



INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

A STUDY ON BLOCKCHAIN TECHNOLOGY IN SUPPLY CHAIN MANAGEMENT

Revolutionizing Logistics: The Impact of Blockchain Technology on Supply Chain Management

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Abstract

A key component in enabling the effective transit of items and services from manufacturers to end users. is supply chain management, or SCM. However, traditional SCM systems often suffer from transparency, traceability, and inefficiency due to their centralized control and manual procedures. Blockchain technology, which offers a decentralized, transparent, and immutable ledger for logging data and transactions between a dispersed network of users, has emerged as a viable remedy to these problems in recent years.

The purpose of this abstract research is to discover supply chain management using blockchain technology in detail. It begins by explaining the basic ideas behind blockchain technology, such as consensus processes, decentralization, and cryptography concepts. It then examines the unique problems that traditional supply chain systems have, such as fraud, opacity, and inefficient practices, and explores how blockchain can help solve these problems.

The study also explores several obstacles to overcome when integrating blockchain technology into supply chain management especially when it comes to protecting data security and privacy concerns in logistics and supply chain. These application cases show how blockchain enables improved supply chain operations, provenance verification, real-time tracking, and transparency.

This abstract study offers important insights into the revolutionary blockchain can transform supply chain management methods by thoroughly evaluating and analysing a body of existing literature, case studies, and industry reports. It highlights how critical it is for researchers, experimenters, and stakeholders to work together to fully realize the potential of blockchain to streamline supply chain operations, build participant trust, and accelerate innovation in international trade networks.

I. Introduction of the Research Area:

Supply chain management has long posed challenges for numerous multinational corporations. These companies have consistently poured substantial resources into addressing inefficiencies and implementing cost-saving measures. With the emergence of blockchain technology, businesses are now contemplating its potential impact on the future of networks for goods. Analysts suggest that blockchain technology holds promise for enhancing supply chain efficiency, fostering trust, and increasing transparency, thereby modernizing supply chain operations.

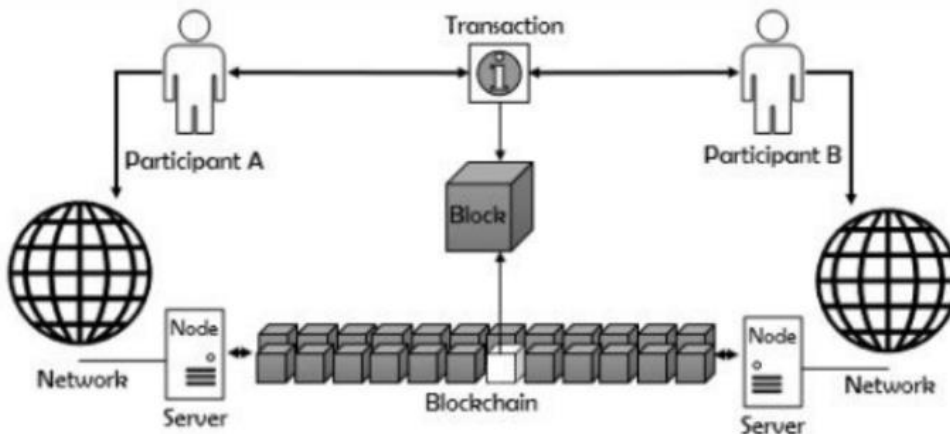
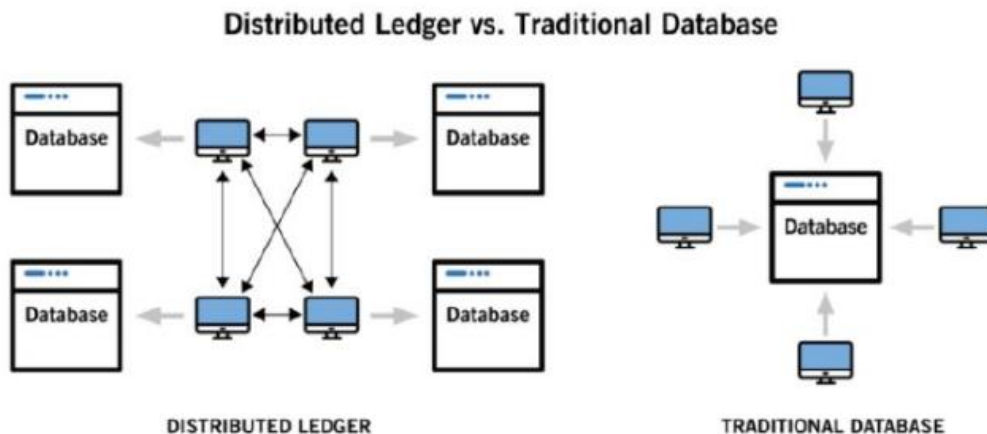


