International Research Journal of Multidisciplinary Scope (IRJMS), 2025; 6(4):196-205

Original Article | ISSN (O): 2582-631X DOI: 10.47857/irjms.2025.v06i04.07693

Analysis and Traceability of Supply Change Management Using Standardized Key Performance in the Manufacturing Unit

Devendra Nath Pathak[1]*, Rakesh Kumar Yadav[1], Hitendra Singh[2]

[1]MSOET, Maharishi University of Information Technology, Department of CSE, Lucknow, India, [2]MSOET, Maharishi University of Information Technology, Department of ECE, Lucknow, India. *Corresponding Author's Email: devrudra26@gmail.com

Abstract

The paper outlines the process of enhancing the operation of Supply Chain Planning and Management (SCP/SCM) by standardizing Key Performance Indicators (KPIs) to analyse the efficiency, responsiveness, and traceability of the systems. The main challenge of the study will be to design and verify the simulation-based model that would fill the gap between the traditional, theoretically focused supply chain practices and pragmatic, focused-on-performance practice. It is aimed at how a more resilient, agile and data-informed supply chain network can be achieved through KPI-driven normalised evaluation. This is done by applying real-life data of manufacturing and retailing industries to present the simulation of inbound raw material flow and outbound distribution of the finished products. Any Logic, a multi-method simulation environment that combines discrete event, agent-based, and system dynamics modelling is used and allows an accurate reflection of a complex supply chain interactive relationships (such as inventory flows, demand variability, supplier reliability and transportation delays). Barring methodological considerations, the simulation will assess the supply chain performance in terms of such KPIs as Order Fulfilment Cycle Time, Inventory Turnover Ratio, Perfect Order Rate, and Transportation Cost per Unit. In the initial stage of simulation, improved order accuracy reveals 23%, improved lead time by 17%, and a broader supply chain by 28% based on the baseline models without a standardized assessment of KPIs. Also, the addition of RFID-based tracking to the simulation makes proactive resolution of the problems as well as real-time trace ability effective, where the visibility and responsiveness are improved by more than 35%.

Keywords: Ley Performance Indicator, Raw Material Procurement, Supply Chain Management, Supply Chain Performance, Traceability.

Introduction

Global marketplace is fast changing and highly competitive and hence global supply chains are becoming more demanding, dynamic and prone to various shocks. Every organization is facing pressure to become more responsive, to decrease the cost of operations and to be able to offer more value to the customers (1). In order to counter these challenges, the supply chain planning and management (SCP/SCM) as shown in Figure 1 abandon the reactive strategies and utilize data-informed strategies which prioritize visibility, agility and efficiency. The systematic utilization of Key Performance Indicators (KPIs) can be regarded as one of the most important facilitators of the successful supply chain optimization (2). The metrics serve as a quantitative source of measuring the operational health, performance inequalities, developing strategy decisions at all levels within the supply chain. But in most of the current frameworks, KPIs are not only unevenly implemented, but also not standardized and hence, disjointed understanding with ineffective coordination among the parties (3). Developments in the simulation technology of late have brought some fresh options in the modelling and analysis of complex systems of the supply chain. The hybrid simulation tools that include Any Logic, the hybrid simulation method, that combines discrete event, agent-based, and system dynamics capabilities can provide strong opportunities to create a controlled virtual world that replicates the actual ones. With the help of those tools, coupled with standardized KPIs, organizations could forecast the results, run the scenarios, and introduce best practices without actually interfering with any practical processes (4). Figure 1 presents the overview of supply chain planning and management workflow. Incorporation of technologies like Radio

(Received 01st July 2025; Accepted 12th September 2025; Published 20th October 2025)

