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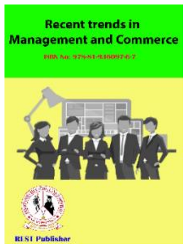

An Empirical Analysis of Real-Time IOT Tracking - Reducing Delays and Problems Towards Supply Chains

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Abstract: *Supply chains deal with ongoing issues like delivery delays, inventory mismatches, and disruptions from unforeseen circumstances in today's globalised economy. The lack of real-time visibility in traditional systems frequently results in increased expenses, inefficiency, and decreased customer satisfaction. This study explores how real-time Internet of Things (IoT) tracking can improve supply chain performance and cut down on delays. IoT makes it possible to continuously monitor inventory, vehicles, and goods, providing precise data that promotes proactive decision-making, increased resilience, and enhanced transparency. Customers of delivery and e-commerce platforms in Bangalore were given structured questionnaires as part of the study's descriptive, quantitative design. Descriptive and inferential statistical methods, such as regression, correlation, and chi-square tests, were used to analyse the data. Results should show how much IoT-enabled tracking enhances customer satisfaction, trust, and delivery reliability while lowering supply chain management inefficiencies. The study emphasises how supply chains could become smarter, more sustainable, and customer-focused systems thanks to IoT.*

Keywords*: Internet of Things (IoT), Real-time tracking, Supply Chain Management (SCM), Customer satisfaction, Transparency, Logistics efficiency, Sustainability.*

1. INTRODUCTION

In the current globalized business environment, supply chains have become more intricate, linked, and susceptible to interruptions. Variables such as inventory mismatches, transportation delays, geopolitical unpredictability's, and unanticipated events like pandemics or natural disasters can have a great impact on operational efficiency. These interruptions not only raise expenses but also hurt customer trust and market competitiveness. The incorporation of new technologies, like the Internet of Things (IoT), has become more popular as companies look for ways to increase resilience and agility. Real-time tracking of assets, vehicles, and goods is made possible by IoT, providing previously unheard-of visibility and control throughout the supply chain. Organizations can make proactive decisions and react quickly to possible threats by using real-time IoT tracking, which gives them timely and accurate data on the movement and condition of products. Businesses can monitor temperature, location, and transit conditions, minimize losses and guarantee product quality, by utilizing IoT sensors, RFID tags, and cloud-based platforms. This technological development increases the overall resilience of the supply chain while reducing delays and disruptions. Given its potential, this study explores how real-time IoT tracking can improve supply chain resilience, emphasizing how it can decrease delays, increase responsiveness, and establish more sustainable operations.

2. BACKGROUND OF THE STUDY

The supply chains of today resemble extensive networks in which products pass through numerous hands, automobiles, and nations before arriving at the consumer. Although this allows for global product delivery, it also increases the likelihood of issues. Delays may be caused by strikes, poor weather, traffic congestion, equipment malfunctions, or even world events. Businesses lose money, deliveries are delayed, and customers are dissatisfied when this occurs. Because of this, companies are now concentrating on strengthening and improving the resilience of their supply chains in order to better manage issues. The Internet of Things is the newest technology that is widely utilized in industry, and its uses enhance contemporary supply chain management. In the 1990s, the phrase "Internet of Things" was first used. The primary work was completed by "Kevin Ashton," an IoT pioneer and cofounder of MIT's Auto-ID Laboratory. He coined the phrase "Internet of Things" to refer to a system in which ubiquitous sensors, such as RFID (Radio-frequency identification), connect the Internet to the physical world [1]. Due to its ease of use in business operations, IoT is utilized in a variety of application areas, particularly in the business sector. The Internet of Things (IoT) is one of the newest remedies for this. Businesses can see the precise location and condition of their products in real time with the aid of IoT devices like trackers and smart sensors. For instance, a business can verify whether a truck is stuck in traffic or whether medications are being transported at the proper temperature. Managers can act quickly before a minor problem becomes a major one thanks to this real-time information. IoT improves the speed, intelligence, and dependability of supply chains in this way.

