains the overall approach used to study how AI, IoT, and Blockchain contribute to sustainability in Green Supply Chain Management. The purpose is to ensure a clear, structured, and reliable process for collecting and analysing the information required for this study.

Type of Research:

This study uses **descriptive and analytical research**. Descriptive research helps in understanding the current awareness and usage of these technologies, while analytical research helps in examining their impact on sustainability.

Sources of Data:

Both **primary and secondary data** are used.

- *Secondary data* includes research papers, journals, articles, and reports related to GSCM and modern technologies.
- *Primary data* is collected directly through a structured questionnaire prepared for this study.

Research Approach:

A **quantitative approach** is followed. This approach allows the study to measure responses in numerical form and test the hypotheses using statistical methods.

Data Collection Tool:

A **structured questionnaire** is mainly used as the tool for primary collection of data. The questions are designed to capture the respondents' level of awareness, their experience with AI, IoT, and Blockchain, and their views on how these technologies affect sustainability.

Sample Size:

The study is based on a sample of **120 respondents**. This sample size is suitable for generating reliable results and conducting statistical tests such as the t-test.

Sampling Method:

A simple and convenient sampling method is used to reach individuals who are familiar with supply chain activities, sustainability practices, or modern technologies.

Statistical Tools:

The study makes use of basic statistical techniques such as **percentages, charts, and a t-test**. These tools help in



analysing responses, identifying trends, and checking whether the assumptions made in the hypotheses are supported by the data.

9. RESEARCH DESIGN

The research design outlines the overall plan used to conduct the study and guide the data collection process. It ensures that the research stays organised and follows a clear direction.

Type of Design:

A **descriptive research design** is used, as the study aims to describe the current role, awareness, and impact of AI, IoT, and Blockchain in sustainable supply chain practices. This design helps capture real perceptions without altering any variables.

Purpose:

The purpose of using this design is to understand how these technologies influence sustainability in actual business conditions. It allows the study to present a clear picture of existing trends and opinions.

Unit of Analysis:

The **individual respondent** acts as the unit of analysis, since the study relies on their personal awareness, experiences, and views related to supply chain technologies.

Research Setting:

The study is carried out in a **natural, non-experimental setting**, where respondents answer the questionnaire based on their genuine knowledge and day-to-day exposure to supply chain activities.

Time Frame:

A **cross-sectional approach** is followed, where data is collected once from the selected sample of 120 respondents. This helps in capturing current opinions and conditions at a single point in time.

10. SAMPLE DESIGN

The sample design explains how the respondents were selected for the study and the structure of the sample used for data collection. It ensures that the study is based on a clear and organised approach.

Sample Size:

The study is based on a total of **120 respondents**. This size is suitable for generating reliable results and conducting basic statistical tests.

Sampling Technique:

A **convenience sampling method** is used. Respondents who were easily accessible and had basic awareness of supply chain operations or modern technologies were included in the study.

Sampling Unit:

The sampling unit consists of **individual participants** who provided their responses to the questionnaire. These participants may include students, employees, or individuals who have knowledge of supply chain activities.

Target Group:

The target respondents are people familiar with sustainability practices or modern supply chain technologies, ensuring that the data collected is relevant to the study.

Data Collection Method:

Primary data is collected through a structured questionnaire containing multiple-choice and scaled questions. This method ensures uniform responses that can be easily analysed.

This sample design ensures that the research remains focused, practical, and aligned with its objectives.

11. DATA ANALYSIS

This section presents a detailed analysis of the data collected from **120 respondents**. The analysis includes frequency results, descriptive statistics, graphical outputs, and hypothesis testing using a one-sample t-test. All impact-related responses were measured on a **1-5 Likert scale**, where 3 represents a neutral opinion.

1. Frequency Analysis

Frequency analysis is used to understand the general views of the respondents on GSCM and technology adoption. It summarises how often each response category appears and helps identify common patterns among participants.