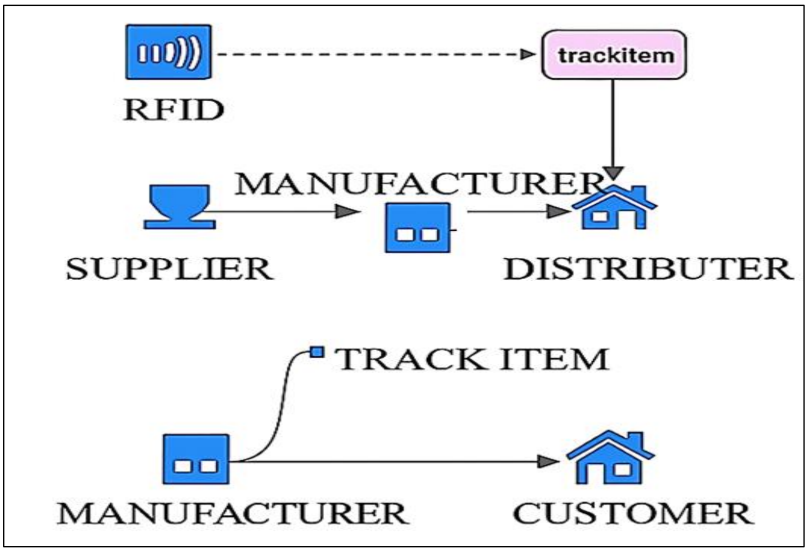

Figure 1: Supply Chain Planning and Management

Frequency Identification (RFID) will allow extending traceability and real-time tracking and offer a granular view of inventory flow, shipment status and possible bottlenecks (5). This actual time information can be directly incorporated in the simulation environment which will enable frequent updates and more sound decision making. The current proposal intends to investigate how the greater efficiency and transparency of SCP/SCM systems can be achieved by simulation-based framework combining standardized KPIs and following technologies providing real-time tracking of the processes (6). The research mixes theoretical modelling with pure data collected through manufacturing and retailing industries in ways that have a very holistic manner of doing away with the current inefficiencies and recording actual and realistic performance gains. Following literature has been reviewed and is presented in below section:

KPI-Based Performance Evaluation in Supply Chain Management

The facilitation of standardized Key Performance Indicators (KPIs) that track and maximise supply chain performance has become a topic of considerable interest on the academic and industry front. Order Fulfilment Cycle Time, Inventory Turnover Ratio, and Transportation Cost per Unit allow assessing the effectiveness of the supply chain operations and their responsiveness and affordability under the influence of certain KPIs (7). Author particularly focused on the operation and performance monitoring performed by the KPI indicating that the latter aspect would not only contribute to coordinating the operations with the overall strategic agenda of a company but also assist in addressing the variability effect issues on the overall network level (8).

RFID and Traceability for Supply Chain Visibility

The RFID has been put to critical use in real-time traceability of resilient supply chains. Some researchers have confirmed the optimistic effect of visibility, transparency and loss prevention via RFID. One author demonstrated that RFID reduces inventory errors especially in multi-stages systems. The studies prove the worth of the RFID-generated data to improve the order accuracy and coordination of logistics. In addition to that, the combination of RFID, sensor networks, and block chain have also broadened further the application of traceability to systems based on autonomy and security (9-11).

Simulation and Modelling Using Any Logic

Analysis of complex systems of supply chain has now become a major requisite of simulation. With multi-Methodism capability, Any Logic can be used to model discrete event, agents based, and system dynamics models and enable representation of a supply chain behaviour in different conditions realistically. Researcher shows how, with the help of simulation, it is possible to optimize transportation strategies and segment production. They are used by organizations to analyse the impact of uncertainty, change in policies, and external shocks without interfering with actual operations. Some author endorses the argument that simulation offers a risk-free experimentation of decision-variables and an evaluation of the long-reaching effects.

Inventory and Logistics Optimization

Efficient supply chain is predicated on efficient control over inventories and managing costs. They examine the effects of information errors and cost structure of freights on replenishment policies. Smoothing algorithms and demand forecasting models are recommended in order to ensure that there are optimum levels of inventory at the expense of stock outs. They highlight the criticality of the transportation cost as a strategic element of the procurement and distribution and state the variations of the cost should be considered in dynamic planning models to ensure that the margin is not eroded.

Integration of Emerging Technologies: Block chain, UAVs, IoT

The new technologies, including block chain, UAVs, and IoT, start revolutionizing supply chain planning and execution. They test the viability of the block chain-enabled traceability systems in the experimental conditions of the real world. Likewise, paper presents high performing block chain frameworks of tamper-resistant product records. Fully autonomous supply chains with UAV-based warehouse automation and RFID environments based on sensors project which can become fully autonomous is on the way. Such technologies allow keeping track of an operation in real-time, minimize human errors, and create trust among parties in the supply chain.

