**1. Introduction**

This document provides a comprehensive guide to the Product management application created. It includes an overview of the application, the technology stack used, the architecture, detailed functional requirements, data models, user interface design, security measures, validation, and flow diagrams.

**2. Overview**

The Product management application is a highly scalable and secured web application designed to manage products and categories for users. The application allows users to register, log in, and manage categories and products. Users can add, edit, and delete products, and upload images and Excel spreadsheets for bulk product management.

**3. Technology Stack**

* **Language:** C#
* **Front-end Framework:** ASP.NET MVC Core
* **JavaScript Framework:** jQuery
* **CSS Framework:** Bootstrap
* **Data Persistence:** Entity Framework Core, SQL Server

**4. Architecture**

The application follows an N-Tier Architecture:

* **Presentation Layer:** ASP.NET MVC Core
* **Data Access Layer:** Entity Framework Core
* **Database:** SQL Server or MySQL

**5. Functional Requirements**

1. **User Registration and Login:**
   * Register with an email and password.
   * Login with email and password.
2. **Category Management:**
   * View, add, edit, and delete categories.
   * Each category has a unique category code in the format "ABC123".
3. **Product Management:**
   * View, add, edit, delete products.
   * Products are displayed with pagination (page size of 10).
   * Products have a unique product code in the format "yyyyMM-###".
   * Users can upload images for products.
   * Users can upload/download products using Excel spreadsheets.

**6. Data Models**

**Product Model:**

public class Product

{

public int ProductId { get; set; }

public string ProductCode { get; set; }

public string Name { get; set; }

public string Description { get; set; }

public string CategoryName { get; set; }

public decimal Price { get; set; }

public string Image { get; set; }

public string UserId { get; set; }

public DateTime CreatedDate { get; set; }

public string CreatedBy { get; set; }

}

**Category Model:**

public class Category

{

public int CategoryId { get; set; }

public string Name { get; set; }

public string CategoryCode { get; set; }

public bool IsActive { get; set; }

public string UserId { get; set; }

public DateTime CreatedDate { get; set; }

public string CreatedBy { get; set; }

}

**7. User Interface**

The user interface is designed using ASP.NET MVC Core with Bootstrap for responsive design. The main views include:

1. **User Registration and Login Views:** Forms for user registration and login.
2. **Category Management Views:**
   * List view for displaying categories.
   * Create, Edit, and Delete views for managing categories.
3. **Product Management Views:**
   * List view for displaying products with pagination.
   * Create, Edit, and Delete views for managing products.
   * Image upload and Excel upload/download functionality.

**8. Security and Validation**

* **Authentication and Authorization:** Implemented using ASP.NET Core Identity. Secure APIs with [Authorize] attributes.
* **Validation:** Data annotations are used for model validation. Custom validation attributes are implemented for complex rules (e.g., category code format).
* **Exception Handling:** Global exception handling is implemented to manage unexpected errors.
* **Data Protection:** Sensitive data, such as passwords, are securely hashed.

**10. Flow Diagrams**

**User Registration and Login Flow:**

User -> Registration Form -> Server (Create User) -> Success -> Login Form

User -> Login Form -> Server (Authenticate) -> Success -> Category Page

**Category Management Flow:**

User -> Category List -> Server (Get Categories) -> Display Categories

User -> Add Category Form -> Server (Create Category) -> Success -> Update Category List

User -> Edit Category Form -> Server (Update Category) -> Success -> Update Category List

User -> Delete Category -> Server (Delete Category) -> Success -> Update Category List

**Product Management Flow:**

User -> Product List -> Server (Get Products) -> Display Products

User -> Add Product Form -> Server (Create Product) -> Success -> Update Product List

User -> Edit Product Form -> Server (Update Product) -> Success -> Update Product List

User -> Delete Product -> Server (Delete Product) -> Success -> Update Product List

User -> Import Products (Excel) -> Server (Import) -> Success -> Update Product List

User -> Export Products (Excel) -> Server (Export) -> Success -> Download File

**11. Conclusion**

The Product management application is designed to be a secure, scalable, and user-friendly platform for managing products and categories. By following the guidelines and implementing the features described in this document, you can ensure a robust and maintainable application. The application uses best practices for security, validation, and architecture, ensuring a high-quality solution for managing product data.