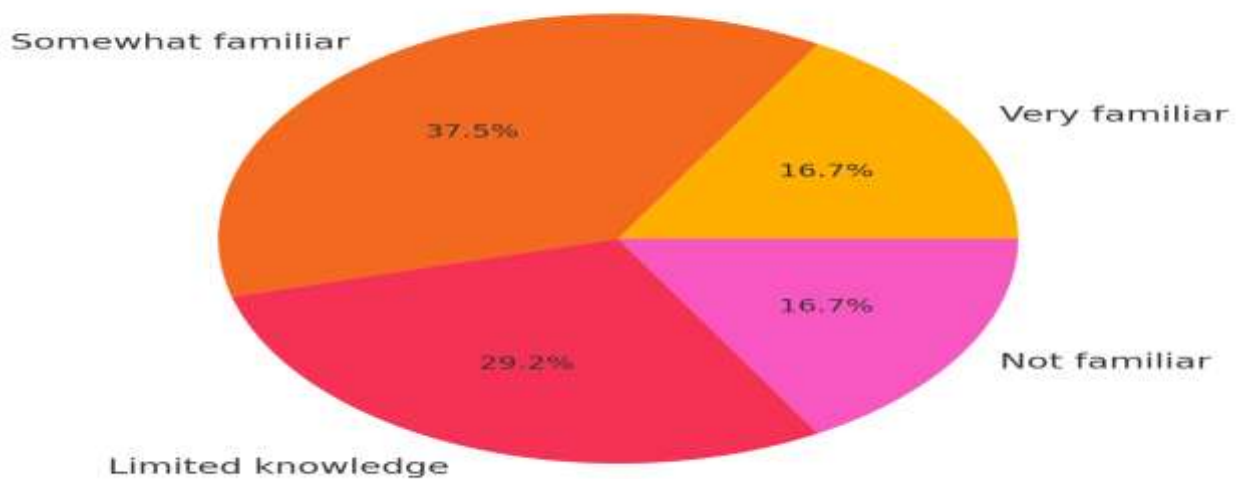
1.1 Familiarity with GSCM

Respondents were asked how familiar they were with Green Supply Chain Management.

Table 1: Familiarity with GSCM (N = 120)

Category	Frequency
Very familiar	20
Somewhat familiar	45
Limited knowledge	35
Not familiar	20

Familiarity with GSCM Among Respondents (N=120)



Interpretation:

Most respondents fall under the “somewhat familiar” category, indicating moderate awareness. A noticeable proportion has limited or no exposure, suggesting that understanding of GSCM is still developing among many individuals.

1.2 Key Drivers for GSCM Adoption

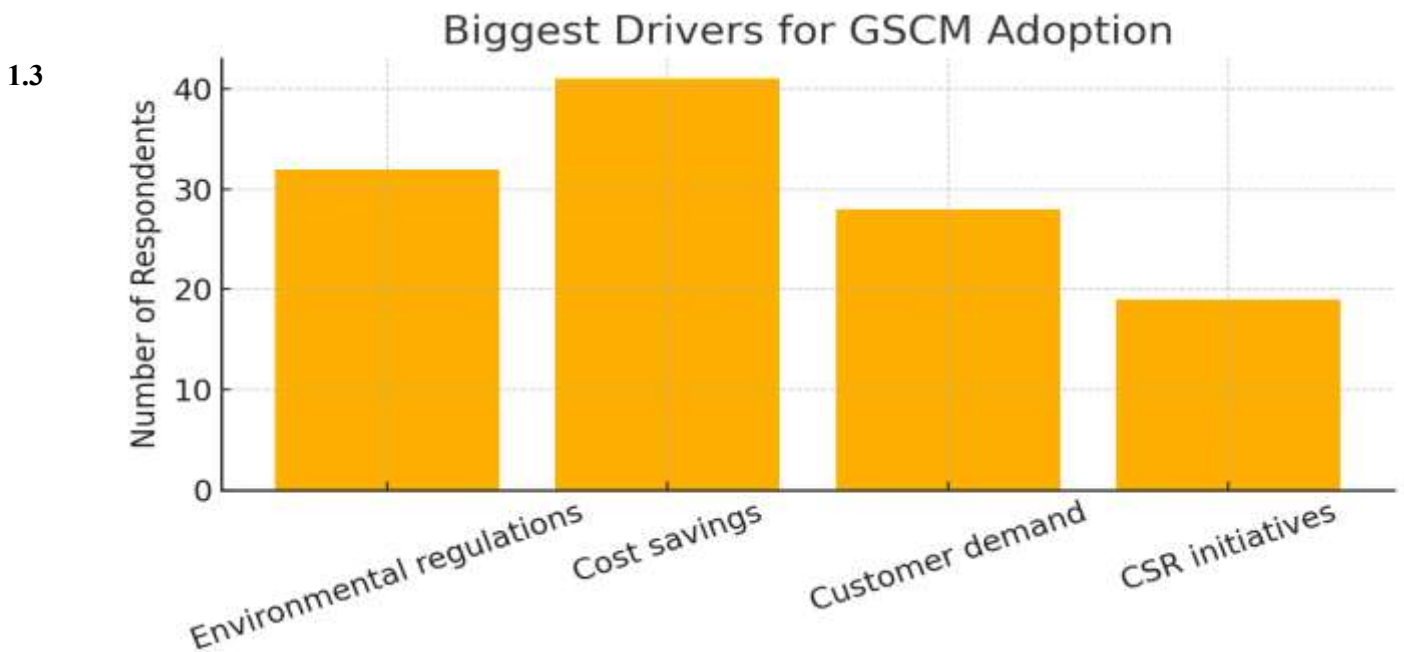
Participants selected the main reasons they believe organisations adopt sustainable supply chain practices.