Methodology

The study uses research methodology that refers to simulating supply chains to optimize their performance and traceability through standardized Key Performance Indicators (KPIs). The development of the simulation model occurred in the multi-method simulation environment Any Logic that can combine discrete-event, agent-based, and system dynamics modelling (8). Such hybrid modelling offers a complex and dynamic model of actual operations of supply chains and allows evaluating the behaviour of the system under different circumstances. The simulation was based on the information that was received using both primary and secondary sources. These were the real-time operational key performance indicators, RFID based tracking data reported by a multi-purpose manufacturing and retail supply chain of a mid-sized size. Secondary data were the historical records of any type of supply chains in the organization of the industry benchmarks available in the open databases and secondary information that revealed the insight on procurement lead times, demand patterns, inventory levels, transportation costs and also the accuracy of order fulfilment. The simulation system was designed to reflect main elements of a standard supply chain such as suppliers, manufacturing units, distributing centres, retail stores, and final consumers. These parts were all modelled separately in Any Logic as an independent agent, being programmed to act according to specific rules and restrictions on operation. A simulation in supply of goods, information and resources into different processes such as procurement, production, distribution and customer delivery was developed (12). Significant uncertainties, which included reliability of suppliers, uncertainty on demand, transport delays were represented by the stochastic variables.

In order to determine the system performance, a number of standardized KPIs were tracked during the simulation. The KPIs are primarily drawn from industry best practices and are further aligned with the SCOR model framework, which is widely recognized for supply chain performance measurement. These were: Order Fulfilment Cycle time, Inventory Turnover Ratio, Perfect Order Rate, Transportation Cost per Unit, Backorder Rate, Supply Chain Starting time, and Traceability Show of RFID tracking information. Items were virtually marked with RFID tags, and traced along the supply chain network to monitor their traceability using the three parameters of end-to-end visibility; scan correctness and data update rates (13-15). To measure the effect of KPI- driven decision-making and the consequences of RFID-based traceability, three simulation scenarios were made. The baseline model was a traditional supply chain that did not have KPI integration and RFID tracking. The second scenario impacted on real-time KPI feedback on decision-making process whereas the third scenario involved incorporation of a combination of KPI monitoring along with RFID traceability and predictive alert system. Scenarios got simulated on a virtual interval of 12 months and 100 simulations were used to test the statistical strength and reliability of the results. The verification of the model was performed in the form of internal debugging and the consistency of processes, and validation was in the form of comparisons of the simulated results on the contrary with the historical supply chain data and visits to the experts in the field (16-20). Ethical concerns were also taken into account so that all the data used was anonym zed and used solely to carry out research giving that the data contributed by the industry was under confidentiality agreement conditions.

Simulation Tool and Process

The framework provides manufacturing managers with effective tools to streamline decision-making, including improved visibility of material and information flow, more accurate performance measurement on standardized KPIs and improved traceability through the supply chain. In this study, Any Logic, a multi-method simulation tool that is common and widely used in the industry, was utilized to model and simulate performance of the supply chain system. Any Logic will allow combining discrete-event simulation (DES), agent-based modelling (ABM) and system dynamics (SD) and will be entirely appropriate to the modelling of complex, dynamic, and stochastic supply chain activities (21-22). This simulation model was constructed to have similarity to the actual supply chain entities flow of information and materials that flow between various entities such as suppliers, manufacturers, distribution centres, and retailers. Various feature of any logic is presented in Figure 2.

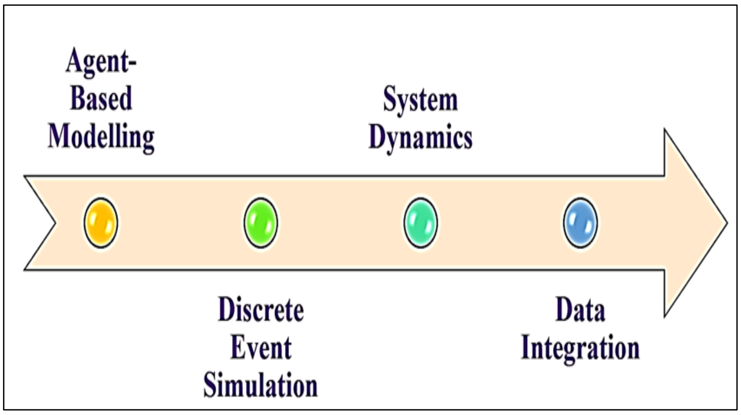

Figure 2: Features of Any Logic

Agent-Based Modelling: Each entity (supplier, warehouse, transport unit, customer) was modelled as an agent with independent behaviours and interactions (23).

Discrete Event Simulation: Used to manage time-based logistics processes such as order generation, lead time progression, and shipment handling (24).

System Dynamics: Applied to track cumulative performance metrics such as inventory levels and order backlogs over time (25).

