FINAL YEAR PROJECT REPORT BS (SOFTWARE ENGINEERING) CARTON QUALITY MANAGEMENT SYSTEM
SUBMITTED BY

BALACH FARHAD	50907
ALI HAIDER	51738
MUHAMMAD OWAIS	52558
SARMAD QAMAR	50868

SUPERVISOR

SIR FAHAD NAJEEB

COORDINATOR

DR. AARIJ MEHMOOD

FACULTY OF ENGINEERING, SCIENCE AND TECHNOLOGYIQRA UNIVERSITY, KARACHI

MARCH 2024

FACULTY OF ENGINEERING, SCIENCE AND TECHNOLOGYDEPARTMENT OF SOFTWARE ENGINEERING

FINAL YEAR PROJECT REPORT BACHELOR OF SOFTWARE ENGINEERINGBALACH FARHAD (50907)
SARMAD QAMAR (50868)

MUHAMMAD OWAIS (52558) ALI HAIDER(51738)

PROJECT:

CARTON QUALITY MANAGEMENT SYSTEMSUPERVISOR:
SIR FAHAD NAJEEB

MARCH 2024

CHAPTER – 1

STATEMENT OF ORIGINALITY

This document is submitted in partial fulfillment of the requirements for the degree of Bachelor of Science in Software Engineering at IQRA University. The work contained within this project, titled "Carton Quality Management System," is entirely our own work and has not been submitted in whole or in part for consideration in any other university or professional qualification.

We attest that the research and analyses presented in this project are the result of our own efforts and any assistance received in the preparation of this project and its assets have been fully disclosed and attributed. All sources utilized, including books, journal articles, websites, and personal communications, have been cited and referenced. This project may contain direct quotations from these sources, which are always explicitly attributed through citation.

The project has been developed under the guidance of Sir Fahad Najeeb, to whom we extend our gratitude for their invaluable support and insights. The contributions made by the team members - Balach Farhad, Sarmad Qamar, Ali Haider, and Muhammad Owais - have been instrumental in the completion of this project, with each member responsible for distinct components as delineated in our project submission.

Our work involves the creation of a comprehensive software solution aimed at enhancing the quality control processes in carton packaging, incorporating features such as categorization of product stock, product measurement, real-time monitoring, and vendor management, among others. The methodologies, designs, and implementations detailed herein are the result of our collaborative efforts, innovative thinking, and commitment to creating a system that meets the specified needs and exceeds expectations.

We have adhered strictly to the ethical guidelines provided by the university, ensuring the integrity of our work and maintaining the trust of those who will review and benefit from our project. Any feedback, suggestions, or inquiries regarding this project are welcomed and can be directed to the undersigned or any of the group members.

ACKNOWLEDGEMENTS

First and foremost, we extend our deepest gratitude to our supervisor, Sir Fahad Najeeb, for his unwavering support, guidance, and expertise throughout the development of the Carton Quality Management System. His invaluable feedback and encouragement were pivotal in steering this project to its completion.

We would also like to express our appreciation to the faculty and staff of FEST Department at IQRA University for providing us with the resources and environment conducive to learning and innovation. Their dedication to fostering a culture of academic excellence has profoundly enriched our educational journey.

A special thanks goes to our group members: Balach Farhad, Sarmad Qamar, Ali Haider, and Muhammad Owais, for their collaboration, hard work, and commitment. This project was a collective endeavor that required each of us to bring our best to the table. The synergy within our team has been a significant factor in our project's success, and it has been a pleasure to work alongside such dedicated individuals.

We are also indebted to our families and friends for their love, understanding, and patience throughout this challenging but rewarding process. Their moral support and encouragement have been our strength and motivation, enabling us to strive for excellence in our work.

Lastly, we wish to acknowledge the contributions of all those who directly or indirectly played a part in the development of this project. Whether through insightful discussions, sharing of knowledge, or provision of feedback, your contributions have been invaluable.

This project stands as a testament to the power of collaboration, dedication, and the pursuit of excellence. We are grateful for the opportunity to work on this project and for the lessons learned along the way.

ABSTRACT

In the competitive landscape of the packaging industry, ensuring the quality of carton packaging is paramount for maintaining customer satisfaction and adherence to industry standards. This project introduces the Carton Quality Management System (CQMS), a comprehensive software solution designed to enhance quality control processes within the carton packaging sector. Developed by a dedicated team of students under the guidance of Sir Fahad Najeeb, CQMS aims to streamline operations, reduce errors, and facilitate the consistent production of high-quality carton packaging materials.

The system focuses on several key functionalities to achieve its goals, including categorization of product stock, precise product measurement, real-time stock monitoring, efficient vendor management and the utilization of reporting and analytics tools for operational insights and improvement areas. Additionally, inventory forecasting and alerts have been incorporated to optimize stock levels and prevent potential shortages or excesses, thereby ensuring a smooth supply chain process.

Methodologically, the project follows a structured development process, encompassing requirement analysis, system design, implementation, and testing phases. The use of agile development practices allowed for iterative feedback and continuous improvement, ensuring that the system effectively meets the needs of its intended users.

The anticipated outcome of the CQMS is to provide businesses in the carton packaging industry with a tool that not only ensures the quality and integrity of their products but also enhances operational efficiency and customer satisfaction. By implementing CQMS, companies can expect to see a reduction in quality control errors, an improvement in inventory management, and an

overall increase in the standard of their carton packaging solutions.

This project represents a significant step towards innovation in quality management practices within the packaging industry, demonstrating the potential of software solutions to address complex industry challenges.

Table of Contents

List of Tables

List of Figures

CHAPTER -1

INTRODUCTION

1.0 Background

The packaging industry stands at a critical juncture, where the demand for quality and sustainability intersects with the technological advancements of the 21st century. In this landscape, carton packaging emerges as a vital component, serving diverse sectors from food and beverage to electronics. This project introduces the Carton Quality Management System (CQMS), conceived to elevate the standards of quality control in carton packaging. The system represents a pioneering effort to integrate advanced software solutions with traditional quality management practices, aiming to revolutionize the industry's approach to ensuring product integrity and customer satisfaction.

1.1 Problem Statement

Despite the critical role of carton packaging in product distribution and protection, the industry grapples with persistent challenges in quality control. The prevalence of manual inspections and fragmented quality management systems leads to inefficiencies, increased waste, and heightened risk of customer dissatisfaction. The CQMS project is predicated on the notion that the current paradigm of quality assurance in carton packaging is inadequate to meet the evolving demands of the market and regulatory standards. It identifies a pressing need for a comprehensive, integrated, and technology-driven solution to these pervasive challenges.

1.2 Project Objectives

The primary aim of the CQMS is to devise a robust and user-friendly software system that automates and enhances quality control processes for carton packaging. Key objectives include:

Streamlining the categorization and measurement of products,
Implementing real-time monitoring and updates of stock levels,
Facilitating vendor management,
Leveraging reporting and analytics tools for strategic insights,
Optimizing inventory through forecasting and alerts.
These objectives are designed to collectively improve operational efficiency, reduce error rates, and elevate customer satisfaction across the carton packaging industry.

1.3 Scope of the Project

The scope of the CQMS project is meticulously defined to address the nuanced needs of quality

control within the carton packaging industry. The system's development is focused on providing a suite of functionalities tailored for quality control managers and production supervisors, facilitating more efficient and accurate management of packaging quality.
Key features include:

- Automated categorization and measurement of carton products to ensure compliance with predefined standards.
- Real-time inventory monitoring and updates, enabling proactive management of stock levels.
- Enhanced vendor management capabilities, designed to streamline interactions and transactions with suppliers.
- Advanced reporting and analytics tools to derive insights into quality control processes and identify areas for improvement.
- Inventory forecasting and alert mechanisms to maintain optimal stock levels, preventing overstocking or stock-outs.

This project intentionally limits its focus to the software aspects of quality management systems, excluding the hardware or physical machinery used in the production and testing of carton packaging.

1.4 Significance of the Study

The significance of the CQMS project transcends its immediate application, offering valuable contributions to both the academic field and the carton packaging industry at large. Academically, it presents a comprehensive case study on the application of advanced software solutions to enhance traditional quality management practices, offering insights and methodologies that can be applied in broader manufacturing contexts. Industrially, the project addresses critical challenges in quality control, providing a scalable and efficient solution that promises to improve product integrity, reduce waste, and enhance customer satisfaction. By setting new benchmarks for quality assurance in carton packaging, CQMS has the potential to influence industry standards and encourage the adoption of similar technologies across other sectors.

1.5 Methodology

The methodology of the CQMS project is anchored in a structured approach to software development, incorporating stages of requirement analysis, design, implementation, and testing. Initial phases involved extensive consultations with industry experts and potential system users to gather functional requirements and identify key challenges in carton packaging quality control. The design phase leveraged modern software engineering principles to outline the system architecture and user interface, ensuring usability and scalability. Implementation was carried out using agile development practices, allowing for iterative refinements based on user feedback. Comprehensive testing, including unit, integration, and user acceptance testing, ensured the reliability and effectiveness of the system before its final deployment.

