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A Data Analytics Approach towards Challenges in Inventory Management in ITC PPB Chennai

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ABSTRACT

The quick adoption of data analytics and business intelligence tools has transformed inventory management practices in the manufacturing industry by improving inventory visibility, stock monitoring, and operational efficiency. This paper studies the application of a data analytics technique to tackle the challenges faced in the inventory management in ITC PPB Chennai. The analysis was based on structured inventory data collected from organizational records and ERP systems. Inventory levels, consumption trends, stock movement, inventory ageing and coverage days were analysed using Power BI dashboards, DAX measures, KPI cards and data visualisation techniques. The results indicate that interactive dashboards are useful for the visibility of inventory performance and in identifying slow-moving, non-moving, overstock and low-coverage inventory effectively. Inventory consumption analysis and movement classification were also found to be important indicators for improving inventory planning and stock control, highlighting the need for proper monitoring and data-driven decision-making. Customer-focused operational practices, continuous monitoring, and inventory visibility through dashboards play a major role in reducing inefficiencies and enhancing stock utilization. The study also found that analytical dashboards help to make faster managerial decisions and improve overall inventory efficiency across different plants and categories. This study provides useful insights into inventory behaviour and practical recommendations in improving the inventory management practices in manufacturing industries.

***Keywords**: Inventory Management, Data Analytics, Power BI, Inventory Visibility, Consumption Analysis, Stock Movement, Inventory Coverage, Operational Efficiency, Dashboard.*

Introduction

The manufacturing sector has undergone considerable change as digital technologies and data analytics have rapidly developed, and inventory management systems are now ubiquitous in the industry. Organizations have adopted analytical tools and business intelligence platforms to improve operational efficiency, inventory visibility and decision making especially in the manufacturing environments such as ITC PPB Chennai. This study focuses on the role of data analytics in solving inventory management problems and improving stock monitoring practices. Understanding these elements is critical to improving inventory management, reducing waste, and ensuring efficient operational planning. The main objective of this study is to examine the factors influencing inventory performance including stock quantity, consumption trends, inventory ageing, coverage days and stock movement.

Simultaneously it tackles the problems that affect managing stock like having too much stock not knowing what's in stock delays in moving materials and monitoring systems that don't work well. When you put these problems and data analysis together you get a picture of how stock behaves and can make better decisions based on facts. This study aims to find out how using data analysis and visualization tools for stock affects keeping track of stock and how efficiently the organization operates. The study also looks at whether types of stock such as moving, slow-moving and non-moving stock really make a difference, in planning and controlling stock.

We used a straightforward method to look at inventory information. This method involved using tools, like Power BI dashboards and charts to make sense of the data. We wanted to see how well the inventory was performing. The main goal of this study is to help companies find problems get a view of their inventory use their stock more effectively and make better plans. By doing this we hope to add something to the field of inventory analytics and help companies make good decisions when it comes to manufacturing.

Background and Significance

Inventory is an important thing in factories and manufacturing places these days. It affects how well things are made how much money is spent and how goods are delivered. Because of digital tools and computer programs the way inventory is managed has changed a lot. Now it is about using data to make good decisions.

There is much inventory data coming from all the different plants and categories and material movements. This means we need tools to look at all this data understand what it means and make inventory work better. When we use Power BI and data analytics together it can really help with managing inventory. We get interactive dashboards we can see what is happening in real time and we get helpful insights automatically. All of this helps us control inventory better. Inventory management is key and using these tools can make a difference, in how we manage inventory.

Key Indicators Used

S. No	Key Inventory Indicators
1	Inventory Stock Quantity
2	Inventory Coverage Days
3	Fast-Moving Inventory
4	Slow-Moving Inventory
5	Non-Moving Inventory
6	Plant & Category-Wise Distribution
7	Material Movement Analysis
8	Overstock Inventory

Importance of Effective Inventory Management in Manufacturing Operations

Effective inventory management is really important, in manufacturing and supply chain operations. It affects how well things run how much stock is used and if production keeps going Organizations can do better with their inventory by keeping an eye on how stock they have how much they use, how many days their inventory lasts and how materials move around. This helps them have extra inventory, fewer shortages and use resources more wisely. Also keeping an eye on inventory helps organizations find stock that is not moving much or at all. This way they can work on making their stock planning and control better.

