International Journal of Social Impact
ISSN: 2455-670X
Volume 11, Issue 2, DIP: 18.02.106/20261102
DOI: 10.25215/2455/1102106
www.ijsi.in |April-June, 2026

Research Paper

Data-Driven Spares Analysis and Cost Minimization with Excel Power Query: A Study of Spare Parts Inventory Management at Indo National Limited (Nippo)

Mohammad Salman Khan A[1], Dr. G. Rajini[2]*

ABSTRACT

Effective spare parts inventory management is critical for maintaining working capital and ensuring a smooth manufacturing process. This study examines the spare parts portfolio of Indo National Limited (Nippo), India's second-largest dry cell battery producer. The main data transformation tool is Microsoft Excel's Power Query. The dataset contains 6,699 stock-keeping units (SKUs) that span six years of purchase receipts, consumption records, and inventory ageing profiles. It underwent a multidimensional examination that comprised ABC classification, inventory ageing evaluation, stock turnover categorisation, procurement behaviour review, and vendor lead time comparison. The investigation revealed that 49.7% of the total on-hand stock value, ₹1.79 crores, had been held for more than 365 days. In addition, 109 things were purchased despite excess inventory, and 500 non-moving products are taking up ₹59.69 lakhs in idle capital. The lead time performance of 172 active suppliers reveals a 110-day disparity between the best and poorest performers, making it difficult to estimate safety stock levels. The paper proposes a three-horizon action plan for lowering inventory carrying costs, improving procurement control, and increasing supply chain responsiveness. The findings reinforce Power Query's position as an easy-to-use and repeatable analytics solution that is audit-ready, making it ideal for mid-market Indian manufacturers.

Keywords: *Spare Parts Inventory, Power Query, ABC Analysis, Inventory Ageing, Cost Minimisation, Procurement Governance, Indo National Limited, Supply Chain Management, Battery Manufacturing, Working Capital*

Spare parts inventory management plays a unique and sometimes underappreciated role in operations and supply chain management. Unlike finished items, which have predictable demand patterns, spare parts have irregular demand, long and uncertain procurement timeframes and are essential for maintenance operations. There is always a trade-off between the cost of keeping too much stock and the risk of running out. In high-volume, process-intensive manufacturing, this tension is extremely important. If a critical

[1]MBA – Logistics and Supply Chain, Student, School of Management Studies, Vels Institute of Science, Technology and Advanced Studies (VISTAS), Pallavaram, Chennai, Indi
[2]Professor & Director-MoUs, School of Management Studies, Vels Institute of Science, Technology and Advanced Studies (VISTAS), Chennai, Tamil Nadu
*Corresponding Author

Received: May 12, 2026; Revision Received: May 14 2026; Accepted: May 16, 2026

component is absent when required, an entire production line may stop. This can erode the cost reductions achieved through diligent inventory management.

Indo National Limited, widely known as the Nippo brand, is one of India's leading battery manufacturers. Founded in 1972 as a partnership with Matsushita Electric Industries of Japan, the company now owns around 28% of India's dry cell battery sector. Its principal production site in Tada covers 56 acres. The company has automated production lines with a capacity of over 800 million batteries per year and is certified to ISO 9001:2015 and ISO 14001. It requires huge and diversified spare parts inventory. It has 6,699 unique SKUs of worth of ₹3.60 crore. But this study shows that this portfolio suffers from significant inefficiencies due to the absence of systematic data analysis. This research fills that void. Utilised Microsoft Excel's Power Query to clean and combine three ERP-generated data sets (purchase receipts, consumption logs, and inventory ageing snapshots) from January 2020 through February 2026. The objectives are ABC classification, ageing analysis, stock turnover categorisation, diagnostics of procurement behaviour and benchmarking of vendor lead time. The results illustrate the financial implications of the identified inefficiencies and provide a ranked, actionable list of recommendations aimed at reducing costs and enhancing governance. Additionally, this research presents a framework for optimizing spare parts in battery manufacturing and various other sectors in India.

Problem of the Study

Indo National Limited (Nippo) had six years of transaction data available in the ERP system, but the company had not done a structured and detailed examination of its spare parts inventory prior to the study. This analytic gap has a measurable impact that is financially valuable.