3. STRUCTURE OF IOT

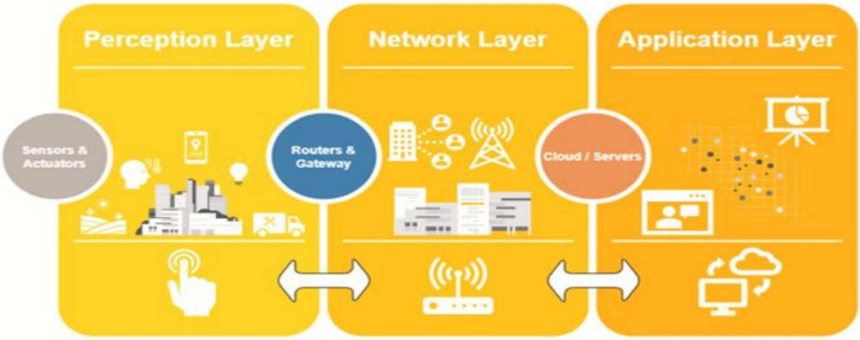

FIGURE 1. Source: Science Article

Three layers make up the general architecture of the Internet of Things: the perception layer, the network layer, and the application layer [3]. The layered architecture of IoT is depicted in Fig. 1. 1. Perception layer: The Internet of Things' overall architecture takes a bottom-up methodology. The bottom layer is the perception layer. The IoT architecture's physical layer is this one. This layer's primary function is to use various sensors, actuators, and other intelligent devices to gather information and physical parameters from the surroundings. 2. Network Layer: The information gathered from the perception layer is shared and sent to servers, applications, and other network devices for additional network layer processing. 3. Application Layer: This is the highest layer in the Internet of Things architecture, and its function is to offer end users services tailored to a particular application. This layer contributes to giving end users an intelligent IoT-based environment. Programs and modules that businesses or enterprises use to view real-time data and make wise decisions for their operations are also included in this layer

4. SIGNIFICANCE OF THE STUDY

FIGURE 2. Source: Science Article

Overstocking, understocking, product delivery delays, and difficulties communicating real-time information are just a few of the problems with the traditional supply chain management process. SCM operations and profitability are significantly increased by efficient and clearly defined SCM procedures. Businesses are implementing the newest technology for the SCM process as a result of technological advancements. Improved SCM procedures have made the process smarter with the rise of IoT. The following characteristics set SCM apart from IoT-based supply chain management.

Instrument: IoT-enabled SCM uses machine-generated information, such as sensors that gather vast volumes of environmental data.

Interconnected: All smart devices, assets, and products in the supply chain are kept connected through the use of IT systems and the Internet, which facilitates efficient coordination and communication.

Intelligent: Business intelligence tools and smart analytics assist managers in making better decisions, increasing productivity and addressing issues in supply chain operations.

Automated: By eliminating manual and time-consuming tasks, IoT speeds up, simplifies, and improves supply chain operations.

Integrated: The various supply chain phases function as a single, interconnected system that shares real-time data and facilitates prompt, well-informed decision-making.

Innovative: IoT offers fresh, cutting-edge solutions that improve value and change supply chains to address today's business issues.

Figure 2 outlines the characteristics of SCM based on IoT. Every step of supply chain management, from manufacturing to warehousing, transportation, and logistics, has been transformed by IoT. IoT offers its services in automation, cost-effectiveness, product and goods tracking and traceability, better and efficient inventory management, enhanced machine performance, and discernible market trends to help businesses expand at every stage

5. TECHNOLOGIES THAT ENABLE SUPPLY CHAIN MANAGEMENT

Radio Frequency Identification (RFID) and other digital technologies work together to enhance supply chain management (SCM) by improving visibility, efficiency, and real-time decision-making. These technologies often integrate with systems like Warehouse Management Systems (WMS) and Enterprise Resource Planning (ERP) to automate and streamline operations.

Radio Frequency Identification (RFID)