1.6 Structure of the Report

The report is organized as follows:

Chapter 2: Literature Review - Reviews existing literature on quality management systems, technological advancements in quality control, and the specific challenges of carton packaging.

Chapter 3: System Design - Describes the architectural framework, design principles, and user interface of the CQMS, including detailed diagrams and models.

Chapter 4: System Implementation and Testing - Details the implementation process, the technologies used, and the testing methodologies employed to ensure system functionality and reliability.

Chapter 5: Results and Discussion - Presents the outcomes of the CQMS deployment, including user feedback, system performance metrics, and a discussion on the project's objectives.

Chapter 6: Conclusion and Future Work - Concludes the report with a summary of findings, contributions to the field, limitations of the study, and potential directions for future research.

1.7 Summary

This introduction sets the stage for a comprehensive exploration of the CQMS project, from the initial motivation and objectives to the detailed design, implementation, and evaluation of the system. The report aims to provide a thorough account of the project's contributions to improving quality control in carton packaging, highlighting the potential for broader applications and future advancements in the field.
These sections offer a deep dive into the specifics of your CQMS project, aligning closely with the information derived from your document and ensuring a tailored, impactful introduction to your FYP report.

CHAPTER – 2

LITERATURE REVIEW

2.1 Introduction

The literature review has underscored a significant gap in the current quality management practices within the carton packaging industry. Challenges such as material variability, the complexity of ensuring consistent quality, and the limitations of manual and fragmented quality control processes are prevalent. These challenges not only hinder operational efficiency but also compromise the ability to meet the increasingly stringent standards of product integrity and customer satisfaction.

2.2 Challenges in Carton Packaging Quality Management

Reflecting on the project description, it's clear that the carton packaging industry faces significant challenges in maintaining high standards of quality. These include material variability, the complexity of ensuring consistent quality across large volumes, and the limitations of existing quality control methodologies that are often manual and time-consuming. The literature reveals a gap in existing solutions' ability to dynamically adapt to the unique requirements of carton packaging, where factors such as material composition and environmental conditions can significantly impact quality.

2.3 Existing Software Solutions and Their Limitations

Existing software solutions in the market, while offering basic functionalities for inventory and quality management, fall short of addressing the unique needs of the carton packaging sector comprehensively. There is a particular deficiency in systems that integrate real-time monitoring, advanced analytics, predictive forecasting, and seamless e-commerce platform integration within a user-friendly interface. The review identifies a critical need for a holistic system that encapsulates these features to facilitate more dynamic, accurate, and efficient quality management processes.

2.4 Technological Innovations in Quality Control

Technological innovations, particularly in the realms of real-time data analysis, AI, and machine learning, present a promising avenue for overcoming these challenges. However, their potential has yet to be fully realized and applied within the context of carton packaging quality management. The CQMS project is positioned to leverage these technologies, offering an innovative solution that not only addresses the identified gaps but also sets a new standard for quality management in the industry.

2.5 Theoretical Frameworks and Models

The exploration of theoretical frameworks and models such as lean manufacturing, TQM, and systems theory highlights the importance of a systematic, process-oriented approach to quality management. These frameworks support the underlying principles of the CQMS project, emphasizing efficiency, continual improvement, and customer focus.

2.6 Summary

In conclusion, the literature review substantiates the necessity and potential impact of the Carton Quality Management System. By bridging the identified gaps with its advanced features and functionalities, CQMS promises to enhance the quality control processes within the carton packaging industry, leading to improved product quality, operational efficiency, and customer satisfaction. The project emerges not only as a response to the existing challenges but as a forward-thinking initiative that embraces technological advancements to revolutionize quality management practices.

This summary encapsulates the essence of the literature review, providing a clear justification for the CQMS project and outlining its expected contributions to the field of carton packaging quality management.

CHAPTER – 3

System Design and Requirements

3.1 Introduction

This chapter delves into the comprehensive design and requirements of the Carton Quality Management System (CQMS), outlining the project plan, delineating the functional and non-functional requirements essential for the system's operation, and specifying the hardware requirements. The CQMS is developed to address the critical challenges in carton packaging quality management, with a focus on enhancing efficiency, reliability, and user experience.

3.2 Project Plan

The project plan for CQMS outlines the phased development approach, starting from requirement analysis, through design and development, to testing and deployment. Key milestones include:

Initial Requirement Gathering and Analysis: Involving consultations with industry experts and potential system users to capture the comprehensive needs and challenges.

System Design and Prototyping: Detailing the system architecture, user interfaces, and interaction flows, supported by iterative prototyping for user feedback.

Development and Implementation: Agile development methodologies are employed, allowing for flexible and iterative enhancements based on ongoing testing and user input.

Testing and Quality Assurance: Rigorous testing phases, including unit testing, integration testing, and user acceptance testing, to ensure the system meets all specified requirements.

Deployment and Evaluation: Final deployment of the CQMS followed by a period of evaluation to assess the system's impact and identify any areas for future improvement.

Figure 1. Gantt Chart

Test / Dates	Week 1(06 Nov)	Week 2(13 Nov)	Week 3(20 Nov)	Week 4(27 Nov)	Week 5(04
Project Setup and Data Collection					
Model Development and Training					
Integration with Inventory System					
Inventory Management					
Sales Order Processing					
Demand and Inventory Forecasting					
Reporting and Analytics					
Final Testing and Deployment					

3.3 Functional Requirements

3.3.1 User Panel

The user panel functionality allows users to interact with the system efficiently, providing a seamless experience in managing and monitoring quality control processes. Key functionalities include:

Categorization of Product Stock: Users can categorize inventory based on product types, facilitating easy organization and retrieval.
Product Measurement and Specifications: The system supports capturing and storing measurements and specifications related to carton products.
Inventory and Product History Tracking: Maintains a comprehensive log of inventory movements and product-related information.
Stock Updates and Real-time Monitoring: Updates stock levels in real-time based on transactions, ensuring accurate inventory management.
Vendor Management: Manages vendor details for purchasing and selling products, enhancing the supply chain efficiency.
Reporting and Analytics Tools: Offers insights on operations and areas for improvement through advanced reporting and analytics.
Inventory Forecasting: Employs forecasting techniques to predict inventory needs and optimize stock levels.
Inventory Alerts: Generates alerts to prevent overstocking or under-stocking, ensuring optimized inventory management.

3.4 Non-Functional Requirements

The system's non-functional requirements focus on usability, reliability, performance, and security, including:

User-friendly Interface: Ensuring easy navigation and use.

Data Accuracy and Integrity: High data accuracy and integrity to avoid errors and inconsistencies.

Security: Robust security measures to protect confidential inventory and sales data.

Scalability: The ability to accommodate future growth and expansion.

Availability and Reliability: High availability and reliability to minimize downtime and disruptions.

3.5 Hardware Requirements

Hardware requirements for the CQMS include:

Server Specifications: Adequate processing power, memory, and storage to support the system's backend operations and database management.
Client Devices: Compatibility with a range of devices, including desktops, laptops, and tablets, ensuring accessibility for users in different environments.

3.6 Summary

Chapter 3 provides a detailed overview of the design and requirements of the Carton Quality Management System, covering the project plan, functional and non-functional requirements, and hardware specifications. This foundational structure ensures the CQMS is well-equipped to address the unique challenges of quality management in carton packaging, emphasizing efficiency, user experience, and scalability.

CHAPTER – 4

4.1 Introduction

Chapter 4 presents a comprehensive overview of the Carton Quality Management System's design and architecture. This chapter is dedicated to elucidating the underlying structure that supports CQMS's functionality, focusing on its Data Flow Diagram (DFD), Entity Relationship Diagram (ERD), and a detailed exploration of use cases that demonstrate the system's capabilities in managing the quality of carton packaging. By dissecting these elements, we aim to provide a clear understanding of how CQMS facilitates efficient quality management processes, from data handling and system interactions to user engagement and operational execution.

