Data Visualisation System for Enhanced Stock Inventory Management

By

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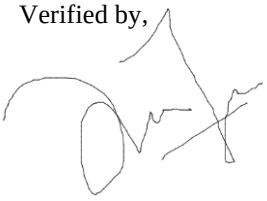

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Date : _____12/9/2024_____

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I would like to express my sincere thanks and appreciation to my supervisor, Shakiroh Binti Khamis who has given me this bright opportunity to engage in a data visualisation system for enhanced stock inventory management project. A million thanks to you.

Finally, I must say thanks to my parents and my family for their love, support, and continuous encouragement throughout the course.

ABSTRACT

The central focus of the project titled "Enhanced Data Visualisation System for Stock Inventory Management" revolves around bolstering data visualisation and interpretation capabilities within the context of stock inventory management. It aims to overcome the limitations associated with insufficient functionalities and visualisations,which often hinder effective decision-making and insights extraction. At its core, this project is driven by two primary objectives. Firstly, it seeks to enrich data visualisation tools and techniques to empower organizations in the realm of stock inventory management. By addressing the shortcomings related to the availability of functionalities and visualisations, the project aims to provide more comprehensive and intuitive tools for users. This enhancement is crucial for streamlining inventory control, reducing operational costs, and improving overall efficiency. Secondly, the project strives to enhance the clarity and precision of data patterns through the strategic application of data visualisation. By harnessing advanced visualisation techniques, it aims to make data patterns more discernible and facilitate more accurate predictions. These improvements are expected to elevate the quality of decision-making within organizations, thereby driving efficiency and profitability. In summary, this project endeavours to revolutionize inventory control practices by addressing limitations and improving data visualisation tools. Through these enhancements, it seeks to make data patterns more accessible, predictions more accurate, and inventory management more efficient, ultimately leading to better-informed decision-making and optimized stock inventory operations.

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SAP	Systems, Applications, and Products

CHAPTER 1

CHAPTER 1 Project Background

1.1 Introduction

Data visualisation is a potent technique that turns complex information into visual representations, making it easier to communicate. It uses graphical elements like charts, graphs, maps, and infographics to clarify data patterns, trends, and insights efficiently. This approach is highly valuable across multiple fields, including business, science, journalism, and academia, enabling users to make informed decisions based on data, discover correlations, and communicate intricate information effectively to a wide audience.[3]

Data visualisation encompasses several critical components. It begins with data representation, involving the thoughtful selection and organization of data. This phase transforms raw data into a coherent visual format, often requiring data cleaning, filtering, and aggregation to highlight essential information. Visual elements like colours, shapes, and chart types are chosen with care, aligning with the data's nature and the intended message. For data analysis goals, a variety of chart and graph types are used, including bar charts, line graphs, scatter plots, pie charts, and heatmaps. Interactivity is a feature of many contemporary visualisations, enabling users to explore data dynamically. Storytelling through data visualisation is a potent method for sequentially conveying insights. Critical considerations include ensuring accessibility, using reliable data sources, employing a wide array of software tools, and adhering to ethical guidelines, all of which are integral to effective data visualisation practices.

Enhanced stock inventory management represents a significant advancement in inventory control. This advanced system leverages technology and data-driven insightsto optimize various aspects of the supply chain, offering real-time visibility into stock levels, movements, and trends. It facilitates quick responses to changes in demand, preventing stockouts and overstocking. Data analytics tools provide historical sales data and demand insights, enhancing decision-making. Automation reduces manual tasks, while inventory optimisation minimizes carrying costs and improves turnover. Multi- channel integration ensures consistent stock availability, and supplier collaboration streamlines processes and negotiations. Enhanced inventory management emphasises forecasting accuracy, cost reduction, compliance, and reporting capabilities.

There are various stock inventory systems that have existed, catering to diverse business needs. Microsoft Excel remains a popular choice for smaller businesses or individuals seeking simple inventory management solutions, allowing for customisable spreadsheets to monitor inventory levels, sales, and purchases. QuickBooks offers both accounting and inventory management features, suitable for tracking stock levels, generating purchase orders, managing vendors, and producing reports. Enterprises often opt for comprehensive solutions like SAP ERP or Oracle NetSuite, which integrate inventory management with other core business functions, enabling real-time tracking of inventory across complex supply chains, automated purchasing processes, warehouse management, and order fulfilment optimisation. For smaller businesses, specialised solutions like Fishbowl Inventory or Wasp Inventory Control provide tailored features such as barcode scanning, multi-location tracking, and inventory forecasting. Cloud-based solutions like Zoho Inventory provide businesses with flexibility and scalability, offering features such as order management, batch tracking, and seamless integrations with various e-commerce platforms. A company's size, the complexity of inventory management, financial constraints, and unique operational requirements are all important factors to consider when choosing an inventory system. Smaller companies with simple inventory requirements might benefit from a solution with more affordable prices and basic features.

In contrast, larger enterprises or those with more intricate inventory processes might require a system with advanced features, greater customization options, and robust integration capabilities to manage their operations efficiently. Evaluating these factors helps ensure that the chosen inventory system aligns with the company's goals and supports its growth effectively.

1.2 Problem Statement and Motivation

In the modern world of today, where virtually everything revolves around data, the collection, analysis, and visualisation of information have become indispensable processes woven into the fabric of our daily lives. Beyond just handling internal writtenor typed data on paper or through various equipment, we now incorporate sophisticated data visualisation techniques and robust systems to optimize stock inventory management, ensuring more effective and efficient operations.

Insufficient functionalities and visualisations impede the meaningful interpretation of data.

Our stock inventory system has two main problems. First, when we look at the data in the system, it's hard to see any important patterns. Second, the predictions we make using this data are often wrong because the information isn't clear. These issues make it tough to understand the data well and can cause mistakes in our plans and predictions. When we can't see patterns easily, it's harder to make good decisions. Also, if the data isn't clear, our predictions won't be reliable. This is a big problem, especially in fields where data helps us make important choices. So, we need to fix these issues to make our data more reliable and useful.

Inability to discern data patterns through stock inventory management and the inadequacy of predictions due to a lack of clarity.

Another problem we are dealing with involves two main issues. First, when we use visualisations to understand our data, it is hard to spot important patterns. Second, the predictions based on the data often lack accuracy due to unclear information. These obstacles make it challenging to glean insightful information from the data and may cause inaccuracies in our projections and analyses. When we cannot easily identify patterns through visualisations, our decision-making process becomes less effective. Moreover, uncleardata undermines the reliability of the predictions we rely on. This presents a significantchallenge, especially in fields where data plays a crucial role in making important decisions. Thus, addressing these issues is essential to improve the reliability and usefulness of our data-driven information.

1.3 Objectives

-To enhance data visualisation and interpretation capabilities by addressingthe limitations of insufficient functionalities and visualisations in stock inventory management.

Power BI as the central data visualisation tool, leveraging its robust features, customisable options, and seamless data integration capabilities. The project starts by thoroughly assessing the existing data visualisation processes to identify any specific limitations. These limitations could include challenges like integrating data sources, using different types of visualisations, and dealing with users who might not be very experienced. We'll then systematically work on addressing these issues as part of the project's goals. In order to develop Power BI reports and dashboards that are clear, simple to understand, and responsive to the individual needs of users, I will give top priority to user-centered design principles.

-To improve the discernibility of data patterns through effective data visualisations and enhance the clarity and accuracy of predictions.

We aim to create meaningful, understandable, and actionable visualisations that enable users to derive valuable insights from intricate datasets by utilizing Power BI's extensive data visualisation features. These user-centrically designed visualisations will be customized to the specific requirements of the organization, guaranteeing their intuitiveness and ease of use. The project will also focus on integrating advanced analytics and machine learning models within Power BI, facilitating more precise predictions, and uncovering deeper patterns within thedata.[2]

1.4 Project Scope and Direction

The purpose of this project is to use PowerBI to improve data visualisation in order to improve stock inventory management. It is also to ensure that the clarity and predictability of datasets, enhancing inventory management efficiency and minimize data loss and facilitate more effective decision-making which improvise users’ experience.

The features and functionality included can help the stock inventory system for better visualisation and prediction:

I. **The system will be able to customize the all the dataset with no limit.**
II. **The system will be able to fit all the dataset and size with no restrictions.**
III. **The system will be able to be user friendly for better understanding in all datasets to all users.**
IV. **The system will be able to view, check and replenish all the stock inventory.**
V. **The system will be able to have better visualisation for better predictions.**

1.5 Contributions

This development initiative is to enhance stock inventory management by leveraging PowerBI for improved data visualisation. The objective is to ensure the clarity and predictability of datasets, ultimately enhancing inventory management efficiency for various sectors, including education, businesses, and government entities. This effort also aims to minimize data loss and facilitate more effective decision-making.

1.6 Report Organization

The ensuing chapters by chapters present the development's specifics. To begin with, Chapter 1 presents the ideas of stock inventory management and data visualisation. Chapter 2 then presents a review of the literature on current stock inventory management systems. Next, Chapter 3 explains how to use PowerBI to improve the data visualisation in stock inventory management. Additionally, Chapter 4 details the preparatory work done on the development process using the Software Development Life Cycle (SDLC), which begins with planning and ends with testing and deployment.

CHAPTER 2 - Literature Review

This chapter will cover on a few existing stock inventory managements. tock inventory managements such as SAP Inventory Management, Zoho Inventory and Oracle NetSuite Inventory Management are reviewed.

2.1 SAP Inventory Management

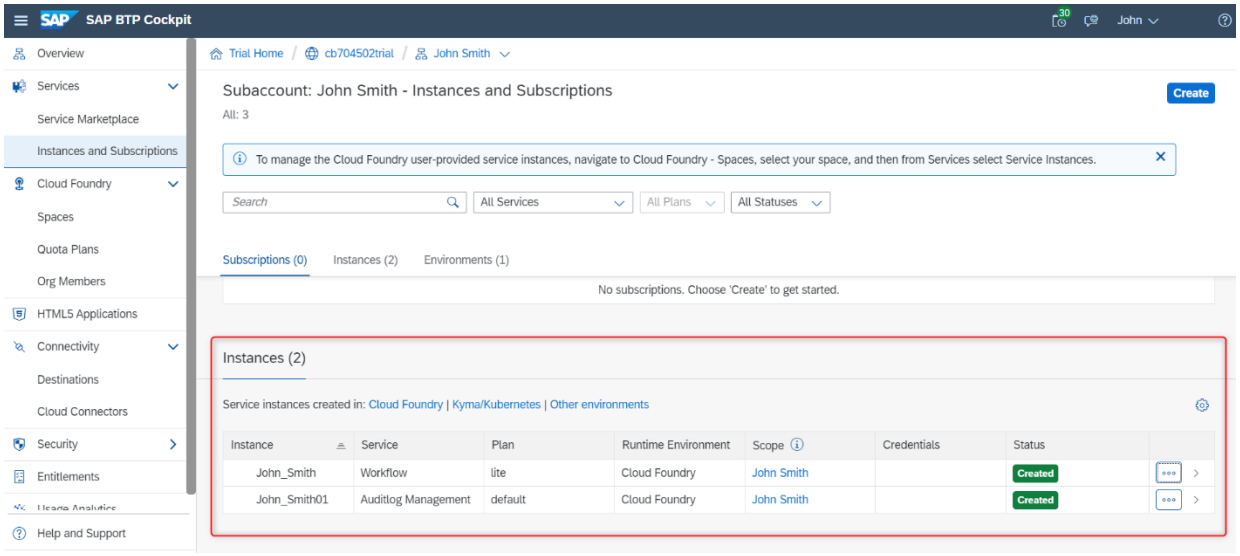


Figure 2.1: SAP Inventory Management

SAP Inventory Management is a system within SAP's Enterprise Resource Planning (ERP) system that focuses on efficiently managing a company's inventory.[4]

Strength

Comprehensive Functionality

SAP Inventory Management offers a couple of functionalities and capabilities to effectively manage inventory, including real-time visibility, goods receipt, goods issue, stock transfers, batch and serial number management, inventory valuation, and integration with other SAP modules. This comprehensive functionality caters to the needs of businesses across a lot of industry

Scalability

SAP Inventory Management offers extensive scalability, capable of meeting the inventory management requirements of businesses across all scales, ranging from small enterprises to expansive corporations with intricate supply chains and numerous locations. It effectively manages substantial transaction volumes and inventory data without experiencing any performance drawbacks.

Integration with SAP ERP

Inventory Management integrates seamlessly with other SAP modules in the SAP ERP system, including Materials Management, Sales and Distribution, Production Planning, and Financial Accounting. This cohesive integration facilitates complete visibility and management control across inventory-related procedures, simplifying workflows and boosting operational efficiency.

Weaknesses

-Complexity and Learning Curve

SAP Inventory Management is known for its complexity, which can result in a steep learning curve for users, particularly those new to the SAP ecosystem.

-Cost

Implementing and maintaining SAP ERP solutions, including Inventory Management, can incur substantial costs, particularly for small and medium-sized enterprises operating within constrained budgets. These expenses encompass licensing fees, implementation charges, customization costs, and ongoing support fees related to SAP software, all of which constitute a considerable investment for businesses.

-Dependency on SAP Ecosystem

Businesses using SAP Inventory Management are heavily reliant on the SAP ecosystem for ongoing support, updates, and compatibility with other SAP modules. This dependency can limit flexibility and interoperability with third-party software solutions, potentially restricting business agility and innovation.

2.2 Zoho Inventory

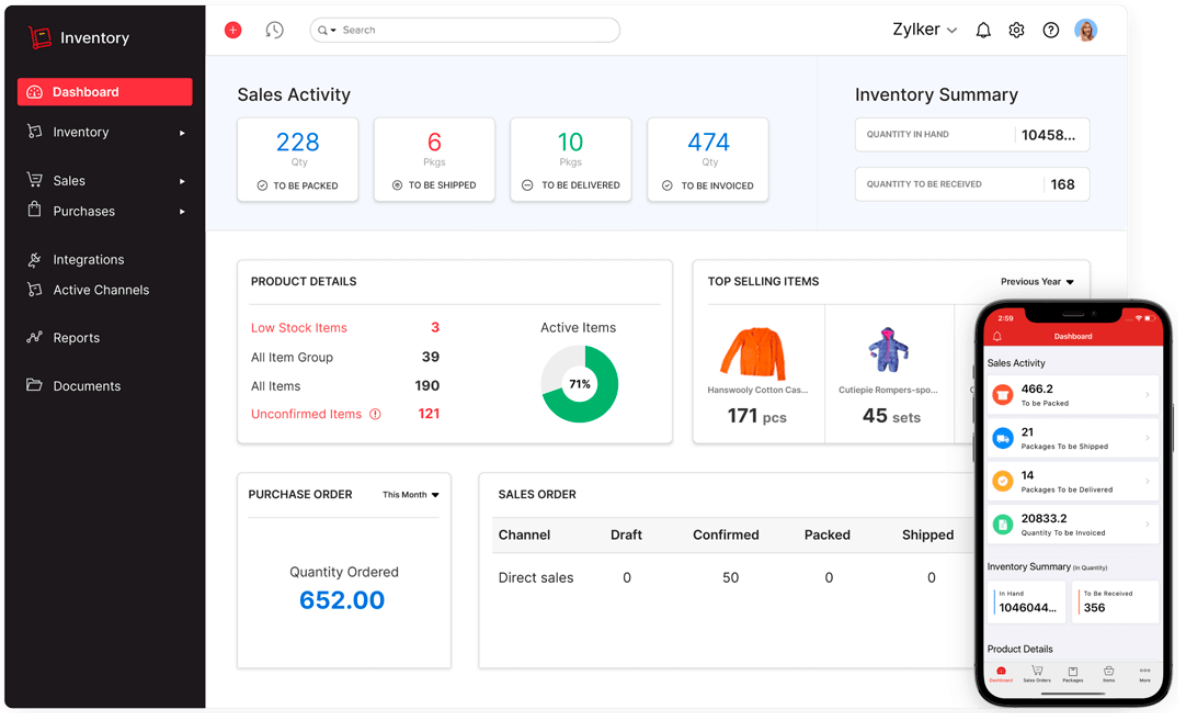


Figure 2.2 Zoho Inventory

Zoho Inventory is a cloud-based inventory management solution developed by Zoho Corporation, a renowned provider of a comprehensive suite of business productivity tools. [5]

Strength

-User-Friendly

Zoho Inventory is user-friendly interface, this makes it easy for businesses to utilize its features without extensive training. This simplicity is particularly beneficial for small businesses or those new to inventory management software.

-Affordability

Zoho Inventory offers some pricing plans, including a free tier with basic features and paid plans. This makes it accessible to businesses with limited budgets, especially startups and small enterprises looking for cost-effective inventory management solutions.

-Customization Option

Zoho Inventory offers extensive customization options for fields, workflows, and reports, allowing businesses to tailor the software to their specific needs. This flexibility enables companies to adapt Zoho Inventory to fit their unique processes and requirements.

Weaknesses

-Scalability Concerns

While Zoho Inventory is well-suited for small and medium-sized businesses, it may encounter challenges when scaling to meet the demands of larger enterprises with higher transaction volumes or more complex inventory management needs. As businesses experience rapid growth, they might find that Zoho Inventory's capabilities are insufficient, necessitating a transition to more scalable solutions to accommodate their evolving requirements.

-Internet Dependency

Zoho Inventory requires a stable internet connection for access and utilize. Businesses operating in areas with unreliable and unstable internet connection might facing internet outages which may encounter difficulties in accessing or using Zoho Inventory, leading to disruptions in inventory management processes.

-Limited Reporting and Analytics

While Zoho Inventory provides essential reporting and analytics features, some users may find its reporting options limited in terms of customization and depth of insights. Businesses that need more advanced reporting and analytics may need to integrate Zoho Inventory with additional tools or solutions to meet their requirements.