Figure 1: Concept



A. Blockchain in Supply Chain Management

1) Explaining Blockchain technology and its limitations

Blockchain is a centralized record that stores files, actions, and digital events carried out by participants, as previously mentioned. Several publications have delved into the workings of blockchain technology, with cryptocurrency, particularly Bitcoin, being one of its best-known applications. In addition to cryptocurrencies, blockchain is reshaping various sectors such as manufacturing, financial services, and supply chains. Rather than dealing with the technical intricacies of blockchain mechanisms, this study highlights its application in supply chain management.

2) Explanation of and its limitations

Although definitions may vary, this technology generally refers to the comprehensive management of material flow from raw material suppliers through manufacturing, storage, and delivery to end users. Given its complexity, it is essential to recognize its limitations. This paper examines all aspects of the supply chain, including manufacturing, distribution, and customer-related activities. In addition, it delves into how management involves managing the entire chain.

B. Blockchain-based supply chain

The seven key objectives of supply chain management (SCM) encompass cost efficiency, quality assurance, speed optimization, reliability enhancement, risk mitigation, sustainability promotion, and adaptability. Blockchain technology emerges as a promising solution to fulfill these objectives. It has been highlighted for its potential to eradicate data silos and provide a unified data source for digital transformation, facilitating real-time data management crucial for fostering trust among network partners. Moreover, blockchain offers various business benefits such as heightened efficiency, enhanced reputation, and improved responsiveness, thus reinforcing trust and security within the supply chain ecosystem. In comparison to existing systems, blockchain presents numerous advantages. It is acknowledged that blockchain, radio frequency identification, and enterprise resource planning are complementing technologies, and finding the optimal integration of these technologies is vital for maximizing their collective impact. Consequently, it is evident that blockchain significantly impacts supply chain performance.

II. Literature Review

Pei Xu, Joonghee Lee, James R. Barth, Robert Glenn Richey (2021) This paper examines what the capacities of blockchain innovation mean for store network straightforwardness through the focal point of the insights insurance group of three (classification, uprightness, and accessibility). eventually, suggestions are created to motivate fate research in convey chain projects of the blockchain age. Rosanna Cole, Imprint Stevenson, James Aitken (2019) This paper pursuit to energize the see of the blockchain period from tasks and convey chain control (OSCM) disposition, sorting out ability districts of programming, and giving a plan to future examinations.

Hanqing Wu, Jiannong Cao, Yanni Yang, Cheung Leong Tung, Shan Jiang, Bin Tang, Yang Liu, Xiaoqing Wang, Yuming Deng (2019) Production network the board is fundamental for acquiring monetary, natural benefits for society. inside the convey chain venture. however, regular SCM systems as a rule are tormented by a wide extent of issues comprising of absence of records sharing, extended delays for records recovery, and lack of quality in item following. current advances in the blockchain age show the awesome capacity to resolve these issues in light of its remarkable highlights alongside changelessness, straightforwardness, and decentralization. regardless of the way that there are some proof of idea studies and overviews on blockchain-based absolutely SCM from the demeanor of operations, the hidden specialized difficulties aren't earnestly analyzed. In this paper, we offer a total assessment of limited potential open doors, new necessities, and thoughts on planning blockchain-based SCM frameworks. We sum up and talk about 4 vital specialized difficulties regarding versatility, throughput, admission to control, insights recovery, and assess the promising arrangements. sometimes, a case seen of planning a blockchain-based absolutely food detectability machine is referenced to offer more prominent experiences en route to handle these specialized requesting circumstances practically speaking.

Archana Prashanth Joshi, Meng Han and Yan Wang (2018) Blockchain is gaining momentum & can be described as one of the most far-fetched topics of today. even though critics question approximately Its flexibility, safety, and sustainability have already impacted the daily lives of many people in a variety of ways as an outcome of its broad impact on companies and organizations. As the benefits of the blockchain age provide more dependable and effective solutions, it is vital to recollect the security and privacy issues. & challenging situations behind creative technology. The variety of blockchain packages includes financial, medical, travel, management of risks, Internet of Everything (IoT), and public and social solutions. Several studies have been performed to raise awareness about the usage of blockchain data in various initiatives. However, a detailed examination of the technical and programmatic approaches has yet to be performed. In this paper, we attempt to finish study on blockchain creation by describing its shape to exclusive consensus methods, as well as the problems and opportunities for privacy and security of data in blockchains. Next, we look at what possible future advances blockchain technology may adapt to in the following years.