Problem Statement

The organization has trouble keeping track of its inventory levels how stock moves and how much of each item is used across plants and categories. Without a system to analyse this data problems like having too much stock not knowing what's in inventory slow-moving items and poor inventory control happen. causes issues with how the organization operates and slows down decision-making by managers. A new system that uses data and tools, like Power BI dashboards and analytics can help fix these problems. The organization needs to monitor inventory in a way. It requires a data-driven inventory system.

Objectives

- To identify and analyse key inventory management challenges affecting inventory visibility and operational efficiency in ITC PPB Chennai.
- To analyse the effect of factors such as stock quantity, consumption trends, inventory coverage, and stock movement on improving inventory planning and control.
- To evaluate how Power BI dashboards and data analytics techniques impact inventory monitoring and managerial decision-making.
- To assess the role of inventory indicators such as fast-moving, slow-moving, non-moving, and overstock inventory in improving inventory management practices.

Review of Literature

Karel Genotiva (2025) Using Power BI for financial analysis and reporting, this study highlighted reporting efficiency, data visibility, and decision-making effectiveness as major factors. The findings revealed that Power BI dashboards improved transparency, reduced reporting delays, and supported data-driven decision-making.

Grace Omotunde Osho, Julius Olatunde Omisola, and Joseph Oluwasegun Shiyanbola (2024) Explored an integrated AI-Power BI model for supply chain visibility and forecasting. The research identified forecasting accuracy, inventory performance, and operational efficiency as important factors. The findings revealed that AI and Power BI dashboards improved forecasting accuracy and inventory turnover.

M. Saravana Priya, Keren Lois Daniel, M. Ananthi, P. Rajkumar, and S. Sharmi Jenitha (2024) Analysed retail sales performance using Power BI dashboards. Variables such as sales revenue, profit margins, and product category performance were examined. The study concluded that dashboards improve performance monitoring and business analysis effectively.

Siddhartha Das, Kallal Banerjee, Soumen Nath, and Sourav Chatterjee (2023) Focused on data visualization for business strategy recommendation using Power BI dashboards. The study identified profitability, sales performance, and forecasting analysis as major indicators supporting decision-making. The findings emphasized that Power BI improves business analysis and planning.

Waltteri Yliranta (2023) Examined data-driven performance optimization in supply chain management using Power BI dashboards. The research highlighted reporting quality, supply chain visibility, and operational monitoring as major factors. The findings showed that Power BI improved reporting accuracy and operational efficiency.

Akash Abaji Kadam, Ramakrishna Garine, and Supriya Akash Kadam (2024) Developed an automated inventory monitoring model using Power BI and data-driven analytics. The study identified inventory shortage alerts, stock-out probability, and supplier performance as key indicators. The findings showed that analytical dashboards improved inventory monitoring and reduced stock-out occurrences.

Dewan Hafiz Nabil, Md. Habibur Rahman, Altaf Hussain Chowdhury, and Brenno Castrillon Menezes (2023) Examined real-time supply chain performance monitoring using Microsoft Power BI dashboards. The research focused on inventory turnover, order cycle time, and operational visibility. The findings revealed that Power BI improved operational transparency and faster decision-making.

Nader Bazzi (2022) Analysed a supply-chain monitoring system using Power BI and information-collaboration frameworks. The study highlighted supplier performance, delivery rates, and supply chain visibility as important factors. The findings showed that Power BI improved coordination and operational monitoring across supply chain activities.

Stefano Gattinoni (2022–2023) Focused on inventory optimization and demand forecasting using analytical tools and forecasting algorithms. The study identified forecast accuracy, inventory performance, and process efficiency as major variables. The findings emphasized the importance of analytical forecasting techniques in improving inventory planning.

Francess Chinyere Okolo, Emmanuel Augustine Etukudoh, Olufunmilayo Ogunwole, Grace Omotunde Osho, and Joseph Ozigi Basiru (2023) Explored the role of business analytics platforms in improving transportation and supply chain efficiency. The research highlighted operational

efficiency, cost efficiency, and supply chain visibility as key factors. The findings revealed that analytics platforms improved forecasting accuracy and operational decision-making.