2.3 Oracle NetSuite Inventory Management

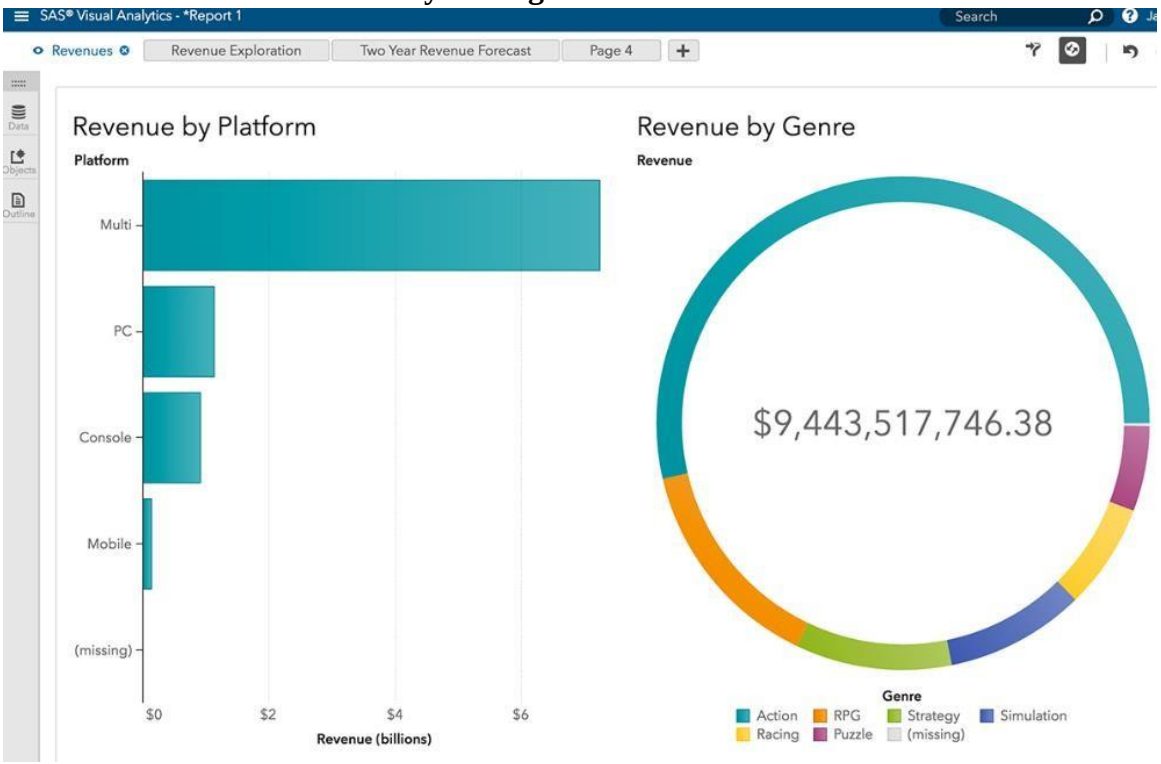


Figure 2.3 Oracle NetSuite Inventory Management

Oracle NetSuite Inventory Management is a module within the NetSuite Enterprise Resource Planning (ERP) suite, provided by Oracle Corporation. It is designed to help businesses efficiently manage inventory operations across multiple locations, streamline processes, and optimize inventory levels to meet customer demand while minimizing costs.[6]

Strength

-Comprehensive Inventory Management

Oracle NetSuite Inventory Management offers a comprehensive suite of features for effectively managing inventory across multiple locations. This includes inventory tracking, stock level optimisation, reorder point management, and demand forecasting. By providing real-time visibility into inventory data, it enables businesses to make informed decisions and swiftly adapt to changing market conditions.

-Scalability

NetSuite Inventory Management is designed to scale effectively and meet the diverse needs of businesses across all sizes, ranging from small startups to large enterprises with intricate

supply chains. It has the capability to manage high transaction volumes and flexibly adjust to the evolving requirements of businesses as they grow and develop.

-Customization and Flexibility

NetSuite offers extensive customization capabilities, allowing businesses to tailor Inventory Management workflows, reports, and dashboards to their specific requirements. Users can configure the system to support unique business processes, industry-specific needs, or compliance requirements.

Weaknesses

-Complexity and Learning Curve

NetSuite is known for its complexity, and users may face a steep learning curve when implementing and using NetSuite Inventory Management, especially if they are not familiar with ERP systems or cloud-based software. Training and support may be required to maximize the system's capabilities effectively.

-Cost

Oracle NetSuite is positioned as a premium ERP solution, and the cost of implementation, licensing, and ongoing support can be significant, particularly for small and medium-sized businesses with limited budgets. The total cost of ownership should be carefully evaluated against the expected benefits and ROI.

-Dependence on Internet Connectivity

-NetSuite Inventory Management is a cloud-based solution, which means it requires a stable and good internet connection for access and utilize. Businesses operating in areas with unstable internet connectivity will facing internet outages which may experience disruptions in accessing NetSuite Inventory Management.

2.4 Comparison Table

	SAP Inventory Management	Zoho Inventory	Oracle NetSuite Inventory Management	Proposed System
No Limit Customization	✘	✘	✘	✓
Low/no cost	✘	✘	✘	✓
User-Friendliness for Beginners	✘	✓	✘	✓
Good Visualisation	✘	✘	✘	✓

Table 2.1: Comparison between similar system and proposed system

Chapter 3

Proposed Method/Approach

3.1 Introduction

In my study, I choose Software Development Life Cycle (SLDC) as the method for developing my system because it offers a structured and systematic approach that is key to a project success. By following SDLC, I can effectively manage risks, ensure high-quality deliverables, and engage stakeholders throughout the development process.

3.2 Method

In this Software Development Life Cycle (SDLC), there are five basic steps: Planning, Design, Analysis, Development, and Testing and Deployment.

3.2.1 Phase 1: Planning

In the first phase, the project goals will be defined, feasibility studies will be conducted, and the overall project scope, budget, and timeline will be established. This phase involves identifying project stakeholders, conducting risk assessments, and creating a project plan that outlines the tasks, resources, and milestones.

Timeline

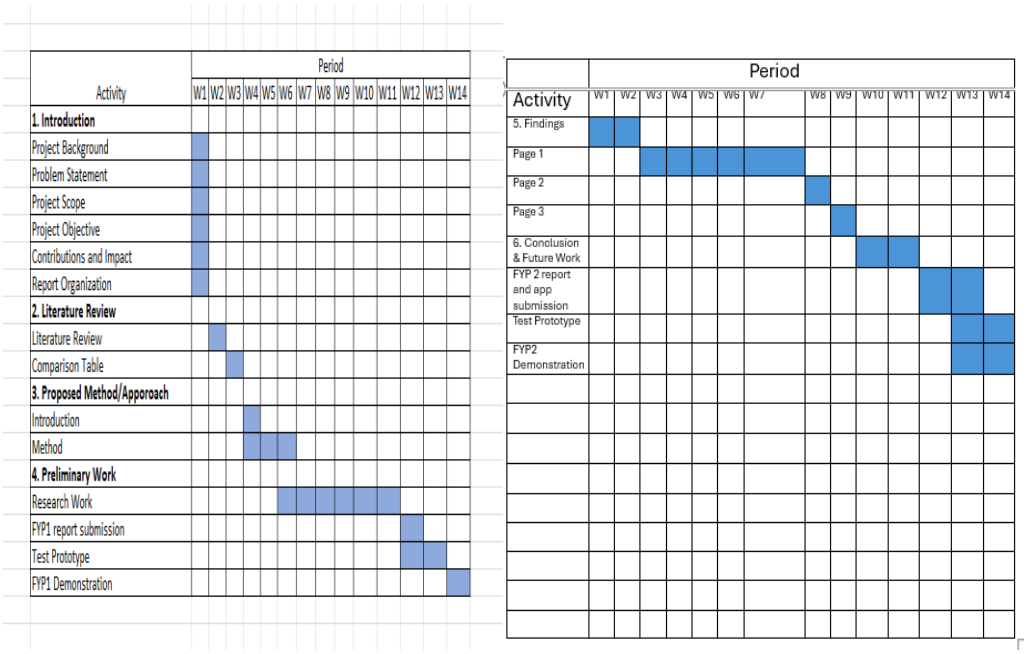


Figure 3.2.1.1 Timeline from FYP 1 to FYP 2

System Design

Software and technology

Data Analysis Expression DAX

Data Analysis Expressions is a powerful formula and query language primarily used in Power BI. It enables users to create sophisticated calculations and custom data manipulation operations within Power BI reports and dashboards. With DAX, you can perform complex calculations, define measures, filter data, and create dynamic visuals that provide valuable insights into your data.

Microsoft Excel

Microsoft Excel is a versatile spreadsheet program that empowers users to conduct tasks related to data analysis, organization, and visualisation. It utilizes a grid layout with cells arranged in rows and columns, enabling users to input and manipulate data, execute calculations, create visualisations like charts and graphs, and generate reports. One common use of Microsoft Excel is to prepare and organize data files that can then be imported into Power BI for the development of more advanced data visualisations and analytics.

Power BI

Power BI is a data analytics tool developed by Microsoft, designed to help users analyse and visualize data from diverse sources. It enables the creation of interactive reports and dashboards, offering valuable insights for informed decision-making. With Power BI, you can connect to various data sources like databases, Excel files, cloud services, and online platforms, consolidating all your data for thorough analysis. Its features include data modelling, DAX formulas, interactive visuals, and sharing functionalities, making it a powerful tool for extracting meaningful insights and facilitating business growth.

Phyton Programming

Python is a flexible and high-level programming language celebrated for its clear and easy-to-understand syntax. It finds extensive use in multiple fields, such as web development, data science, and artificial intelligence. Python's rich ecosystem of libraries and frameworks, including `pandas`, `numpy`, and `matplotlib`, makes it highly effective for complex data analysis and manipulation. Its combination of accessibility and robust functionality helps explain its widespread appeal among both beginners and seasoned developers.

Using Python for Data Preprocessing in Power BI

Integrating Python into Power BI offers a robust method for data preprocessing, enhancing the data manipulation and analytical capabilities of the dashboard. To leverage Python in Power BI, you first need to set up your environment by ensuring that Python is installed on your system and configuring Power BI to recognize your Python installation. This involves installing Python from the official website and adding any necessary libraries, such as `pandas` and `numpy`, using Python's package manager, pip. Once set up, you can specify the Python installation location in Power BI Desktop under the `Options` menu.

Python scripts can be used to import and preprocess data directly within Power BI. By selecting `Get Data` and then `Python script` in Power BI Desktop, you can write Python code to load and clean your dataset. For example, you might use a script to read a CSV file into a panda Data Frame, handle missing values, and convert date columns to a proper datetime format. The processed data is then available for further analysis and visualisation in Power BI.

Data cleaning and transformation are key areas where Python excels. Using Python's `pandas` library, you can handle missing values, normalize numerical data, and encode categorical variables. For instance, you might fill missing values with forward filling or perform normalization to standardize the range of numerical data. This preprocessing ensures that the data is ready for accurate analysis and reporting.

Feature engineering is another area where Python's capabilities are highly beneficial. You can create new features from existing data to enhance your analysis. For example, deriving new columns based on calculations or binning continuous variables into categorical ranges can provide additional insights and improve the quality of your data analysis.

Although Power BI includes a range of visualisation tools, Python allows for the creation of custom plots that can complement standard visualisations. By using libraries like `matplotlib` or `seaborn`, you can generate specialised charts and graphs tailored to your specific analytical needs. These custom visualisations can provide unique perspectives and deeper insights into your data.

Once the data is pre-processed with Python, it becomes part of Power BI's data model, where it can be used to create interactive reports and dashboards. The processed data can be seamlessly integrated into Power BI reports, allowing you to build comprehensive visualisations and perform further analysis. Additionally, Python scripts can be rerun to update the dataset with the latest information, ensuring that your reports reflect the most current data.

In summary, using Python programming in Power BI significantly enhances data preprocessing capabilities. Python's advanced data manipulation and visualisation tools enable more precise and insightful analysis, complementing Power BI's native features. This integration provides a powerful means of preparing data for business intelligence, ultimately leading to more informed and effective decision-making.

Hardware

The hardware that involves in this project is computer. The function of computer is to use the PowerBI tools and data visualize for enhanced the stock inventory management.

Description	Specifications
Processor	Asus Intel® Core™ i5-8300H CPU @ 2.30GHz
Ram	12GB
Storage	512GB C Drive
Graphic Card	NVIDIA GeForce GTX 1060
Operation System	Window 11

Table 3.2.1.2 Specifications of laptop

3.2.2 Phase 2: Analysis

During the analysis phase, a comprehensive examination of the project's requirements, constraints, and objectives will be conducted. This involves gathering data and analysing existing systems or processes if applicable. The goal is to identify potential challenges, dependencies, and opportunities that will impact the project's implementation. Through careful analysis, we will refine the project scope, prioritize requirements, and develop a detailed functional specification document that serves as a blueprint for the development phase.

3.2.3 Phase 3: Design

In the design phase, detailed system specifications and architectural designs are developed based on the gathered requirements. This includes designing the system's structure, user interface, database schema, algorithms, and integration points.

3.2.4 Phase 4: Development

In the Development phase, the project moves from planning and analysis to actual implementation. This stage will involves designing system architecture, developing software components, creating databases, and integrating various modules as per the project requirements. Development tasks are typically divided into smaller, manageable units known as sprints or iterations, allowing for incremental progress and continuous feedback from stakeholders. Quality assurance measures are integrated into the development process to ensure that the final product meets the specified standards and user expectations.

3.2.5 Phase 5: Testing and Deployment

During the Testing and Deployment phase, the primary goal is to verify the functionality, performance, and usability of the developed system. This phase involves conducting thorough testing procedures, including unit testing, integration testing, system testing, and user acceptance testing, to detect and rectify any defects or inconsistencies in the system. Once the system successfully passes all tests and receives approval from stakeholders, it is ready for deployment into the production environment. Deployment activities encompass data migration, user training, system documentation, and providing ongoing support to ensure a seamless transition and optimal performance post-launch.

Chapter 4

Preliminary Work

4.1 Introduction

The preliminary work phase involved essential tasks like defining project goals, assessing feasibility, conducting risk assessments, gathering requirements from stakeholders, and conducting initial research. This groundwork ensures alignment with business objectives and sets the stage for successful project execution in subsequent phases.

4.2 Research Work

Research work involves asking questions, looking at what others have studied, conducting experiments or surveys, analysing data, and sharing findings. It is about exploring ideas and solving problems systematically across various fields like science, academia, business, and society.

4.2.1 Phase 1: Planning

In this phase, the time digging into various resources to understand how stock inventory management systems work was spent and literature review regarding the stock inventory management system was also conducted. From the previous existing system, the comparison table was made in chapter 2 to clarify the weakness of existing system and outline areas for improvement in the proposed system, with a primary emphasis on enhancing data visualisation.

	SAP Inventory Management	Zoho Inventory	Oracle NetSuite Inventory Management	Proposed System
No Limit Customization	**X**	**X**	**X**	✓
Low/no cost	**X**	**X**	**X**	✓
User-Friendliness for Beginners	**X**	✓	**X**	✓
Good Visualization	**X**	**X**	**X**	✓

Considering insights gleaned from existing systems, an opportunity to enhance data visualisation, particularly concerning inventory-related insights, has been identified. With the aim of rendering

data more comprehensible and actionable for decision-makers, the decision was made to leverage Power BI, renowned for its proficiency in crafting clear and insightful charts and graphs.

Besides, data preprocessing is also conceptualized. This involves determining the data requirements, identifying the sources of data, and defining the objectives for data preparation. The planning phase helps to outline what preprocessing tasks need to be performed to ensure that the data is suitable for analysis and reporting in Power BI. This phase sets the stage for designing the preprocessing workflows and scripts.

4.2.2 Phase 2: Analysis

During Phase 2, the Analysis stage, an in-depth examination of data sourced from various websites was conducted. This scrutiny revealed significant flaws within the current stock inventory systems that could adversely impact user experience.

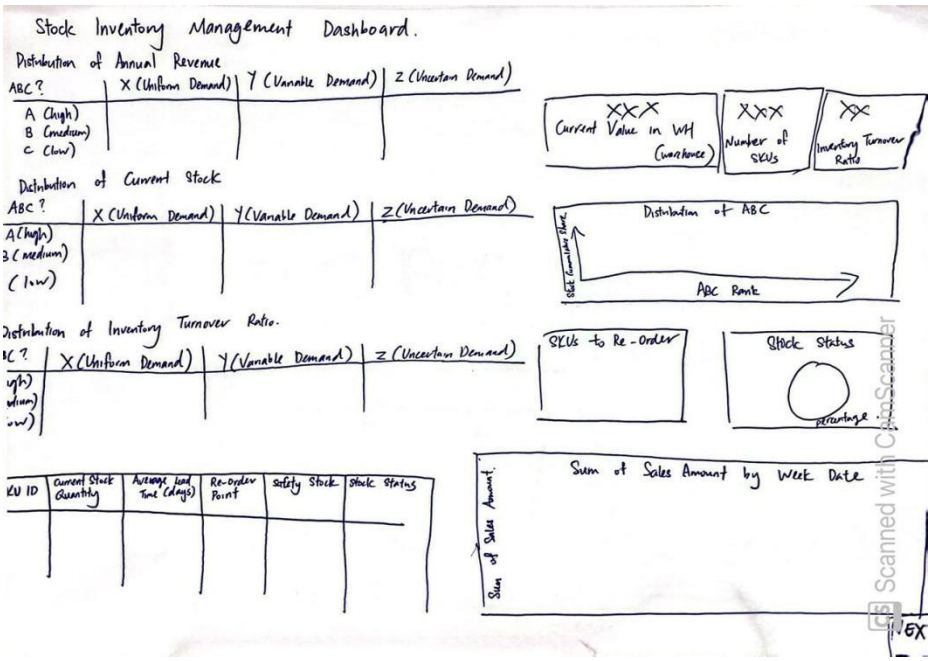
Armed with these insights, the project scope was meticulously defined, prioritizing the critical areas requiring remediation. Subsequently, a robust plan was devised to enhance the presentation of data pertaining to inventory management, aimed at improving user experience and system performance. The primary objective of this initiative is to enhance the system's data visualisation of the stock inventory management.

After that, descriptive analytics was carried out for the proposed system. Descriptive analytics focused on summarizing and understanding historical data related to inventory management. At first, for the data collection, the inventory data on the stock inventory, which are the past order of a company, and the stock were collected in Excel file. In past order record, the Order Date, SKU ID (stock keeping unit) and Order Quantity were collected, while in Stock record, Current Stock Quantity, Units (Nos/Kg), Average Lead Time (days), Maximum Lead Time (days) and Price Unit for each SKU ID were collected to build the data visualisation in PowerBI, After that, the data was structured and organized to facilitate meaningful analysis and insights for creating visualisations for a dashboard in PowerBI.

Besides that, the dataset has also needed to be understand from its structure, quality, and any issues that need to be addressed. This involves identifying data quality problems such as missing values, inconsistencies, or inaccuracies that need to be corrected. Analysing the data helps to determine the specific preprocessing tasks required, such as data cleaning, transformation, and enrichment, which will be implemented in the subsequent phases.

4.2.3 Phase 3: Design

For design phase, A dashboard draft was made on how to design in the dashboard for the stock inventory management system in PowerBI.