III. Problem Statement

There are several obstacles to overcome when integrating blockchain technology into supply chain management, especially when it comes to protecting data security and privacy. Supply chains manage enormous volumes of sensitive data, so it's still very important to be concerned about how vulnerable blockchain systems are to security lapses and privacy issues.

IV. Objectives of the Study

To check the familiarity of different types of employees in the organization regarding blockchain technology.
To check the blockchain technology and how logistics firms can benefit from it.
To analyze the privacy concerns of various employees regarding blockchain implementation in supply chain management.

V. Hypothesis

H0 employees are not familiar with blockchain technology

H1 employees are familiar with blockchain technology

H1 is accepted

H0 employees do not have any specific concerns regarding the use of blockchain in supply chain management

H1 employees do not have any specific concerns regarding the use of blockchain in supply chain management

H1 accepted

VI. Research Methodology

To respond to the study questions. The present investigation uses the literature review technique. While acknowledging numerous review articles discussing the technical facets of blockchain technology within supply chain contexts, this study refrains from reaching specific managerial conclusions regarding supply chain management. Instead, it presents fundamental research insights. Furthermore, it delves into a thorough examination of blockchain reviews and their practical applications to foster a more comprehensive and insightful comprehension of The influence control over the chain.

VI. 1 Research design:

Any research approach can be used by a researcher. to conduct any studies, along with mixed techniques techniques, and qualitative and quantitative data. while accomplishing research in which new insights from present understanding are needed or a phenomenon isn't nicely understood, the interpretive research philosophy is used via the qualitative studies approach. therefore, the qualitative approach is the maximum appropriate research technique to use given the nature of analyzing blockchain generation and its application in delivery

chain management. The look will use an exploratory studies technique to take a look at the potential consequences of incorporating blockchain generation into supply chain management.

VI. 2 Source of Data

We collect both primary and secondary data for our research. Secondary data is collected from previously published articles and primary data is collected using a questionnaire.

VI. 3 Data Collection method

For collecting primary data we are using questionnaire method in which question were asked and they need to rate the answer based on their preferences. For secondary data we have gone through articles published earlier on various websites.

VI.4 Population:

All the working employees of ADANI ports & logistics

VI. 5 Sampling Method

We are using convenient sampling method in which a group of people belonging to same characteristics and traits are selected to answer the questions.

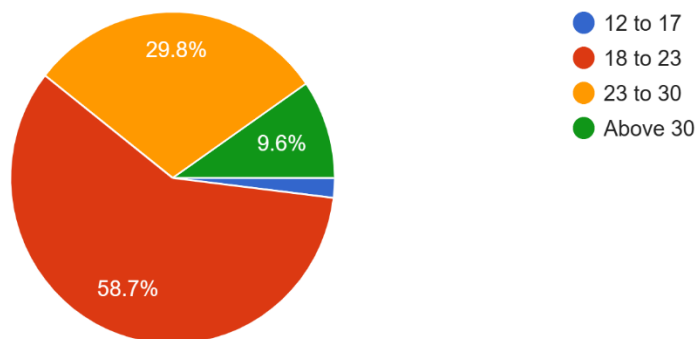
VI. 6 Data collection instrument:

As we want statistics data, we are surveying a series of primary information.

VII. Data Analysis and Interpretation

❖ Graphical presentation

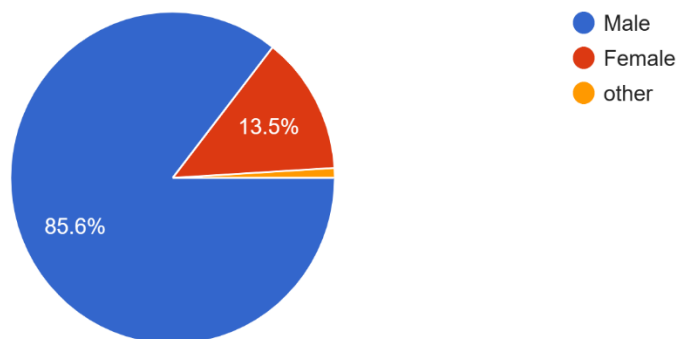
2.3 Age
104 responses



Analysis: From the above chart researchers have found that the age group between 18 to 23 has a large number of respondents 58.7%, followed by the age group between 23 to 30 years carrying 29.8%. with 9.6% of the age group are above 30