4.2 Data Flow Diagram

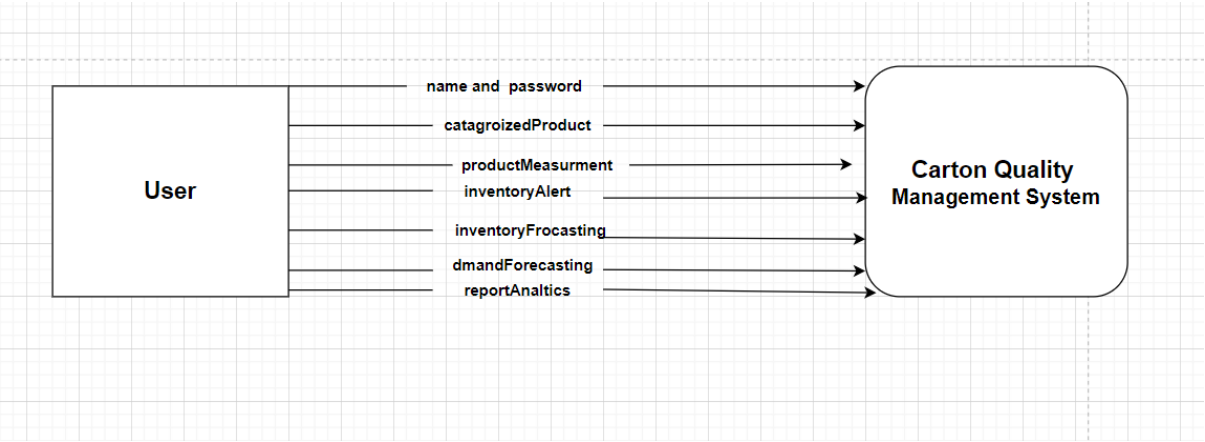


Figure 2. DFD

Add Product into Inventory

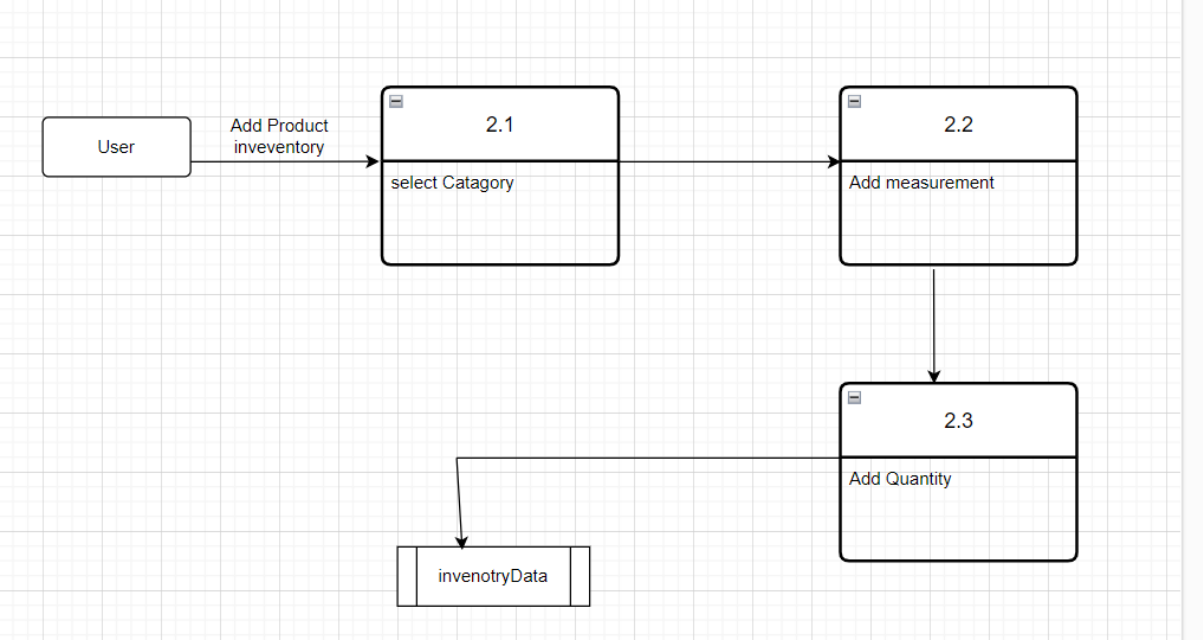


Figure 3. DFD Add Product to Inventory

Order Product

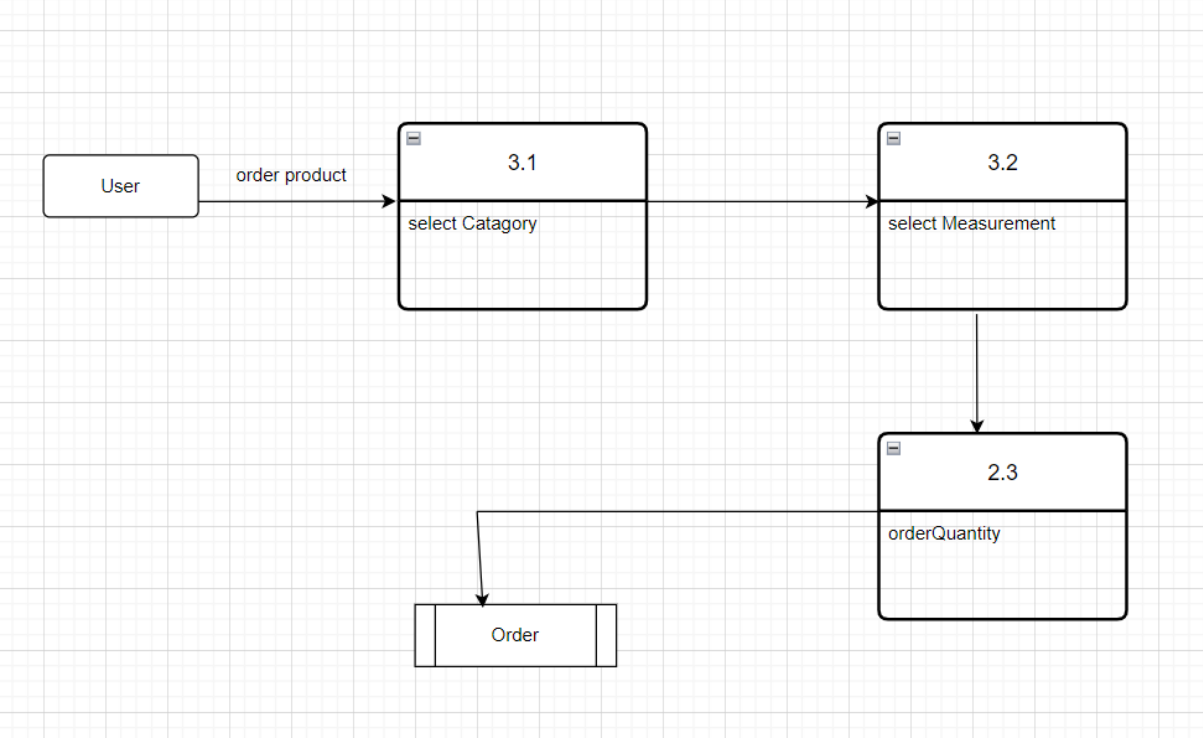


Figure 4. DFD Order Product

Inventory Forecasting

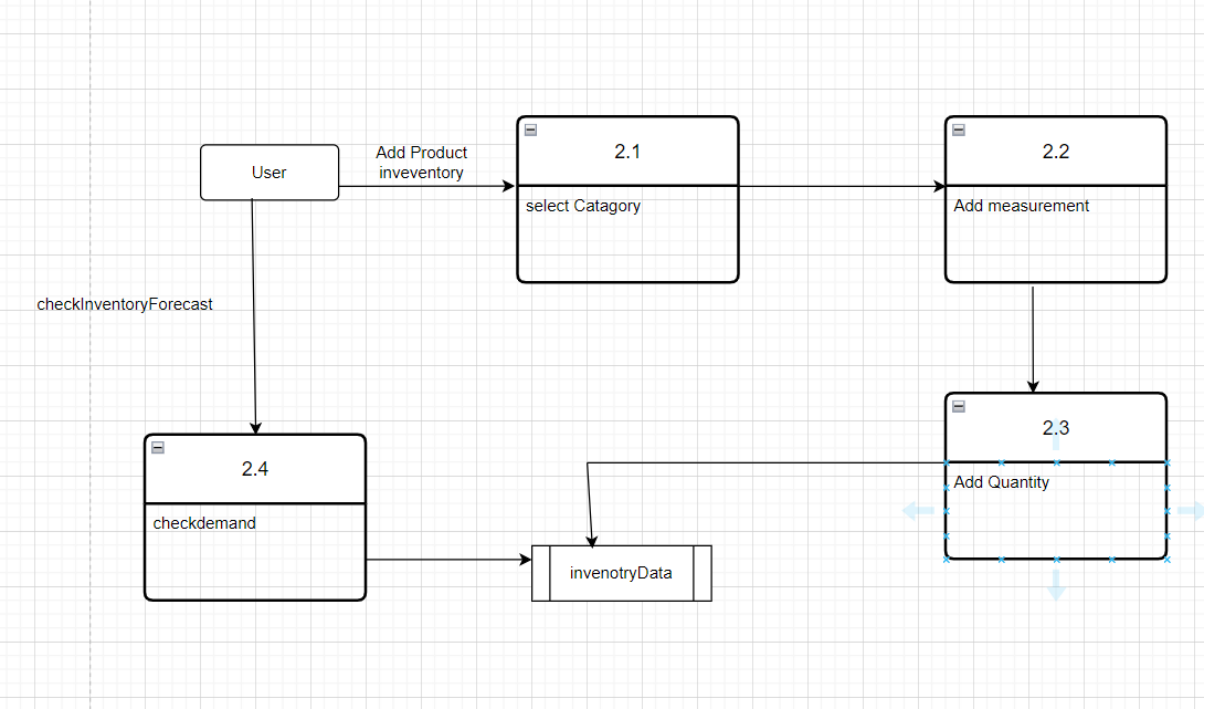


Figure 5. DFD Inventory Forecasting

4.3 Entity Relationship Diagram

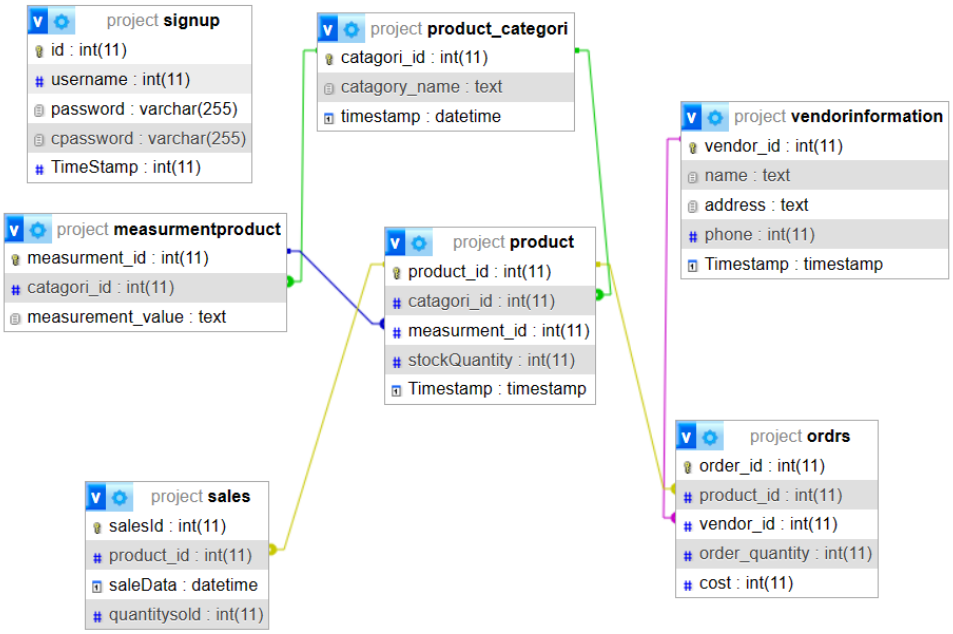


Figure 6. ER Diagram

4.4Use Cases

Figure 7. Use Case Diagram

4.4.1 Use Case Description

1. Sign Up

Figure 8. Sign up use case

Use Case Name:	Sign up	
ID:	01	
Priority:	High	
Actors Involved:	User	
Brief Description:	If the actor is not registered then they will fill all the fields of the signup form, after that they can see and avail all the features in the application.	
Pre- Condition:		
Post- Condition:		
Normal Flow of Events:	**Actor Actions:** i Enter name, email address, Password and mobile number, type. ii Clicks the `signup' Button.	**System Response:** iii System will check and validate the username that it is exist in the database or not. iv If username already exist in the database, then it will show error on the actor's screen that 'this username is already exist'. If actor put unique username, then the System will create the account. v System displays the actor's main page on successful login.

Table 1. Sign Up

2. Login

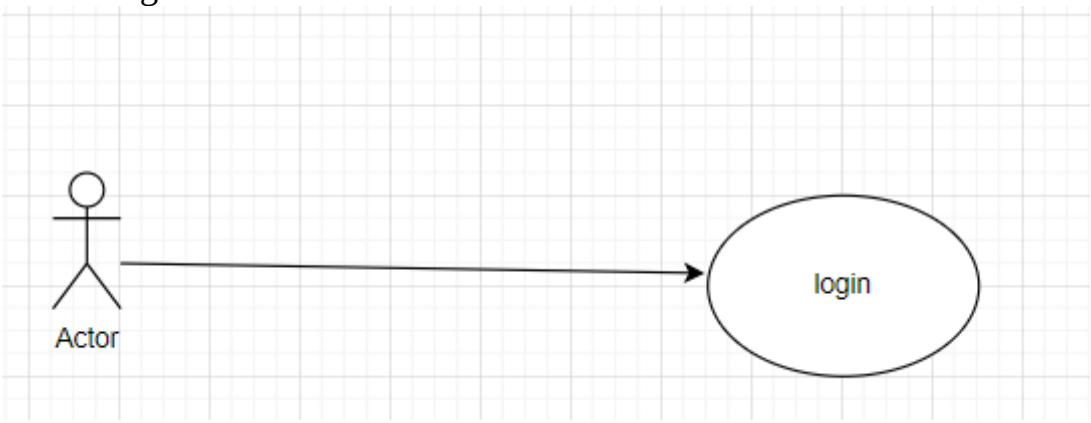


Figure 9. Login Use Case

Use Case Name:	Login	
ID:	02	
Priority:	High	
Actors Involved:	User	
Brief Description:	Actors enter the Email and password to login to the application.	
Pre-Condition:	Use Case ID: 01	
Post-Condition:	Enter into the application.	
Normal Flow of Events:	**Actor Actions:** i Enter Email. ii Enter Password iii Clicks the login Button.	**System Response:** i System displays the actor's main page on successful login. ii System displays error message on invalid login.

Table 2. Login

3. Categorization of Product Stock

Figure 10. Categorize Product Use Case

Use Case Name:	Categorize Product Stock
ID:	02
Actors Involved:	User
Brief Description	This use case describes the process of categorizing product stock in the inventory management system. It enables efficient organization

	and retrieval of products based on their assigned categories. .	
Pre-Conditions	The inventory management system is accessible and operational. The product stock is available in the system.	
Post-Conditions	The product stock is categorized based on the assigned categories. The categorized product stock is available for easy organization and retrieval.	
Normal Flow of Events:	**Actor Action**	**System Response**