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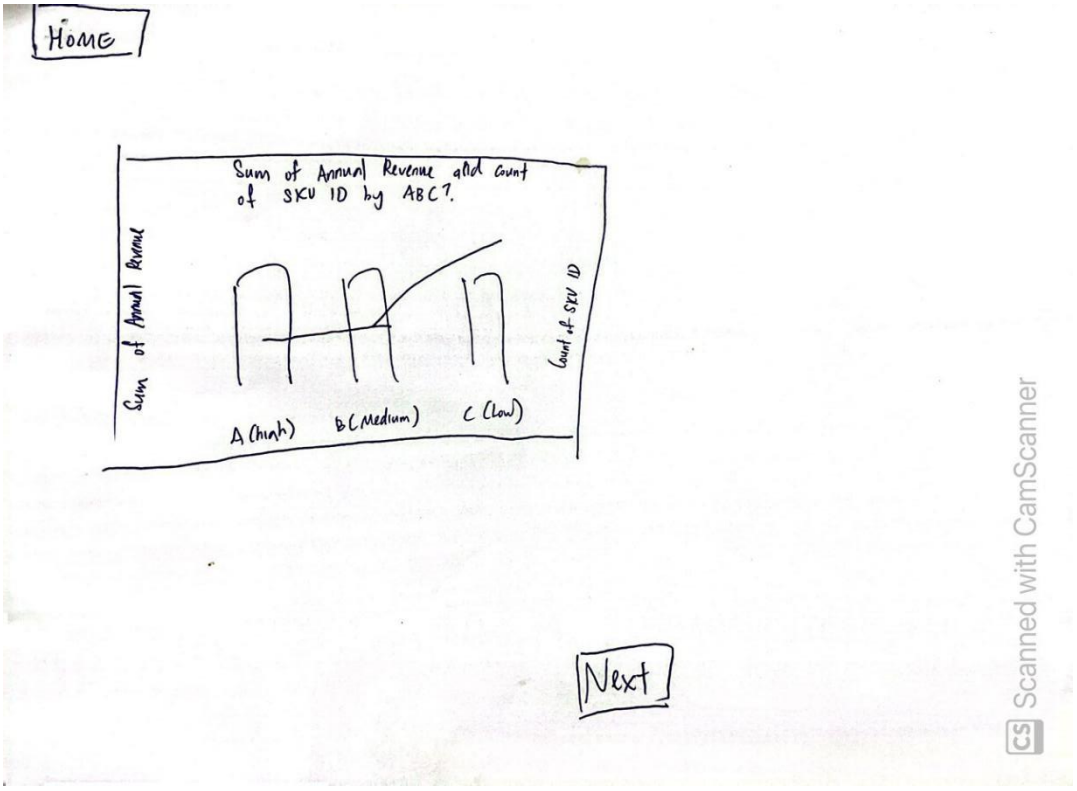

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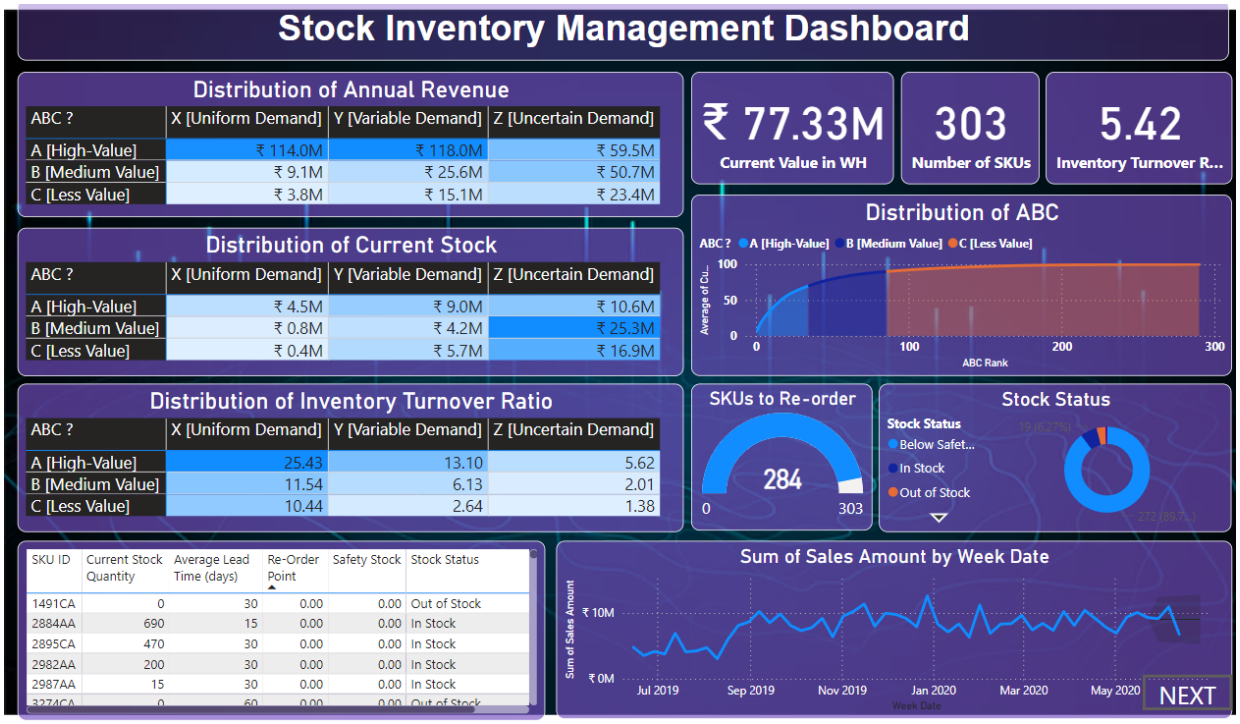
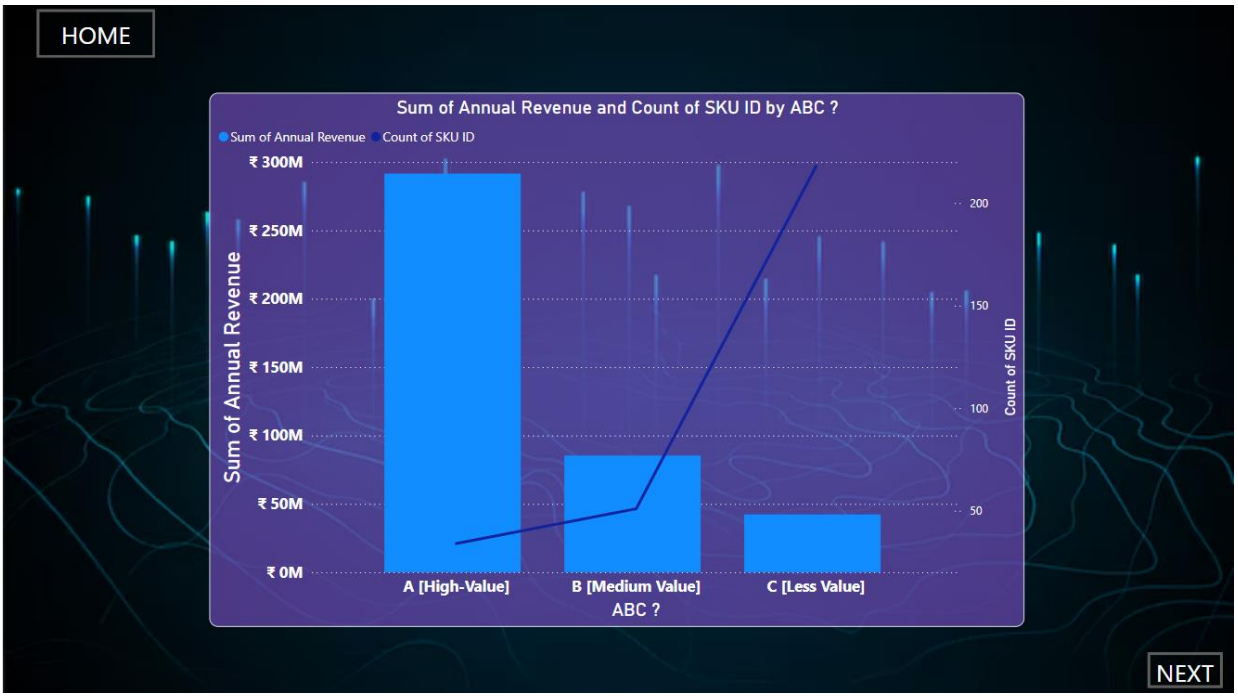
Figure 4.2.3.1 Drafts of Data Visualisation for stock inventory management

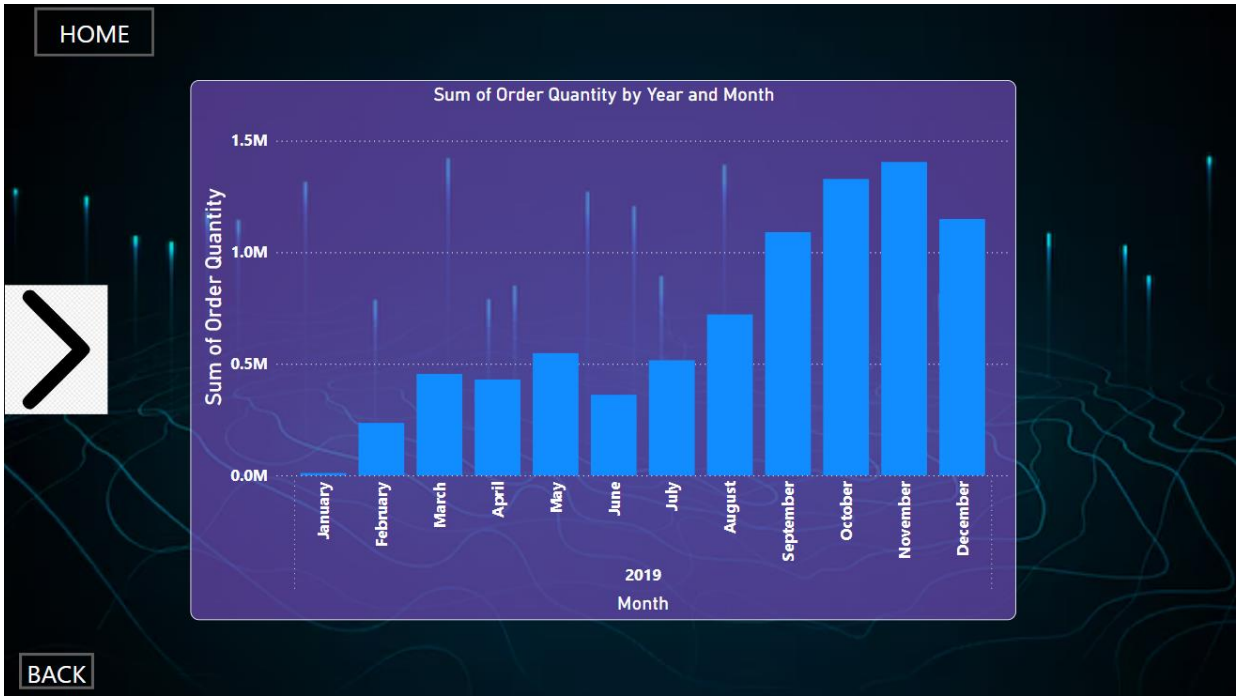
After the draft, the design has been applied to PowerBI and some modifications was made for better data visualisation. The diagram below shows the dashboard which has been done in PowerBI.


Stock Inventory Management Dashboard
Distribution of Annual Revenue
ABC ? | X [Uniform Demand] | Y [Variable Demand] | Z [Uncertain Demand]
A [High-Value] | ₹ 114.0M | ₹ 118.0M | ₹ 59.5M
B [Medium Value] | ₹ 9.1M | ₹ 25.6M | ₹ 50.7M
C [Less Value] | ₹ 3.8M | ₹ 15.1M | ₹ 23.4M
₹ 77.33M
Current Value in WH
303
Number of SKUs
5.42
Inventory Turnover R...
Distribution of Current Stock
ABC ? | X [Uniform Demand] | Y [Variable Demand] | Z [Uncertain Demand]
A [High-Value] | ₹ 4.5M | ₹ 9.0M | ₹ 10.6M
B [Medium Value] | ₹ 0.8M | ₹ 4.2M | ₹ 25.3M
C [Less Value] | ₹ 0.4M | ₹ 5.7M | ₹ 16.9M
Distribution of ABC
ABC ? A [High-Value] B [Medium Value] C [Less Value]
ABC Rank
Distribution of Inventory Turnover Ratio
ABC ? | X [Uniform Demand] | Y [Variable Demand] | Z [Uncertain Demand]
A [High-Value] | 25.43 | 13.10 | 5.62
B [Medium Value] | 11.54 | 6.13 | 2.01
C [Less Value] | 10.44 | 2.64 | 1.38
SKUs to Re-order
284
0
303
Stock Status
Stock Status
Below Safet...
In Stock
Out of Stock
SKU ID | Current Stock Quantity | Average Lead Time (days) | Re-Order Point | Safety Stock | Stock Status
1491CA | 0 | 30 | 0.00 | 0.00 | Out of Stock
2884AA | 690 | 15 | 0.00 | 0.00 | In Stock
2895CA | 470 | 30 | 0.00 | 0.00 | In Stock
2982AA | 200 | 30 | 0.00 | 0.00 | In Stock
2987AA | 15 | 30 | 0.00 | 0.00 | In Stock
Sum of Sales Amount by Week Date
Sum of Sales Amount
₹ 10M
₹ 0M
Jul 2019
Sep 2019
Nov 2019
Jan 2020
Mar 2020
May 2020
Week Date
NEXT

Page 1


HOME
Sum of Annual Revenue and Count of SKU ID by ABC ?
Sum of Annual Revenue
Count of SKU ID
₹ 300M
₹ 250M
₹ 200M
₹ 150M
₹ 100M
₹ 50M
₹ 0M
200
150
100
50
A [High-Value]
B [Medium Value]
C [Less Value]
ABC ?
NEXT

Page 2



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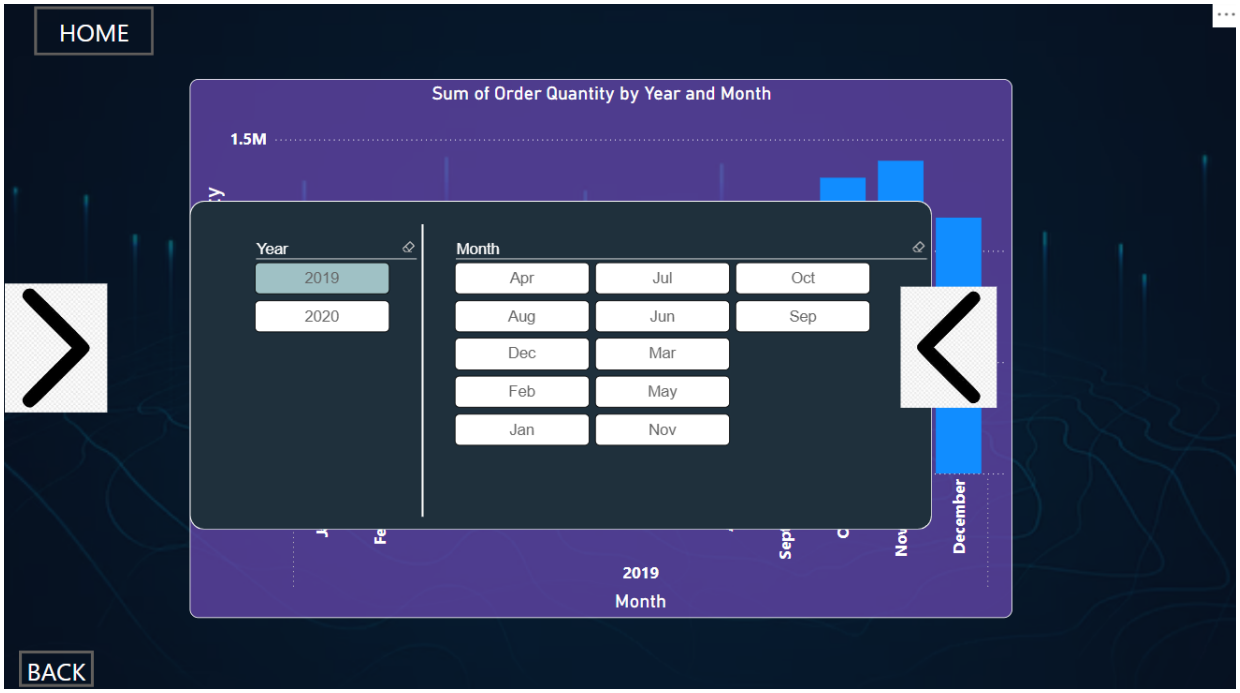


Page 3 (Slicer and Filter)

Figure 4.2.3.2 Data Visualisation in PowerBI

Besides, the entity relationship diagram has also been drafting to make sure that some of the table can be linked to another table for running. Here is the draft and the design in PowerBI.

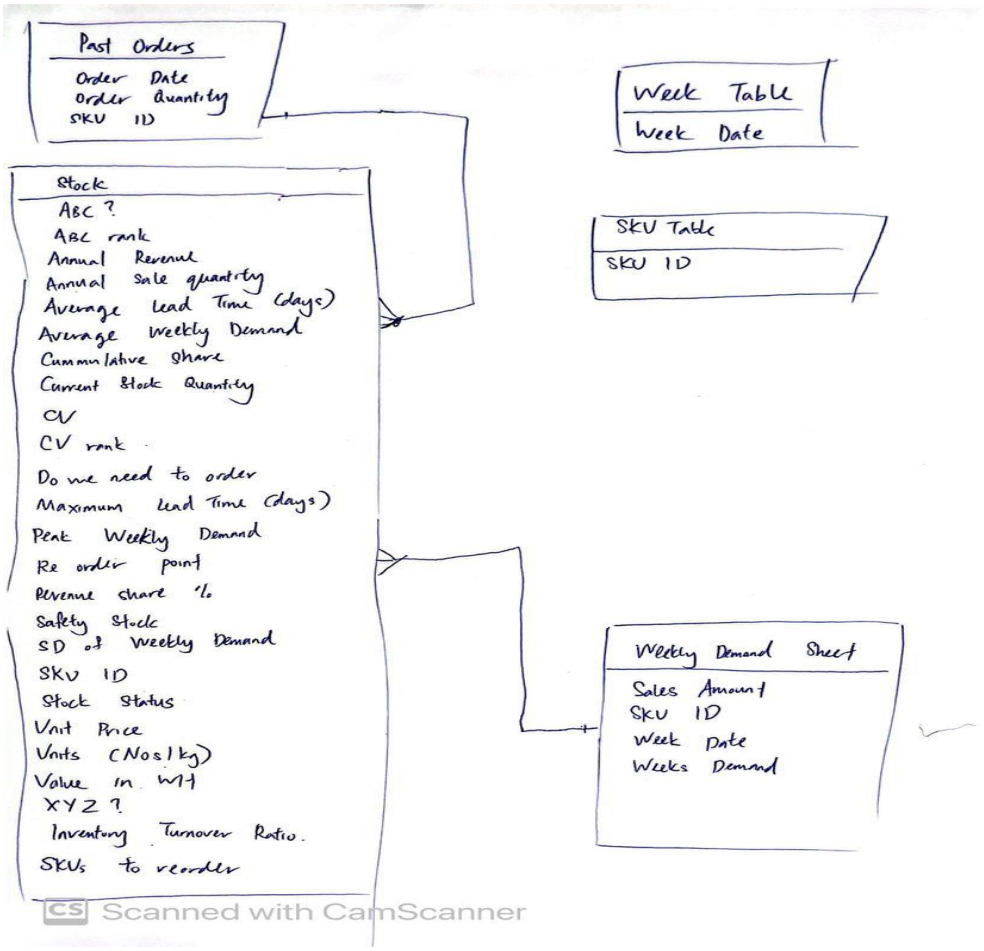


Figure 4.2.3.3 Draft of ERD

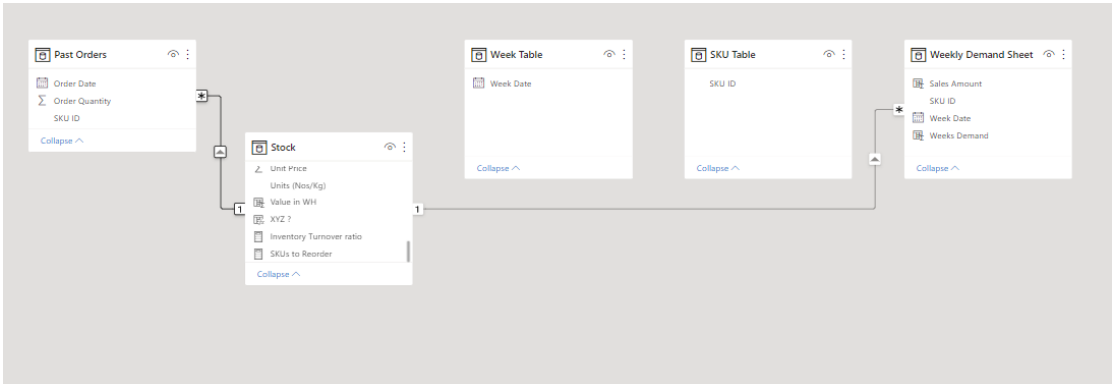


Figure 4.2.3.4 ERD in PowerBI

In the design phase, Python programming will be strategically applied to prepare and transform the data according to the specifications established in the planning and analysis phases. This

phase focuses on developing a comprehensive approach to data preprocessing that aligns with the identified requirements. Python scripts will be crafted to handle various data transformation tasks, such as cleaning, normalization, and feature engineering, ensuring that the data is structured and ready for analysis. This careful design ensures that the preprocessing procedures effectively meet the objectives set out earlier, optimizing the data for integration and use within Power BI.