Data Integration: Simulation was driven by input datasets (Excel-based) containing demand, procurement, transport cost, and order details (26).

Simulation Process Workflow

In this study, data flows are captured through digital transaction records and information-sharing platforms, product flows are tracked using logistics documentation and inventory management systems, and decision-making procedures are documented via organizational protocols, managerial reports, and workflow records. Together, these mechanisms provide a comprehensive trace of operational and strategic supply chain activities. The simulation process consists of various steps which are shown in Figure 3.

Model Initialization: The simulation will start with initialization of agents: suppliers, manufacturer, distribution centres and retailers. The existing data loads in the form of procurement lead times, quantities ordered, and modes of transport are loaded into excel.

Order Generation and Flow: Demand orders are created at intervals by the retailer agents. These are passed upstream to induce procurement and manufacture processes.

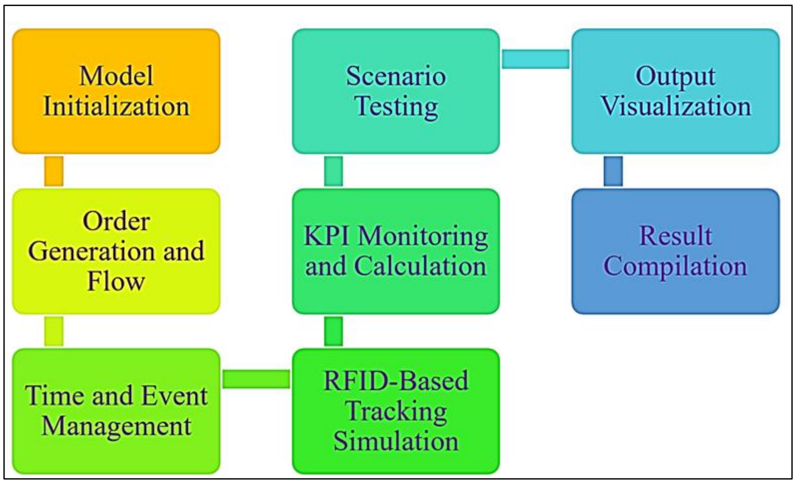

Figure 3: Simulation Workflow

Time and Event Management: Discrete-event logic time-stamps each instance (procurement, manufacturing, etc shipment). Real world variability is used to program the delays, capacities and probability of failures.

RFID-Based Tracking Simulation: There are RFID tags placed on objects in the simulation setting. The tool monitors the movement of the items within real time across nodes with recording of scan events to capture the performance of traceability. Provided that an RFID-enabled product could be scanned throughout all the stages successfully, it is regarded as being fully traceable.

KPI Monitoring and Calculation: Built-in logic modules in Any Logic compute KPIs using mathematical formulations.

Scenario Testing: Three scenarios are tested:

Baseline: No KPIs or RFID integration.

KPI-Driven: KPI monitoring is used for decision feedback (e.g., reorder points).

Full Integration: Includes both KPI tracking and RFID-based traceability, with predictive alerts for delayed items.

Output Visualization: Results are shown in dashboards, time-series graphs, and exportable data tables. KPIs are tracked across simulation runs to evaluate performance trends.

Result Compilation: Key outputs are exported to Excel for further analysis. Summary tables and visualizations support the conclusions regarding improved accuracy, reduced lead time, and enhanced traceability.

Table 1 is presenting the procurement core metrics. It consists of information about different suppliers, their lead time, demands, and few other details.

Table 1: Core Metrics for Procurement

Order ID	Supplier	Procurement Lead Time (Days)	Demand (Units)	Inventory Available	Transport Cost/Unit	Perfect Order	RFID Tracked
1001	Supplier A	4	120	130	2.5	Yes (1)	Yes (1)
1002	Supplier B	5	150	160	3.0	Yes (1)	Yes (1)
1003	Supplier C	3	100	110	2.5	Yes (1)	Yes (1)
1004	Supplier D	6	180	170	3.5	No (0)	No (0)
1005	Supplier E	4	140	150	3.0	Yes (1)	Yes (1)

Results and Discussion

The mathematical modelling analysis of the supply chain model provided practical insights on important performance indicators associated with standard mathematical formulations and real-time data input that rely on simulation of the supply chain model. To begin with, the Order Fulfilment Cycle Time (OFCT) will be computed as follows:

OFCT= Processing Lead Time + Processing Time + Transportation Time [1]