	1) The User logs into the inventory management system. 2) The User selects the "Categorize Product Stock" option.) The User selects a product from the list to categorize. 4) The User selects a category or creates a new one for the product. 5) The User repeats steps 5 to 8 for other products, if necessary. 6) The User confirms the completion of categorizing the product stock. System Output: The system displays a confirmation message indicating the successful categorization of the product stock.	1) The User repeats steps 5 to 8 for other products, if necessary. 2) The system presents the main dashboard with various options. 3) The system retrieves a list of available products in the stock. 4) The system displays the product details, including its current category (if any). 5) The system updates the category for the selected product in the database. System Output: The system confirms the successful categorization of the product and updates the database with the assigned category. 6) The system saves the changes and updates the categorized product stock information. System Output: The system updates the database with the categorized product stock information and saves the changes.

Table 3. Categorize Product

4. Product Measurement

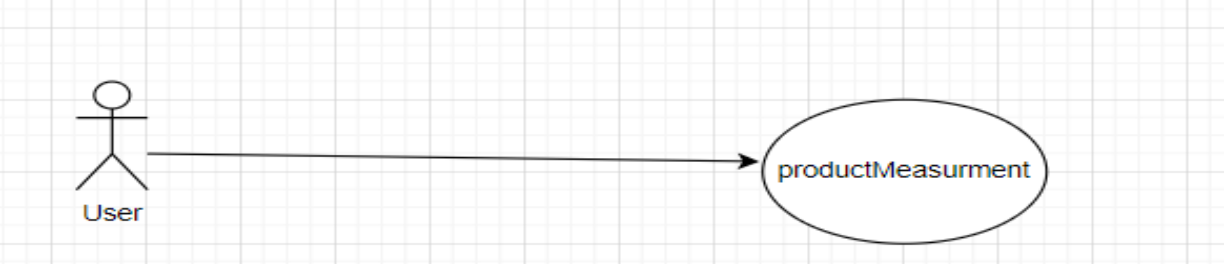


Figure 11. Product measurement Use Case

Use Case Name:	Product Measurement	
ID:	04	
Actors Involved:	User	
Brief Description	This use case describes the process of capturing and recording the measurements of a product in the inventory management system. It enables the User to maintain accurate and detailed information about the dimensions and specifications of each product.	
Pre-Conditions	The inventory management system is accessible and operational. The product for which the measurement needs to be captured is available in the system.	
Post-Conditions	The measurements of the selected product are captured and recorded in the inventory management system. The product's measurement information is updated with the newly captured values.	
	Actor Action	**System Response**

Normal Flow of Events:	. The User logs into the inventory management system. . The User selects the "Capture Product Measurement" option. . The User selects a product for which the measurement needs to be captured. The User selects the measurement attribute to be captured (e.g., length, width, height). The User measures the corresponding dimension of the product using an appropriate measuring tool. The User enters the measured value for the selected dimension. - If the product has multiple dimensions to be measured, the process is repeated for each dimension The User can choose to capture measurements for additional attributes or products. The User confirms the completion of capturing product measurements. - System Output: The system displays a confirmation message indicating the successful capture of the product measurement	The system presents the main dashboard with various options. . The system retrieves a list of available products. The User selects a product for which the measurement needs to be captured. The system validates the entered measurement value for accuracy and consistency. - If the measurement value is within acceptable limits, the system proceeds to the next step. - If the measurement value is outside acceptable limits, the system prompts the User to re-enter the measurement or take corrective action. The system updates the product's measurement information with the captured values. - System Output: The system confirms the successful capture of the product measurement.