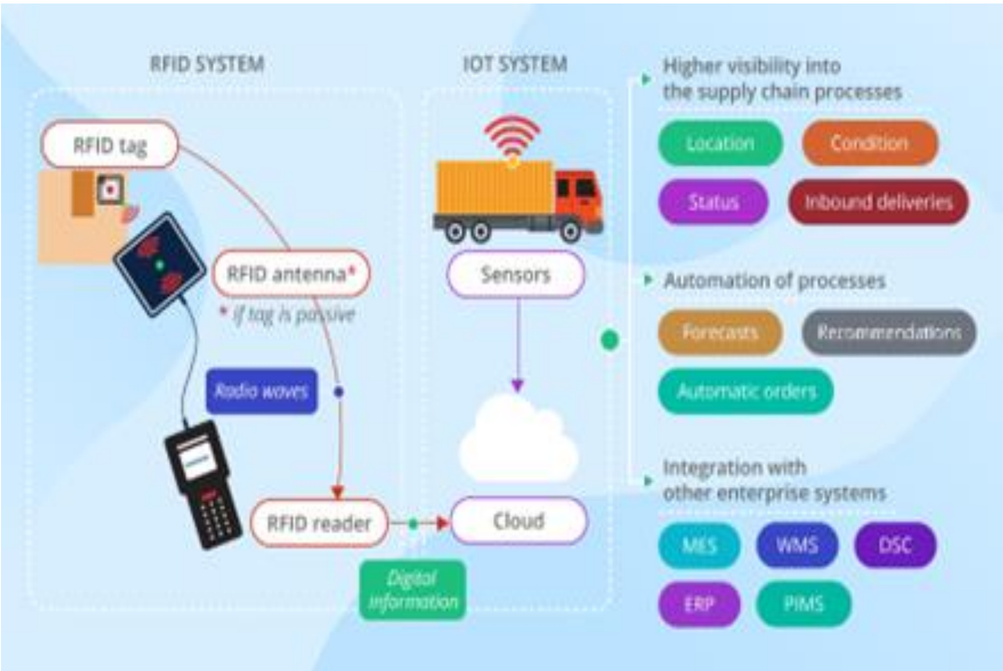

FIGURE 3. RFID systems use radio waves to automatically identify and track tagged items, providing a major upgrade from traditional barcodes.

- Tags: Microchips with antennas are attached to individual products, pallets, or containers, storing unique identification data. Passive tags are powered by the reader's signal, while active tags have their own battery and a longer read range.
- Readers: Devices that emit radio waves to scan tags and capture data, which is then sent to a central management system.
- Benefits:
- Automated data capture: Enables the scanning of multiple items simultaneously without needing a line of sight.
- Real-time tracking: Provides instant updates on the location and status of goods throughout the supply chain.
- Improved accuracy: Reduces human error and provides precise inventory counts.

6. INTERNET OF THINGS (IOT)

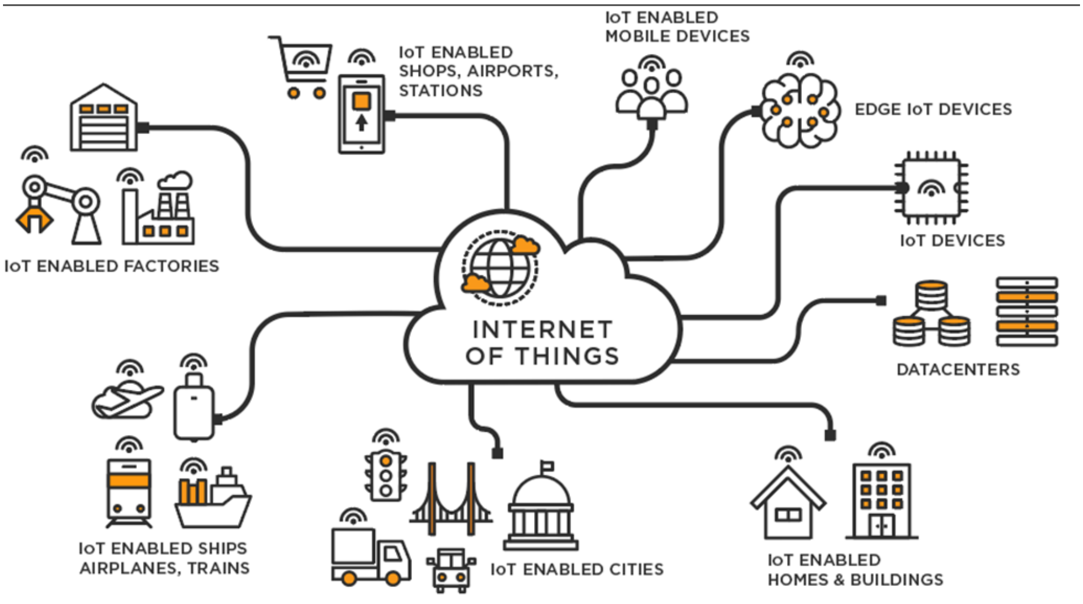

FIGURE 4.

IoT creates a network of interconnected physical devices embedded with sensors and software that can collect and exchange data.