4.2.4 Phase 4: Development

In the development phase, the process commenced with the integration of the inventory data file into Power BI. Subsequently, the Data Analysis Expressions (DAX), a formula language utilized in Power BI and other Microsoft data analysis tools has been proceeded. This step followed an exhaustive study and understanding of DAX's functionalities and applications within the context of Power BI.

The DAX of annual sale quantity, annual revenue, revenue share %, cumulative share, ABC classification, average weekly demand, SD (standard deviation) of the weekly demand, CV (coefficient of variance), CV rank, XYZ classification (X= uniform demand, Y= variable demand, Z= uncertain demand), value of WH(warehouse), peak weekly demand ,ABC rank, safety stock, re order point, is ordering required, stock status, week table, weekly demand sheet, weeks demand and sales amount are studied and applied in PowerBI.

```
1 Annual Sale Quantity = CALCULATE(
2     SUM('Past Orders'[Order Quantity]),
3     FILTER('Past Orders',
4     'Past Orders'[SKU ID]='Stock'[SKU ID] &&
5     'Past Orders'[Order Date] >= DATE(2020, 6, 14) - 365
6 ))
```

Figure 4.2.4.1 Annual Sales Quantity

Annual sales quantity is a key metric for businesses, reflecting the total number of products sold in a year. It guides decisions on inventory, pricing, and marketing strategies, helping companies track growth, identify successful products, and set performance targets.

```
1 Annual Revenue = Stock[Annual sales quantity]*Stock[Unit Price]
```

Figure 4.2.4.2 Annual Revenue

Annual revenue represents the total income earned by a business from its operations within a single fiscal year. It is determined by multiplying the number of annual sales quantities sold by their corresponding prices.

```
1  Revenue Share % = 100*Stock[Annual Revenue]/SUM(Stock[Annual Revenue])+0
```

Figure 4.2.4.3 Revenue Share

Revenue share refers to the portion of total revenue that a business or individual receives as compensation for their contribution to generating that revenue. It's a common arrangement in various business models, partnerships, and affiliate programs where parties agree to share a percentage of the revenue generated from sales or services.

```
1  Cummulative share = CALCULATE(
2      SUM(Stock[Revenue Share %]),
3      FILTER(stock,
4      Stock[Revenue Share %]>=EARLIER(Stock[Revenue Share %])))
```

Figure 4.2.4.4 Cumulative share

Cumulative share typically refers to creating a cumulative share measure or calculation within a dataset or report.

```
1  ABC ? = if(Stock[Cummulative share]<=70,"A [High Value]",if(Stock[Cummulative share]<=90,"B [Medium Value]","C [Less Value]"))
```

Figure 4.2.4.5 ABC classification

The ABC classification is a widely used technique in inventory management and supply chain optimisation. Its primary purpose is to categorize inventory items based on their importance or value within an organization's operations.

A-Class Items are the most important items in terms of revenue, profitability, or criticality to operations. While they often represent a smaller percentage of the total items, they contribute significantly to the broad value of the inventory.

B-Class Items fall into the category of moderate importance or value compared to A-Class items. They are not as critical but still contribute significantly to the overall inventory. B-Class items may include products with moderate sales volume, less expensive components, or supplies with

moderate usage patterns. They require attention and management, albeit not as intense as A-Class items.

C-Class Items are the least valuable or important items in the inventory. It represents a larger percentage of the total items but contribute less to the overall value or performance. C-Class items may include low-selling products, inexpensive components, or supplies with minimal usage. These items are managed with simpler inventory strategies and may not require frequent monitoring or extensive inventory controls.

By categorizing items into ABC classes, organizations can tailor their inventory management approaches to each class's specific characteristics. The ABC classification system helps organizations optimize inventory levels, reduce carrying costs, and ensure the availability of critical items when needed.

```
Average Weekly Demand = CALCULATE(
    AVERAGE('Weekly Demand Sheet'[Weeks Demand]),
    FILTER('Weekly Demand Sheet',
        'Weekly Demand Sheet'[SKU ID]=Stock[SKU ID]
    )
)
```

Figure 4.2.4.6 Average Weekly Demand

Average weekly demand refers to the average amount of a product that customers request on a weekly basis. This metric is commonly used in supply chain management, retail, and manufacturing to forecast inventory needs, plan production schedules, and optimize resource allocation.

```
Stdev of Weekly Demand = CALCULATE(
    STDEV.P('Weekly Demand Sheet'[Weeks Demand]),
    FILTER('Weekly Demand Sheet',
        'Weekly Demand Sheet'[SKU ID]=Stock[SKU ID]
    )
)
```

Figure 4.2.4.7 Stdev (standard deviation) of Weekly Demand

The standard deviation (Stdev) of weekly demand is a measure that quantifies the amount of variation in the demand for a product or service over weekly intervals. In simpler terms, it tells you how spread out the weekly demand data points are from the average weekly demand.

```
1 Coeff. Of Variation = IF(Stock[Stdev of Weekly Demand]>0,Stock[Stdev of Weekly Demand]/Stock[Average Weekly Demand],1000)
```

Figure 4.2.4.8 Coeff. (Coefficient Variation)

The coefficient variation (CV) is a statistical metric employed to gauge the comparative variability or spread of data within a dataset, especially when dealing with datasets that feature diverse scales or units of measurement.

```
Coeff. Var Rank = RANK.EQ(Stock[Coeff. Of Variation],Stock[Coeff. Of Variation],ASC)
```

Figure 4.2.4.9 Coeff. Var Rank

The concept of "CV rank" involves ranking data based on their coefficient of variation (CV) values.

```
1 XYZ ? = IF(Stock[Coeff. Var Rank]<=0.2*max(Stock[Coeff. Var Rank]),"X [Uniform Demand]",
2     IF(Stock[Coeff. Var Rank]<=0.5*MAX(Stock[Coeff. Var Rank]),"Y [Variable Demand]",
3     "Z [Uncertain Demand]"
4     )
5 )
```

Figure 4.2.4.10 XYZ classification

The XYZ classification system is a method used in inventory management to categorize items based on the predictability of their demand. This approach complements the ABC classification system by focusing on how consistent or variable demand patterns are, which aids in optimizing inventory control strategies.

X-Class Items are characterized by their stable and predictable demand. These items experience consistent demand over time, making inventory forecasting relatively straightforward. Typical examples of X-Class items might include everyday essentials, standard components, or materials with a regular usage rate. Such items generally need less frequent monitoring and can be managed with basic replenishment techniques.

Y-Class Items have a moderate level of demand variability. Their demand patterns are less stable than X-Class items, but they are not highly erratic. Demand for Y-Class items might vary due to factors like seasonal changes, promotional activities, or market shifts. As a result, these items require closer monitoring and more flexible inventory control measures, such as maintaining safety stock or adjusting ordering practices.

Z-Class Items exhibit high demand variability and unpredictability. The demand for these items can fluctuate significantly, making accurate inventory forecasting challenging. Examples of Z-Class items include trendy products, seasonal goods, or components with irregular usage. Managing these items necessitates advanced inventory control strategies, including dynamic forecasting, agile supply chain practices, and substantial safety stock to minimize the risk of stockouts and excess inventory.

By using the XYZ classification system, organizations can tailor their inventory management strategies to match the demand characteristics of each item category. This leads to improved inventory control, better customer service, reduced risk of stockouts, and more efficient inventory costs. Ultimately, the XYZ classification helps organizations balance inventory availability with cost-effectiveness by aligning their management practices with the specific demand patterns of their products.

```
1 Value in WH = Stock[Current Stock Quantity]*Stock[Unit Price]
```

Figure 4.2.4.11 Value in WH (warehouse)

Value in WH (warehouse) refers to the total monetary value of inventory or goods stored in a warehouse. This value is crucial for businesses as it represents the investment tied up in inventory and affects financial statements, cash flow, and profitability.

```
ABC Rank = RANK.EQ(Stock[Cummulative Share],Stock[Cummulative Share],ASC)
```

Figure 4.2.4.12 ABC rank

The ABC ranking method sorts of inventory into three categories based on importance. A-Class Items are the most valuable and need careful attention. B-Class Items are of moderate importance and require regular management. C-Class Items are the least important, making up a large portion of inventory but with less impact. This system helps businesses manage their inventory more effectively by focusing resources where they are needed most.

```
1 Peak Weekly Demand = CALCULATE(
2     MAX('Weekly Demand Sheet'[Weeks Demand]),
3     FILTER('Weekly Demand Sheet',
4     'Weekly Demand Sheet'[SKU ID]=Stock[SKU ID]
5     )
6 )
```

Figure 4.2.4.13 Peak Weekly Demand

Peak weekly demand refers to the highest level of demand for a product or service experienced during a single week. This metric is important for businesses as it helps them understand the maximum level of customer interest or sales volume they might encounter within a specific timeframe.

```
1 Safety Stock = ( Stock[Peak Weekly Demand] * Stock[Maximum Lead Time (days)]/7 ) - ( Stock[Average Weekly Demand] * Stock[Average Lead Time (days)]/7 )
```

Figure 4.2.4.14 Safety Stock

Safety stock is the extra inventory a company keeps on hand beyond what is anticipated to meet regular demand. This reserve plays a crucial role in inventory management by helping businesses sustain high service levels, reduce the risk of running out of stock, and fulfil customer needs even when demand fluctuates or supply chain disruptions occur.

```
1 Re order point = Stock[Safety Stock]+(Stock[Average Weekly Demand]*Stock[Average Lead Time (days)]/7)
```

Figure 4.2.4.15 Reorder point

The reorder point is a crucial aspect of inventory management, defining the threshold at which a new order should be initiated to restock items before they reach critically low levels or run out completely. It is essentially about determining when to replenish inventory to meet customer demand during the time it takes to receive order.

```
. Is Ordering Required ? = IF(Stock[Current Stock Quantity]<=Stock[Re-Order Point],"Yes","No")
```

Figure 4.2.4.16 Is Ordering Required?

For this “Is Ordering Required?” is based on the current stock quantity and the reorder point. If the reorder point is higher than the current stock quantity, the output is “Yes”, or else will be “No”

```
1 Stock Status = IF(Stock[Current Stock Quantity] = 0, "Out of Stock",
2     IF(Stock[Current Stock Quantity] < Stock[Safety Stock], "Below Safety Stock",
3         IF(Stock[Is Ordering Required ?]="Yes","Below ROP, above Safety Stock", "In Stock"
4     )
5 ))
```

Figure 4.2.4.17 Stock Status

Stock status refers to the current condition or state of inventory within a business or warehouse. It provides information about the availability, quantity, and condition of items in stock. Monitoring stock status is essential for inventory management, supply chain optimisation, and meeting customer demand.

```
1 Week Table = GENERATESERIES(DATE(2020,06,14)-365,DATE(2020,06,14),7)
```

Figure 4.2.4.18 Week Table

Week Table refers to a table or dataset that contains information related to weeks within a specific time frame. Such a table is commonly used in various data analysis and reporting scenarios to organize and analyse data based on weekly intervals.

```
1 Weekly Demand Sheet = GENERATE('Week Table','SKU Table')
```

Figure 4.2.4.19 Weekly Demand Sheet

A "Weekly Demand Sheet" is a document or spreadsheet that contains information about the demand for products or services on a weekly basis. It is commonly used in inventory management, sales forecasting, and supply chain optimisation to track and analyse demand trends over time.

```
Weeks Demand = CALCULATE(
    SUM('Past Orders'[Order Quantity]),
    FILTER('Past Orders',
        'Past Orders'[SKU ID]='Weekly Demand Sheet'[SKU ID] &&
        'Past Orders'[Order Date] >= 'Weekly Demand Sheet'[Week Date]-6 &&
        'Past Orders'[Order Date] <= 'Weekly Demand Sheet'[Week Date]
    )
)+0
```

Diagram 4.2.4.20 Weeks Demand

Weeks Demand refers to the total demand for a product across multiple weeks. It's the aggregate or sum of demand quantities over a specific period, often expressed in units, volume, or other relevant units of measurement. Analysing weekly demand allows businesses to gain insights into broader demand trends, spot patterns, and make data-driven decisions regarding inventory management, production scheduling, and resource allocation.

```
Sales Amount = LOOKUPVALUE(Stock[Unit Price],Stock[SKU ID],'Weekly Demand Sheet'[SKU ID]) * 'Weekly Demand Sheet'[Weeks Demand]
```

Diagram 4.2.4.21 Sales Amount

Sales amount can be defined as the total monetary value of goods or items sold by a business within a period. The sales amount calculated by using the unit price from the Stock table based on the SKU ID in the 'Weekly Demand Sheet' table using LOOKUPVALUE. The LOOKUPVALUE function searches the Stock table for the unit price associated with a specific SKU ID from the 'Weekly Demand Sheet' table. Once it finds the corresponding unit price, it multiplies it by the demand quantity ('Weeks Demand') from the 'Weekly Demand Sheet' table.

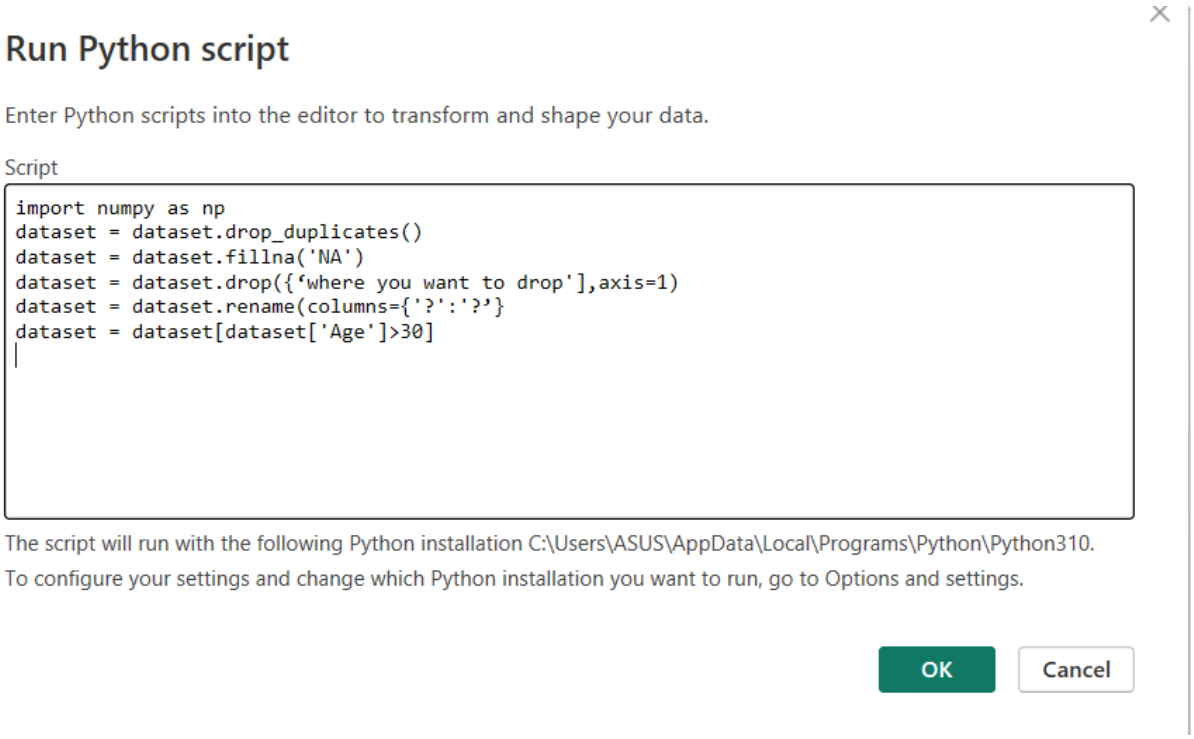


Diagram 4.2.4.22 Run Python Script

Python scripting is instrumental in the data preprocessing phase, offering users the ability to clean and filter datasets before importing them into Power BI. By employing Python, users can effectively tailor their data to meet specific requirements and enhance its quality. For example, Python scripts can be used to remove duplicate entries, ensuring that the dataset is free from redundant information. Missing values can be addressed by filling them with placeholders such as 'NA,' which maintains dataset integrity and consistency. Additionally, Python allows users to drop unnecessary columns that are not needed for analysis, thereby streamlining the dataset and focusing only on relevant information.

Users who learn Python programming can apply these techniques to prepare their data with precision. This capability ensures that when data is imported into Power BI, it is well-organized and aligned with the analytical objectives. Python's flexibility in data manipulation helps users maintain high data quality, which is crucial for generating accurate and insightful reports and dashboards in Power BI.

4.2.5 Phase 5: Testing and deployment

In this phase, the testing and deployment were conducted based on the principles of usability testing. The primary objectives of usability testing were to identify potential issues in the design, uncover opportunities for improvement, and gain insights into the behaviour and preferences of our target users. This approach enabled us to refine the product based on authentic user feedback, ensuring a more user-friendly and effective solution.

Usability testing is categorised as five different components, which are learnability, efficiency, memorability, errors, and satisfaction.

Learnability

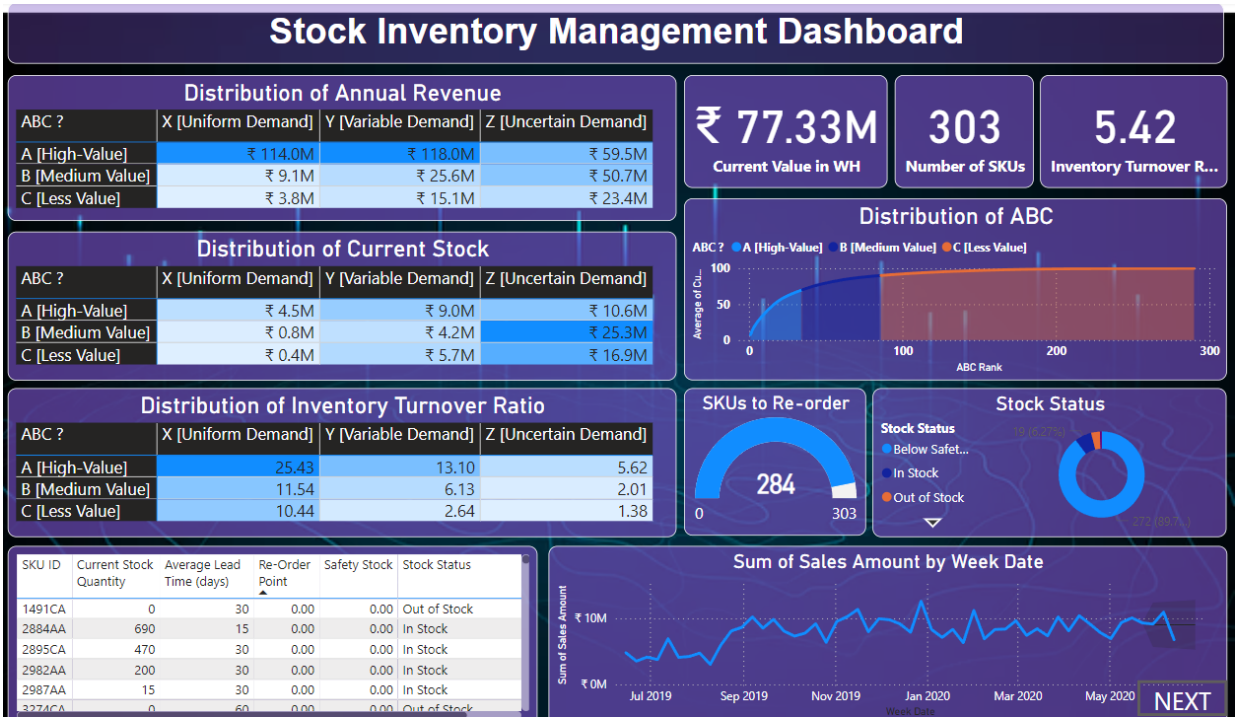


Figure 4.2.5.1 Data Visualized in Proposed Dashboard

Efficiency refers to how quickly new users can learn to use the system. For new users, the proposed system offers high learnability, particularly with PowerBI, due to its user-friendly functions. The features provided are not only convenient but also highly useful, making it more convenient for newcomers to navigate and utilize PowerBI effectively for the data visualisation. Figure above shows data for a set of data when the data was clicked to check the information of the item.