Table 2: Drivers for GSCM Adoption (N = 120)

Driver	Frequency
Cost savings	41
Environmental regulations	32
Customer demand	28
CSR initiatives	19

Interpretation:

Cost reduction emerges as the leading driver, showing that many organisations connect sustainability with operational efficiency. Regulatory pressure is the second strongest factor, followed by customer expectations and CSR-related motives.



Technology Considered Most Impactful

Respondents were also asked to identify which technology they believe has the strongest influence on sustainability.

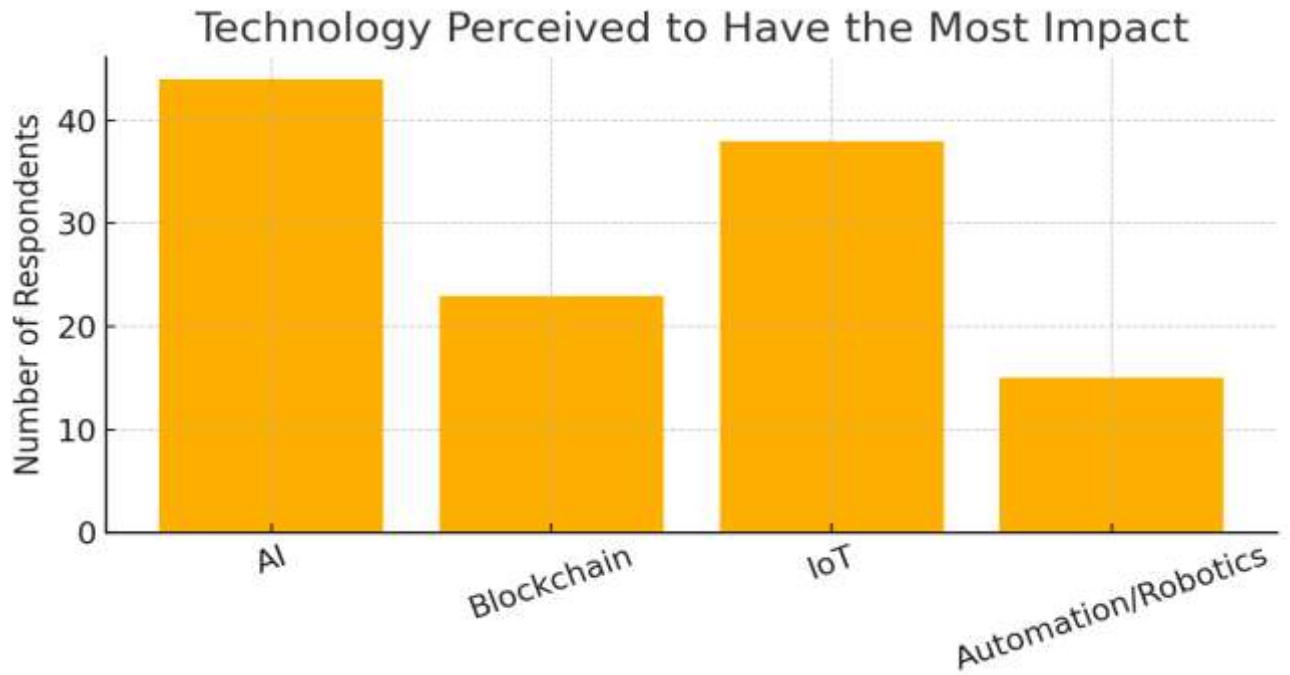
Table 3: Technology with Highest Perceived Impact (N = 120)

Technology	Frequency
Artificial Intelligence	44
Internet of Things	38
Blockchain	23
Automation/Robotics	15

Interpretation:

AI receives the strongest support, largely due to its capabilities in forecasting, optimisation, and efficient decision-making. IoT is also widely recognised for improving visibility and control. Blockchain and automation receive fewer votes, possibly due to limited practical exposure.