The research focuses on certain problems:

- Nearly 50% of on-hand stock (₹1.79 crores) has been in stock for more than 365 days, indicating an alarming level of obsolescence and capital lock-up that requires quick disposition action.
- Procurement decisions were made without proper stock visibility checks, leading to 109 documented occurrences of purchasing items with excess inventory. The avoidable capital commitment is ₹24.57 lakh.
- For 6 years in a row, 500 non-moving SKUs with a total stock value of ₹59.69 lakhs had zero consumption, indicating potential procurement errors, engineering modifications, or abandoned operational requirements.
- The ABC categorisation shows an aberrant distribution, with Class C products accounting for 55% of total stock value, above the theoretical norm of 5-10%. This suggests that inventory control bands and borders may be mis calibrated, resulting in inadequate control of high-value items.
- Vendor lead times vary by up to 110 days, making it difficult to determine proper safety stock levels and resulting in over-ordering and stockouts among the 172 active suppliers.
- There are 693 SKUs valued at ₹23.10 lakhs with no procurement receipt history. This results in audit trail inadequacies and compliance issues that cannot be addressed without a committed reconciliation effort.

These are not isolated data anomalies, but rather systemic governance flaws in procurement policy and inventory review frequency.

Need for the Study

The study is motivated by the current operational context of Indo National Limited (Nippo) and the academic value of applying data-driven methodologies for spare parts management in Indian manufacturing in general. From an organisational perspective, the business of battery manufacturing in India is characterised by thin margins, commodity pricing pressure and oligopolistic rivalry. The upshot is an environment where working capital efficiency is closely tied to competitive viability. The dry cell battery industry is estimated to be worth around ₹3,000 crore annually with a 5-8% annual growth rate and limited top-line growth potential. In this environment, cost discipline afforded by efficient inventory management is the major driver of profitability improvement.

From a research perspective, the current literature on spare parts inventory management is biased towards capital intensive industries such as aerospace, automotive, rail and oil and gas. The battery manufacturing industry is a mix of chemical processing equipment, mechanical assembly lines, automated testing equipment and electrical infrastructure. This sector has a unique spare parts ecosystem that has been relatively under-researched in academia. Moreover, the majority of empirical studies in this field have been carried out in large multinationals or under the umbrella of complex optimisation models that are not accessible to mid-market practitioners. This work seeks to address both shortcomings by conducting an industry-specific empirical investigation, using an accessible and generally available analytical tool, Microsoft Excel Power Query, to present findings that are both academically relevant and practically replicable.

Finally, the study contributes to the growing national priority of enhancing supply chain performance in Indian manufacturing, which aligns with the government's Make in India drive and the overarching goal of establishing globally competitive, lean manufacturing operations.

Scope of the Study

The scope of the research is outlined in four lines. In terms of organization, the research is limited to the inventory of spare parts at Indo National Limited (Nippo), which includes all 6,699 SKUs stored in the company's ERP system under the categories of mechanical, electrical, chemical, and consumable spare parts. In terms of time, the evaluation period includes purchases made from January 2020 to February 2026 (about six years' worth of 14,210 purchase orders) and issues made between those dates (94,567 issue orders), with inventory taken as of early 2026. Functionally, this study addresses the interconnected domains of inventory control, purchasing process, and supplier performance. The only tool used for this study is Microsoft Excel with Power Query, which shows how inventory optimisation can be done without using analytics software.

Objectives of the Study

- Analyse spare parts inventory at Indo National Limited (Nippo) using Power Query to categorise by consumption, turnover, and value-added.
- Conduct ABC analysis, age inventory, and calculate stock cover ratio to identify capital underperformance and obsolescence threats in the inventory portfolio.
- Analyse procurement behaviour trends and identify purchases that violate inventory sufficiency principles, resulting in unnecessary capital commitments.
- Benchmark 172 vendors' lead-time performance to identify structural underperformers, safety stock, and management implications.

- Propose solutions to reduce inventory costs and improve procurement and governance with financial impacts.

LITERATURE REVIEW

The review of literature provided above relies on studies from such areas as spare parts inventory management optimisation, inventory classification systems, inventory ageing and obsolescence management, vendor management, and supply chain data analysis.

Foundations of Spare Parts Inventory Management

Nahmias (2009) outlines in depth the concepts of spare parts inventory management, distinguishing between consumable and repairable parts and highlighting the characteristics of demand patterns that render typical inventory management models unreliable. The FSN and stock coverage analysis used in this study are based on the author's classification scheme. Kang, Marandi, Basten, and de Kok (2023) make an important contribution to the field of spare parts inventory management by developing an effective inventory control model that does not rely on any distributional assumptions about demand patterns. The authors' application of the proposed model to ASML, a firm that manufactures semiconductor lithography equipment, demonstrates its success in providing the needed level of service while remaining cost-effective. The writers' research is valuable. Organisations, like Indo National Limited, have demand data that is either sparse or non-standard. Kang, Marandi, Basten, and de Kok (2024) advance the development of robust inventory management by introducing the concept of emergency shipments when demand patterns are highly erratic, particularly during the early phases of operating a new product. The authors' case study demonstrates that their enhanced model can reduce the average waiting time for spare parts by up to 3.5 hours compared to the regular stochastic model while retaining the same level of expenditures.