Efficiency

Efficiency in usability testing refers to how quickly users can accomplish tasks or goals within a system or interface effectively. In proposed system, it is high efficiency due to the task duration is short. This is because the dashboard can reduce the average task duration for data analysis compared to other stock inventory management systems. For instance, users can effortlessly generate and access the latest sales report or customize a different data visualisation of the sales report in just a few clicks, significantly reducing both the time required and the overall effort involved.

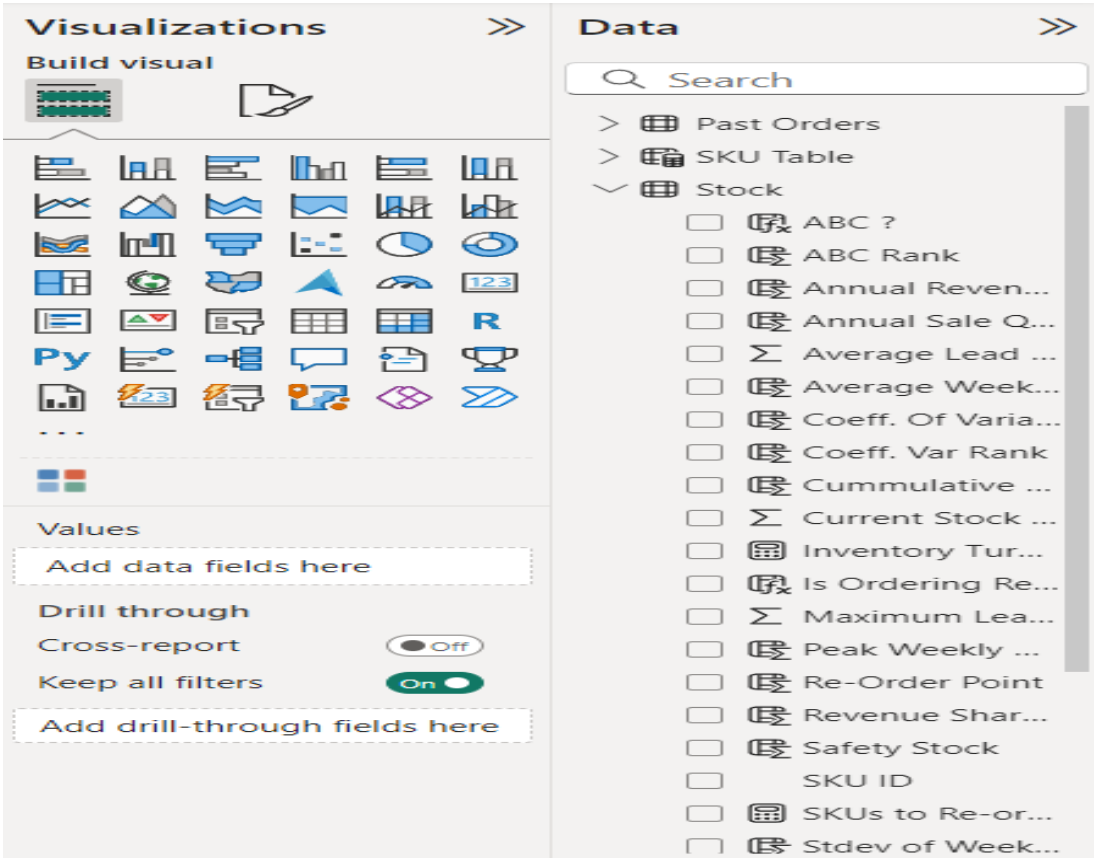


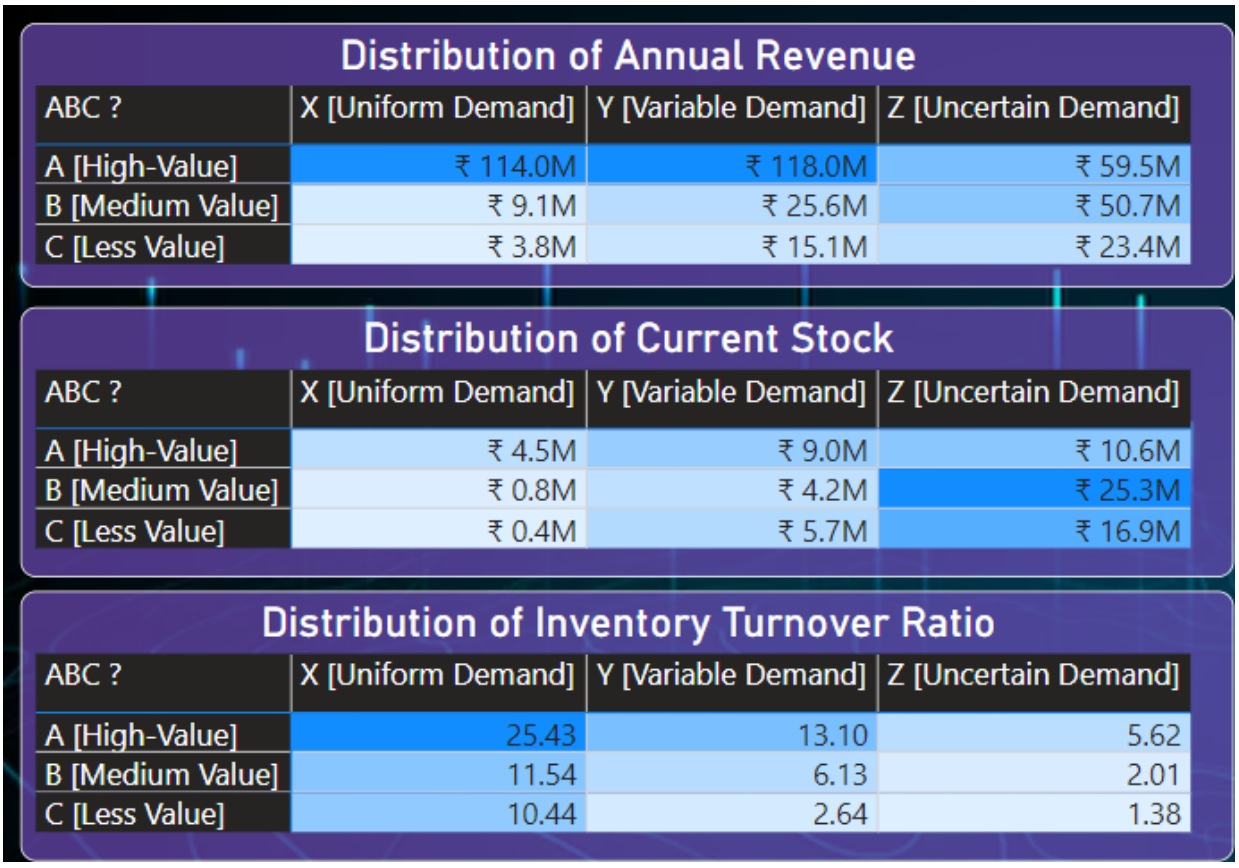
Figure 4.2.5.2 Data Visualisation functions on PowerBI

New user can also easily create their own data visualisation based on the data provided and using the visualisation functions provided by PowerBI and the module created for the dataset. New user can now customize the data visualisation dashboard based on what they need.

Memorability

Memorability measures how easily users can recall how to use a system or interface after their first experience or after a break from using it. It reflects the ease with which users can remember and navigate the system without needing to relearn its functions. A memorable design allows users to recall how to perform tasks and navigate the interface without the need for extensive re-learning or referencing user manuals.

In the proposed system, it is high memorability because of the design elements throughout the dashboard, including layout, colour schemes, and terminology. For example, the table consistently use dark blue for higher values and light blue for lower values, helping users quickly interpret trends briefly. Here is the example of the table in proposed system which users can easily view and handle the data quickly.



Distribution of Annual Revenue

ABC ?	X [Uniform Demand]	Y [Variable Demand]	Z [Uncertain Demand]
A [High-Value]	₹ 114.0M	₹ 118.0M	₹ 59.5M
B [Medium Value]	₹ 9.1M	₹ 25.6M	₹ 50.7M
C [Less Value]	₹ 3.8M	₹ 15.1M	₹ 23.4M

Distribution of Current Stock

ABC ?	X [Uniform Demand]	Y [Variable Demand]	Z [Uncertain Demand]
A [High-Value]	₹ 4.5M	₹ 9.0M	₹ 10.6M
B [Medium Value]	₹ 0.8M	₹ 4.2M	₹ 25.3M
C [Less Value]	₹ 0.4M	₹ 5.7M	₹ 16.9M

Distribution of Inventory Turnover Ratio

ABC ?	X [Uniform Demand]	Y [Variable Demand]	Z [Uncertain Demand]
A [High-Value]	25.43	13.10	5.62
B [Medium Value]	11.54	6.13	2.01
C [Less Value]	10.44	2.64	1.38

Figure 4.2.5.3 Data Visualized in Dashboard

Errors

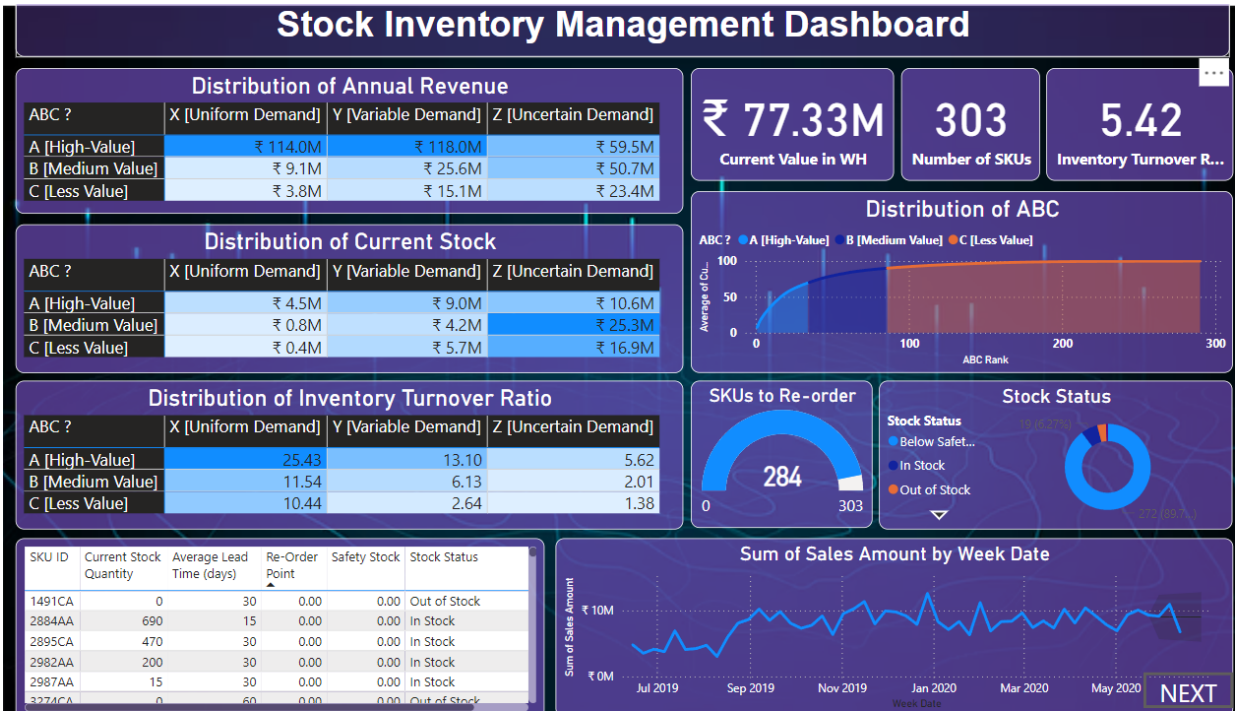
Errors refers to instances where users encounter difficulties, make mistakes, or are unable to complete tasks successfully within the system or interface being tested.

In the proposed system, the users may misinterpret data visualisations or misunderstand the meaning of certain metrics presented in the dashboard. Users may need to make some try and error to understand how the dashboard works for several times.

Satisfaction

Satisfaction in usability testing refers to how satisfied users are with their overall experience while interacting with a system, interface, or product. It encompasses various factors such as ease of use, efficiency, effectiveness in task completion, aesthetics, perceived value, and emotional response.

In proposed system, users can view the dashboard so clearly about the data which helps them easily to get the data they want but not calculating hardly to get the sum of data.



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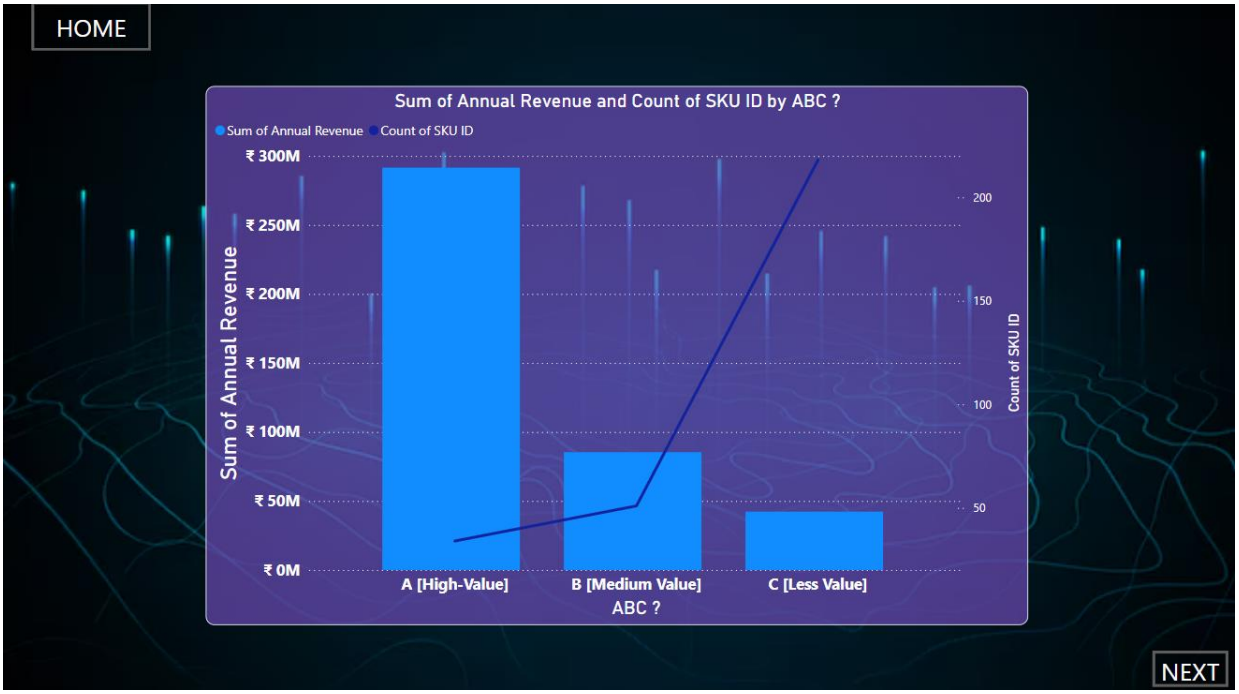


Page 2

Page 3

Figure 4.2.5.4 Value of a stock inventory management needed in Dashboard.

Chapter 5 Findings

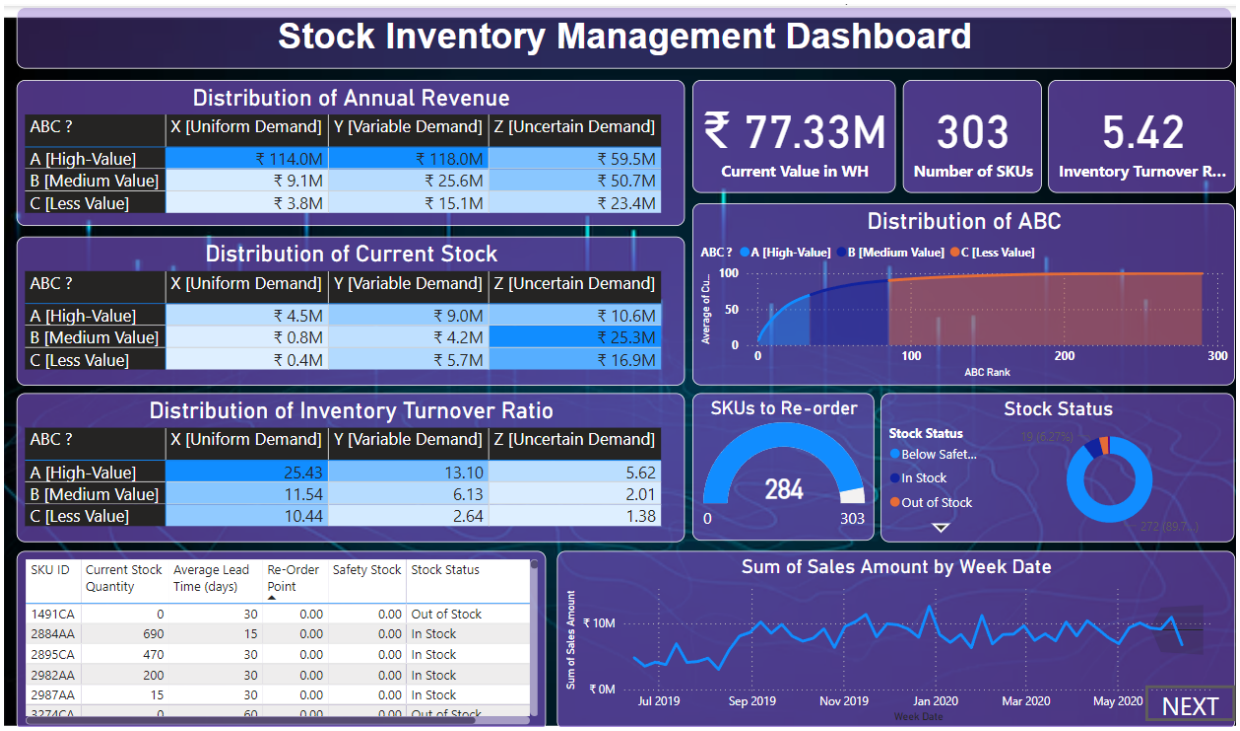


Figure 5.1 Page 1

Figure 5.1 provides a comprehensive overview of all necessary information for enhanced stock visualisation and improved decision-making.