2.



Descriptive Statistics

Descriptive statistics summarise the central tendencies and variation in the impact scores for AI, IoT, and Blockchain. These results help determine whether respondents view each technology positively.

Table 4: Descriptive Statistics of Impact Scores (1-5 Likert Scale)

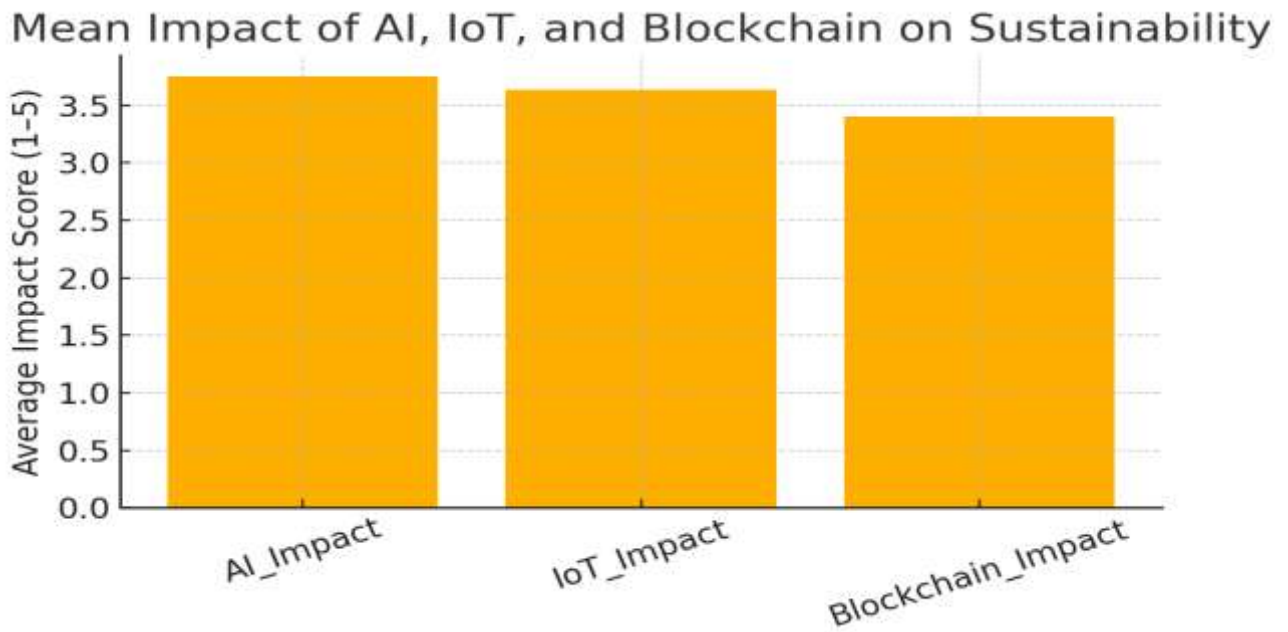
Technology	Mean	SD	Minimum	Maximum
AI Impact	3.75	0.55	2.23	5.00
IoT Impact	3.63	0.66	2.18	5.00
Blockchain Impact	3.41	0.64	1.13	4.89

Interpretation:

- All three means exceed the neutral point of 3, showing that respondents generally view these technologies as beneficial for sustainability.
- AI has the highest mean, suggesting it is considered the most effective tool.
- IoT also shows a positive impact, especially due to monitoring and tracking abilities.

- Blockchain has a comparatively lower mean but still stands above neutral, indicating a moderately positive perception.

3.
One-



Sample T-Test

A one-sample t-test was conducted to determine whether the mean score of each technology is significantly above the neutral value of 3.