- Integration with RFID: IoT sensors can be integrated into RFID tags to monitor environmental conditions like temperature and humidity for sensitive products such as food or pharmaceuticals.
- Real-time insights: Provides logistics managers with a deeper understanding of their operations, from freight management to equipment monitoring.

Cloud for Internet of Things (IoT)

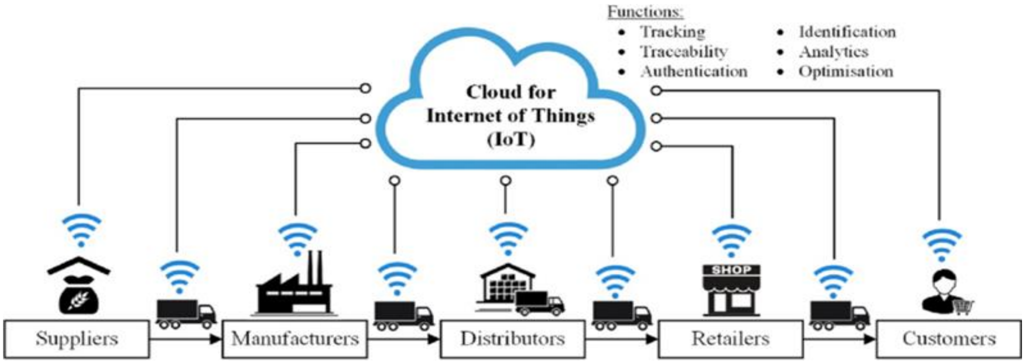

FIGURE 5.

Cloud for the Internet of Things (IoT) in supply chain management refers to cloud platforms providing the necessary storage, computing power, and infrastructure to collect, process, and analyze vast amounts of data generated by IoT devices like sensors and tracking tags. This combination creates a unified system that offers real-time visibility, enhanced collaboration, predictive insights, and operational efficiency across the supply chain, transforming raw data into actionable information for better decision-making and cost savings. It also aids in several functions like tracking, traceability, analytics, etc.

7. BLOCKCHAIN

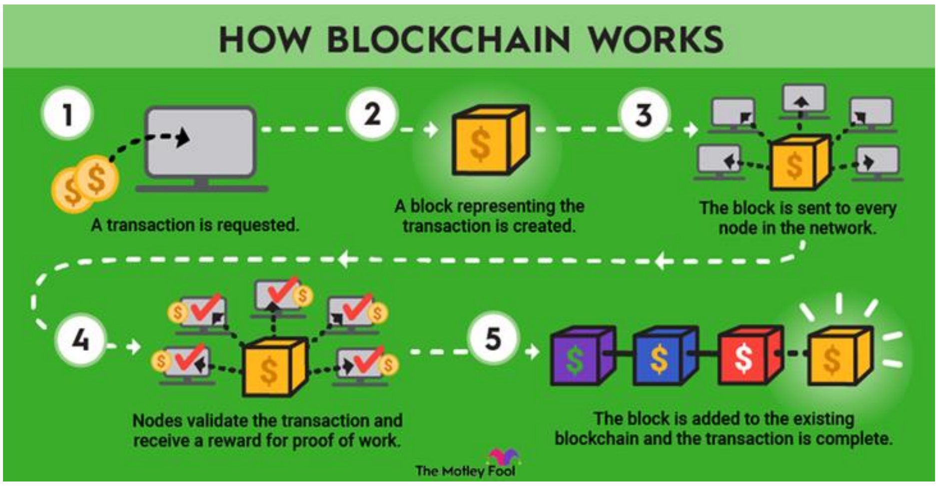

FIGURE 6.

Blockchain creates a decentralized, immutable, and transparent record of transactions that is shared across a business network.

- Supply chain transparency: By linking blockchain to RFID tags, companies can create a tamper-proof chain of custody for products, preventing counterfeiting and enhancing traceability.
- Data security: Enhances the security of shared supply chain data and fosters trust among partners.