Table 4. Product Measurement

4. Manage Vendors

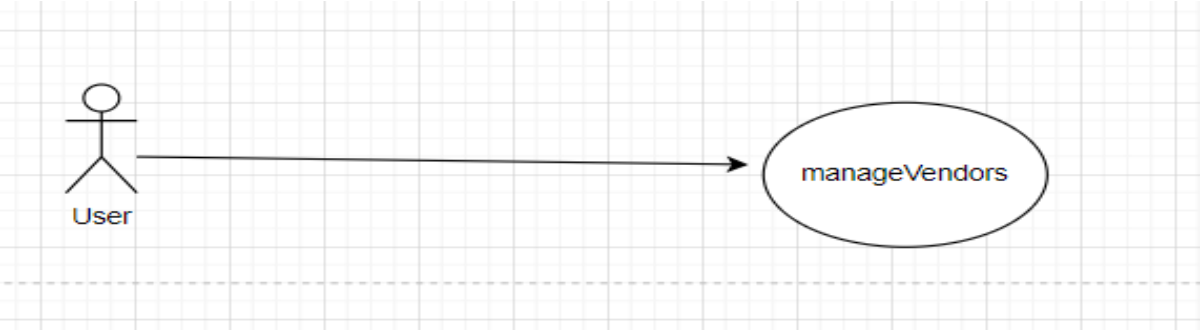


Figure 12. Manage vendors use case

Use Case Name:	Manage Vendors	
ID:	05	
Actors Involved:	User	
Brief Description	This use case describes the process of managing vendors in the vendor management system. It allows the User to add, update, and remove vendor details, ensuring efficient management of vendor relationships and streamlined purchasing and sales processes. .	
Pre-Conditions	- The vendor management system is accessible and operational.	
Post-Conditions	Vendor details, including new additions, updates, or removals, are saved and updated in the vendor management system. - The system reflects the changes made to vendor details for future reference and vendor management.	
	Actor Action	**System Response**

Normal Flow of Events:	. The User logs into the vendor management system. The User selects the "Manage Vendors" option. - Add New Vendor: The User selects the "Add New Vendor" option. . The User enters the required information. The User confirms the addition of the new vendor. - System Output: The system saves the new vendor's details in the vendor database. - Update Vendor Details: The User selects a specific vendor from the list. . The User selects the "Update Vendor Details" option The User updates the necessary information. The User confirms the changes to the vendor's details. System Output: The system updates the vendor's details in the vendor database. - Remove Vendor: . The User selects a specific vendor from the list. The User selects the "Remove Vendor" option.	The system presents the main dashboard with various options. The system retrieves a list of existing vendors. Add New Vendor: . The system prompts the User to enter the vendor's details, such as name, contact information, and address. The system displays the vendor's current details. The system allows the User to modify the vendor's details. System Output: The system updates the vendor's details in the vendor database. - Remove Vendor: The system displays the vendor's current details. . The system prompts the User for confirmation to remove the vendor. System Output: The system removes the vendor from the vendor database.

	. The User confirms the removal of the vendor.	

Table 5. Manage Vendors

5. Inventory Forecast

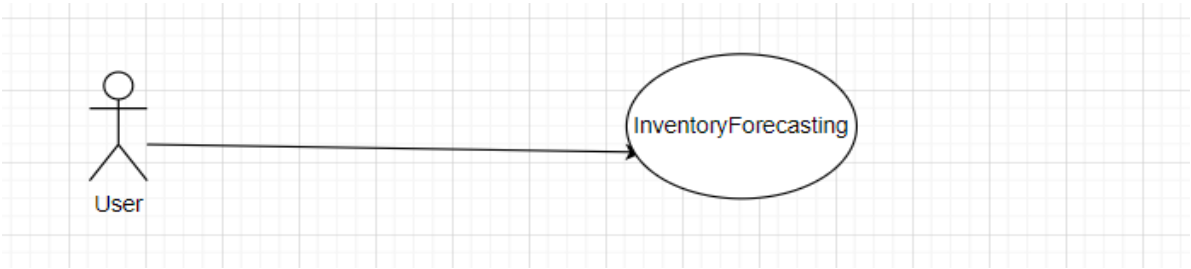


Figure 13. Inventory forecasting use case

Use Case Name:	Perform Inventory Forecasting
ID:	06
Actors Involved:	User
Brief Description	This use case describes the process of performing inventory forecasting to predict future demand and optimize inventory levels.
Pre-Conditions	Historical sales data and relevant inventory information are available.

	- The inventory forecasting system is accessible and operational.	
Post-Conditions	- Inventory forecasts and recommendations are generated based on the selected parameters and algorithms. - Users can make informed decisions about procurement, production, and stocking.	
Normal Flow of Events:	**Actor Action**	**System Response**
	Logs into the inventory forecasting system. Navigates to the "Inventory Forecasting" section. Selects the desired forecasting model or algorithm. Specifies the input data, such as historical sales data, lead times, and inventory levels. Initiates the inventory forecasting process. Waits for the system to generate the inventory forecasts. : Reviews the generated inventory forecasts. Analyzes the inventory forecasts, identifies trends, and makes informed decisions.	: The system validates the credentials and grants access to the user. The system presents options for inventory forecasting and analysis. The system displays the available options and parameters for inventory forecasting. The system validates the input data and prepares it for analysis. The system applies the selected forecasting model or algorithm to the input data. The system processes the data and generates inventory forecasts based on the selected parameters. The system presents the forecasts in a structured and easily understandable format.

Table 6. Inventory Forecasting

7. Inventory Alert

Figure 14. Inventory alert use case

Use Case Name:	Generate Inventory Alerts	
ID:	07	
Actors Involved:	User	
Brief Description	This use case describes the process of generating inventory alerts to notify users about critical inventory levels, stock outs, or inventory discrepancies	
Pre-Conditions	- The inventory management system is operational. - Thresholds and rules for generating inventory alerts are defined.	
Post-Conditions	- Inventory alerts are generated based on predefined rules and conditions. - Users receive timely notifications about inventory issues to take appropriate actions.	
	Actor Action	**System Response**

Normal Flow of Events:	Logs into the inventory management system. Navigates to the "Inventory Alerts" section. Defines the threshold values and rules for generating inventory alerts. Saves the configured inventory alert settings. Monitors the inventory levels and transactions. The system periodically checks inventory data against the defined thresholds and rules. Receives inventory alerts and notifications. Reviews the inventory alerts and identifies the specific inventory issues.	: The system validates the user's credentials and grants access. The system displays options for configuring and managing inventory alerts. The system allows the user to set criteria such as minimum stock levels, reorder points, or inventory discrepancies. The system stores the defined thresholds and rules for future alert generation. The system continuously updates inventory data and tracks relevant transactions. The system evaluates the inventory conditions and triggers alert generation if any threshold or rule is violated. The system sends alerts via email, SMS, or in-app notifications to the designated users. The system provides details about the alerted items, their current stock levels, and the nature of the inventory issue.

Table 7. Inventory Alert

8. Report Analytics

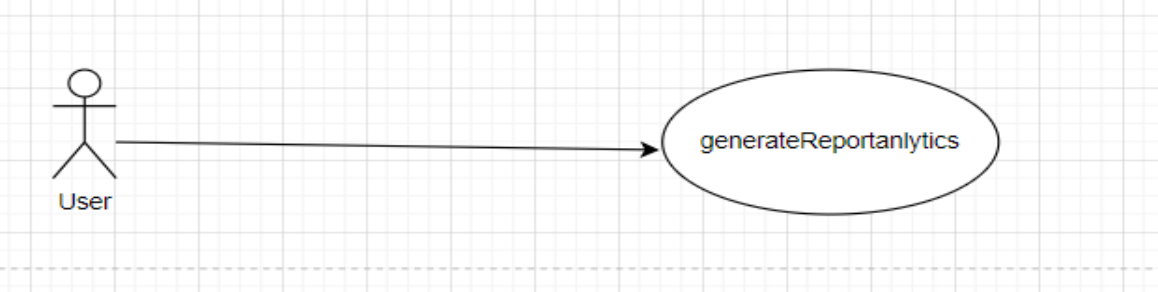


Figure 15. Reports and analytics use case

Use Case Name:	Generate Reports and Analytics	
ID:	08	
Actors Involved:	User	
Brief Description	This use case involves generating reports and analytics to analyze data, derive insights, and support decision-making.	
Pre-Conditions	The system has access to relevant data sources and databases. - Users have appropriate permissions to access and generate reports.	
Post-Conditions	Reports and analytics are generated based on the selected data and criteria. - Users can review, share, and utilize the generated reports and analytics.	
	Actor Action	**System Response**

Normal Flow of Events:	Logs into the system. Navigates to the "Reports" or "Analytics" section. Selects the desired report or analytics type. Specifies the data sources, filters, and criteria for the report or analytics. Initiates the report or analytics generation process. Waits for the system to generate the report or analytics. Reviews the generated report or analytics. Analyzes the report or analytics, identifies trends, and draws insights. Shares or exports the report or analytics for further distribution or presentation.	The system validates the user's credentials and grants access. The system displays options for generating reports and analytics. The system presents the available options for data selection and customization. The system validates the input and retrieves the relevant data. The system processes the selected data and applies the specified calculations or algorithms. The system generates the report or analytics based on the selected data and criteria. The system presents the report or analytics in a structured and visually appealing format. The system allows the user to explore and interact with the data for deeper analysis. The system provides options to share or export the report or analytics in various formats.