Inventory Classification Techniques

Teunter, Babai, and Syntetos (2010) investigate the application of ABC analysis of intermittent spare part demand, discovering that standard ABC criteria focused only on value produce less-than-ideal solutions due to a failure to account for demand characteristics. The inefficiency caused by the application of conventional ABC principles is consistent with the anomalous distribution identified in the Nippo inventory dataset. Borowiak (2025) investigates the combination of ABC and XYZ categorisation systems in an automotive case study. Cross-classification has been shown to improve segmentation and forecasting accuracy, as well as tailoring ordering procedures and safety stock for different categories. As demonstrated by Borowiak (2025), this combination adds to improved customer service while also reducing stock, making it particularly relevant for contemporary cost-oriented research. Scarf, Syntetos, and Teunter (2024) provide an overview of the collaborative planning of maintenance and spare part inventories and demonstrate a significant mismatch between models and real planning. According to the authors, businesses that keep maintenance and spare parts inventory planning separate, as is frequently the case in practice, miss out on significant cost savings. This is likewise true for Indo National Limited, where maintenance and spare parts purchase have traditionally been handled by separate organisational units. An easy-to-implement, multi-step approach for maintenance spare parts inventory management in industrial companies is presented by Cavalieri, Garetti, Macchi and Pinto (2008).

Data Analytics and Inventory Optimisation

Waller and Fawcett (2013) examine the importance of data analysis in revolutionising the supply chain. The authors contend that employing even the most basic data analytical tools when working with well-organised and structured data produces better outcomes than using advanced data analytical approaches with poor-quality and disorganised data. As a result, the adoption of a Power Query-based strategy for data structuring and cleaning is justifiable, given that the goal of this study is to extract useful insights from data acquired from Indian manufacturers. Bacchetti and Saccani (2012) emphasise that the gap between scientific research in advanced spare parts classification and existing industry practices involves the implementation of excessively simplistic methodologies comprising the use of only one criterion for spare parts classification and failure to put the knowledge gained through the process of classification into action when making decisions on reordering policies. The authors advise that practical procedures be employed by practitioners rather than waiting for complex approaches to become available is consistent with the pragmatic nature of the methodology used in this study. Numerous studies on industrial industries show that using structured ABC and age classification of stocks results in 15-22% working capital improvements.

Vendor Management and Alternate Sourcing

Studies on alternative procurement strategies for MRO spare parts have indicated that deliberate diversification of supplier sources has the potential to drastically lower costs. This includes identifying commercially accessible alternatives to OEM parts using analytics tools and tracking their lead times, resulting in cost reductions while maintaining part availability. Identifying and evaluating alternative vendors as part of a procurement plan is one of the most underutilised ways to save money on spare parts management. Aligni (2024) emphasises implementation guidelines for certification of replacement parts, emphasising that approved vendor lists should include certified alternatives, and inventory management techniques should be updated based on risk and lead time assessments. Before establishing alternate sourcing policies, it is recommended to audit suppliers' technological compatibility for vital components or highly regulated industries.

This research literature review has provided a sound theoretical foundation for the current research issue. Among the main concepts identified in the reviewed literature, the inapplicability of conventional inventory models to spare parts, the benefits of multi-criteria classification of spare parts, the importance of data quality as a prerequisite for analysis, the economic significance of old spare part disposal, and cost-cutting opportunities associated with vendor management are all relevant to the problem statement at Indo National Limited (Nippo).

RESEARCH METHODOLOGY

The current research applies a descriptive-analytical methodology, integrating quantitative data analysis with prescriptive suggestions. The research is based on secondary data only which is obtained from the ERP system of Indo National Limited (Nippo).

Data Sources

The ERP system produced three interrelated datasets. The Purchase Receipts file contains 14,210 transactions between January 2020 and February 2026, including vendor information, item codes, amounts, values, and dates. The Issues file contains 94,567 consumption transactions from the same time, including goods supplied from stores for maintenance and

production use. The inventory ageing report offers a current view of all 3,182 products in stock, divided into six age bands ranging from 0 to 365 days. The total number of unique SKUs across the three datasets is 6,699.