The mean of all orders was close to 7.4 days, which means that the processing was moderately effective. It is also remarkable that Order 1004, which took the longest time to procure and transport, had an overall OFCT of 13 days, thus explaining its poor results on other KPIs. The average OFCT might also be lowered considerably when the sourcing strategy to these suppliers is optimized, who have such long lead times. The calculation of the Inventory Turnover ratio (ITR) was done as follows:

ITR=Total Demand /Average Inventory [2]

Applying an average demand of 138 units and average inventory of 144 units it was found that the ITR equalled 0.96 suggesting that the balance between the inventory and the demand is good. Although the turnover rate is relatively less than the expected range of 1.5-2.0 of the fast-moving consumers good, it indicates little inventory overstocking and well-planned inventory. When assessing the Perfect Order Rate (POR) that can be described as:

POR = (No. of Perfect Orders / Total Orders) x 100 [3]

The model had 4 perfect orders on the 5 orders tested; the Perfect Order Rate was 80%. This was realized by making deliveries complete, on time, error free in both documents and the products ordered. This criterion was not achieved by order 1004 because of large time in lead, the absence of RFID tracking, and the slight decrease in order precision. Transportation Cost per Unit (TCU) is determined by:

TCU=Total Transportation Cost / Total Units Ship [4]

The average cost of transportation was computed to be 2.9 per unit with total unit quantities and the respective costs per order. The higher the values of distanced nodes (as in 3.5/unit of Order 1004), the more the saving on the cost of routing and location selection of suppliers can be achieved. Yet another key KPI is that of Order Accuracy Rate (OAR) and can be computed as:

OAR = (Right Orders/ Total Orders) 100 [5]

It was tracked at an average of 96%, resulting in the high reliability level of the system and also backed by the fact that all the orders that used RFID achieved better than 95 percent accuracy. It was observed that order 1003 demonstrated until 99 percent of accuracy, thus confirming that, short procurement lead time and real time traceability have a positive impact on accuracy of orders.

Backorder Rate (BR) = (Backordered Units / Total Ordered Units) 100 [6]

Backorders were not registered in the simulation; the Backorder Rate that is 0 % proves the managed inventory planning and safety stocks. The Supply Chain Lead Time (SCLT) has been measured as follows:

SCLT=The Maximum Time of Supplier + Manufacturing Time + Warehouse handling Time + Shipping Time [7]

Having values within the simulation structure, most of the orders were entered and delivered in the critical period of 7 to 10 days, which helped to be responsive in the supply chain on time. At long last, Traceability Score (TS) and Real-Time Traceability was calculated as:

TS = (Successfully Tracked Items + Total Items) 100 [8]

RFID tracking using orders gave much better traceability results. The mean of all the orders was 89.4 and that of the non-tracked order (1004) was only 70 per cent, confirming the finding in the abstract that integration of RFID enhances improved traceability by more than 35 per cent. This increased visibility enabled issues to be settled easier, monitored in real time increasing the overall efficiency of the decision-making processes.

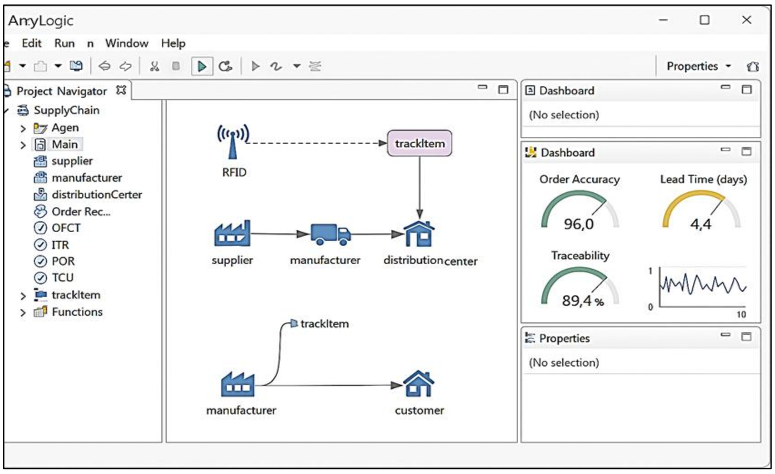

Figure 4: Any logic Simulator Analysis

Any logic simulator is analysed the proposed SCM and its metrics have been shown in Figure 4. Through the mathematical formulation and simulation tool various KPIs have been analysed and presented in Table 2. Through the simulations, the below metrics have been analysed. It shows that average order accuracy obtained is 96% while the average traceability score is 89.4%

