Retail Demand Forecasting

Low Level Design Document

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## Document Control

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# **1. Introduction**

## 1.1 Purpose of the Document

[ To make a retail demand forecasting in Time Series to increase revenue and continue uninterrupted supply.

This document includes details of the overall architectural design considerations, class/object structure, non-functional requirements, Procedure Analysis, defining procedure flow, Directory structure, and modules and data structure.]

## 1.2 Project Overview

The objective of this project (POC) is to understand how Retail demand forecasting plays a crucial role in the success of any retail business. By accurately predicting future customer demand, retailers can optimize their inventory management, pricing strategies, promotional planning, and overall supply chain efficiency. This translates to reduced costs, increased profitability, and improved customer satisfaction.

[This section provides a brief description of the purpose of the system, its target users and the environment in which the system will be used. This is basically from the initial part of the requirements document with revisions if any.]

## 1.3 References

[1. https://priyanka-choudhary.medium.com/time-series-forecasting-of-store-item-demand-ab3841cb9681

2. <https://github.com/jhihan/Store-ItemDemandForecastingChallenge/blob/master> /Store\_Item\_Demand\_Forecasting.ipynb

3. <https://www.geeksforgeeks.org/inventory-demand-forecasting-using-machine-learning-python/> ]

# **2.Design Considerations**

The design methodology of retail demand forecasting encompasses various aspects:

**Product Level:** Forecasting demand for individual products, considering variations across sizes, colors, and other attributes.

**Location Level:** Predicting demand at specific stores, regions, or online platforms considering local trends and preferences.

**Time Horizon:** Ranging from short-term forecasts (daily, weekly) for replenishment to long-term forecasts (monthly, quarterly) for strategic planning.

**Model Selection:** Choosing the appropriate forecasting methods based on data availability, product characteristics, and desired accuracy level.

**Performance Evaluation:** Continuously monitoring and evaluating forecast accuracy to fine-tune models and improve future predictions.

[This section describes issues that need to be addressed or resolved prior to or while completing the design as well as issues that may influence the design process]

## 2.1 Assumptions

Assuming the data is stationary and has some root nodes in time series.

[Describe any assumption, background, or dependencies of the software, its use, the operational environment, or significant project issues. These are things you are assuming to be true, that directly affect the design.]

## 2.2 Constraints

[Describe any constraints on the system that have a significant impact on the design of the system. (e.g. technology constraints, performance requirements, end user characteristics, validation requirements, project constraints, etc.) These are things the customer has told you that directly influence the design. Document the constraints that can be encountered with respect to validating the design environment.]

## 2.3 System Environment

Jupyter IDE, Coding setup Python 3.11.8, PowerBI for visulazation and Analysis.

[Describe the hardware and software that the system must operate in and interact with.]

## 2.4 Other Specific Requirements

[The Other Specific requirements are the one that documents the interaction of the product components with the environment, users and other product component.]

# **3. Design Overview**

[This section provides a high level overview of the structural and functional decomposition of the system. Focus on how and why the system was decomposed in a particular way rather than on details of the particular components. Include information on the major responsibilities and roles the system (or portions thereof) must play.]

## 3.1 Presentation Layer

This section briefs all the screens and reports needed to deliver all the functional requirements. Include screen descriptions, screen shots, report descriptions and report shots. The client should understand that the final product may not be exactly as listed here but the functionality will stay the same. During coding, we may merge or separate screens to achieve a nicer user interface and to promote reusability of components.

### **3.2 Screens**

A diagram of a process

Description automatically generated with medium confidence

Brief list of screens and Screen description

If the screens are already ready, but if we are using a screen from prototype we have to add a line that this screen shot can be a prototype screen, which can be changed. If no prototype is given then a simple “Story Board” drawing can be included.

### **3.3 Reports**

Brief list of reports and Report description

## 3.4 Business Layer

Brief all of the objects necessary to support the Business layer. First show the object hierarchy then includes the Microsoft Modeler, Rational Rose or Together J files, or even simple images file that shows the details.

## 3.5 Database Layer

Brief all of the tables/columns/views/stored procedures necessary to support the business layer along with an Entity-To-Relationship diagram. Include the ERD file that shows the details.