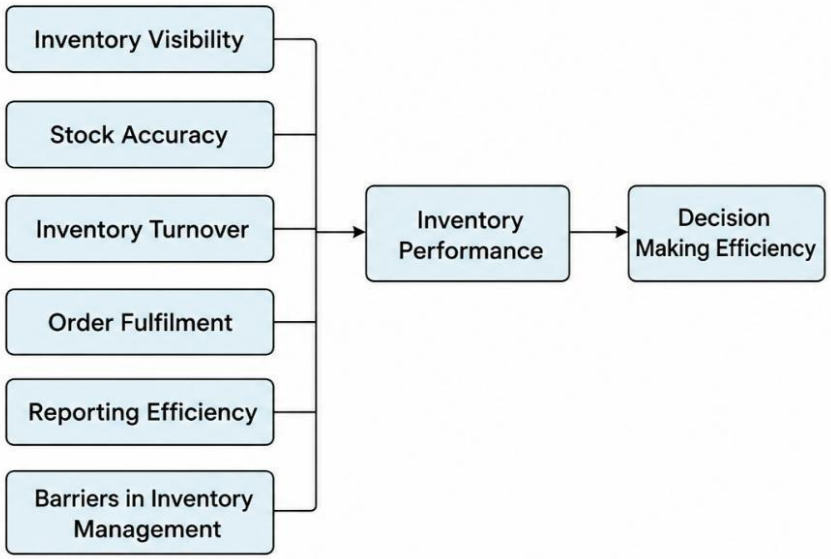
Research Gap

While earlier studies have looked at things that affect inventory management. How well operations run there are still some big gaps. Karel Genotiva (2025) and Waltteri Yliranta (2023) studied how to make reporting more efficient and improve data visibility. They did not really connect these things to inventory management systems. Some researchers like Grace Omotunde Osho and others (2024) and Siddhartha Das and others (2023) looked at forecasting and making dashboards that're easy to understand. They missed out on inventory indicators such as how stock moves and how much inventory is covered. M. Saravana Priya and others (2024) focused on using dashboards to monitor things. They did not think about operational problems, like having too much stock and inventory that does not move. Most studies did not provide analytical solutions to improve inventory visibility and making good operational decisions. Future studies need to combine inventory analysis, monitoring with dashboards and analyzing stock movement. They should focus on solutions to make inventory management practices better. Inventory management is key and inventory analytics can really help.

Research Design

A Quantitative Research design was adopted, using inventory data and analytical dashboards to measure inventory performance and operational efficiency numerically.

Research Model



Data Source

- **Secondary Data**: We get this from things like inventory and operational information that is collected from systems like ERP reports in Excel, company records and things we read in journals and research articles. We also get it from websites that talk about managing inventory and using Power BI for analytics. This Secondary Data is really important for our work, with Secondary Data.

Data Collection Method

- We looked at the inventory and what people used from the organizations inventory records the ERP systems and Excel reports.
- Then we used Power BI dashboards and DAX measures to make sense of the inventory and consumption data and create some visualizations.

Data Analysis Tool

Software: Microsoft Power BI, Microsoft Excel Tools:

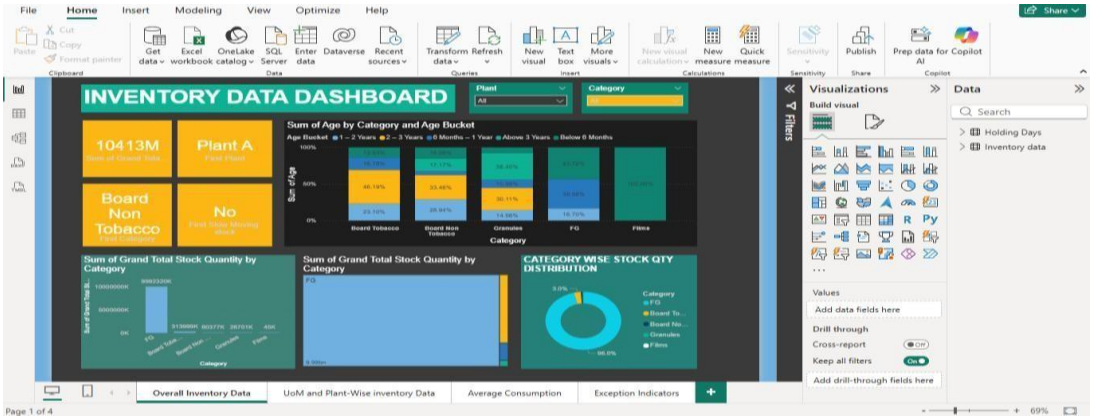
- DAX Measures
- Stock Movement Analysis
- KPI Analysis
- Dashboard Visualization

Ethical Considerations

- Organizational inventory data was used only for academic purposes.
- Confidentiality and data privacy were maintained throughout the study.
- Data collected from the organization was handled securely without misuse.