2.4 Gender

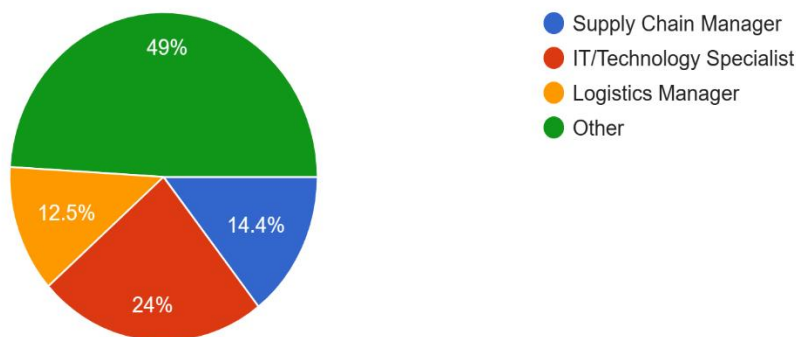
104 responses



Analysis: From the above chart researchers have found that the male respondents were 85.6% of the total number of respondents and the remaining were female respondents which were 13.5% of the total 104 responses.

2.5 What is your role within your organization?

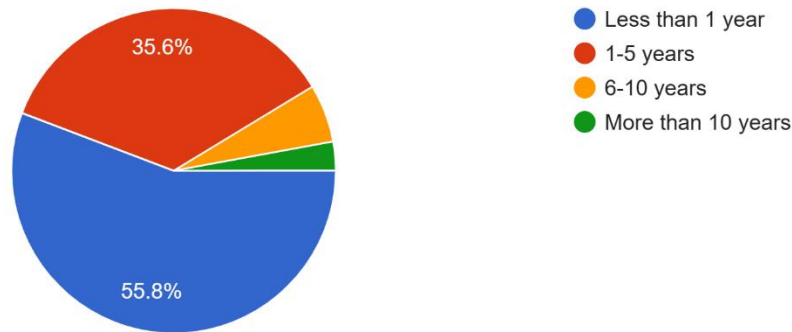
104 responses



Analysis: From the above chart researchers have found that the other large numbers of respondents carrying 49% out of the total number of respondents, were role It/Technology specialists carrying 24% of respondents with second rank, followed by 12.5% and 14.4% from logistics manager and supply chain manager respectively.

2.6 How many years of experience do you have in supply chain management?

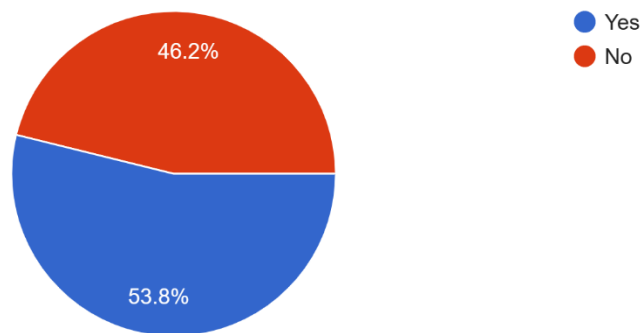
104 responses



Analysis: From the above chart researchers have found that the respondents with experience of less than 1 year carried a large number out of total respondents having 35.6%. Respondents 1-5 years of experience carrying second rank. 53.

3.1. Are you familiar with blockchain technology and its application in supply chain management?

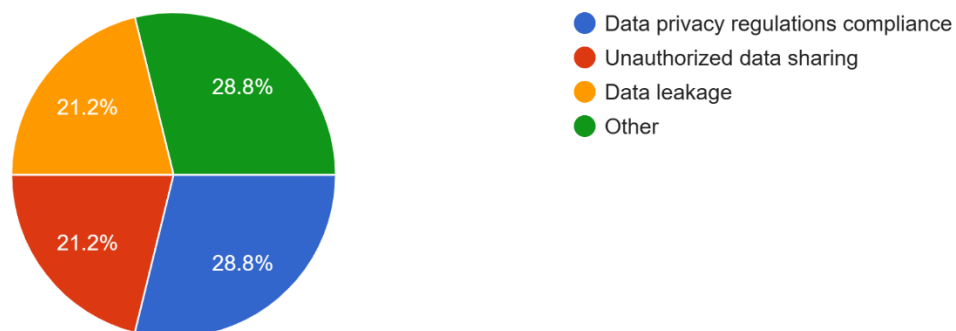
104 responses



Analysis: 53.8% of employees are familiar with blockchain technology and the rest of 46.2% are not familiar. Out of 104 respondents.

4.3. What are your main privacy concerns regarding the use of blockchain in supply chain management?

104 responses



Analysis: as per the researcher data privacy regulation compliance and others are 28.8% and data leakage and unauthorized data sharing respondents are less than 28.8% so data privacy is a primary concern in logistics and supply chain management

VIII. Reliability test

Case Administration Overview			
		N	%
Cases	Valid	104	100.0
	Excluded ^a	0	.0
	Sum	104	100.0
a. Listwise deletion using all variables in the procedure.			