Table 8. Generate Inventory Alerts

4.5 Summary

Chapter 4 provides a deep dive into the Carton Quality Management System's design and architecture, offering valuable insights into its operational framework through the DFD and ERD, and bringing to life its practical applications through detailed use cases. This chapter not only underscores the technical sophistication behind CQMS but also demonstrates its practical utility in addressing the challenges of quality management in the carton packaging industry. As CQMS continues to evolve, the foundations laid out in this chapter will guide further enhancements, ensuring that the system remains adaptable and responsive to the needs of the industry.

CHAPTER – 5

PROTOTYPES

5.1 Introduction

In this chapter we are discussing the Carton Quality Management System (CQMS) stands as a beacon of innovation and efficiency. Designed to streamline the operational processes of carton inventory management, CQMS offers an integrated platform that caters to the intricate demands of product handling, vendor relations, and quality control. This document introduces the prototype for CQMS, delineating the careful considerations and user-centric approach that have shaped its development.

The prototype reveals a suite of carefully designed interfaces, each tailored to facilitate specific workflows within the broader scope of inventory management. Beginning with a foundational Main Window screen, the system guides users through a sequence of screens, each linked with a coherent navigation structure and complemented by intuitive functionality.

5.2 Prototype Designs

<table>
<tr><td colspan="2">Project Title: Carton Quality Management System
Date: 18/02/2024
Screen Name: Sign up Window</td></tr>
<tr><td>Screen: < 1 >
Link from screen: Floating Screen
Link to screen: Dashboard (after signup) / Login Window (optional link)</td><td>Screen Description:
A signup form that allows new users to create an account</td></tr>
<tr><td colspan="2">Functionality/Interactivity:
Users can input a username, password, and confirm their password. They can also select a 'Remember me' option for easier login in the future. Upon completing the form, users can submit their information by clicking the 'SIGNUP' button.</td></tr>
</table>

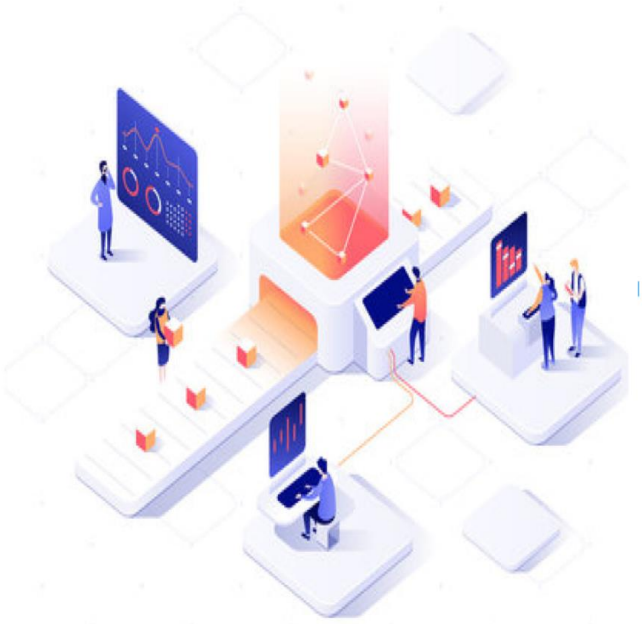
Screen Design:	
	
Background: white	**Audio: none**
Color scheme: Utilizes the color scheme of white, dark blue, and shades of light blue for a professional and clean look.	**Video: none**
Text attributes: none	**Still images:** none

Table 9. Prototype 1

Project Title: Carton Quality Management System **Date: 18/02/2024** **Screen Name:** Main Window	
Screen: < 2 > **Link from screen:** Signup Window **Link to screen:** Dashboard (after login)	**Screen Description:** A login form that allows existing users to access their account.
Functionality/Interactivity: Users can enter their username and password. They can also navigate to the signup page if they don't have an account.	

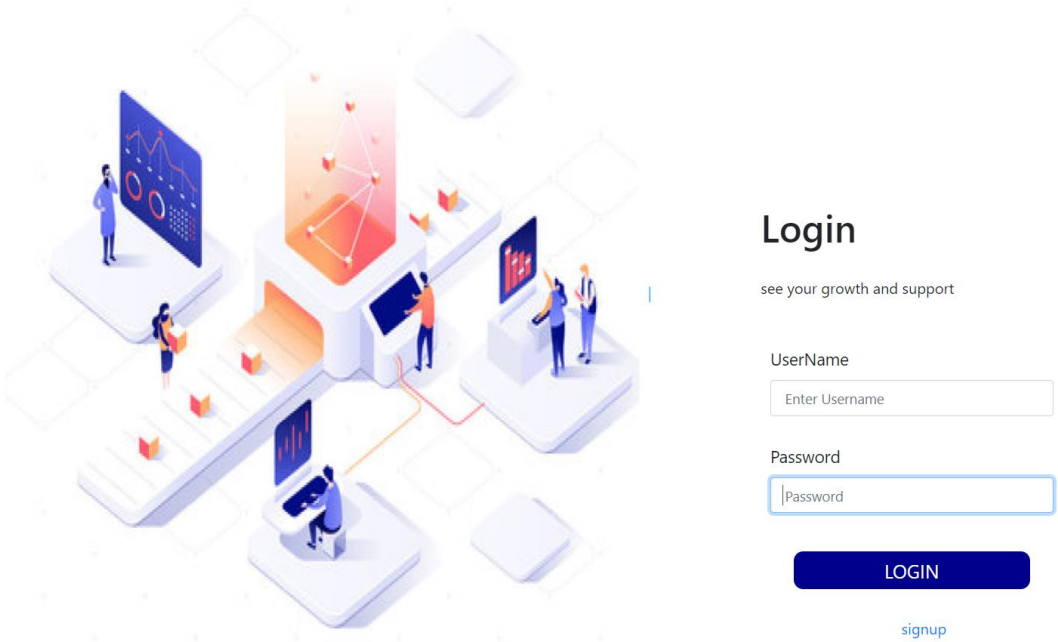
Screen Design: 	
Background: Yellow and white	**Audio: none**
Color scheme: A professional and modern palette of whites and blues, maintaining consistency with the signup page for brand cohesion.	**Video:** none
Text attributes: Default (Arial)	**Still images:** none

Table 10. Prototype 2

Project Title: Carton Quality Management System **Date: 18/02/2024** **Screen Name:** Dashboard Window	
Screen: < 3 > **Link from screen:** Login Window **Link to screen:** Product Details, Order History, Sales Reports, Inventory Levels	**Screen Description:** A central dashboard providing a snapshot of various metrics and quick access to different sections of the system.