Data Transformation via Power Query

Microsoft Excel's Power Query was the key analytical tool for all ETL (Extract, Transform, and Load) tasks. The transformation process involved merging three source datasets using item codes as the primary key, standardising vendor names to resolve 172 active supplier records with spelling variations, computing derived metrics like Consumption Percentage (Total Issues ÷ Total Purchases × 100), Stock Coverage Ratio (On-hand Quantity ÷ Average Monthly Consumption), and Weighted Average Purchase Price, and creating categorical classification flags for inventory status and stock.

Analytical Techniques

Five complimentary analytical approaches were used. ABC Classification evaluated goods based on cumulative stock value contribution, utilising bands of ≤80% (Class A), 80-95% (Class B), and >95% (Class C). Inventory Ageing Analysis divided stock into six age bands, assessing both amount and value in each band. Stock turnover was characterised as fast-moving, slow-moving, normal-moving, or No Consumption based on issue frequency and consumption ratios. Procurement behaviour study identified products purchased despite surplus inventory and items with no consumption during the analysis period. Vendor Lead Time Analysis calculated the mean, median, minimum, maximum, and standard deviation of lead times for all 172 active vendors and 5,228 item-level procurements, allowing for performance rating and safety stock calibration.

ANALYSIS AND INTERPRETATION

Table 1: Inventory Status Distribution

Inventory Status	No. of Items	Stock Value (INR)	% of Total Value	Key Implication
Active Inventory	1,583	₹2,12,58,966	59.0%	Primary management focus
Fully Consumed	3,176	₹0	0.0%	Historical records — zero balance
Non-Moving Stock	500	₹59,69,357	16.6%	Capital tie-up — urgent review needed
Missing Receipt History	693	₹23,09,665	6.4%	Data integrity risk — reconcile
Opening Stock	747	₹64,80,210	18.0%	Prior-period carry-over — verify relevance
Total	6,699	₹3,60,18,198	100.0%	—

The status distribution shows that, while 62.8% of SKUs are active or consumed (showing reasonable portfolio health on the surface), nearly one in every four items by count and more than 23% by value fall into the worrying categories of non-moving stock, missing history, or unverified opening stock. The fully consumed category (3,176 SKUs) increases the active portfolio count and should be stored for better analytical clarity.

Table 2: Inventory Ageing Analysis

Age Band	Qty (Units)	Stock Value (INR)	% of Total	Risk Level
0 – 30 Days	20,170	₹84,08,791	23.3%	Low
31 – 60 Days	20,813	₹25,89,602	7.2%	Low – Medium
61 – 90 Days	1,302	₹12,20,558	3.4%	Medium
91 – 180 Days	4,415	₹27,92,987	7.8%	Medium – High
181 – 365 Days	12,988	₹31,11,423	8.6%	High
Above 365 Days	38,665	₹1,78,94,837	49.7%	CRITICAL
Total	98,353	₹3,60,18,198	100.0%	—

The ageing analysis is the study's most operationally relevant discovery. Half of the on-hand stock value, 38,665 units worth ₹1.79 crore, has been held for over 365 days. When the 181-365-day and above-365-day buckets are combined, 58.3% of total stock value (₹2.10 crore) reflects inventory that has been inactive for more than six months. This confirms a long-standing demand-procurement imbalance.

Table 3: Stock Turnover Category Analysis

Category	No. of Items	% of Portfolio	Stock Value (INR)	Value %
Fast-moving	3,453	51.5%	₹45,12,617	12.5%
Slow-Moving	1,938	28.9%	₹2,15,75,701	59.9%
No Consumption	692	10.3%	₹22,95,807	6.4%
Normal Moving	616	9.2%	₹76,34,073	21.2%
Total	6,699	100.0%	₹3,60,18,198	100.0%

The 1,938 slow-moving SKUs account for a disproportionately high 59.9% of total stock value although accounting for just 28.9% of the portfolio, showing that procurement of higher-value items has not been properly calibrated to real consumption needs. The 692 non-consumption items contribute ₹22.95 lakh to inventory without clear operational purpose.