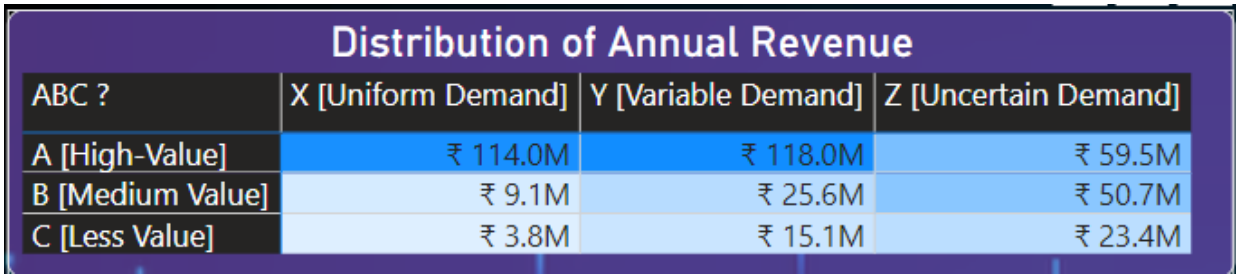


Figure 5.1.1 Distribution of Annual Revenue

Figure 5.1.1 shows the table of distribution of annual revenue of the stocks. The table of distribution of annual revenue for stock inventory, categorised into A (high value), B (medium value), C (low value), and X (uniform demand), Y (variable demand), Z (uncertain demand), serves several key purposes in inventory management. This classification helps businesses optimize their inventory practices, improve financial planning, and enhance overall operational efficiency.

Inventory Management

The primary use of this table is to guide inventory management practices. Products categorised as A (high value) with X (uniform demand) are crucial because they generate significant revenue and have predictable demand. Businesses should prioritize these items by ensuring they are always in stock to avoid missed sales and lost revenue. Conversely, A (high value) products with Y (variable demand) require flexible inventory management strategies. Businesses might need to adjust stock levels based on anticipated fluctuations to prevent overstocking or stockouts. A (high value) products with Z (uncertain demand) present challenges due to their high revenue potential but unpredictable demand. Inventory strategies for these items should include robust forecasting and risk management practices to handle potential demand variability effectively

For B (medium value) items with X (uniform demand), the focus should be on maintaining stable inventory levels to ensure steady sales. These products are less critical than high-value items but still contribute reliably to revenue. B (medium value) items with Y (variable demand) require adaptive inventory approaches, such as monitoring trends and adjusting stock levels to match demand changes. B (medium value) products with Z (uncertain demand) need a balanced approach, combining forecasting with risk management to avoid over-investing in stock that may not sell.

For C (low value) items with X (uniform demand), efficient inventory management is important to optimize resource allocation and minimize holding costs. C (low value) items with Y (variable demand) should be managed with cost-effectiveness in mind, ensuring that resources are not wasted on items with fluctuating demand. Finally, C (low value) products with Z (uncertain demand) require minimal investment and careful monitoring to avoid overstocking and associated costs.

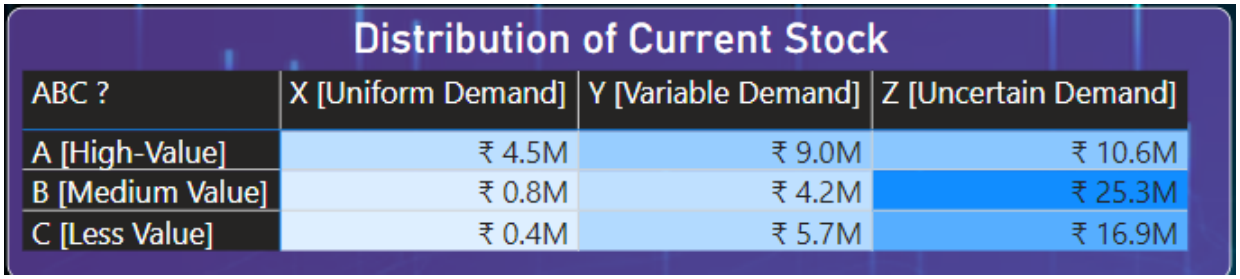
Financial Planning

This table aids in financial planning by providing insights into the revenue contribution and demand stability of different products. A (high value) products with X (uniform demand) offer reliable revenue streams, making them central to financial forecasts and budgeting. They provide a stable foundation for revenue predictions. For A (high value) products with Y (variable demand), financial plans should include provisions for demand fluctuations, incorporating flexibility to manage revenue changes. A (high value) items with Z (uncertain demand) necessitate contingency planning to address potential revenue volatility and uncertainties.

For B (medium value) products with X (uniform demand), financial planning can be more straightforward, focusing on stable revenue contributions. B (medium value) items with Y (variable demand) require more dynamic financial strategies, with adjustments based on demand trends. Financial forecasts for B (medium value) products with Z (uncertain demand) should account for possible variations and risks.

C (low value) items with X (uniform demand) contribute to steady but lower revenue, aiding in budget planning for operational expenses. Financial strategies for C (low value) products with Y (variable demand) should be designed to manage potential revenue fluctuations while maintaining cost efficiency. For C (low value) items with Z (uncertain demand), financial planning should focus on minimizing risks and managing investment carefully to avoid over-committing resources.

In conclusion, by using this table, it helps businesses streamline their operations by prioritizing inventory management efforts based on the revenue impact and demand patterns of different products. By categorizing products into these groups, businesses can focus on critical items that drive revenue while managing lower-value items more efficiently. This approach ensures that resources are allocated effectively, reducing waste, optimizing stock levels, and enhancing overall operational efficiency.



Distribution of Current Stock

ABC ?	X [Uniform Demand]	Y [Variable Demand]	Z [Uncertain Demand]
A [High-Value]	₹ 4.5M	₹ 9.0M	₹ 10.6M
B [Medium Value]	₹ 0.8M	₹ 4.2M	₹ 25.3M
C [Less Value]	₹ 0.4M	₹ 5.7M	₹ 16.9M

Figure 5.1.2 Distribution of Current Stock

Figure 5.1.2 shows the table of distribution of current stock. The table of distribution of current stock that categorizes inventory into A, B, C and further into X (uniform demand), Y (variable demand), Z (uncertain demand) serves several critical purposes in inventory and business management. By using this table, businesses can improve their inventory management, balance stock levels more effectively, and boost overall operational efficiency..

Optimizing Inventory Management

The table aids in classifying inventory according to both its value and demand patterns. For high-value items (A) with consistent demand (X), businesses should focus on maintaining optimal stock levels to ensure these critical products are always available without overstocking. Effective management of these items is essential for steady revenue and requires careful inventory control. For high-value items (A) with variable demand (Y), the table recommends using flexible inventory strategies. This includes employing advanced forecasting methods to predict demand changes and adjust stock levels, accordingly, helping to reduce the risk of stockouts or excess inventory.

High-value items (A) with uncertain demand (Z) are more challenging to manage due to unpredictable sales patterns. The table indicates the need for robust forecasting methods and risk management strategies. Businesses may need to employ contingency planning and maintain safety stock to mitigate potential disruptions in supply or demand.

Enhancing Financial Planning

From a financial perspective, this table aids in planning and budgeting by providing insights into the revenue contribution and demand stability of different inventory categories. High-value items (A) with uniform demand (X) provide reliable revenue streams, making them central to financial forecasts and budget planning. Conversely, high-value items (A) with variable demand (Y)

require flexible financial strategies to accommodate potential revenue fluctuations. High-value items (A) with uncertain demand (Z) necessitate careful financial planning, including risk assessment and scenario planning to manage the impact of demand unpredictability on revenue.

For medium-value items (B) with uniform demand (X), financial planning can focus on maintaining stable inventory levels and ensuring consistent revenue contributions. Medium-value items with variable demand (B and Y) require adjustments in financial forecasts based on demand trends. Medium-value items (B) with uncertain demand (Z) should include risk factors in financial plans to account for potential variations in sales.

Low-value items (C), while less impactful individually, still contribute to overall financial performance. Low-value items (C) with uniform demand (X) support stable but lower revenue, aiding in budget management for operational costs. For low-value items (C) with variable demand (Y), cost-effective inventory strategies and flexible financial planning are necessary to handle demand fluctuations. Low-value items (C) with uncertain demand (Z) require careful monitoring and minimal investment to avoid overstocking and reduce financial risk.

Improving Operational Efficiency

The table facilitates improved operational efficiency by guiding inventory practices based on the characteristics of each stock category. By categorizing inventory into high, medium, and low value, and further by demand patterns, businesses can prioritize their resources and focus on managing high-value items more closely. This structured approach helps in reducing carrying costs, avoiding stockouts, and minimizing excess inventory. Effective management of each category ensures that resources are allocated efficiently, operations are streamlined, and customer demands are met promptly.

In conclusion, the table that categorizes current stock by value and demand patterns is a valuable tool for optimizing inventory management. It aids in enhancing financial planning and boosting operational efficiency. By customizing inventory practices to the specific traits of each stock category, businesses can achieve better inventory control, reduce costs, and enhance overall performance.

Distribution of Inventory Turnover Ratio

ABC ?	X [Uniform Demand]	Y [Variable Demand]	Z [Uncertain Demand]
A [High-Value]	25.43	13.10	5.62
B [Medium Value]	11.54	6.13	2.01
C [Less Value]	10.44	2.64	1.38

Figure 5.1.3 Distribution of Inventory Turnover Ratio

Figure 5.1.3 displays a table categorizing inventory turnover ratios into A (high value), B (medium value), and C (low value), with further classification into X (uniform demand), Y (variable demand), and Z (uncertain demand). This table serves as a valuable tool for optimizing inventory management and enhancing business performance. By examining inventory turnover ratios within these categories, businesses can make informed decisions about inventory control, allocate resources more effectively, and refine their financial strategies. Here's how this table can be utilized effectively.

Optimizing Inventory Management

The Inventory Turnover Ratio assesses how effectively inventory is managed and sold over a given period. By categorizing inventory into high, medium, and low value, along with demand patterns, businesses can customize their inventory management strategies. For high-value items (A) with uniform demand (X), a high turnover ratio indicates these items are selling quickly and efficiently, justifying their continued high stock levels. Conversely, a low turnover ratio may indicate issues such as overstocking or weak sales, signaling the need to review and adjust inventory levels and sales strategies.

High-value items (A) with variable demand (Y) may experience fluctuating turnover ratios. Monitoring these ratios helps in adjusting stock levels to align with changing demand. If turnover rates decline, businesses might need to improve demand forecasting and adjust inventory levels accordingly to prevent both stockouts and overstocking.

For high-value items (A) with uncertain demand (Z), the turnover ratio can be more volatile. Analysing this data helps in assessing the effectiveness of current inventory management practices and deciding whether to implement additional measures such as safety stock or advanced forecasting techniques to manage demand uncertainty better.

Medium-value items (B) with uniform demand (X) should have a steady turnover ratio. A low turnover ratio may indicate inefficiencies or the need to enhance sales efforts. For medium-value items (B) with variable demand (Y), businesses should use turnover ratios to adjust inventory levels based on demand fluctuations. If turnover rates fall, it could signal the need for improved inventory management or marketing strategies.

Low-value items (C) with uniform demand (X) typically have a lower turnover ratio, which is expected. However, if turnover ratios are too low, it might indicate overstocking or slow-moving inventory that ties up resources. For low-value items (C) with variable demand (Y), managing turnover ratios helps in balancing stock levels to align with demand changes and prevent inefficiencies.

Enhancing Financial Planning

The table helps in assessing the financial implications of inventory turnover across different categories. High-value items (A) with uniform demand (X), having a high turnover ratio, often contribute significantly to revenue and justify higher investment in stock. Conversely, a low turnover ratio for these items might suggest a need to reevaluate purchasing decisions or sales strategies.

High-value items (A) with variable demand (Y) require careful financial planning to manage fluctuations in turnover ratios. Businesses should use these insights to adjust budgets and financial forecasts accordingly. For items with uncertain demand (Z), a fluctuating turnover ratio may lead to more conservative financial planning, incorporating risk management practices to account for potential variability in sales.

For medium-value items (B), Analysing turnover ratios aids in budgeting and financial planning by highlighting which products are performing well and which may require strategic adjustments. Low turnover ratios for medium-value items may prompt a review of sales strategies or inventory policies.

Low-value items (C), with typically lower turnover ratios, impact financial planning by tying up capital in slow-moving inventory. Monitoring these ratios helps in managing resources

effectively and making decisions about reducing stock levels or discontinuing underperforming products.

Improving Operational Efficiency

Understanding inventory turnover ratios across different categories enhances operational efficiency by identifying which products are moving quickly and which are not. High-value items (A) with uniform demand (X) should be managed to ensure that inventory levels are optimized for quick turnover, reducing carrying costs and improving cash flow. Medium-value (B) and low-value (C) items with varying demand patterns need tailored strategies to improve turnover rates and minimize excess inventory.

In conclusion, the table of distribution of Inventory Turnover Ratio, categorised by value and demand patterns, provides valuable insights for optimizing inventory management, enhancing financial planning, and improving operational efficiency. By analysing turnover ratios in this context, businesses can make informed decisions to better align inventory levels with demand, reduce costs, and improve overall performance.

Figure 5.1.4 Current Value in WH (warehouse)/Number of SKUs (stock keeping units)/Inventory Turnover Ratio

Figure 5.1.4 shows the table of current value in warehouse, number of stocks keeping units and inventory turnover ratio of the stocks. This table serves multiple crucial purposes in inventory control and overall business management. These metrics collectively provide a comprehensive view of inventory performance, aiding in strategic decision-making and operational efficiency.

The current value of inventory in the warehouse represents the total monetary worth of the stock on hand. This figure helps businesses assess the financial investment tied up in their inventory, aiding in effective cash flow management and efficient capital allocation. It also plays a crucial role in budgeting and financial planning, enabling informed decisions about purchasing and resource distribution.

The number of SKUs refers to the total count of distinct inventory items, reflecting the complexity of inventory management. A high SKU count can complicate inventory control, so monitoring SKU distribution helps businesses identify overstocked or understocked items, adjust stock levels accordingly, and potentially simplify operations by consolidating SKUs.

The inventory turnover ratio measures how frequently inventory is sold and replenished over a specific period. This key performance indicator reveals the efficiency of inventory management. A high turnover ratio indicates effective management and strong sales, while a low ratio may signal overstocking or slow-moving inventory. Analysing this ratio helps businesses align stock levels with demand, reduce carrying costs, and improve profitability.

Combining these metrics on a dashboard provides a holistic view of inventory performance. It enables businesses to make more informed decisions by integrating data on inventory value, SKU distribution, and turnover rates. This comprehensive approach aids in improving inventory forecasting and planning, as businesses can analyze trends and make adjustments to inventory

management strategies accordingly. Additionally, it enhances visibility and control over inventory, allowing managers to track real-time data, monitor performance trends, and generate detailed reports for strategic planning and performance reviews.

In conclusion, including the current value in the warehouse, the number of SKUs, and the inventory turnover ratio on an inventory management dashboard offers valuable insights that support effective decision-making. This integrated view helps businesses optimize inventory control, improve operational efficiency, and enhance financial management, contributing to overall success and sustainability.

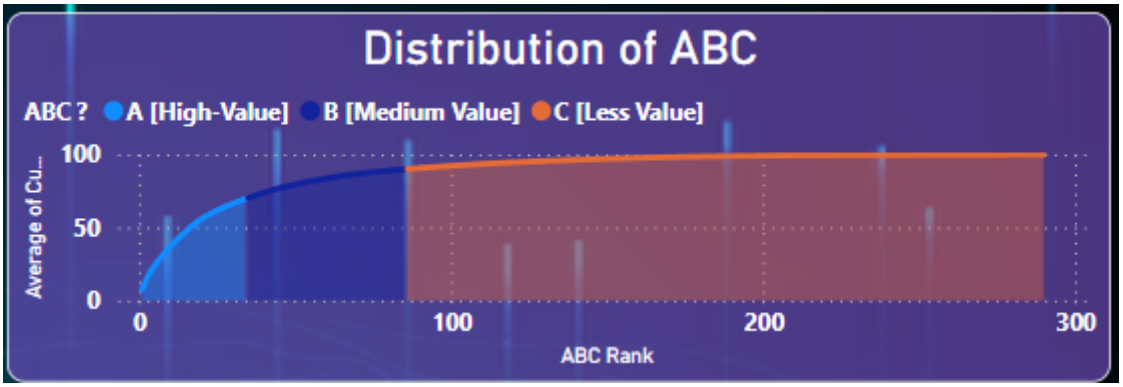


Figure 5.1.5 Distribution of ABC

Figure 5.1.5 displays the graph chart of distribution of ABC in the dashboard. Using a graph chart on a dashboard, where the x-axis represents the ABC rank (A, B, C) and the y-axis shows the average cumulative share, provides a clear and insightful view of inventory distribution and value. This type of chart is instrumental in understanding how inventory value is allocated across different categories. By visualizing this distribution, businesses can quickly see that a small proportion of high-value items (A) often represents a large portion of the total inventory value.

The graph chart allows managers to identify which inventory categories—A, B, or C—hold the most significant cumulative share of inventory value. A steep curve in the chart typically indicates that high-value items (A) contribute a substantial share of the cumulative value, while medium-value (B) and low-value (C) items contribute progressively less. This insight is crucial for prioritizing inventory management efforts, ensuring that resources and attention are allocated to managing the most valuable items effectively to prevent stockouts and optimize profitability.

In addition to prioritizing inventory management, the graph chart supports strategic decision-making. By illustrating the cumulative share of each ABC category, the chart provides actionable data that can guide decisions on inventory investment and management strategies. For instance, if the chart reveals that a significant percentage of inventory value is concentrated in category A, it underscores the need for more focused management of these high-value items. Conversely, if lower-value items (B and C) hold a larger cumulative share, businesses can adjust their inventory policies to manage these items more cost-effectively.

The visualisation also enhances forecasting and planning by showing how inventory value accumulates across different categories. Understanding the cumulative share helps businesses anticipate the effects of stock adjustments, pricing strategies, or new product introductions on overall inventory value. This foresight aids in aligning inventory management practices with future business needs and market conditions.

Furthermore, tracking the average cumulative share over time allows businesses to monitor changes in inventory distribution and assess the effectiveness of their inventory management strategies. Shifts in the graph can signal changes in sales performance or highlight areas needing adjustment, ensuring that inventory management remains aligned with business objectives.

Finally, a graph chart with ABC rank and cumulative share provides a clear and effective way to communicate inventory data to stakeholders. It offers a visual representation that simplifies discussions about inventory management performance, resource allocation, and strategic planning, making it easier to convey complex data and support decision-making processes.

In conclusion, using a graph chart to display the distribution of ABC categories with the x-axis representing ABC rank and the y-axis showing the average cumulative share offers valuable insights into inventory value distribution. It helps prioritize inventory management, supports strategic decision-making, enhances forecasting and planning, and facilitates effective communication with stakeholders, ultimately contributing to more efficient and strategic inventory management.