Dependability Statistics	
Cronbach's Alpha	N of Items
.851	9

Interpretation: With a Cronbach's Alpha fee of 0.851 and nine gadgets, this shows correct to terrific internal consistency reliability.

zero to 0.5: bad reliability

0.5 to 0.7: Medium reliability

0.7 to 0.9: excellent reliability

Above 0.9: excellent reliability

Values above 0.7 normally suggest true inner consistency reliability.

Values above 0.8 are considered excellent and above 0.9 wonderful.

In this situation, a Cronbach's alpha fee of 0.851 indicates that the gadgets inside the scale or test are highly correlated, indicating that they're efficiently measuring the identical underlying construct. that is a acceptable end result for tests or scales in which reliability is important.

IX. Normality test

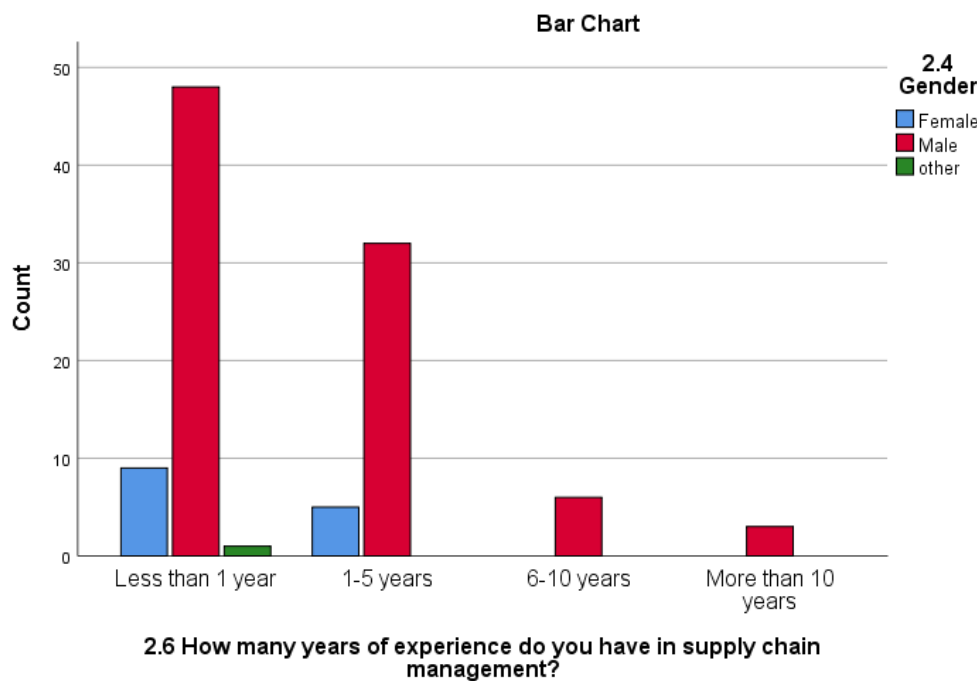
Tests of Normality							
	2.6 How many years of experience do you have in supply chain management?	Kolmogorov-Smirnov ^a			Shapiro-Wilk		
		Statistic data	df	Sig.	Statistic data	df	Sig.
3.1. Are you familiar with blockchain technology and its application in supply chain management?	Less than 1 year	.366	58	.000	.633	58	.000
	1-5 years	.373	37	.000	.631	37	.000
	6-10 years	.492	6	.000	.496	6	.000
	More than 10 years	.385	3	.	.750	3	.000
3.2. Have you or your organization implemented blockchain technology in your supply chain processes?	Less than 1 year	.384	58	.000	.626	58	.000
	1-5 years	.415	37	.000	.605	37	.000
	6-10 years	.319	6	.056	.683	6	.004
	More than 10 years	.385	3	.	.750	3	.000
4.2. Do you believe that blockchain technology can effectively address security concerns in supply chain management?	Less than 1 year	.378	58	.000	.715	58	.000
	1-5 years	.258	37	.000	.790	37	.000
	6-10 years	.319	6	.056	.683	6	.004
	More than 10 years	.175	3	.	1.000	3	1.000
4.3. What are your main privacy concerns regarding the use of blockchain in supply chain management?	Less than 1 year	.190	58	.000	.844	58	.000
	1-5 years	.230	37	.000	.813	37	.000
	6-10 years	.312	6	.069	.767	6	.029
	More than 10 years	.385	3	.	.750	3	.000
a. Lilliefors Significance Correction							

This cost suggests the chance of looking at the obtained result, assuming that the statistics are commonly disbursed. A small p-value (generally under 0.05) suggests that the statistics deviate notably from a regular

distribution.