Table 4: ABC Classification Summary

ABC Class	No. of Items	Stock Value (INR)	% of Total Value	Management Priority
A	562	₹2,52,02,173	35.0%	Highest — Tight Control
B	816	₹72,11,851	10.0%	Moderate — Regular Monitoring
C	5,322	₹3,96,22,372	55.0%	Simplified — Periodic Review
Total	6,700	₹7,20,36,396	100.0%	—

The ABC distribution shows a substantial abnormality. In normal inventory theory, Class C items account for only 5-10% of total value; here, they account for 55%. This atypical distribution, which has previously been identified as a symptom of mis calibrated band boundaries (Teunter, Babai, and Syntetos, 2010), implies that reorder policies and control intensities are not properly matched to item value, resulting in insufficient attention to high-value items and over-management of low-value ones. Recalibration is needed.

Table 5: Vendor Lead Time Performance Distribution

Lead Time Band (Median)	Vendor Count	Share (%)	Performance Rating
< 15 Days	69	40.1%	Excellent
15 – 30 Days	39	22.7%	Good
30 – 60 Days	35	20.3%	Moderate
> 60 Days	28	16.3%	Poor
Total	172	100.0%	—

While 40.1% of vendors deliver within 15 days, a significant minority of 28 vendors (16.3%) routinely take more than 60 days. The performance spread across 172 suppliers ranges from 0 days (SAI Sri Enterprises) to 110 days (Honka Limited), resulting in a 110-day difference that makes uniform safety stock planning difficult and generates material supply risk. This considerable variation highlights the critical necessity for vendor performance management programs and selective consolidation of sourcing toward the best-performing suppliers.

Findings

- Ageing stocks worth ₹1.79 crore (49.7% of total stock value) include 38,665 units older than 365 days. These represent the portfolio's largest capital exposure, which must be liquidated immediately through write-offs or vendor returns.
- 109 SKUs were purchased without inventory checks, resulting in a capital cost of ₹24.57 lakh. It suggests that no systems exist for determining whether there is extra stock before issuing purchase orders.
- During the six-year analysis period, 500 SKUs with a stock value of ₹59.69 lakhs remained unconsumed. Such SKUs may have been purchased due to mistakes, obsolete equipment, or changes in maintenance strategy that were not updated in inventory rules.
- The balance between slow and fast-moving skews towards slow movement. 1,749 slow-moving SKUs make up 40.4% (₹1.45 crore) of total stock value, indicating over-procurement of valuable stock compared to consumption rate.
- ABC Classification Bands: Class C items typically account for 55% of total stock, but in our case, they account for nearly five times that amount. This means that the current classification bands must be evaluated to match with stock priorities.
- Lead times vary by 110 days among 172 vendors. Furthermore, 28 suppliers had median lead times of more than 60 days, indicating a high-risk area.
- Obsolete SKUs are worth around ₹2.10 crores (58.3% of total portfolio value), taking into account both ageing and slow-moving products.
- Audit found 693 SKUs (of ₹23.10 lakhs) without validated procurement history in the database. This means that these SKUs must be reconciled to mitigate future audit risks related with their procurement.

Suggestions

Based on the analysis, the following recommendations are proposed:

Immediate Recommendations (0-30 Days)

- Evaluate and write-off 38,665 items (₹1.79 crore) that are older than 365 days. The team should comprise representatives from Finance, Asset Management, and Operations, whose goal is to decide if this lot may be returned to the vendor, moved

internally, or salvaged/written off. This plan will free up most of the inventory's locked-up capital.
- Create a system-level procurement hold for 109 extra products by including stock availability checks into the ERP purchase order process. This eliminated wasteful procurement and saved ₹24.57 lakhs.
- Create a task team to investigate and resolve 693 missing receipt documents, improving audit trail transparency for ₹23.10 lakhs of stock.

Short-Term Recommendations (30-90 Days)
- Review 1,749 slow-moving inventory items (₹1.45 crore) based on current equipment registers and maintenance schedules. Identify obsolete items, duplicates, and alternate sources through active vendors. Clearing off 30-40% of the stock will free up over ₹40 lakhs in funds.
- Add velocity/criticality and value as criteria to correct boundary limitations for Class A, B, and C categories in ABC analysis. This addresses the anomalous Class C distribution of high-value items and ensures accurate reordering and cycle-counting frequencies.
- Start performance improvement negotiations with 28 vendors whose deliveries take more than 60 days. Agree on target lead times, implement quarterly vendor scorecards, and give the laggard 6 months to demonstrate improvement or change suppliers.

Strategic Recommendations (90+ Days)
- Implement a biannual evaluation of sluggish and non-moving inventory items, with cross-functional sign-off from operations, procurement, finance, and stores departments. This technique will act as a preventative measure against future accumulation of idle stock items.
- Consider using DDMRP principles for high-value, long-lead-time spare parts to prevent stockouts and reduce inventory levels.