8. ROBOTICS AND AUTOMATION

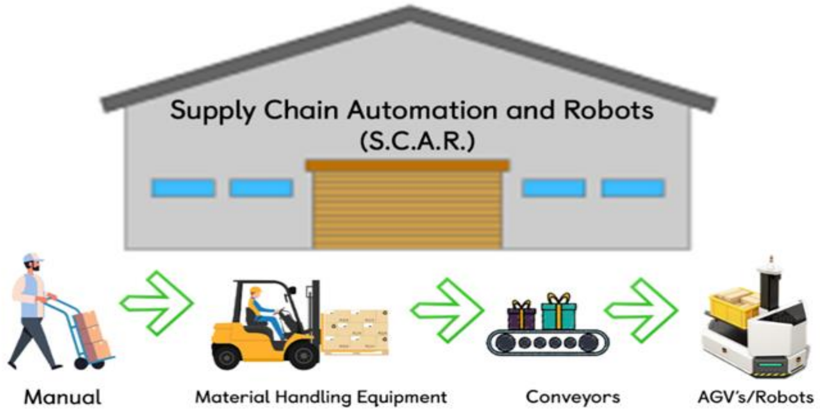

FIGURE 7.

Robotics and automation replace manual, repetitive, and error-prone tasks with automated systems.

- Automated handling: Robots are used in warehouses for tasks such as picking, sorting, and palletizing goods.
- Collaboration: Collaborative robots ("cobots") work alongside human employees to increase productivity and workplace safety.
- Integration with RFID: RFID enables robots and automated guided vehicles (AGVs) to identify and transport items through the warehouse without manual intervention.

These technologies combine to create a comprehensive, data-driven SCM ecosystem:

- Data collection: RFID tags and IoT sensors attached to products and equipment automatically capture vast amounts of real-time data.
- Data processing: Cloud computing provides scalable infrastructure for processing and storing the massive volumes of data collected from RFID and IoT devices.
- Data analysis and insights: AI and advanced analytics transform this raw data into actionable insights for demand forecasting, inventory optimization, and identifying potential bottlenecks.
- Process automation: Robotics and Robotic Process Automation (RPA) execute tasks based on the insights from AI, automating everything from warehouse operations to order fulfillment.

Secure record-keeping: Blockchain provides a secure, transparent, and verifiable record of product movement and transactions across the entire supply chain

9. NEED OF THE STUDY

Supply chains deal with a number of issues in the fast-paced world of today, such as delayed deliveries, excess or missing inventory, and limited visibility into the location of products at any given time. These issues raise expenses, annoy clients, and reduce a company's ability to compete. Conventional supply chain systems react slowly and are unable to deal with unforeseen problems like traffic bottlenecks, strikes, equipment malfunctions, or worldwide calamities like pandemics. Because of this, there is a great need for more intelligent solutions that can give businesses real-time information and enable them to act quickly to prevent more serious issues. By enabling businesses to track inventory, vehicles, and goods in real time, the Internet of Things (IoT) provides a potent solution to these problems. To comprehend how IoT can contribute to supply chains becoming faster, more dependable, and more efficient, this study is necessary. It also examines how IoT can improve supply chains' resilience and sustainability, lower losses, and satisfy customers. By examining these topics, the study hopes to assist researchers and companies in comprehending the advantages of IoT and identifying more effective ways to leverage it for expansion and success

10. REVIEW OF LITERATURE

Rejeb, A., Keogh, J. G., & Treiblmaier, H. (2019)

This paper investigates the integration of Blockchain and IOT to enhance modern supply chains and value networks, efficiency, security, and transparency. It suggests six research directions to investigate how Blockchain affects IOT characteristics like interoperability, scalability, and traceability, providing a solid foundation for further research.

Adeusi, K. B., Adegbola, A. E., Amajuoyi, P., Adegbola, M. D., & Benjamin, L. B. (2024)

This paper examines the way in which supply chain management is being impacted by IOT technology. It describes how IOT solutions assist companies in increasing visibility, increasing productivity, reducing expenses, and better managing risks. It also highlights issues, scalability problems, and reliance on technology that need to be resolved.

Sallam, K., Mohamed, M., & Mohamed, A. W. (2023)

The article describes the fundamentals of IoT and demonstrates how sensors, real-time data, and sophisticated analytics enable businesses to monitor and manage their supply chains more effectively. It also explores how IOT will continue to influence and enhance supply chain management in the upcoming years with future trends and innovations.

Archana, T. (2025).

This study explores the way in which IOT and AI work together to improve the speed and intelligence of supply chain monitoring. Devices such as sensors, GPS trackers, and RFID tags can provide real-time data on the location, state, and status of goods. This integration helps businesses benefit from visibility, efficiency, and decision-making throughout their supply chain.

Pundir, A. K., Jagannath, J. D., & Ganapathy, L. (2019, January)

This paper focuses on identifying the problem across supply chains to increase overall visibility. End-to-end visibility is more crucial than ever in the complex networks, multiple modes of distribution, and numerous stakeholders of today. It focuses on the necessity of more intelligent ways to improve the efficiency and transparency of supply chains.