Cross Tabulation 1

2.6 How many years of experience do you have in supply chain management? * 2.4 Gender Crosstabulation					
Count					
		2.4 Gender			Total
		Femal e	Male	other	
2.6 How many years of experience do you have in supply chain management?	Less than 1 year	9	48	1	58
	1-5 years	5	32	0	37
	6-10 years	0	6	0	6
	More than 10 years	0	3	0	3
Total		14	89	1	104



The crosstab shows the gender differences at different levels of experience in supply chain management with the following percentages:

Less than one year of experience: Of the 58 respondents in this group, 15.5% are women, 82.8% are men, and 1.7% are from other gender categories.

1-5 years of experience: Of the 37 responses, 13.5% are women and 86.5% are men.

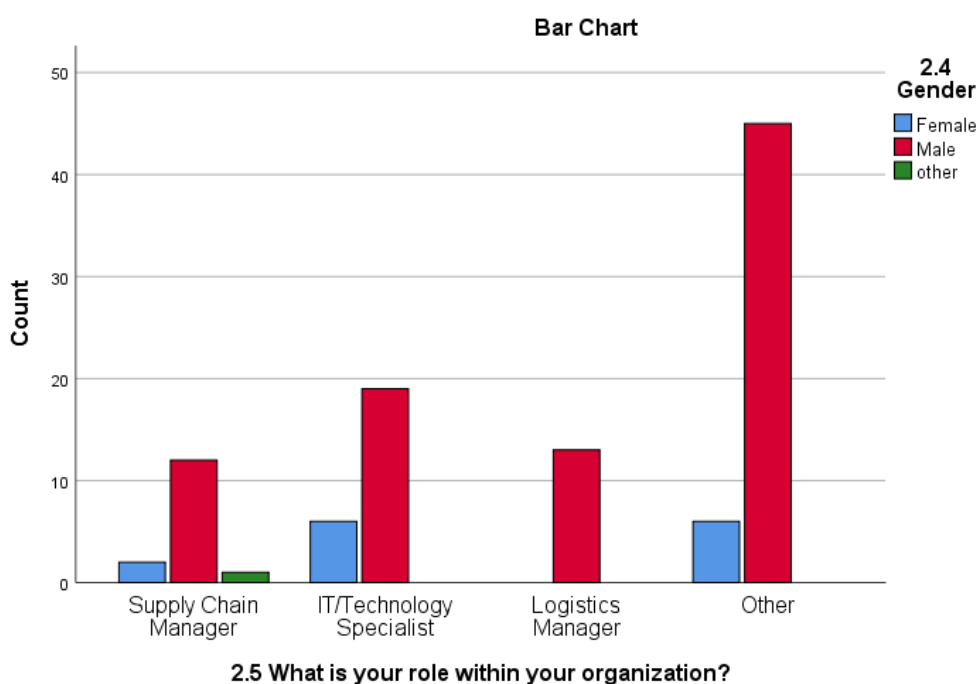
6-10 years of experience: All six responses in this group are male.

More than ten years of experience: All three answers are men.

This data shows a strong male presence at all levels of experience, with a significant proportion of respondents having less than one year of experience. In addition, the number of responses decreases with increasing experience levels, suggesting that retaining skilled workers in the profession may be difficult.

Cross Tabulation 2

2.5 What is your role within your organization? * 2.4 Gender Crosstabulation						
Count						
		2.4 Gender			Total	
		Femal e	Male	other		
2.5 What is your role within your organization?	Supply Chain Manager	2	12	1	15	
	IT/Technology Specialist	6	19	0	25	
	Logistics Manager	0	13	0	13	
	Other	6	45	0	51	
Total		14	89	1	104	



The cross-tabulation shows the distribution of gender in several jobs within the companies with the following percentages:

Supply Chain Manager: Of the 15 responses, 13.3% are women, 80% are men, and 6.7% fall into other gender groups.

IT/Technology Specialist: Of the 25 respondents, 24% are women and 76% are men.