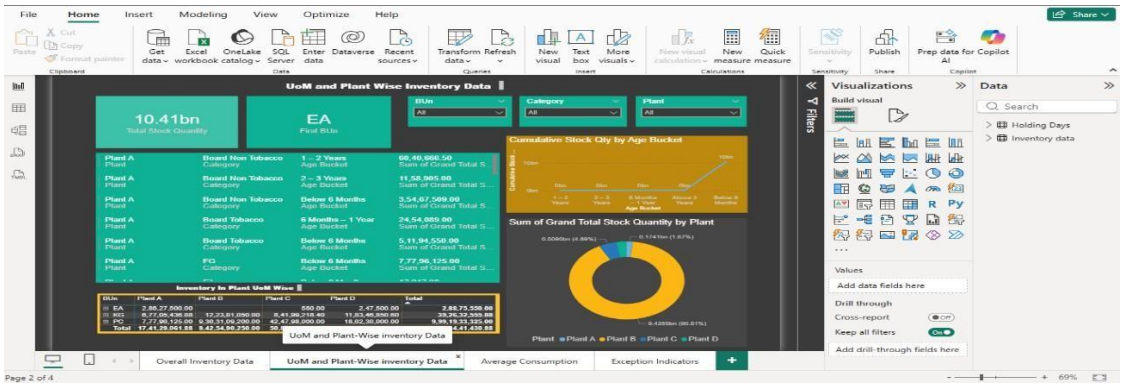
Results

Overall Inventory Data Dashboard



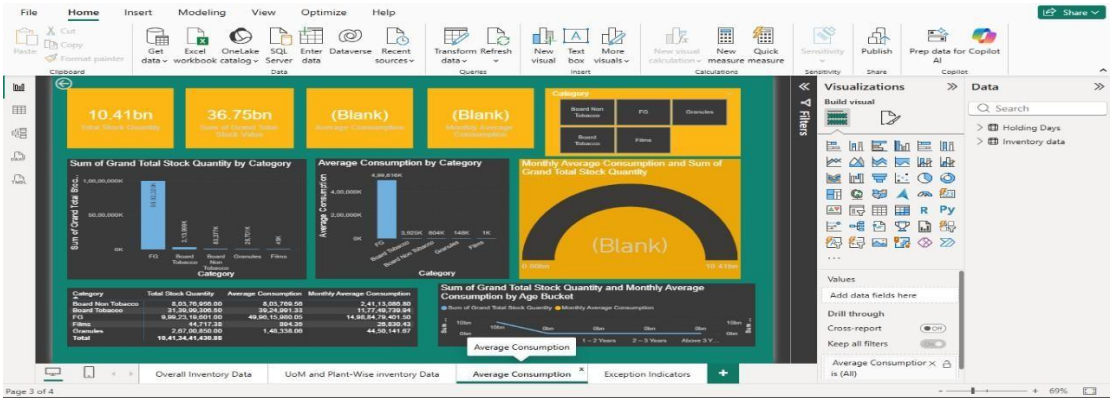
The main dashboard shows how inventory is spread out across categories and age groups. Finished Goods contribute the most to the stock quantity among all the categories. When we look at the inventory ageing analysis, we see that most of the stock is in the category of than 6 months old which means the inventory is moving quickly. The tools we use to visualize the inventory make it easier to see what is going on and help us make decisions, about Finished Goods and the rest of the inventory.