Gariya, N., Shaikh, A., Ahmad, A., Sharma, K., & Sharma, A. (2024)

This paper describes how the integration of IOT technology has led to an evolution in supply chain management. This combination has enhanced inventory control, optimization, and visibility, which has made supply chain management smarter and effective. It minimizes waste and delays while facilitating real-time tracking, improved data analysis, more efficient logistics, and cost reduction.

Murala, D. K., Siddamshetti, K., & Milanova, M. (2024)

This article explains IOT, its core technologies, and its implications in supply chain management. Moreover, it reviews previous research by classifying it according to the methods used, the industries it focuses on, and the main areas of supply chain operations, it addresses.

De Vass, T., Shee, H., & Miah, S. (2021)

This study investigates the opportunities and challenges of using IOT in supply chains by interviewing managers in the Australian retail sector. It gives actual instances of how IOT can help businesses by assisting them in making more informed investment choices. It also identifies obstacles to adoption and makes recommendations for further research in this field.

Chamekh, M., El Asmi, S., Hamdi, M., & Kim, T. H. (2018, October).

This study examines how supply chain management is being impacted by the adoption of IOT. It emphasizes how internal connectivity enhances data quality and reliability, guaranteeing improved tracking and supporting documentation for important supply chain operations.

Zhou, W., & Piramuthu, S. (2015, May)

This ongoing study uses IoT-based automatic tracking and tracing technologies to investigate a less-studied issue in supply chains. It presents a framework with three levels of traceability, tracking the actual movement of goods, keeping an eye on corporate operations, and assessing output

11. PROBLEM STATEMENT

Delivery delays, inventory mismatches, equipment failures, and disruptions from things like traffic jams, strikes, or even pandemics are all common problems in today's complicated supply chains. Businesses find it challenging to react swiftly and efficiently when traditional systems are unable to provide real-time updates. Higher expenses, disgruntled clients, and decreased productivity result from this. By providing businesses with real-time information about their inventory, vehicles, and goods, real-time IoT tracking provides a solution that enables them to make better and faster decisions. Adoption of this technology is still difficult for many businesses, though, due to factors like high costs, a lack of technical expertise, and problems with data management. Understanding how IoT can decrease delays, boost productivity, and improve supply chains' responsiveness and dependability is the main goal of this study

12. RESEARCH OBJECTIVE

- To assess the level of awareness among supply chain stakeholders (manufacturers, distributors, retailers, logistics providers) regarding the use of Real-Time IoT tracking systems.
- To measure the satisfaction level of users (supply chain participants) with IoT-based tracking solutions in terms of accuracy, transparency, cost-effectiveness, and efficiency

13. RESEARCH METHODOLOGY

In order to examine how Bangalore consumers view real-time IoT tracking in supply chains, this study uses a descriptive and quantitative research methodology. Measuring the effects of IoT-enabled tracking on delivery transparency, customer satisfaction, and trust is the main goal. The research design used was survey-based. Primary data for the study were gathered using structured questionnaires with closed-ended questions scored on a 5-point Likert scale, which goes from Strongly Disagree to Strongly Agree. Reliability is guaranteed by this design, which also makes statistical interpretation of customer perceptions possible. Customers who live in Bangalore and frequently use delivery and e-commerce platforms (Amazon, Flipkart, Swiggy, Zomato, BigBasket, etc.) with real-time tracking capabilities make up the study's population. An ideal population for examining technology-enabled supply chain practices is Bangalore, one of India's top IT and logistics centres.

Yamane's Formula (1967) was used to determine the necessary sample size:

n=1+N(e2) N

Where:

- n = Sample size
- N = Population size
- e = Level of precision (5% = 0.05)

The sample size was determined using Yamane's method with a 5% margin of error. The necessary sample size was determined to be roughly 109 participants in order to guarantee statistical reliability, based on a total population of 150 respondents.

To ensure diversity in age, occupation, and IoT-enabled delivery system usage patterns, a convenience sampling technique was employed to gather responses from customers in various Bangalore zones. Sectioned, closed-ended questions in a structured questionnaire:

Age, gender, occupation, and frequency of online purchases are examples of demographic data.

IoT tracking as perceived by consumers (accuracy, reliability, delivery transparency, convenience). Level of satisfaction with tracking systems enabled by IoT. A 5-point Likert scale (strongly disagree to strongly agree) is used for measurement.

