**Eble Coach Services**

Functional Requirements Specification

LRFM Customer Segmentation Model

Version 1.0

**Document Control**

Document History

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| **Version** | **Date** | **Author** | **Change Summary** |
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# Introduction

## Purpose

This document outlines the functional requirements for deploying and integrating the LRFMbased customer segmentation model at Eble Coach Services. The segmentation model aims to enhance customer understanding by categorizing passengers based on behavioral metrics such as recency, frequency, length of engagement, and monetary value. It will support personalized marketing, loyalty program optimization, and customer retention strategies. This document serves as a reference point for the design, development, testing, and implementation phases, ensuring alignment between data science, IT, commercial team stakeholders in the deployment and usage of the segmentation outputs.

## Scope

**Inclusions**

The following CRM functionalities are included as part of this project:

* Customer segmentation based on Length, Recency, Frequency, and Monetary value (LRFM)
* Enablement of targeted marketing and communication strategies using segmentation outputs
* Access to segmentation insights via Power BI dashboards for commercial and marketing teams
* Automated updates of segmentation data on a scheduled basis
* Integration of segment labels with customer profiles in the CRM
* Integration with external third-party marketing automation platforms **Exclusions**

The following are out-of-scope for this phase of the project:

* Advanced AI-driven customer strategic insights mapping
* Real-time personalization engines or recommendation systems

## Intended Audience

This document is intended for use by the following stakeholder groups:

* **Data Science and Analytics Team** – for model development, testing, and maintenance
* **Business Analysts and Commercial Strategy Teams** – to interpret segment insights and recommend business actions
* **IT Support and System Administrators** – for deployment, access control, and infrastructure support
* **CRM Project Implementation Team** – to guide integration of segmentation outputs into the

CRM

* **Third-party marketing automation platforms Team** – to leverage communication for targeted campaigns and engagement strategies

## Related Documents

The following documents provide additional context and supporting information for this Functional Requirements Specification:

* Project Proposal
* Data Requirements

## Definitions and Acronyms

A glossary for any specialised terms, abbreviations, or acronyms used within the document.

Example:

|  |  |
| --- | --- |
| **Term/Acronym** | **Definition** |
| LRFM | Length, Recency, Frequency, and Monetary – key metrics used in customer segmentation |
| Length | The total duration in days from a customer's last recorded transaction to the first recorded transaction. |
| Frequency | The number of transactions or purchases a customer has made within the observation window. |
| Recency | The number of days since a customer’s most recent transaction, calculated from the observation period's end. |
| Monetary | The total amount spent by a customer during the observation period. |
| CLV | Customer Lifetime Value – a prediction of the total value a customer brings to a business over the entire relationship |
| KMeans | A machine learning clustering algorithm used to group similar customers based on LRFM features |
| MLflow | An open-source platform used for tracking machine learning experiments and models |
| Segment | A group of customers with similar behavioral characteristics identified through clustering |
| Normalization | A data transformation technique to scale numerical values for model compatibility |
| Power BI | A Microsoft data visualization and business intelligence tool used for dashboarding and reporting |
| CRM | Customer Relationship Management – a system for managing company interactions with current and potential customers |

# System Overview

## System Description

The LRFM-based customer segmentation model, is designed to provide a unified, data-driven view of each customer’s value and behavior. Its primary purpose is to enable personalized engagement, improve customer retention, and support revenue growth through targeted marketing strategies. By integrating the segmentation outputs into the CRM, the system will empower commercial and marketing teams to identify high-value and at-risk customers, optimize campaign targeting, and tailor loyalty programs. Additionally, the system will automate the periodic update of segments and support strategic decision-making by providing clear insights into customer behavior patterns across various channels. This will lead to more efficient resource allocation, improved customer experience, and increased profitability.

## High-Level System Architecture

The LRFM customer segmentation engine, which processes historical transactional data to generate customer segments through a KMeans clustering model.

Data is extracted from the data warehouse (flight data containing flight bookings, customer profiles, fare information, etc.) Once cleaned and transformed, it is passed through the LRFM computation module, which calculates customer behavioral metrics such as Length, Recency, Frequency, and Monetary value. These features are then normalized and clustered using KMeans, and customer segments are assigned.

This output enables:

* Access by Power BI, which visualizes customer distributions, trends, and strategic insights via dashboards.
* Integration with the CRM system, where segment tags are appended to customer profiles for use in campaign targeting, upselling, and churn prevention.
* Access to marketing automation tools, for rule-based campaign triggers.

A scheduler ensures that segmentation is refreshed periodically (e.g., monthly), and MLflow tracks model performance and logs experiment metadata.

## Scope of Functional Enhancements

The upgraded CRM system introduces automated LRFM-based customer segmentation, replacing the current manual process. It enables seamless integration of segment labels into customer profiles, enhances targeting through real-time insights via Power BI, and improves campaign effectiveness. Scheduled model updates ensure up-to-date segmentation, while the overall user experience is

streamlined through centralized access and reduced manual effort.