Figure 5.1.6 SKUs (Stocks Keeping Units) to Re-Order

Figure 5.1.6 shows a chart for SKUs to re-order in the dashboard. Utilizing SKUs (Stock Keeping Units) for managing reordering on a dashboard significantly enhances inventory control and operational efficiency. By displaying SKUs along with their associated reorder points, current stock levels, and historical data, the dashboard streamlines the replenishment process. This clarity allows inventory managers to quickly identify which items need reordering, reducing the risk of stockouts and preventing overstocking. Consequently, inventory levels can be maintained more accurately and efficiently, minimizing manual oversight and ensuring that the right products are always available.

The accuracy of purchase orders is improved through effective SKU management. Each SKU represents a unique item, and by tracking these individually, businesses can ensure they order the precise quantities needed. This approach mitigates errors that can arise from handling generic inventory data, ensuring that inventory replenishment is both accurate and timely. By reducing the chances of ordering incorrect quantities, businesses can maintain optimal stock levels and avoid unnecessary costs.

A dashboard that features SKU data also enhances inventory visibility. Managers gain a comprehensive view of current stock levels, reorder points, and historical sales data for each SKU. This visibility enables informed decision-making about when and how much to reorder, using the latest data. It ensures inventory management decisions are based on real-time information and trends, leading to more efficient control and optimisation of stock levels.

Data-driven decision-making is further supported by incorporating SKU data into the dashboard. By Analysing metrics such as sales velocity, lead times, and historical trends for each SKU, businesses can determine optimal reorder quantities and timing. This approach aligns inventory

levels with actual demand, reducing carrying costs and improving inventory efficiency. It allows for adjustments based on precise data, rather than relying on static or historical averages.

The dashboard can also automate reorder alerts based on SKU data. When stock levels for specific SKUs fall below predefined thresholds, the system can trigger notifications to prompt timely reordering. This automation minimizes manual monitoring and ensures that replenishment actions are taken promptly, helping to avoid stockouts and maintain continuous product availability.

Optimizing inventory turnover is a key advantage of effective SKU management. By analyzing turnover ratios and adjusting reorder points for different SKUs, businesses can improve inventory efficiency. This ensures that inventory moves swiftly, reducing the risk of capital being tied up in slow-moving or excess stock, and enhancing overall inventory management and financial performance.

Additionally, managing SKUs for reordering aids in better forecasting and planning. Reviewing historical sales data and trends for each SKU allows businesses to anticipate future demand and adjust reorder strategies accordingly. This proactive approach helps prepare for seasonal fluctuations and market changes, leading to more accurate and effective inventory planning.
Strengthening supplier relationships is another advantage of efficient SKU management. Accurate forecasting and timely reorder placements help maintain good rapport with suppliers and ensure a smooth supply chain. Reliable and well-timed orders can result in better supplier terms and more dependable delivery schedules.

Lastly, incorporating SKUs into reorder management on a dashboard streamlines workflow. By consolidating all necessary information in one place, managers can efficiently handle reordering tasks without switching between multiple systems or spreadsheets. This consolidation improves productivity, reduces administrative overhead, and simplifies the inventory management process.

In conclusion, leveraging SKUs for reordering on a dashboard enhances inventory control by streamlining replenishment processes, improving order accuracy, and increasing visibility. It supports data-driven decision-making, automates alerts, optimizes turnover, and strengthens

supplier relationships. Additionally, it facilitates better forecasting and planning while simplifying workflow, leading to more efficient and effective inventory management.

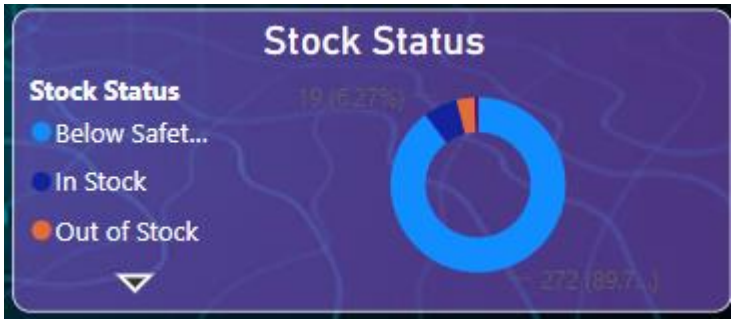


Figure 5.1.7 Stock Status

Figure 5.1.7 displays a chart of stock status. Using a color-coded chart to represent stock status on a dashboard is an effective strategy for improving inventory management. In this chart, light blue signifies items that are below safety stock levels, dark blue indicates items that are in stock, and orange marks items that are out of stock. This visual approach provides immediate clarity, allowing inventory managers to quickly assess the state of their inventory at a glance. The distinct colors help to streamline decision-making by clearly differentiating between items that need urgent attention and those that are currently well-stocked.

The chart is particularly useful for identifying critical inventory issues. Items marked in orange are out of stock and require immediate action to prevent disruptions in sales or operations. Light blue items, which are below safety stock levels, signal a potential risk of running out soon and need to be monitored closely. Dark blue items are currently in stock but should still be reviewed periodically to ensure they remain at optimal levels. This color-coding helps prioritize tasks and address inventory issues based on their urgency.

By providing a clear visual representation of stock statuses, the chart facilitates proactive inventory management. Managers can swiftly identify which items need to be reordered or adjusted to prevent stockouts. This proactive approach minimizes the risk of running out of stock and helps maintain smooth inventory operations. The chart also aids in inventory planning and forecasting by offering a snapshot of current stock levels, which can be used to predict future needs and adjust inventory policies accordingly.

Additionally, the color-coded chart streamlines communication and reporting by presenting inventory information in a clear and intuitive manner. This visual representation makes it easier for stakeholders to grasp the current stock situation without deciphering complex data. Its

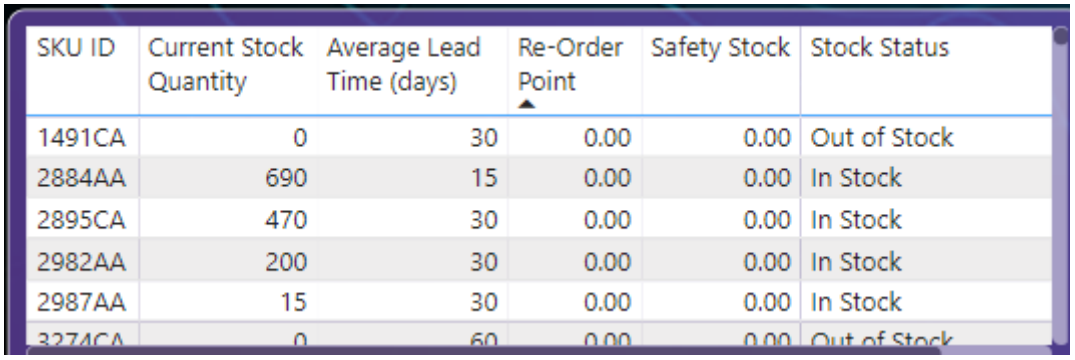
simplicity is especially beneficial in meetings and presentations, where quick understanding is crucial.

The chart also aids in inventory optimization by clearly identifying items that require immediate attention and those that are sufficiently stocked. This visibility helps balance inventory levels, minimize excess stock, and ensure critical items are available when needed. Maintaining optimal stock levels improves operational efficiency and reduces carrying costs.

Incorporating this chart into the dashboard enhances decision-making by providing a clear, visual summary of inventory conditions. Managers can quickly assess whether to reorder, adjust safety stock levels, or address supply chain issues based on the chart's immediate feedback. This streamlined approach helps in making timely and effective decisions aligned with inventory management goals.

Finally, the chart allows for ongoing performance monitoring. Regularly reviewing the status of inventory items helps track changes in stock levels, identify recurring issues, and adapt inventory strategies as needed. This continuous monitoring ensures that inventory control remains effective and responsive to changing business conditions.

In summary, a color-coded stock status chart on a dashboard enhances inventory management by providing clear visual insights into stock levels. It helps identify critical issues, facilitates proactive management, supports planning and forecasting, streamlines communication, and optimizes inventory control. This approach ultimately contributes to more effective and efficient inventory management.



SKU ID	Current Stock Quantity	Average Lead Time (days)	Re-Order Point	Safety Stock	Stock Status
1491CA	0	30	0.00	0.00	Out of Stock
2884AA	690	15	0.00	0.00	In Stock
2895CA	470	30	0.00	0.00	In Stock
2982AA	200	30	0.00	0.00	In Stock
2987AA	15	30	0.00	0.00	In Stock
3274CA	0	60	0.00	0.00	Out of Stock

Figure 5.1.8 Table of Stock

Figure 5.1.8 displays a table for stock, including SKU ID, Current Stock Quantity, Average Lead Time (days), Reorder Point, Safety Stock, and Stock Status. Incorporating a table on a dashboard with columns for SKU ID, Current Stock Quantity, Average Lead Time (days), Reorder Point, Safety Stock, and Stock Status offers a detailed and organized approach to managing inventory. This table provides a comprehensive overview of essential inventory metrics in one easily accessible format, enabling managers to effectively monitor and manage stock levels. By consolidating key data, the table helps ensure that inventory decisions are based on complete and accurate information.

The table's Reorder Point and Safety Stock columns are particularly crucial for facilitating timely reordering. The Reorder Point is the inventory level at which a new order should be placed to prevent stockouts, while the Safety Stock acts as a buffer to manage fluctuations in demand and supply delays. By comparing the Current Stock Quantity with these benchmarks, inventory managers can decide when to reorder items, ensuring they maintain optimal inventory levels and avoid running out of stock.

The Stock Status column, which classifies items as In Stock, Out of Stock, or Below Safety Stock, provides immediate visibility into the inventory's current state. This classification helps prioritize actions by clearly identifying which items need urgent replenishment and which ones are at risk of running low. Items marked as Out of Stock require immediate attention, while those Below Safety Stock need closer monitoring to avoid potential stockouts.

Including Average Lead Time in the table enhances inventory planning by indicating the typical time required to receive orders once placed. Understanding the lead time for each SKU allows

managers to better align their reorder schedules with supply chain dynamics, ensuring that new stock arrives in time to meet demand. This foresight is essential for maintaining consistent stock levels and avoiding disruptions in supply.

The table facilitates data-driven decision-making by consolidating key inventory metrics. Managers can assess the interplay between Current Stock Quantity, Reorder Point, Safety Stock, and Average Lead Time to make informed decisions about reorder timing and quantities. This holistic approach helps optimize inventory levels, balance order sizes, and adjust safety stock based on historical trends and data.

By streamlining inventory management, the table reduces the need to reference multiple reports or systems. This consolidation of information into a single view simplifies workflow, enhances efficiency, and makes it easier to manage inventory. Managers can quickly access and update stock levels, leading to more effective and responsive inventory control.

Additionally, the table is valuable for communication and reporting purposes. It provides a clear and structured way to present inventory data to stakeholders, such as senior management or finance teams. The detailed breakdown of stock quantities, lead times, and reorder points ensures that everyone involved has a comprehensive understanding of inventory status, facilitating informed discussions and decisions.

Regular review of the table allows for monitoring performance and identifying trends over time. By tracking changes in stock levels, lead times, and stock statuses, businesses can detect patterns such as recurring stockouts or delays in lead time. This ongoing monitoring supports continuous improvement and enables adjustments to inventory management practices to better meet evolving business needs.

In summary, a dashboard table that includes SKU ID, Current Stock Quantity, Average Lead Time, Reorder Point, Safety Stock, and Stock Status provides a comprehensive and detailed view of inventory management. It enhances decision-making, facilitates timely reordering, improves planning, and streamlines inventory control. Furthermore, it supports effective communication, reporting, and performance monitoring, contributing to more efficient and effective inventory management.

Figure 5.1.9 Line Graph for Sum of Sales Amount by Week Date

Figure 5.1.9 shows a line graph for sum of sales amount by week date. Using a line graph to display the sum of sales amounts by week date on a dashboard is an effective method for tracking sales trends and forecasting future performance. This visualisation provides a clear, continuous view of how sales figures change over time, allowing for better insights into sales patterns and trends.

Tracking Sales Trends

The primary usage of a line graph for sum of sales amount by week date is to track and visualize sales trends over time. Each point on the graph represents the total sales amount for a specific week, connected by a line to show the progression of sales figures. This continuous line helps identify trends, such as periods of high or low sales, seasonal fluctuations, and growth patterns. By examining the graph, managers can quickly understand how sales performance evolves week by week and spot any anomalies or significant changes in sales volume.

Analysing Sales Performance

The line graph allows for detailed analysis of sales performance by providing a visual representation of total sales amounts over weeks. This helps in assessing the effectiveness of sales strategies, promotional campaigns, and seasonal influences. For example, a spike in sales might correlate with a marketing campaign or a seasonal event, while a decline might indicate issues that need addressing. This analysis helps in making informed decisions to enhance sales performance and address potential challenges.

Facilitating Forecasting and Planning

One of the key benefits of incorporating a predictive element into the line graph is its ability to facilitate forecasting and planning. By extending the graph with a prediction line based on historical sales data, businesses can estimate future sales trends. This predictive line is created using statistical models or algorithms that analyze past sales patterns to forecast future

performance. This foresight aids in inventory planning, budgeting, and setting realistic sales targets, allowing businesses to prepare for expected changes in sales volume and adjust strategies accordingly.

Identifying Seasonal Patterns

The line graph helps identify seasonal patterns in sales data. By visualizing sales amounts across different weeks, it becomes easier to recognize recurring trends associated with specific times of the year. For example, sales might peak during holiday seasons or certain months due to seasonal demand. Understanding these patterns allows businesses to better prepare for peak periods, optimize inventory levels, and plan marketing efforts to capitalize on high-demand periods.

Improving Decision-Making

With a line graph showing both historical sales data and predictive forecasts, managers can make more informed decisions. The historical data provides insights into past performance, while the predictive forecasts help anticipate future trends. This combination of information supports strategic planning, resource allocation, and decision-making by providing a comprehensive view of sales trends and potential future scenarios.

Enhancing Communication and Reporting

The line graph, especially with predictive elements, enhances communication and reporting by offering a clear and compelling visual representation of sales data. It simplifies the process of presenting sales performance to stakeholders, such as senior management or investors. The ability to show both past sales trends and future predictions in a single graph makes it easier to convey complex information and support discussions about sales strategy and performance.

Monitoring Performance Over Time

Regularly reviewing the line graph enables ongoing monitoring of sales performance. By keeping track of weekly sales data and comparing it with predictive forecasts, businesses can assess whether actual sales are aligning with predictions. Discrepancies between actual and forecasted sales can indicate areas where adjustments may be needed, whether in strategy, inventory, or sales tactics.

In summary, a line graph displaying the sum of sales amounts by week date on a dashboard offers valuable insights into sales trends, performance, and forecasting. By visualizing historical sales data and incorporating predictive elements, businesses can track trends, analyze performance, identify seasonal patterns, and make informed decisions. This approach enhances forecasting, improves communication, and supports effective sales planning and strategy.

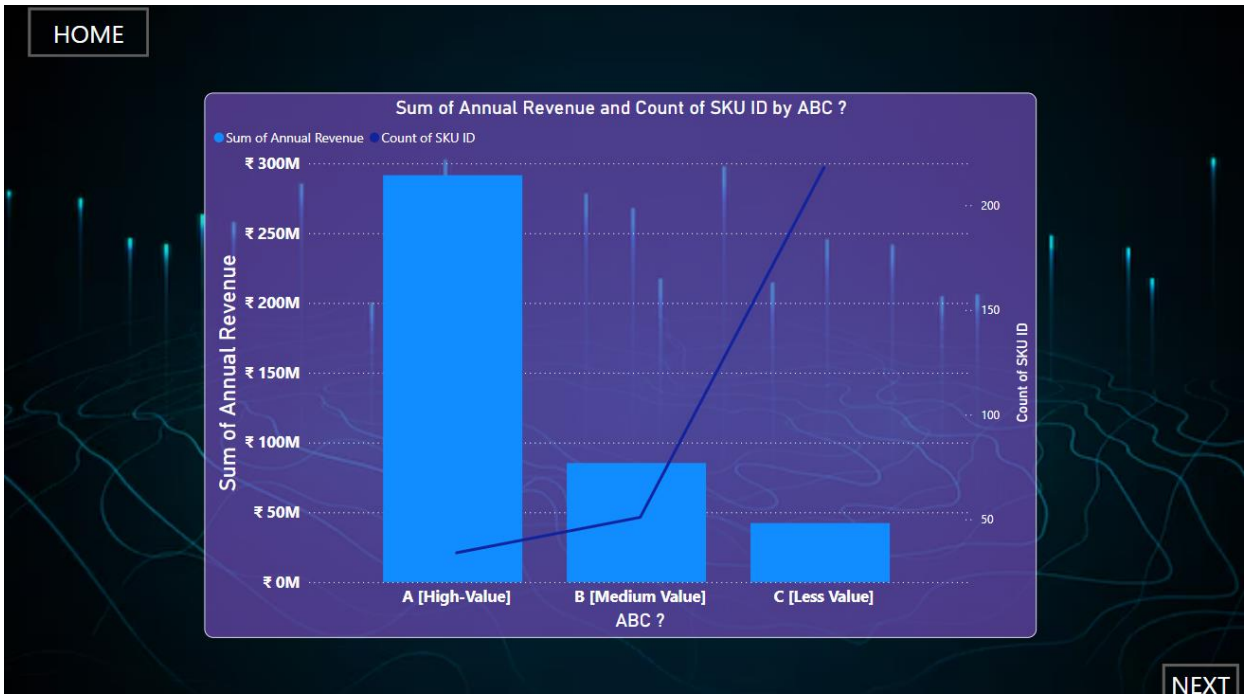


Figure 5.2 Page 2

Figure 5.2 presents a bar-line chart illustrating the sum of annual revenue and the count of SKU IDs by ABC categories. In this chart, the left Y-axis displays the sum of annual revenue using bars, while the right Y-axis shows the count of SKU IDs with a line graph. This dual-axis approach provides a comprehensive view of both financial performance and inventory complexity, aiding in inventory and financial management. The x-axis categorizes data into ABC segments, typically denoting high, medium, and low-value items. This dual-axis approach provides a comprehensive view of how revenue and SKU count are distributed across different categories.

The primary use of this chart is to visualize the relationship between annual revenue and the number of SKUs in each ABC category. By presenting the sum of annual revenue as bars, the chart highlights which categories contribute the most to overall revenue. Typically, Category A (high-value items) will display higher revenue bars, indicating its significant financial impact.

This helps managers understand revenue concentration and prioritize efforts towards high-revenue categories, ensuring that resources are allocated effectively to maximize profitability.

Conversely, the line graph representing the count of SKU IDs provides insight into the volume of inventory items associated with each revenue category. This allows for an analysis of how the number of SKUs correlates with revenue generation. For instance, there may be many SKUs in Category C (low-value items) but fewer in Category A (high-value items). Understanding this distribution helps in assessing inventory diversity and managing stock levels more efficiently, ensuring that high-value items are adequately stocked while potentially optimizing the inventory of lower-value items.

Combining revenue and SKU count data in a single chart enables a balanced approach to inventory and financial management. Analysing both metrics together allows managers to make informed decisions regarding inventory allocation and pricing strategies, optimizing both financial performance and stock management. For example, if Category A has high revenue and a moderate number of SKUs, it might be beneficial to focus on expanding this category. Conversely, if Category C has many SKUs but generates minimal revenue, it may indicate a need to review and possibly reduce the variety of low-value items to avoid excessive inventory costs.