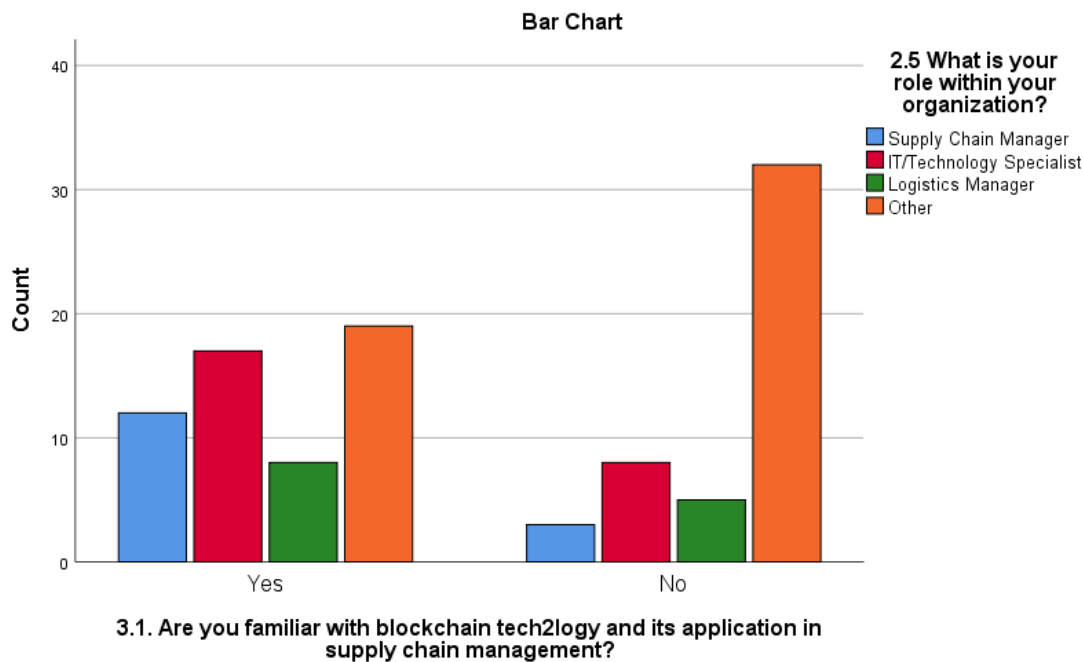
Logistics manager: All thirteen respondents in this category are male.

Other: Out of 51 responses, 11.8% are women and 88.2% are men.

These results show a significant predominance of men in all job positions, especially in logistics management positions without women. While women are well represented in the Supply Chain Manager and IT/Technology Specialist professions, gender diversification initiatives may be necessary, especially in areas historically dominated by men.

Cross Tabulation 3

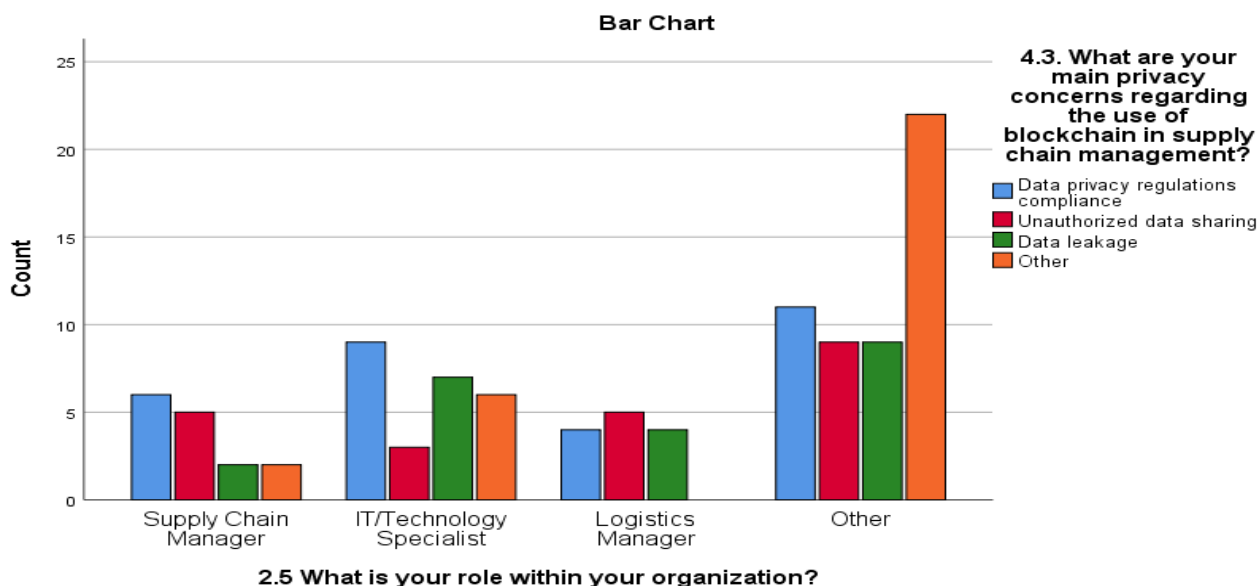
3.1. Are you familiar with blockchain technology and its application in supply chain management? * 2.5 What is your role within your organization? Crosstabulation							
Count							
		2.5 What is your role within your organization?				Total	
		Supply Chain Manager	IT/Technology Specialist	Logistics Manager	Other		
3.1. Are you familiar with blockchain technology and its application in supply chain management?	Yes	12	17	8	19	56	
	No	3	8	5	32	48	
Total		15	25	13	51	104	