CONCLUSION

This study demonstrates that conducting a structured and data-driven inventory analysis using simple tools such as Microsoft Excel and Power Query uncovers numerous inefficiencies in spare part inventory management. Using this research approach, Indo National Limited (Nippo) identified critical aged inventory worth Rs. 1.79 crore, non-moving inventory of Rs. 59.69 lakh, unnecessary excess purchases of Rs. 24.57 lakh, and vendor spread of 110 days, all of which impede safety stock planning. All these difficulties add up to a significant material inefficiency in terms of working capital, which can be alleviated by implementing action plans based on the study's results.

In conclusion, this study demonstrates the reliability, reusability, and auditability of the Power Query approach as a dependable alternative for doing inventory analysis in manufacturing organisations. The multidimensional inventory analysis approach, which is based on ABC classification, ageing, procurement, and vendor analysis, allows for a comprehensive examination of inventory status, which is impossible to do using single metrics. A key revelation found during this investigation demonstrates how data inconsistencies such as faulty ABC classification, a lack of purchase history, and procurement concerns negatively impact inventories. As the results show, these challenges

are significant enough that data governance should be highlighted in every inventory analysis project.

Finally, from a broader viewpoint, this research is highly valuable to academics and practitioners since it adds to the current literature on operations management in Indian industry. More specifically, it reveals that the problem of cost minimisation in spare parts inventory does not necessitate complicated mathematical models or significant IT investments.

REFERENCES

Aligni. (2024). Alternate parts in manufacturing: Need and implementation. Aligni Manufacturing Management Software. https://www.aligni.com/resources/alternate-parts-manufacturing

Bacchetti, A., & Saccani, N. (2012). Spare parts classification and demand forecasting for stock control: Investigating the gap between research and practice. Omega, 40(6), 722–737. https://doi.org/10.1016/j.omega.2011.06.008

Borowiak, J. (2025). Application of ABC and XYZ methods to inventory management in an automotive industry enterprise. Journal of Civil Engineering and Transport, 7(3). https://doi.org/10.24136/tren.2025.009

Cavalieri, S., Garetti, M., Macchi, M., & Pinto, R. (2008). A decision-making framework for managing maintenance spare parts. Production Planning & Control, 19(4), 379–396. https://doi.org/10.1080/09537280802034471

Indo National Limited. (2024). About us — Powering India forward for 50+ years. Official Company Website. https://www.nippo.in/About

Kang, Z., Marandi, A., Basten, R. J. I., & de Kok, T. (2023). Robust spare parts inventory management. SSRN Working Paper 4553430. https://papers.ssrn.com/sol3/papers.cfm?abstract_id=4553430

Kang, Z., Marandi, A., Basten, R. J. I., Stip, J., & de Kok, T. (2024). Robust spare parts inventory management with emergency shipments. SSRN Working Paper 4899665. https://papers.ssrn.com/sol3/papers.cfm?abstract_id=4899665

Nahmias, S. (2009). Production and operations analysis (6th ed.). McGraw-Hill Irwin. https://scholarcommons.scu.edu/faculty_books/76/

Scarf, P., Syntetos, A., & Teunter, R. (2024). Joint maintenance and spare-parts inventory models: A review and discussion of practical stock-keeping rules. IMA Journal of Management Mathematics, 35(1), 83–109. https://doi.org/10.1093/imaman/dpad020

Teunter, R. H., Babai, M. Z., & Syntetos, A. A. (2010). ABC classification: Service levels and inventory costs. Production and Operations Management, 19(3), 343–352. https://doi.org/10.1111/j.1937-5956.2009.01098.x

Waller, M. A., & Fawcett, S. E. (2013). Data science, predictive analytics, and big data: A revolution that will transform supply chain design and management. Journal of Business Logistics, 34(2), 77–84. https://doi.org/10.1111/jbl.12010

Acknowledgment

The author(s) appreciates all those who participated in the study and helped to facilitate the research process.

Conflict of Interest

The author(s) declared no conflict of interest.

How to cite this article: Md., Salman, K.A. & Rajini, G. (2026). Data-Driven Spares Analysis and Cost Minimization with Excel Power Query: A Study of Spare Parts Inventory Management at Indo National Limited (Nippo). *International Journal of Social Impact*, *11*(2), 052-062. DIP: 18.02.106/20261102, DOI: 10.25215/2455/1102106