# Functional Requirements

## Functional Area: Assign Segment Tags to Customer Profiles

* **Description**:

The system shall automatically assign a customer segment (based on LRFM scoring and KMeans clustering) to each customer record in the CRM upon data sync or segmentation refresh.

* **Use Case**:

A new transaction is recorded for a customer. The segmentation engine updates the LRFM values, recomputes the customer’s segment, and the CRM reflects this segment in real-time for the sales and marketing teams to act on.

* **Pre-Conditions**:
  + The segmentation engine has been executed successfully. o CRM integration APIs are active.
  + Customer transactional data is available and clean.
* **Post-Conditions**:
  + The CRM profile includes an up-to-date customer segment.
  + Segment tags are visible for downstream campaign targeting and reporting.
* **Flow of Events**:

**Basic Flow**:

* 1. Customer data flows into the segmentation engine via ETL.
  2. LRFM values are computed and normalized.
  3. KMeans assigns the customer to a segment. 4. Segment label is pushed into CRM via API.

5. CRM user sees the segment on the customer profile.

# Data Requirements

## Data Input and Output

**Input Data**:

* Historical transactional data including flight date, fare amount, coupon no, and customer ID

(UNIQUEKEY)

* Customer profile details such as full name
* Real-time API feeds from flight data (optional future scope)

**Output Data**:

* Customer records enriched with LRFM scores and segment labels
* Power BI dashboards showing segment distributions, CLV trends, and churn risks
* Exportable reports in Excel formats for commercial teams
* API responses returning customer segment on request for integration with external tools

**Validation Rules**:

* UNIQUEKEY must be non-null and unique per customer

**Transformation Logic**:

* Recency = Days since last flight
* Length = Days between first and last flight
* Frequency = Number of flight bookings
* Monetary = Sum of fare amounts per customer
* LRFM values are normalized and passed through KMeans for clustering
* Final output includes segment label appended to each customer record

## Data Storage

|  |  |  |
| --- | --- | --- |
| **DR ID** | **Requirement** | **Priority** |
| DR-001 | All experiment runs, metrics, parameters, models, and artifacts shall be logged and stored using MLflow Tracking. | Must Have |

# User Interface and Interaction Requirements

## UI Overview

The Power BI dashboard interface should be interactive, visually appealing, and aligned with Eble Coach Services’ branding guidelines, including the use of official colors, fonts, and logo placement. It should provide a seamless user experience that enables business users such as the Commercial, Marketing, and Customer Experience teams to quickly gain insights from customer segmentation outputs. Key design principles include:

* **Intuitive Navigation**: Tabs or buttons should allow users to switch between different segments.
* **Dynamic Filtering**: Users should be able to filter dashboards by flight date, region, customer type, and segment using slicers or search bars.
* **Data Accessibility**: Tables and visualizations must include drill-down capabilities, tooltips, and sorting options for enhanced usability.
* **Highlighting Key Metrics**: KPIs such as CLV, Segment Size %, Average Spend, and Flight Frequency should be displayed clearly.

The goal is to allow decision-makers to explore customer behaviors and trends effectively and take action based on the segmentation insights.

## Screen Layouts and Navigation

The Power BI dashboard will consist of multiple interconnected report pages, each designed to give the user seamless access to customer segmentation insights, LRFM scoring, and related business performance metrics. Navigation will be intuitive, using tabs, bookmarks, and buttons to simulate a multi-screen application experience.

**Key Screens:**

* **Overview Dashboard**

Displays high-level KPIs such as number of customers, average CLV, top segments by volume. Also includes a summary of active vs dormant customer groups with drill-through capabilities. A table with searchable/filterable customer profiles. Displays Name, LRFM scores, assigned cluster, and last transaction date.

* **Segment Profile Page**

Provides detailed characteristics for each customer segment (e.g., "High-Value Customers", "Low-Value Infrequent Buyers") with metrics like average spend, frequency, and retention length. Users can filter by segment or customer ID.

* **Monthly Trends Dashboard**

Shows line charts indicating the distribution of customer segments over time, including seasonality patterns.

**Navigation Flow:**

A vertical sidebar enables movement between dashboards guiding users through specific insights.

# Integration and Interoperability Requirements

## Interfaces with External Systems

|  |  |  |
| --- | --- | --- |
| **IN ID** | **Requirement** | **Priority** |
| IN-001 | The segmentation model shall integrate with the **Eble Coach Services CRM system** to sync customer profiles via APIs. | Must Have |
| IN-002 | The CRM shall integrate with the company’s marketing automation tools via APIs. | Must Have |

# Assumptions, Constraints, and Dependencies

## Assumptions

* The segmentation data is Flight data as most agents provide their details during booking making it difficult to profile a customer using booking data.
* The unique key is used as the customer identifier
* Each leg of a coupon are considered as one transaction to mitigate bias.

## Dependencies

* Data availability from Flight data is essential for generating accurate LRFM scores and clustering outputs.
* Successful integration with the CRM platform depends on API endpoints being functional and documented by the CRM vendor or internal IT team.
* Integration with the company’s marketing automation tools via APIs.

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