Anticipated Result- It is anticipated that the methodology will provide insights into:

- How Bangalore consumers view the value of real-time IoT tracking.
- If IoT tracking boosts trust and decreases perceived delivery delays.
- The general degree of customer satisfaction with supply chain services made possible by technology.

14. DATA ANALYSIS AND INTERPRETATION

- **Correlation Coefficient (r)** → ranges from -1 to +1.
  - Close to **+1** → strong positive relationship.
  - Close to **0** → weak/no relationship.
  - Close to **-1** → strong negative relationship.
- **Sig. (2-tailed)** → p-value.
  - If **$p < 0.05$** → statistically significant.
  - If **$p < 0.01$** → highly significant (marked with **).

Awareness Analysis

- Awareness is **positively correlated** with:
  - Satisfaction level (**$r = 0.494$, $p < 0.01$**) → more awareness → higher satisfaction.
  - Frequency of delay analysis (**$r = 0.588$, $p < 0.01$**) → those aware also report more insights on delays.
  - Trust level (**$r = 0.543$, $p < 0.01$**) → awareness improves trust in IoT tracking.
- Strength: mostly **moderate correlation (0.4–0.6)**.

Satisfaction Level Analysis

- Very strong correlation with:
  - Age factor analysis (**$r = 0.939$, $p < 0.01$**).
  - Frequency analysis (**$r = 0.879$, $p < 0.01$**).
  - Checking status, Importance, Security (**$r \approx 0.925$, $p < 0.01$**).
- Interpretation → Satisfaction is strongly influenced by how frequently IoT devices are used, their reliability, and security features.

Consumer Satisfaction vs Consumer Preference

- High positive correlation (**$r = 0.863$, $p < 0.01$**).
- Meaning → consumers who are satisfied are also more likely to prefer IoT-enabled supply chain solutions.

Experience Analysis

- Correlation with awareness is weaker (**$r = 0.220$, $p < 0.05$**), but significant.
- Suggests experience doesn't directly drive awareness strongly, but still has a role.

Commonly Device Used Analysis

- Shows **moderate correlation** with satisfaction (**$r = 0.819$**) and preference (**$r = 0.819$**).
- Indicates that the type of IoT device influences satisfaction and adoption preference.

TABLE 1.

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.978[a]	.956	.952	.23453
a. Predictors: (Constant), Consumer preference analysis, awareness analysis, Experience analysis, commonly device used analysis, Benefit analysis, Consumer preference analysis, frequency analysis, Frequence of delay analysis, Consumer satisfaction analysis, Consumer recommendation analysis, Consumer will analysis				

Model R R Square Adjusted R Square Std. Error of the Estimate 1 .978a .956 .952 .23453 a Predictors: (Constant), Consumer preference analysis, awareness analysis, Experience analysis, commonly device used analysis, Benefit analysis, Consumer preference analysis, frequency analysis, Frequence of delay analysis, Consumer satisfaction analysis, Consumer recommendation analysis, Consumer will analysis.

TABLE 2.

ANOVA[a]						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	129.851	11	11.805	214.617	.000[b]
	Residual	5.940	108	.055		
	Total	135.792	119			
a. Dependent Variable: age factor analysis						
b. Predictors: (Constant), Consumer preference analysis, awareness analysis, Experience analysis, commonly device used analysis, Benefit analysis, Consumer preference analysis, frequency analysis, Frequence of delay analysis, Consumer satisfaction analysis, Consumer recommendation analysis, Consumer will analysis						

Regression SS (129.851)

- This is the variation in the dependent variable (**age factor analysis**) that is explained by the predictors.
- Very large compared to the residual → model explains most of the variance.

Residual SS (5.940)

- This is the unexplained variation (error).
- Since it's quite small compared to regression SS, the model fits the data well.

F-value (214.617)

- Tests whether the regression model as a whole is statistically significant.
- A very high F-value (>>1) indicates the model is a good fit.

Significance (Sig. = .000)

- Since **$p < 0.001$**, the regression model is **highly significant**.
- This means the set of independent variables significantly predicts the dependent variable (age factor analysis)

TABLE 3.