Table 5: One-Sample T-Test Results (Test Value = 3)

Technology	Mean	SD	t-Statistic	p-Value
AI	3.75	0.55	14.960	< 0.001
IoT	3.63	0.66	10.533	< 0.001
Blockchain	3.41	0.64	6.992	< 0.001

Brief Explanation of the T-Test

A t-test checks whether the average score (mean) is significantly different from a reference value. Here, the reference value is 3, representing a neutral view.

- A **high t-value** means the sample mean is far from neutral.
- A **p-value below 0.05** means the difference is statistically meaningful, not due to chance.

Interpretation:

All three technologies show p-values below 0.001, meaning their impact scores are **significantly higher** than neutral. This confirms that respondents believe AI, IoT, and Blockchain positively affect sustainability. AI shows the highest t-value, indicating the strongest statistical support.



4. Combined Interpretation

Based on the frequency data, descriptive results, and t-test outcomes:

- **AI** is consistently rated the highest contributor to sustainable supply chain performance.
- **IoT** plays a strong supporting role through monitoring, data capture, and operational visibility.
- **Blockchain** is viewed as helpful for transparency and trust-building, though perceived impact is slightly lower.
- All three technologies show statistically significant results, meaning respondents' opinions are strongly in favour of their positive influence.

These results directly support the research hypotheses and align with the conceptual model proposed earlier.

12.FINDINGS

The study reveals several clear patterns based on responses from 120 participants. Most respondents have moderate familiarity with Green Supply Chain Management, although a notable group still has limited exposure. Cost savings and environmental regulations emerge as the strongest reasons for adopting GSCM practices, showing that both financial and compliance-related factors drive sustainability initiatives.

Among the three technologies studied, AI is viewed as the most impactful, followed closely by IoT. Respondents believe both technologies improve decision-making, tracking, and resource use. Blockchain also shows a positive impact, but it is perceived as slightly less influential, possibly due to lower adoption or understanding. The t-test results confirm that all three technologies have a statistically significant positive influence on sustainability, with p-values well below 0.05.

Overall, the findings support the research model and hypotheses by showing that emerging technologies play an important role in enhancing sustainable supply chain performance.

13.DISCUSSION

The findings align with existing research showing that AI, IoT, and Blockchain contribute positively to sustainable supply chain practices. AI's strong results reflect its usefulness in forecasting, optimisation, and improving operational efficiency. IoT is also recognised for enabling real-time visibility and better control across different stages of the supply chain.

Blockchain, while positive, received lower scores compared to AI and IoT. This is consistent with the fact that Blockchain is still developing in many sectors, which may explain lower familiarity and adoption among respondents.

The identified drivers of GSCM--mainly cost savings and regulatory pressure--fit real-world trends where organisations adopt green practices when they offer financial benefits or when compliance is required. The statistical significance further strengthens the argument that respondents clearly associate these technologies with improved sustainability.

Overall, the results validate the conceptual framework and show that the three technologies, individually and collectively, contribute to building more sustainable and efficient supply chain systems.

14.CONCLUSION

This study aimed to understand how Artificial Intelligence (AI), the Internet of Things (IoT), and Blockchain contribute to sustainability within supply chain operations. Based on the responses of 120 participants, the results show a consistently positive perception of all three technologies. AI received the strongest support, followed by IoT, due to their practical use in improving forecasting, monitoring, and operational decision-making. Blockchain also showed a meaningful impact, although at a moderate level, which may reflect its relatively newer stage of adoption.

The statistical analysis confirms that the mean impact scores for all technologies are significantly higher than neutral, indicating strong agreement among respondents about their value in supporting Green Supply Chain Management. Cost savings and regulatory requirements were identified as the major drivers of GSCM adoption, showing that organisations are motivated by both financial benefits and compliance needs.

Overall, the study concludes that emerging technologies play an important role in building more transparent, efficient, and environmentally responsible supply chain systems. The findings support the proposed research model and validate the hypotheses, demonstrating that technology adoption is closely linked to sustainability outcomes.

15. RESEARCH IMPLICATIONS

The findings of this study provide several practical and strategic implications for organisations and stakeholders involved in sustainable supply chain practices.

1. Organisations can strengthen sustainability performance by adopting AI and IoT to improve planning, visibility, and resource utilisation.
2. Policymakers can use these insights to design clearer guidelines and incentives that encourage technology-driven GSCM adoption.
3. Technology developers have opportunities to create solutions that support transparency and traceability within supply chains.
4. Supply chain managers can benefit from integrating multiple technologies together rather than relying on a single tool.