The chart also supports strategic forecasting and planning by providing a historical perspective on revenue and SKU distribution. Observing trends over time helps in predicting future revenue potential and inventory needs. For instance, an increasing trend in revenue and SKU count for Category B might suggest an opportunity to invest more in this category to capitalize on its growth potential.

Additionally, this chart improves communication and reporting by providing a clear and organized view of complex data. Combining revenue and SKU counts visually helps stakeholders easily understand the relationship between financial performance and inventory levels. This clarity is especially useful in presentations and reports, where efficiently conveying detailed insights is essential.

Regularly reviewing the bar-line chart facilitates continuous monitoring of performance and trends. By observing how changes in SKU counts impact revenue and vice versa, businesses can

make timely adjustments to their inventory management strategies. This ongoing analysis helps align inventory practices with emerging trends and market demands, leading to more effective management of both inventory and financial performance.

In summary, the bar-line chart that displays the sum of annual revenue and count of SKU IDs by ABC category offers a detailed and insightful view of inventory performance. By visualizing both revenue and SKU distribution, it supports strategic decision-making, enhances forecasting, and improves reporting. This approach helps in balancing revenue generation with inventory management, ultimately contributing to more effective and efficient management of both financial and inventory resources.

Figure 5.3 Page 3

Figure 5.3 shows the bar chart of the sum of order quantity by year and month. Slicer and filter are created in this page. Using a bar chart to display the sum of order quantity by year and month on a dashboard is an effective way to visualize order trends and make data-driven decisions. This type of chart allows users to see the total order quantities over different time periods, providing insights into ordering patterns and seasonal variations. The integration of a chiclet slicer further enhances the chart's functionality by allowing users to filter and compare data based on their specific needs.

Visualizing Order Trends

The bar chart serves as a powerful tool for visualizing the sum of order quantities over time. Each bar represents the total number of orders for a specific year or month, with the height of the bar indicating the volume of orders. This visual representation makes it easy to identify trends, such as peak ordering periods, seasonal fluctuations, and overall changes in order volume. By observing the bar chart, users can quickly grasp how order quantities evolve over time and pinpoint any notable patterns.

Enhancing Data Exploration with Chiclet Slicer

The chiclet slicer is a versatile tool integrated with the bar chart to improve data exploration and analysis. Users can interact with the chiclet slicer to filter the chart data based on their preferences. For instance, users can select a specific year to view the total order quantities for that year alone, providing a focused look at annual ordering patterns. Alternatively, users can choose a specific month to examine order quantities for that month across different years, which helps in Analysing month-to-month variations and trends.

Comparing Data by Year and Month

The chiclet slicer also allows users to compare data by year and by month effectively. For example, by selecting multiple years, users can view and compare how order quantities have changed year-over-year within the same month. This comparison is useful for understanding long-term trends and assessing the impact of various factors on ordering patterns over time. Additionally, users can compare order quantities across different months within the same year to identify seasonal trends and make informed inventory or sales decisions.

Supporting Strategic Decision-Making

The chiclet slicer enables users to filter and compare data, enhancing strategic decision-making. By isolating specific time periods, users can assess the effectiveness of marketing campaigns, evaluate the impact of seasonal promotions, and adjust inventory levels as needed. This capability supports more informed and responsive inventory and marketing strategies. For instance, if the chart reveals a significant increase in order quantities during certain months, businesses can plan inventory and staffing needs to accommodate these peak periods.

Improving Operational Efficiency

By 7uj order quantities over time and utilizing the chiclet slicer for detailed filtering, businesses can enhance operational efficiency. The chart helps identify trends that can inform inventory management practices, such as adjusting reorder points or optimizing stock levels based on seasonal demand. The ability to filter by specific years or months ensures that inventory and supply chain decisions are aligned with actual order trends, reducing the risk of overstocking or stockouts.

Facilitating Communication and Reporting

The bar chart, paired with the chiclet slicer, improves communication and reporting by displaying order data in a clear, interactive format. This visualisation helps stakeholders easily grasp ordering trends and performance metrics. Whether for internal meetings or external reports, it offers a straightforward method for presenting complex data, aiding stakeholders in making informed decisions based on both historical and current order trends.

Monitoring Performance Over Time

Regular review of the bar chart allows for continuous monitoring of order performance. By using the chiclet slicer to filter data, businesses can track changes in order quantities over time and assess the effectiveness of their strategies. Monitoring these trends helps in identifying areas for improvement and ensuring that ordering practices are optimized to meet business goals.

In summary, a bar chart showing the sum of order quantities by year and month, enhanced with a chiclet slicer, offers a dynamic and insightful view of ordering trends. The chart enables users to visualize total order quantities over different time periods, while the slicer allows for detailed filtering and comparison. This approach supports strategic decision-making, improves operational efficiency, and facilitates effective communication and reporting, ultimately contributing to better inventory and order management.

Figure 5.4 Nagivation Buttons and Slicer Button

Figure 5.4 displays navigation buttons and a slicer button that enable seamless movement between different pages and functions. These navigation buttons play a vital role in enhancing user experience and efficiency on a dashboard. They simplify access to various sections, reports, and analytical tools, making it easy for users to switch between different data views. By providing a straightforward navigation method, these buttons minimize the time spent navigating through complex menus or multiple screens, thus improving workflow efficiency and allowing users to focus more on data analysis.

Slicer buttons are essential for filtering and interacting with data on a dashboard. They enable users to dynamically select and adjust criteria such as date ranges, categories, or other variables, refining the data displayed. This interactive filtering enhances data analysis by allowing users to focus on specific subsets relevant to their needs. For example, a slicer button could filter sales data by region or product type, offering a detailed view of performance metrics and trends. This flexibility supports more granular insights and comparative analysis, aiding users in making well-informed decisions based on targeted data segments.

Together, navigation and slicer buttons greatly enhance the usability and functionality of a dashboard. Navigation buttons streamline the user interface by providing quick and intuitive access to various features, improving workflow efficiency and user satisfaction. Slicer buttons allow users to interactively explore and filter data, facilitating deeper insights and detailed analysis. By integrating these tools, dashboards become more user-friendly and effective, enabling easier data management and analysis. This combination ultimately supports better decision-making and strategic planning within organizations.

Chapter 6 Conclusion & Future Works

6.1 Conclusion

Objective 1: To enhance data visualisation and interpretation capabilities by addressing the limitations of insufficient functionalities and visualisations in stock inventory management.

The objective of enhancing data visualisation and interpretation capabilities in stock inventory management has been successfully achieved. This has been accomplished through the development of a highly functional and user-friendly dashboard in Power BI, which significantly improves the way stock inventory data is presented and utilized.

The dashboard integrates a range of visual elements, including line charts, bar charts, and tables, to offer a multifaceted view of inventory data. Each type of visualisation serves a specific purpose, such as tracking trends over time with line charts, comparing different categories with bar charts, and providing detailed numerical data with tables. This variety ensures users can access and interpret data from various angles, leading to a more comprehensive understanding of stock performance and trends.

To further enhance user experience, interactive features such as chiclet slicers have been incorporated into the dashboard. These slicers allow users to filter data dynamically based on various criteria, such as specific time periods. This functionality enables users to focus on the most relevant information, making it easier to perform detailed analysis and extract actionable insights. The ability to interactively filter and drill down into specific subsets of data addresses previous limitations related to static or less flexible reporting methods.

The dashboard is designed to facilitate effective decision-making by presenting data in an intuitive and organized way. This layout allows users to swiftly identify trends, evaluate inventory levels, and make informed choices based on real-time information. The integration of real-time data updates ensures that decisions are made with the most current information, enhancing the accuracy and relevance of the insights provided by the dashboard.

Overall, the improvements to the stock inventory management dashboard have resolved previous limitations related to functionality and visualisation. The addition of diverse visualizations, interactive features, and real-time data updates has created a more effective and user-friendly tool

for inventory management. These enhancements enhance data clarity and interpretability, leading to better decision-making and greater operational efficiency in managing stock inventory.

Objective 2: To improve the discernibility of data patterns through effective data visualisations and enhance the clarity and accuracy of predictions.

For the second objective, which is to improve the discernibility of data patterns through effective data visualisations and enhancing the clarity and accuracy of predictions has also been successfully achieved. This has been accomplished through the implementation of well-chosen visualisations and robust predictive analytics within the Power BI dashboard.

To enhance the discernibility of data patterns, the dashboard has been designed with a variety of intuitive and effective visualisations. For instance, detailed line charts have been used to track and illustrate trends over time, allowing users to easily spot changes and patterns in stock levels, sales, and other key metrics. Bar charts and column charts provide clear comparisons across different categories or periods, making it straightforward to analyze variations and identify significant patterns.

In addition to these core visualisations, the dashboard has been enhanced with features like data labels and trendlines to further clarify the data presented. Data labels on charts provide exact numerical values at a glance, which helps in understanding the magnitude of changes and trends. Trendlines are included to highlight overall directions and patterns within the data, making it easier to see long-term trends and seasonal effects.

Predictive analytics have been integrated into the dashboard to enhance the accuracy and clarity of forecasts. By utilizing Power BI's forecasting capabilities, future trends are projected based on historical data. The dashboard displays these forecasts alongside actual data, providing a clear comparison that helps users evaluate the accuracy of predictions. This feature includes visual indicators, such as shaded areas representing forecast confidence intervals, which offer insights into the reliability of the predictions and the range of possible future values.

Interactive elements, such as slicers and filters, have also been employed to allow users to explore different scenarios and observe how changes in data inputs impact predictions. This scenario

analysis capability enables users to test various assumptions and view potential outcomes in real-time, facilitating a deeper understanding of how different factors influence future trends.

Overall, the enhancements to the dashboard have significantly improved the visibility of data patterns and the clarity and accuracy of predictions. With well-designed visualisations and advanced forecasting tools, users can more easily identify trends, analyze patterns, and make informed decisions based on reliable data projections. These improvements ensure that users have the insights necessary to manage inventory effectively and anticipate future needs with greater precision.

6.2 Future Work

To build upon the current enhancements and further improve the stock inventory management dashboard, several key areas of development are planned. These initiatives aim to expand functionality, refine data accuracy, and enhance user experience.

1. Advanced Visualisation Techniques

To provide deeper insights into the data, the introduction of advanced visualisation types will be explored. Although the current dashboard does not include heat maps, scatter plots, or funnel charts, integrating these visualisations could offer new perspectives and help identify complex patterns and correlations. Custom visualisations tailored to specific inventory management needs will also be developed to highlight unique metrics and trends relevant to the business.

2. Improved Data Integration and Quality

Future developments will aim to enhance data integration by ensuring real-time or near-real-time updates. This could involve incorporating additional data sources or increasing the frequency of data refreshes. Additionally, efforts will focus on improving data quality through automated checks and validation processes, ensuring that the information presented is accurate and reliable.

3. Enhanced Reporting and Analytics

Advanced reporting capabilities will be developed to enable users to generate detailed, customisable reports based on the dashboard data. This will include options for exporting data, scheduling reports, and creating automated summaries. Additional performance metrics and key performance indicators (KPIs) will be introduced to provide a more comprehensive evaluation of inventory management effectiveness.

4. Enhanced User Interaction and Personalization

To improve user engagement and data exploration, more customization options will be introduced. This includes allowing users to personalize dashboard views and reports according to their roles and preferences. Expanding interactive features such as drill-throughs and dynamic filtering will enable users to explore data more deeply and obtain tailored insights.

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POSTER


Data Visualization System for Enhanced Stock Inventory Management
Introduction
Data visualization simplifies complex information by transforming it into visual formats like charts, graphs, and maps. It's crucial across sectors for making data-driven decisions and conveying insights effectively.
Enhanced stock inventory management optimizes supply chains using technology and data insights. It offers real-time visibility into stock levels, automates tasks, minimizes costs, and ensures stock availability.
Various inventory systems cater to different needs, from Excel for smaller businesses to comprehensive solutions like SAP ERP for enterprises. Cloud-based options like Zoho Inventory offer scalability and features like order management and integrations. Choosing the right system depends on business size, complexity, and budget.
Problem Satement
Insufficient functionalities and visualizations impede the meaningful interpretation of data.
Inability to discern data patterns through stock inventory management and the inadequacy of predictions due to a lack of clarity.
Method -SDLC Method
First Phase - Planning
Second Phase - Analysis
Third Phase - Design
Forth Phase - Development
Fifth Phase - Testing and Deployment
Contribution
Company:
Improved decision-making through data-driven insights.
Enhanced operational efficiency and cost-effectiveness in inventory management.
Increased competitiveness and adaptability in dynamic market environments.
Society:
Better inventory management contributes to reduced waste and environmental impact.
Improved product availability and customer satisfaction.
Facilitated transparency and accountability in supply chain operations.
IT:
Leveraged advanced data analytics tools and techniques for meaningful insights.
Implemented scalable and flexible cloud-based solutions for efficient stock management.
Utilized automation and AI-driven algorithms for predictive analytics and decision support.
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Universiti Tunku Abdul Rahman
Bachelor of Information Systems (Honours) Digital Economy Technology
Prepared by Ong Zhi Le (21ACB06136)

FINAL YEAR PROJECT WEEKLY REPORT

(Project II)

Trimester, Year: Y3S3	**Study week no.: 6**
Student Name & ID: Ong Zhi Le 21ACB06136	
Supervisor: Ms Shakiroh Binti Khamis	
Project Title: Data Visualisation System for Enhanced Stock Inventory Management	

1. WORK DONE

[Please write the details of the work done in the last fortnight.]

- Present the designed dashboard with supervisor.

2. WORK TO BE DONE

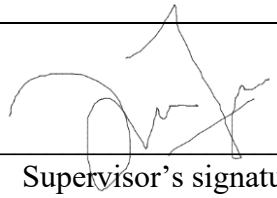
- Enhance the data visualisation for dashboard.
- Continue to work on the report.

3. PROBLEMS ENCOUNTERED

No problem encounter in week 6.

4. SELF EVALUATION OF THE PROGRESS

Learn and compare different stock inventory management system from proposed system to help the project.



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Student's signature

FINAL YEAR PROJECT WEEKLY REPORT

(Project II)

Trimester, Year: Y3S3	**Study week no.: 8**
Student Name & ID: Ong Zhi Le 21ACB06136	
Supervisor: Ms Shakiroh Binti Khamis	
Project Title: Data Visualisation System for Enhanced Stock Inventory Management	

1. WORK DONE

[Please write the details of the work done in the last fortnight.]

- Present the supervisor the enhanced version of the design dashboard.
- Make data preprocessing for the dataset.

2. WORK TO BE DONE

- Enhance the visualisation of the dashboard to be more user friendly.
- Continue coding for enhancing the data visualisation on stock inventory management.
- Continue to work on the report.

3. PROBLEMS ENCOUNTERED

No problem encounter in week 8.

4. SELF EVALUATION OF THE PROGRESS

Find more content from YouTube and self-learning.

Supervisor's signature

Student's signature

FINAL YEAR PROJECT WEEKLY REPORT

(Project II)

Trimester, Year: Y3S3	Study week no.: 10
Student Name & ID: Ong Zhi Le 21ACB06136	
Supervisor: Ms Shakiroh Binti Khamis	
Project Title: Data Visualisation System for Enhanced Stock Inventory Management	

1. WORK DONE

[Please write the details of the work done in the last fortnight.]

- Present the supervisor the enhanced version of the design prototype.

2. WORK TO BE DONE

- Enhance the data visualisation of the dashboard to be more user friendly.
- Continue DAX expression for enhancing the dataset and data visualisation on stock inventory management.
- Continue to work on the report.

3. PROBLEMS ENCOUNTERED

No problem encounter in week 10.

4. SELF EVALUATION OF THE PROGRESS

Think from the user's perspective to enhance the mobile application to be more user friendly.

Supervisor's signature Student's signature

FINAL YEAR PROJECT WEEKLY REPORT

(Project II)

Trimester, Year: Y3S3	Study week no.: 12
Student Name & ID: Ong Zhi Le 21ACB06136	
Supervisor: Ms Shakiroh Binti Khamis	
Project Title: Data Visualisation System for Enhanced Stock Inventory Management	

1. WORK DONE

[Please write the details of the work done in the last fortnight.]

- Present the supervisor the enhanced version of the dashboard.

2. WORK TO BE DONE

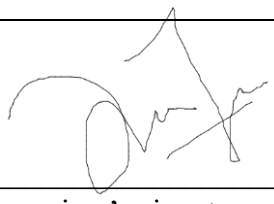
- Debug the system.
- Complete the report for FYP2.

3. PROBLEMS ENCOUNTERED

-No more problem encountered

4. SELF EVALUATION OF THE PROGRESS

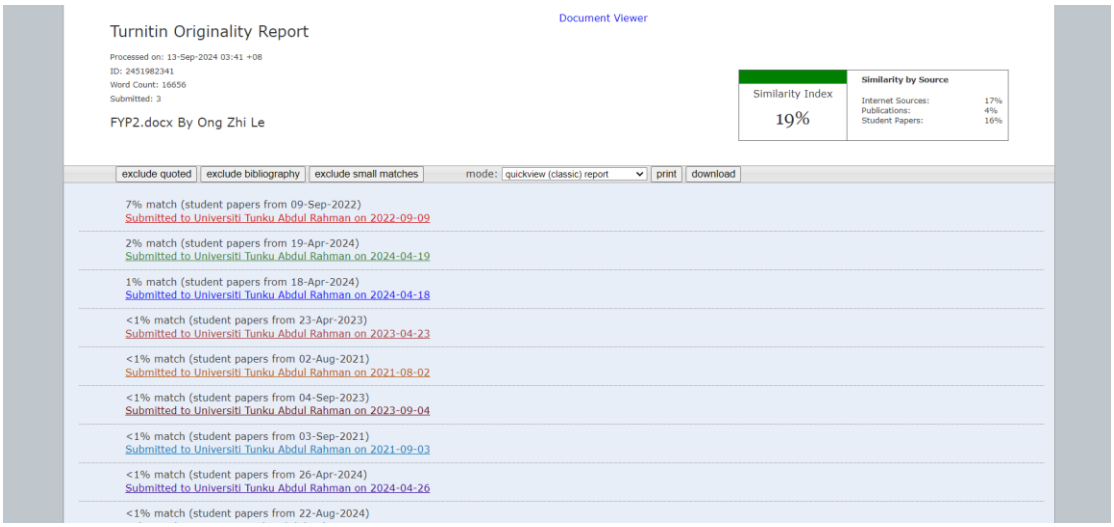
Good time management skills as have already completed most of the idea as planned as well as organize and make plans for future improvement.



Supervisor's signature

Student's signature

PLAGIARISM CHECK RESULT



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ID Number(s)	21ACB06136
Programme / Course	Bachelor of Information Systems (Honours) Digital Economy Technology
Title of Final Year Project	Data Visualisation System for Enhanced Stock Inventory Management

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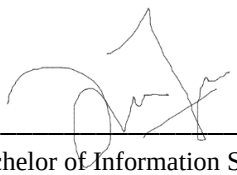

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Bachelor of Information Systems (Honours) Digital Economy Technology

Faculty of Information and Communication Technology (Kampar Campus), UTAR

Signature of Supervisor	Signature of Co-Supervisor
Name: SHAKIROH BINTI KHAMIS	Name: _____
Date: 13/09/2024	Date: _____

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FACULTY OF INFORMATION & COMMUNICATION TECHNOLOGY
(KAMPAR CAMPUS)

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Student Name	Ong Zhi Le
Supervisor Name	Ms Shakiroh Binti Khamis

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