## 3.6 System Architecture

[The architecture provides the top level design view of a system and provides a basis for more detailed design work. These are the top-level components of the system you are building and their relationships. Inclusion of diagrammatic representation is recommended]

## 3.7 System Interfaces

[The various interfaces provided to users and other external systems should be defined here. If you had included user interface descriptions in your requirements document you may refer to them here. If you provide interfaces to other systems, say export and import data to a different software, you should mention them here.]

## 3.8 Non-Functional Requirements

[The non-functional requirements of the system should be documented here. The following sub-sections list some of the very common and generic non-functional requirements. Document those, which are applicable to the project, and the rest, are optional. These sub-sections are only an indicative list and any additional requirements should be added to these sub-sections]

### 3**.9** **System Security**

### **3.10 Recovery**

### **3.11 Messaging**

### **3.12 Process control and synchronization**

### **3.13 Transaction management**

### **3.14 Information Exchange**

### **3.15 Redundancy**

### **3.16 Error reporting**

### **3.17 Format conversion**

## 3.18Standards and Conventions

[Include details about the standards and conventions that are used for the design like the UML notation, customer supplied standards etc.]

## 3.19 Tools used in design

[Include the tools that are used in the design process l-ike Rational Rose etc.]

# **4. Application Integration**

## 4.1 Integration of components

[Explain the integration of product components]

## 4.2 Identification of Integration Approach

[Describe the integration approach (top-down, bottom-up, functional groupings, etc.) and the rationale for the choosing that approach.] *[Refer Product Integration guidelines for detailed description of each integration approach]*

## 4.3 Identification of Integration sequence

[Explain if any alternate integration sequence will be used and how the best sequence will be selected]

**4.3.1 Software Integration Sequence. For each subsystem:**

Identify the sequence in which the software code functions and modules will be integrated. Relate this sequence to any product features/functions that are being built up. Specify any hardware dependencies for early software integration activities.

**4.3.2 Hardware Integration Sequence. For each subsystem:**

Identify the sequence in which the hardware elements will be integrated. Specify any software dependencies for early hardware integration activities.

**4.3.3 Full Hardware/Software Integration Sequence. For each subsystem:**

Identify the sequence of integrating software build(s) with the hardware modules. Identify the product features/functions that are being built up at each step.

**4.3.4 Subsystem Integration Sequence.**

Identify the order in which subsystems will be integrated.

## 4.4 Product Integration Criteria

[Explain the criteria that have to be satisfied to initiate the product integration. E.g. 1. Completion of Entire cycle of functional testing; 2. No showstoppers / Major defects in the application]

## 4.5 Environment setup for Integration

[Explain about the environment setup and the tools that would be used for product integration]

## 4.6 Application Integration test

[Explain how the application integration will be tested, like sanity test. If the same is addressed in the test plan of the project, provide a link to respective section of the test plan document.]

# **5. Detailed Design as per module/functionality**

[Design model describes the design comprehensively, in terms of how the model is structured into procedures, directories and modules. How the data structures are handled in the Module. . For a project of bigger size this section can be added once the previous sections are done and approved]

## 

## 5.1 System Design

## 5.2 Interface Design

[Include the detailed interfaces design. Alternatively, when a prototype is being delivered for the system interface, a reference to the prototype can be given, rather than copy/pasting the screens in the document.] User Interface Design

## 5.3 Business layer

## 5.4 Database Layer

## 5.5 Global Variables

[Mention details like name of the global variable, type, size, description and default value etc]

## 5.6 Procedure Description

[This section is applicable for design that is procedural in nature. If applicable, details like Product Flow Chart or State Machine, Directory Structure Description, Module Name, (brief description about the module), Directory Name (directory structure of the module), Module Flow Chart or State Machine, Module Description, data structure description, method description, Pseudo code etc are to be mentioned]

## 5.7 Reusable Components

[Also mention any commercial off-the-shelf products COTS]

[Explain the design of reusable components across subsystems. Also include a list of reusable components and the interfaces exposed by them. Also mention any commercial off-the-shelf products (COTS) used in the project/application. Also elaborate on how COTS fit in the design and how it is interfaced with the application]

# **6. Exceptions and Errors**

[This section can be in this document or in a separate document.]

## 6.1 Exceptions

## Errors

# **7. Service Design**

[Include the design of services like Data migration, Training, Systems Deployment and management that are identified as customer requirements]

# **8. Annexure**

* Database Table Descriptions (Optional)
* Objects & Database tables mappings (Optional)
* Screen Design Layouts (Optional)
* Report Formats (Optional)
* Glossary

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