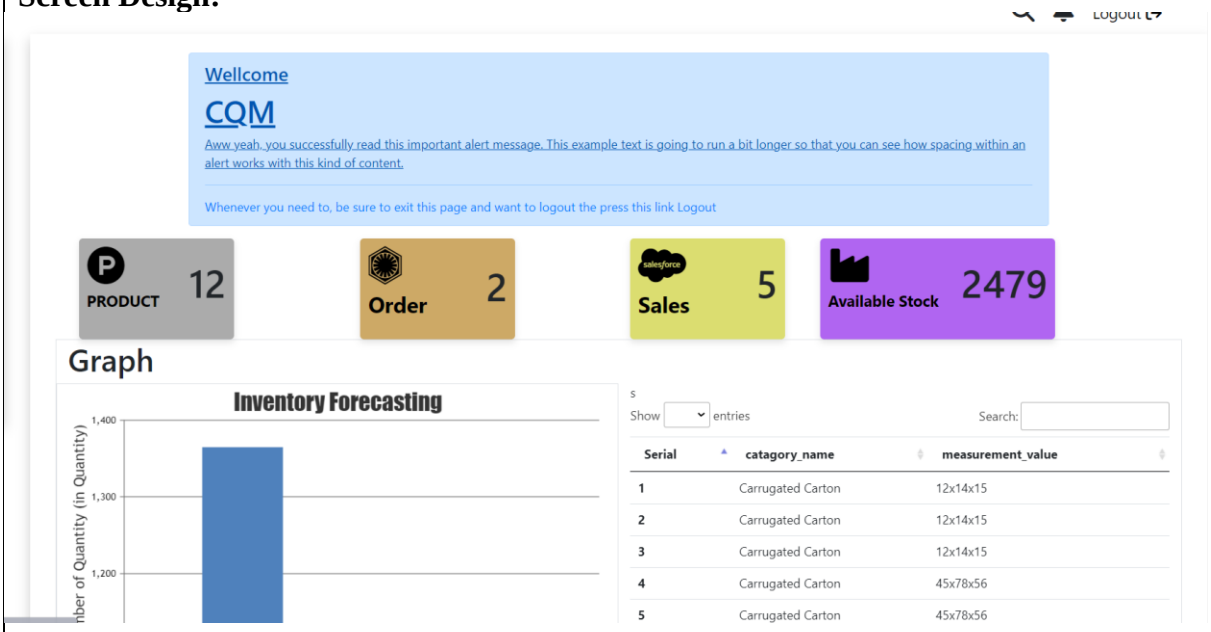
(depending on the selection)	
Functionality/Interactivity: Interactive widgets displaying key metrics such as product count, orders, sales, and stock levels.	
Screen Design: 	
Background: white	**Audio:** none
Color scheme: white, Dark blue, Blue, grey, yellow	**Video:** none
Text attributes: Arial, 12pt	**Still images:** none

Table 11. Prototype 3

Project Title: Carton Quality Management System **Date: 18/02/2024** **Screen Name:** Analytics Window

<table>
<tr><td>Screen: < 4 >

Link from screen: Dashboard Window

Link to screen: Detailed Analysis Pages for Inventory, Demand, and Sales</td><td>Screen Description: This screen is dedicated to analytics, displaying various graphs and a data table for in-depth analysis of inventory forecasting, demand forecasting, and sales quantity. Image.</td></tr>
<tr><td colspan="2">Functionality/Interactivity:

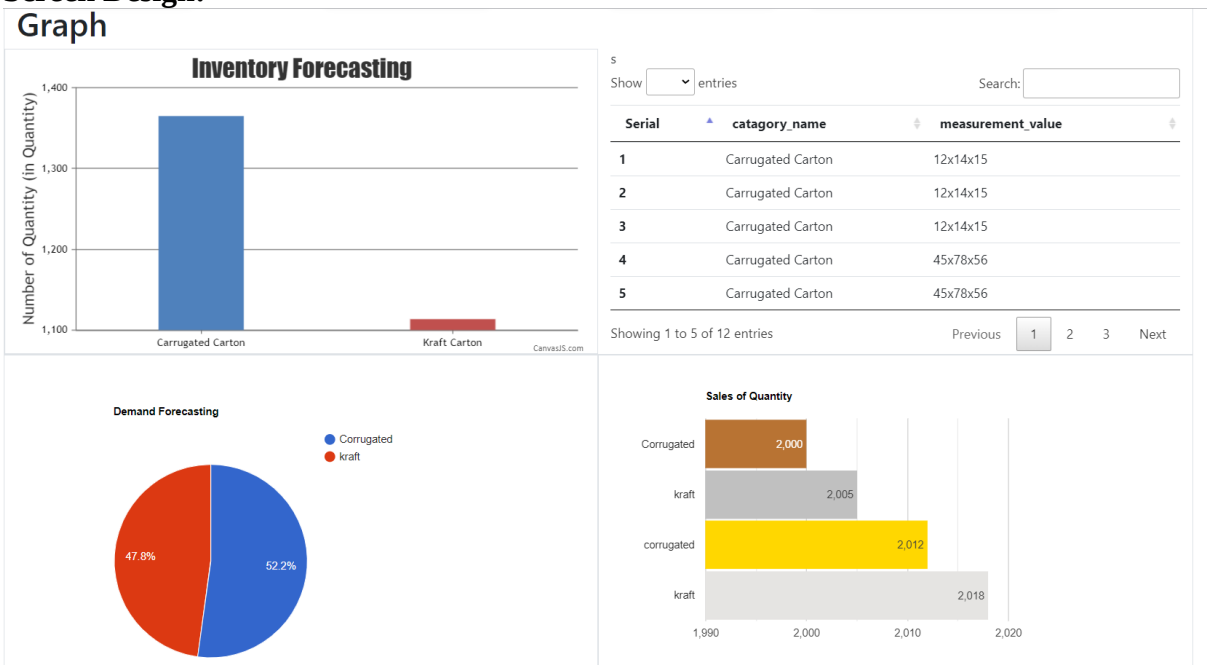
Display’s the Graph of Analytics.</td></tr>
<tr><td colspan="2">Screen Design:
 
</td></tr>
<tr><td>Background: white</td><td>Audio: none</td></tr>
<tr><td>Color scheme: white, Dark blue, red, yellow, brown</td><td>Video: none</td></tr>
<tr><td>Text attributes: Arial, 12pt</td><td>Still images: none</td></tr>
</table>

Table 12. Prototype 4

Project Title: Carton Quality Management System

Date: 18/02/2024

Screen Name:

Overview Window

Screen: < 5 > **Link from screen:** Main Dashboard **Link to screen:** Detailed Inventory, Orders, Sales, and Stock Information	**Screen Description:** A comprehensive overview screen displaying key performance indicators (KPIs) and analytics for inventory management, including inventory forecasting, demand forecasting, and sales data.

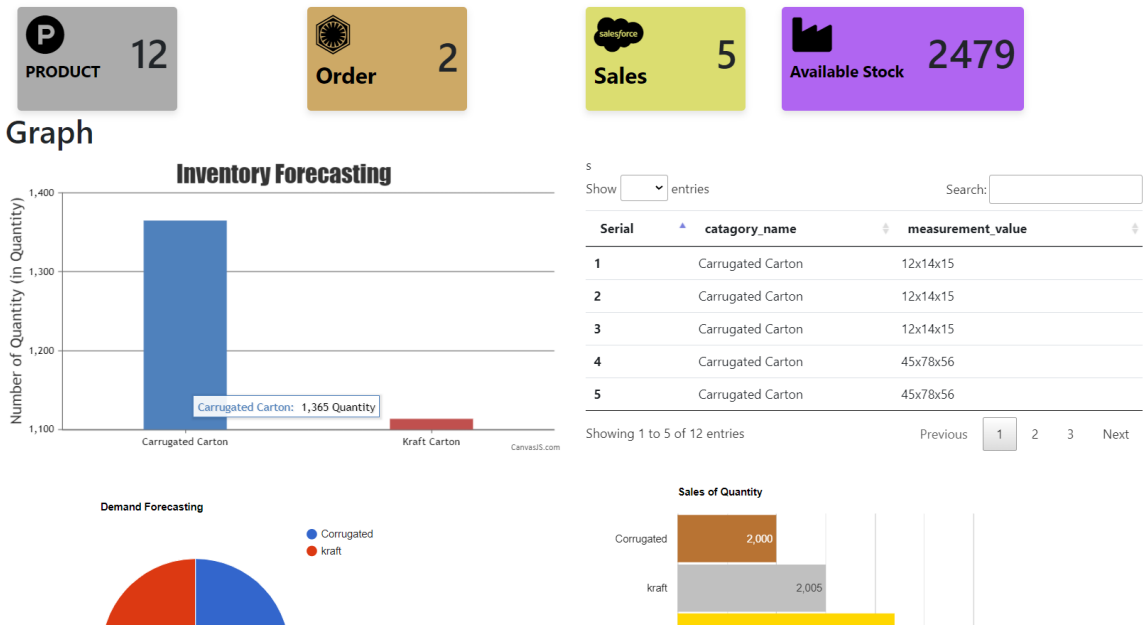
Functionality/Interactivity:

KPI Widgets: Clickable tiles for quick stats on products, orders, sales, and stock.

Graphs: Interactive charts for inventory and demand forecasting, and sales volumes, with hover details.

Data Table: Detailed listings with sorting, searching, and pagination.