UoM And Plant-Wise Inventory Data



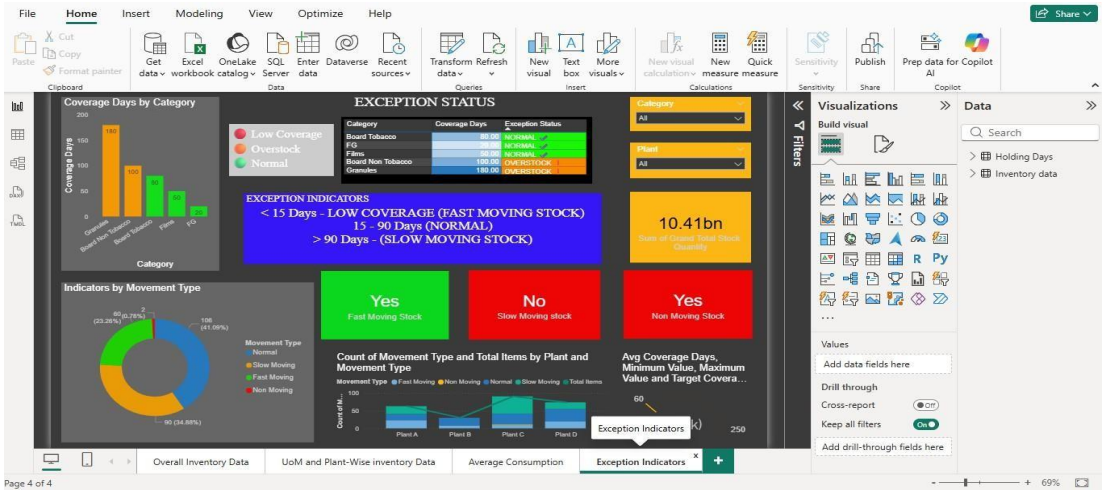
The dashboard looks at how inventory's spread out across different plants and units of measurement. It shows that Plant B has the inventory of all the plants. The dashboard also helps us keep track of inventory by showing a stock analysis and a matrix visualization, which makes it easier to see how each plant is doing with their inventory. This helps with monitoring inventory levels. Plant B has the quantity. The analysis and visualization tools, on the dashboard are useful.

Average Consumption Dashboard



The dashboard looks at the stock we have in each category. How much of it we use. It shows that Finished Goods have the use, on average compared to the other categories. We can use charts and special cards to keep an eye on how we are using our stock and how well our operations are doing. This helps us see what is going on with Finished Goods and other things.

Exception Indicators Dashboard



The inventory dashboard shows us when we have problems, with our stock like when we do not have enough of something or when we have much. It also tells us what is selling fast and what is not selling at all. We can see that some things are overstocked, which means we have more than we need and other things are just right. The inventory dashboard really helps us keep an eye on our stock. Makes sure we are doing things correctly with our inventory.

Suggestion

- The first thing companies need to do is improve inventory visibility. They should use tools like Power BI to keep an eye on what is happening with their inventory. This helps them see what is going on and make sure everything runs smoothly.
- Next companies need to reduce the problems of having much stock or not enough stock. To do this they should keep an eye on how long their inventory lasts and how much they are using. This will help them avoid having much or too little inventory.
- Companies should also focus on keeping track of their inventory all the time. They need to watch how their stock is moving how old it is. How different types of inventories are doing. This information will help them plan better and make decisions.

- To make decisions companies need to use data. They should use dashboards and keep an eye on important numbers to make sure everything is running well. They can also use calculations to help them understand what is going on with their inventory.
- Lastly companies need to make sure they are, in control of their inventory. They should regularly look at what's selling fast what is selling slow and what is not selling at all. This will help them use their inventory better and avoid wasting time and money.

Limitations of the Study

- The research was done using information from ITC PPB Chennai. This means the results might not be true for places.
- We looked at the records and data that the organization had during the time we were studying.
- There are some things that can affect how inventory is managed that we did not think about. These things could make a difference in how the inventory works.
- The main thing we looked at was how well we could see what was in the inventory how things were moving in and, out of the inventory and how well the inventory was covered. We used Power BI to help us understand these things.

Future Scope

This study is a start to understanding how to manage inventory and use data in manufacturing. We can learn more by using bigger sets of data and better ways to analyse it. New technologies like predicting what will happen using intelligence to forecast and tracking inventory in real time can make inventory planning and operations better. We should also look into combining ERP systems with Power BI dashboards so we can see inventory better and make decisions based on data in manufacturing. Inventory management and data analytics, in manufacturing are important. We need to keep working on them.

Conclusion

The study shows that inventory visibility and stock monitoring are really important for managing inventory and making operations run smoothly. Companies that use Power BI dashboards and other tools to analyse data are better at controlling inventory and making decisions. The study found that looking at inventory analytics helps companies see when they have much stock, not enough stock and how stock is moving. Companies need to focus on making inventory visibility and operational monitoring by using data to manage inventory. Inventory visibility and stock monitoring are key, to making this work.

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