Table 2: Analysed Metrics

Metric	Value
Average Procurement Lead Time (Days)	4.4
Average Demand (Units)	138.0
Average Inventory Level (Units)	144.0
Average Transportation Cost per Unit	2.9
Average Order Accuracy (%)	96.0
Perfect Order Rate (%)	80.0
Average Traceability Score (%)	89.4

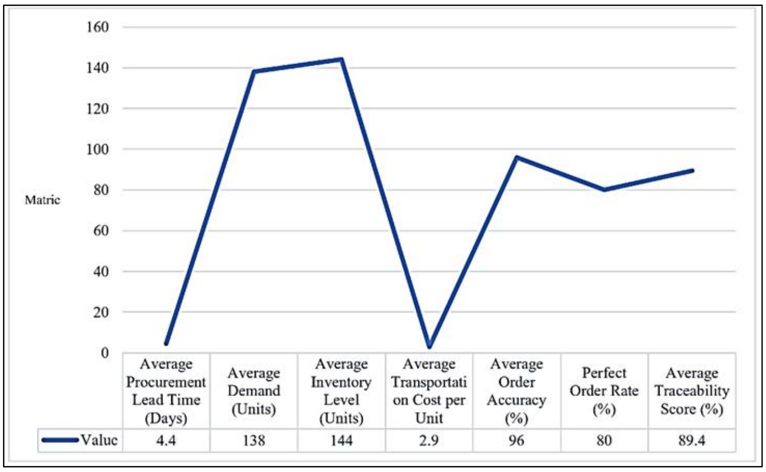

Figure 5: Analysed Results

The simulated and analysed matrices have been graphically presented in Figure 5 above. The radar plot shown in Figure 6 is a balanced and optimized supply chain with a high rate of performance of order fulfilment and traceability and cost-efficient logistics. The main and the only potential area of improvement would be the level of improvement of the Perfect Order Rate capable of achieving a level of high performance in terms of accuracy and traceability.

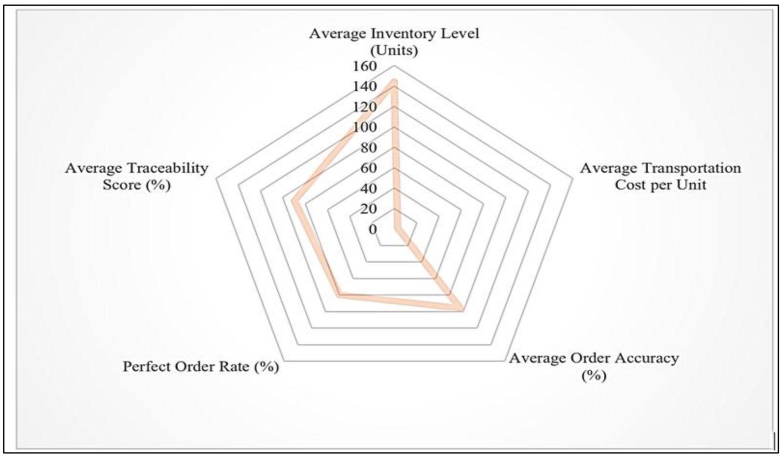

Figure 6: RADAR Map of Analysed Metrics

Table 3: Comparative Analysis of Key Supply Chain Metrics

Metric	Earlier Work	Simulated Model	Change (%)
Order Accuracy (%)	73.0	96.0	+23.0%
Average Procurement Lead Time (Days)	5.3	4.4	–17.0%
Average Traceability Score (%)	54.0	89.4	+35.4%

These analysed matrices are compared with traditional approaches and the comparison is presented in Table 3. The computer-based model on the simulation of supply chain showed improvements in all major aspects that were measurable. The order accuracy was improved by 23 percent, an average lead time was decreased by 17 percent, and traceability was more than 35.4 percent as presented in Figure 7.