LIMITATIONS:

Although the study offers meaningful insights, certain limitations should be acknowledged.

1. The sample size of 120 respondents may not capture the diversity of all industries.
2. The study relies on perception-based responses, which may vary across individuals.
3. Only three technologies were examined, leaving out other tools that may influence sustainability.
4. The cross-sectional design restricts the ability to observe changes over time.

FUTURE SCOPE:

Based on the limitations, several areas offer potential for future research.

1. Expanding the sample to include more respondents from varied sectors.
2. Conducting sector-specific studies to compare adoption patterns.
3. Using longitudinal methods to track changes in perception and usage over time.
4. Including additional emerging technologies for a more comprehensive analysis.
5. Incorporating real operational data to measure actual sustainability performance.



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17.QUESTIONNAIRE

1. How familiar are you with Green Supply Chain Management (GSCM)?
 - a) Very familiar - I work with GSCM strategies regularly
 - b) Somewhat familiar - I understand the basics
 - c) Limited knowledge - I've heard of it but don't use it
 - d) Not familiar at all
2. Which of the following do you think is the biggest driver for organizations to adopt GSCM?
 - a) Environmental regulations
 - b) Cost savings and efficiency improvements
 - c) Customer demand for sustainable products
 - d) Corporate social responsibility (CSR) initiatives
3. Which technology do you believe has the most impact on sustainable supply chain management?
 - a) Artificial Intelligence (AI)
 - b) Blockchain
 - c) Internet of Things (IoT)



d) Automation and Robotics

4. How does your organization track and measure sustainability in the supply chain?

- a) Through digital monitoring tools and reports
- b) Manual tracking with periodic assessments
- c) A mix of both digital and manual tracking
- d) There is no formal tracking system

5. What is the most common challenge in adopting green supply chain practices in your organization?

- a) High implementation costs
- b) Resistance to change from employees
- c) Lack of management commitment
- d) Limited technological expertise

6. How does your company encourage sustainability in supplier selection?

- a) We have strict sustainability requirements for suppliers
- b) We prioritize cost over sustainability in supplier selection
- c) We encourage but do not enforce sustainable practices
- d) Supplier sustainability is not considered

7. How is IoT currently being used in your organization's supply chain?

- a) Real-time tracking of shipments and inventory
- b) Monitoring energy consumption and emissions
- c) Both A and B
- d) IoT is not used in our supply chain

8. Has your organization implemented blockchain technology in the supply chain?

- a) Yes, for tracking and transparency
- b) Currently in the planning/implementation stage
- c) Considering it but not yet implemented
- d) No, we have no plans to use blockchain

9. What would encourage employees to engage more in sustainable supply chain practices?

- a) Training and awareness programs
- b) Incentives for sustainability initiatives
- c) Integration of green practices into daily operations
- d) Stronger enforcement of sustainability policies



10. In your opinion, what area of GSCM needs the most improvement in your organization?

- a) Waste reduction and recycling programs
- b) Energy-efficient logistics and transportation
- c) Supplier sustainability audits and compliance
- d) Employee awareness and engagement

11. How does your company handle excess inventory to minimize waste?

- a) It is resold or donated
- b) It is recycled or repurposed
- c) It is discarded as waste
- d) I am not aware of any specific strategy

12. Do you believe your organization's leadership is committed to sustainability?

- a) Yes, sustainability is a core part of our business strategy
- b) Somewhat, but more action is needed
- c) There is limited commitment to sustainability
- d) No, sustainability is not a priority

13. What is the most significant benefit your organization has experienced from adopting GSCM?

- a) Cost savings and operational efficiency
- b) Improved brand reputation and customer trust
- c) Compliance with environmental regulations
- d) No significant benefits observed yet

14. How do you see the future of GSCM in your industry?

- a) It will become a mandatory standard for all businesses
- b) It will continue to grow but remain optional
- c) It will face resistance due to high costs
- d) It will not significantly impact supply chain strategies

15. Which factor is most critical for ensuring long-term success in GSCM?

- a) Strong leadership and policy enforcement
- b) Employee engagement and skill development
- c) Adoption of advanced technology solutions
- d) Consumer awareness and demand for green products

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