The crosstab shows how familiarity with the blockchain era and its implementation in delivery chain management varies using organizational tasks. a few of the 104 respondents, 54% are acquainted with blockchain and 46% are not. specifically, the "different" group has the most understanding of blockchain (37%), observed using IT/era professionals (68%). But supply chain managers and logistics managers had decreased tiers of familiarity at eighty% and 62%, respectively. These findings highlight the importance of focused training and training activities to improve consciousness and adoption of blockchain technology, particularly amongst supply chain control decision-makers.

Cross Tabulation 4

2.5 What is your role within your organization? * 4.3. What are your main privacy concerns regarding the use of blockchain in supply chain management? Crosstabulation						
Count						
		4.3. What are your main privacy concerns regarding the use of blockchain in supply chain management?				Total
		Data privacy regulations compliance	Unauthorized data sharing	Data leakage	Other	
2.5 What is your role within your organization?	Supply Chain Manager	6	5	2	2	15
	IT/Technology Specialist	9	3	7	6	25
	Logistics Manager	4	5	4	0	13
	Other	11	9	9	22	51
Total		30	22	22	30	104



X. Results and Findings

Cross-analysis provides useful information about how employees in different positions in companies are familiar with management. Of 104 respondents, 56 are familiar with blockchain technology and its applications, while 48 are not. IT/Technology Specialists have the highest level of familiarity (68%), followed by Supply Chain Managers (80%). Conversely, logistics managers have a lower level of familiarity, namely 62%. In particular, the "Other" category, which includes numerous occupations not listed, demonstrates a high level of expertise with blockchain. Overall, these findings indicate variable levels of knowledge across organizational positions, underscoring the need for targeted education and training activities to improve awareness.

The findings of the take a look at advise that logistics agencies can significantly advantage of blockchain technology in delivery chain control. Blockchain improves transparency, traceability, and security throughout the delivery chain, lowering counterfeiting, fraud, and highly-priced paperwork. Logistics corporations can use blockchain to enhance operations, reduce expenses, and increase customer delight by imparting actual-time visibility into the motion of products.

There are more than 30 employees who have their primary concerns about the usage of management due to privacy regulations, and more than 40 employees such as IT/Technology specialists and logistics managers are mainly interested in the usage of advanced management chain each data prevent unauthorized data sharing and data leakage. This shows that specific employees have specific primary interests in employing blockchain-based systems to control the distribution system for the entire company efficiently and effectively. So, in conclusion, we can say that Blockchain technology is useful in Supply Chain Management for the regulation of personal data protection, which further follows the prevention of unauthorized data sharing and data leakage in Supply Chain Management.

XI. Conclusion:

The study emphasizes how complicated privacy issues are in supply chains guided by blockchain technology, with distinct problems related to various organizational functions. The need for strong procedures to satisfy legal obligations is highlighted by the emerging focus on compliance with data privacy rules. Although supply chain operations can benefit greatly from blockchain's transparency and efficiency, privacy concerns must be addressed for the technology to be successfully implemented.

XII. REFRERNCES:

❖ PICTURES TAKEN FROM

<https://www.researchgate.net/publication/364580709> Blockchain in Supply Chain Management

❖ LITERATURE REVIEW TAKEN FROM

1. <https://www.emerald.com/insight/content/doi/10.1108/IJPDLM-08-2019-0234/full/html>
2. <https://www.emerald.com/insight/content/doi/10.1108/SCM-09-2018-0309/full/html>
3. <https://ieeexplore.ieee.org/abstract/document/8846964/authors#authors>
4. <https://www.researchgate.net/profile/Archana-Joshi/publication/325173502> A survey on security and privacy issues of blockchain technology/links/5b40d165a6fdccbcf9079f73/A-survey-on-security-and-privacy-issues-of-blockchain-technology.pdf? sg%5B0%5D=started experiment milestone&origin=journalDetail
5. <https://ieeexplore.ieee.org/abstract/document/9841565>

❖ Data Analysis and Interpretation Is Done From:

<https://www.ibm.com/products/spss-statistics>