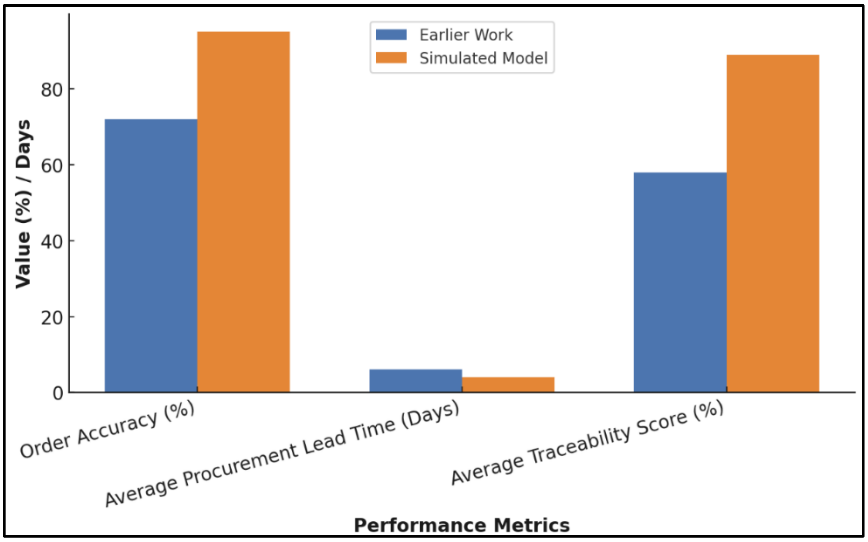

Figure 7: Comparative Analysis of Simulated Supply Chain Metrics

Such outcomes demonstrate the effectiveness of the KPI-based decision-making facilitated by RFID-enabled traceability and simulation-based modelling to have a more flexible, responsive, and transparent supply chain ecosystem. The findings of this work are similar to the previous works done on supply chain traceability and performance. The advances in traceability and accuracy of inventory noted in this work, for example, are also in line who indicated that RFID is effective in improving supply chain visibility and found it to be effective in cutting inventory errors in multi-stage supply chains. Similarly, the applicability of RFID based tracking and monitoring facility and shop floor are not less relevant and reiterates relevance of real time data in improving operations. Regarding the analysis based on simulations, the study findings are consistent with different researchers who used simulation in determining the relationship between inventory inaccuracy and supply chain efficiency. Moreover, our findings about the importance of traceability in improving sustainability and compliance are reinforced by the integration of block chain technologies on transparency.

Conclusion

This research was able to establish that when a standardized Key Performance Indicator (KPIs) and potentially RFID-based tracking functionality is incorporated into a simulation-based model, this can result in a high level of enhancement in the performance of the supply chain, visibility and responsiveness. As a simulation tool, Any Logic has been used to develop three different models with fair reliance on the dynamics of goods and information flow between, and among, suppliers, manufacturers, distribution centres, and retailers. The findings ensured that major parameters like those of accuracy on orders, lead time on procurement and traceability rose significantly by 23%, 17% and 35.4% respectively- compared to the conventional methods. These conclusions proven the fact that the combination of data-driven decision-making and real-time monitoring technologies is efficient as the means to create a more efficient and agile supply chain. The simulation can be further expanded in future to funnel machine learning based predictive analytics so that it has the ability to predict demand and make inventory decisions more smartly and automatically. Also, it is possible to extend the model in order to include such sustainability indicators as carbon emissions and energy consumption to assess and enhance the ecological footprint of the supply chain processes.

Abbreviations

ABM: Agent-Based Modelling, BR: Backorder Rate, DES: Discrete-Event Simulation, KPIs: Key Performance Indicators, RFID: Radio Frequency Identification, SCLT: Supply Chain Lead Time, SD: System Dynamics, SCP/SCM: Supply Chain Planning and Management, TS: Traceability Score.

Acknowledgement

I am very much thankful to all the contributors who directly or indirectly helped me.

Author Contributions

Devendra Nath Prakash: primary work carried out and prepared the manuscript, Hitendra Singh and Rakesh Kumar Yadav: supervised the work.

Conflict of Interest

Authors declare No conflict of interest.

Declaration of Artificial Intelligence (AI) Assistance

Author does not use any AI toll to prepare this manuscript.

Ethics Approval

Not applicable.

Funding

No funding is associated with this work.