Coefficients						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.030	.186		.163	.871
	frequency analysis	-.023	.097	-.018	-.242	.810
	awareness analysis	-.212	.114	-.058	-1.856	.066
	Experience analysis	-.082	.111	-.036	-.736	.464
	Frequency of delay analysis	-.252	.106	-.240	-2.371	.020
	Benefit analysis	.034	.088	.031	.384	.702
	Consumer preference analysis	.530	.076	.404	6.966	.000
	Consumer will analyze	.364	.171	.231	2.125	.036
	Consumer recommendation analysis	.466	.081	.584	5.733	.000
	Consumer satisfaction analysis	.078	.082	.081	.951	.344
	Commonly device used analysis	.025	.059	.033	.428	.669
	Consumer preference analysis	.004	.076	.005	.048	.962
a. Dependent Variable: age factor analysis						

Interpretation of Results

- **Constant (0.030, p = 0.871)**

- Not significant → no meaningful standalone impact.
- **Frequency Analysis (B = -0.023, p = 0.810)**
    - Not significant → frequency doesn't affect age factor analysis.
- **Awareness Analysis (B = -0.212, p = 0.066)**
    - Marginal effect (p = 0.066 ~ close to 0.05).
    - Slight **negative impact**, but not strong enough to be conclusive.
- **Experience Analysis (B = -0.082, p = 0.464)**
    - Not significant.
- **Frequency of Delay Analysis (B = -0.252, Beta = -0.240, p = 0.020)**
    - **Significant negative predictor**.
    - More delays are associated with lower scores in age factor analysis.
- **Benefit Analysis (B = 0.034, p = 0.702)**
    - Not significant.
- **Consumer Preference Analysis (B = 0.530, Beta = 0.404, p = 0.000)**
    - **Highly significant positive predictor**.
    - Strongest impact → higher consumer preference strongly improves age factor analysis.
- **Consumer Will Analysis (B = 0.364, Beta = 0.231, p = 0.036)**
    - Significant positive predictor.
    - Willingness matters, but less strongly than preference.
- **Consumer Recommendation Analysis (B = 0.466, Beta = 0.584, p = 0.000)**
    - **Highly significant & strongest overall predictor (highest Beta = 0.584)**.
    - Recommendations from consumers play the **most powerful role** in influencing age factor analysis.
- **Consumer Satisfaction Analysis (B = 0.078, p = 0.344)**
    - Not significant.
- **Commonly Device Used Analysis (B = 0.025, p = 0.669)**
    - Not significant.
- **Consumer Preference Analysis (duplicate row, B = 0.004, p = 0.962)**
    - Likely a data entry/collinearity issue. The first one (B = 0.530, p = 0.000) is valid

15. SUGGESTIONS

For Marketers

- In marketing campaigns, emphasize the transparency, speed, and dependability of real-time IoT tracking.
- Make customized offers and demand projections using data generated by the Internet of Things.
- By demonstrating how IoT lowers delays and increases delivery accuracy, you can win over customers' trust and loyalty.
- Work together with logistics partners to guarantee that marketing communications accurately portray service dependability.
- Make IoT-enabled supply chains a point of differentiation in the marketplace.

For Consumers

- Make active use of delivery and e-commerce apps' real-time tracking features.
- Offer reviews and comments to assist companies in enhancing their offerings.
- Choose companies that use open, Internet of Things-based tracking systems to ensure accountability.
- To make better purchasing decisions, keep up with supply chain digital innovations.
- Encourage businesses to use IoT to run more sustainably and effectively.

16. CONCLUSION & RECOMMENDATIONS

This study emphasizes how supply chain management could be revolutionized by real-time Internet of Things (IoT) tracking, which would make it more customer-focused, transparent, and efficient. According to Bangalore consumers' research, trust, satisfaction, and delivery dependability are all directly enhanced by IoT-based tracking awareness and adoption. Businesses can take proactive measures, reduce delays, maximize resources, and respond swiftly to interruptions such as traffic, equipment failure, or unforeseen global events with the help of real-time data. Furthermore, an intelligent and networked supply chain ecosystem is produced by combining IoT with cutting-edge technologies like automation, blockchain, and cloud computing. Although the advantages are obvious—such as increased visibility, lower operating costs, and a better customer experience—problems like the high cost of implementation, the need for technical expertise, and the complexity of data management must be addressed for wider adoption. All things considered, supply chains powered by IoT signify a move towards operations that are more intelligent, robust, and sustainable. In addition to achieving operational excellence, companies that adopt these innovations will boost their long-term competitiveness and customer trust in a global market that is changing quickly.

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