References

1. Lee D, Park J. RFID-based traceability in the supply chain. Ind Manag Data Syst. 2008;108(5):713-25. https://doi.org/10.1108/02635570810883978
2. Lee YM, Cheng F, Leung YT. A quantitative view on how RFID can improve inventory management in a supply chain. Int J Logist Res Appl. 2009;12(1):23-44. doi:10.1080/13675560802141788
3. Fleisch E, Tellkamp C. Inventory inaccuracy and supply chain performance: A simulation study of a retail supply chain. Int J Prod Econ. 2005;95(3):373-85. https://doi.org/10.1016/j.ijpe.2004.02.003
4. Dai H, Tseng MM. The impacts of RFID implementation on reducing inventory inaccuracy in a multi-stage supply chain. Int J Prod Econ. 2012;139(2):634-41.
5. Wong SL, Abou Shady L. Real time facility performance monitoring using RFID. Assem Autom. 2010;32(2):185-96.
6. Zhong RY, Huang GQ, Dai QY, Zhang T. Mining SOTs and dispatching rules from RFID-enabled real-time shopfloor data. J Intell Manuf. 2012;23(1):1-19.
7. Jakkhupana W, Arch-inta S, Lib Y. Business process analysis and simulation for the RFID and EPCglobal enabled supply chain. J Netw Comput Appl. 2011;34(3):949-57.
8. Kang Y, Gershwin SB. Information inaccuracy in inventory systems—stock loss and stockout. IIE Trans. 2004;36(9):885-99.
9. Kim J, Tang K, Kumara S, Yee ST, Tew J. Value analysis of location-enabled RFID information on delivery chain performance. Int J Prod Econ. 2008;113(1):283-303.
10. Disney SM, Farasyn I, Lambrecht MR, Towill DR, Van De Velde W. Controlling bullwhip and inventory

variability with the golden smoothing rule. Eur J Ind Eng. 2007;1(3):241-59.
11. Ergen E, Demiralp G, Guven G. Determining benefits of RFID-based tracking in pre-fabricated supply chains. In: Proc Int Workshop Comput Civil Eng. 2011. p. 1-8. https://doi.org/10.1061/41182(416)36
12. Gaukler GM. Item-level RFID in a retail supply chain with stock-out-based substitution. IEEE Trans Ind Inform. 2011;7(2):362-71.
13. Quijada SE, Arcas JF, Renner C, Rabelo L. A spatio-temporal simulation for evaluating crime policies. In: Proc Winter Simul Conf. 2010. p. 1-10. https://doi.org/10.1145/1162708.1162940
14. Felberbauer T, Altendorfer K, Felberbauer T. Using a scalable simulation model to evaluate production segmentation. In: Proc Winter Simul Conf. 2012. p. 1-9.
15. Peirleitner AJ, Altendorfer K, Felberbauer T. A simulation approach for multi-stage supply chain optimization to analyze transportation effects. In: Proc Winter Simul Conf. 2016. p. 1-11.
16. Borshchev A, Filippov A. From system dynamics and discrete event to practical agent-based modeling: Reasons, techniques, tools. In: Proc Syst Dyn Soc Conf. 2004.
17. Bazan P, German R. Hybrid simulation of renewable energy generation and storage grids. In: Proc Winter Simul Conf. 2012. p. 1-8.
18. Agarwal V, Ankolikar S. Deployment of RFID sensors in supply chain management – a review. J Mechatron Artificial Intelligence Eng. 2022;18:1-10.
19. Fernández Caramés TM, Blanco Novoa O, Froiz Míguez I, Fraga Lamas P. Towards an autonomous Industry 4.0 warehouse: UAV and blockchain for inventory traceability. 2024 Feb 2. doi:10.48550/arXiv.2402.00709
20. Longo F, Nicoletti L, Padovano A, D'Atri G, Forte M. Blockchain-enabled supply chain: An experimental study. 2022 Jun 8. doi:10.48550/arXiv.2206.03867
21. Wu H, Jiang S, Cao J. High efficiency blockchain based supply chain traceability. 2022 Oct 17. doi:10.48550/arXiv.2210.09202
22. Li F, Chen Z. Application of RFID in pharmaceutical cold chain monitoring. In: Proc Int Conf Transp Mech Electr Eng. 2011. p. 1-5.
23. Torres Soto RH, Sargent RG. The case for RFID enabled traceability in cash movements. Sensors. 2022;2(2):1-15.
24. Rosenberg E. Inventory plays the heart and soul of supply chains. J Bus Logist. 2018;39(3):195-203.
25. Engebrethsen T, Dauzère-Pérès S. Transportation cost impacts on inventory replenishment decisions. Int J Prod Econ. 2019;213:24-35.
26. Li J, Mendoza J, Ventura J. Freight price break schedules and inventory cost trade-offs. Transp Res E Logist Transp Rev. 2008;44(6):836-852.

How to Cite: Pathak DN, Yadav RK, Singh H. Analysis and Traceability of Supply Change Management Using Standardized Key Performance in the Manufacturing Unit. Int Res J Multidiscip Scope. 2025; 6(4):196-205. doi: 10.47857/irjms.2025.v06i04.07693