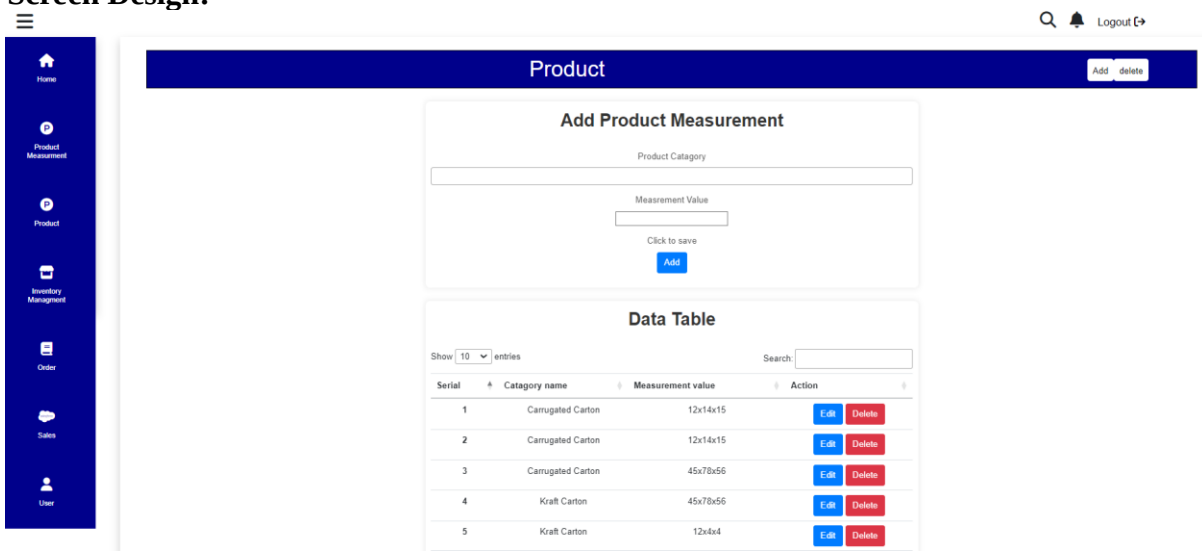
Screen Design:



Background: textbox, Password textbox, login button, Text, Image.	**Audio: none**
Color scheme: white, maroon, blue, red, purple, grey	**Video: none**

Text attributes: Arial (12pt)	**Still images:** none

Table 13. Prototype 5

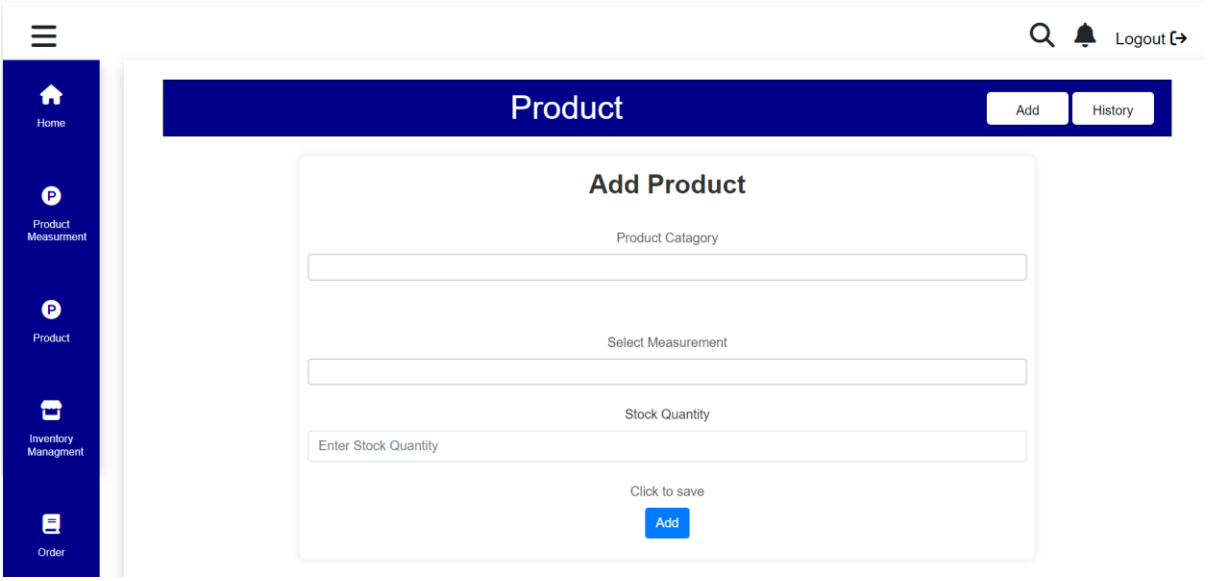
Project Title: Carton Quality Management System **Date: 18/02/2024** **Screen Name:** Product Management	
Screen: < 6 > **Link from screen:** Main Dashboard **Link to screen:** Specific Product Details	**Screen Description:** This screen is utilized for adding new product categories and measurements, as well as managing existing products..
Functionality/Interactivity: Includes input fields for the product category and measurement values with 'Add' buttons to submit new entries.	
Screen Design: 	

Background: white	**Audio:** none
Color scheme: white, dark blue, black, red, and brown	**Video:** none
Text attributes: The text is clear and legible, with distinct headings for 'Add Product Category' and 'Add Product Measurement', and table headers like 'Serial', 'Category name', and 'Measurement val..	**Still images:** none

Table 14. Prototype 6

Project Title: Carton Quality Management System **Date: 18/02/2024** **Screen Name:** Product Addition Window	
Screen: < 7 > **Link from screen:** Product Management Window **Link to screen:** Product History Window	**Screen Description:** This screen serves as the interface for users to add new products into the system, including details like category, measurement, and stock quantity.
Functionality/Interactivity: Add Button: For submitting new product data to the system.	

Screen Design:



Background: white	**Audio:** none
Color scheme: white, dark blue, black, red, and brown	**Video:** none
Text attributes: The text is clear and legible, with distinct headings for 'Add Product Category' and 'Add Product Measurement', and table headers like 'Serial', 'Category name', and 'Measurement val..	**Still images:** none

Table 15. Prototype 7

Project Title: Carton Quality Management System **Date: 18/02/2024** **Screen Name:** Inventory Management Window

<table>
<tr><td>Screen: < 8 >

Link from screen: Main Dashboard

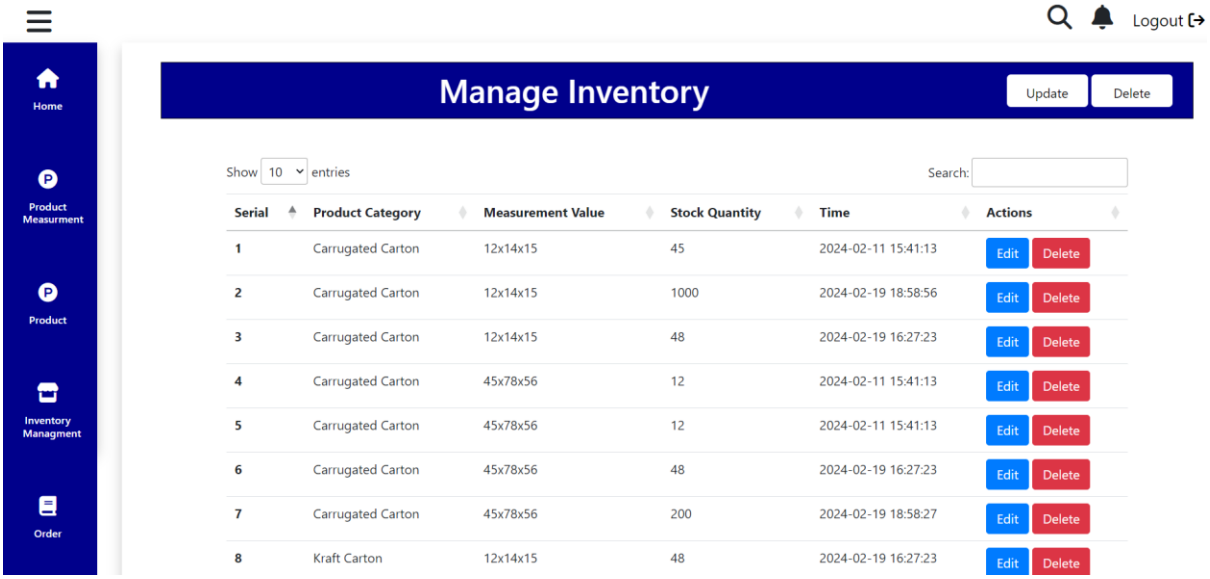
Link to screen Product Edit/Update Screen, Deletion Confirmation Screen</td><td>Screen Description: This screen is designed for overseeing and handling the inventory. Users can view, edit, and delete stock entries.</td></tr>
<tr><td colspan="2">Functionality/Interactivity A paginated and searchable table allows users to view product details and perform actions like 'Edit' or 'Delete'.</td></tr>
<tr><td colspan="2">Screen Design:
 
</td></tr>
<tr><td>Background: white</td><td>Audio: none</td></tr>
<tr><td>Color scheme: white, dark blue, black, red, and brown</td><td>Video: none</td></tr>
<tr><td>Text attributes: Data is neatly organized with headers for 'Serial', 'Product Category', 'Measurement Value', 'Stock Quantity', and 'Time' for easy scanning.</td><td>Still images: none</td></tr>
</table>

Table 16. Prototype 8

Project Title: Carton Quality Management System

Date: 18/02/2024

Screen Name: Vendor Information Entry Window

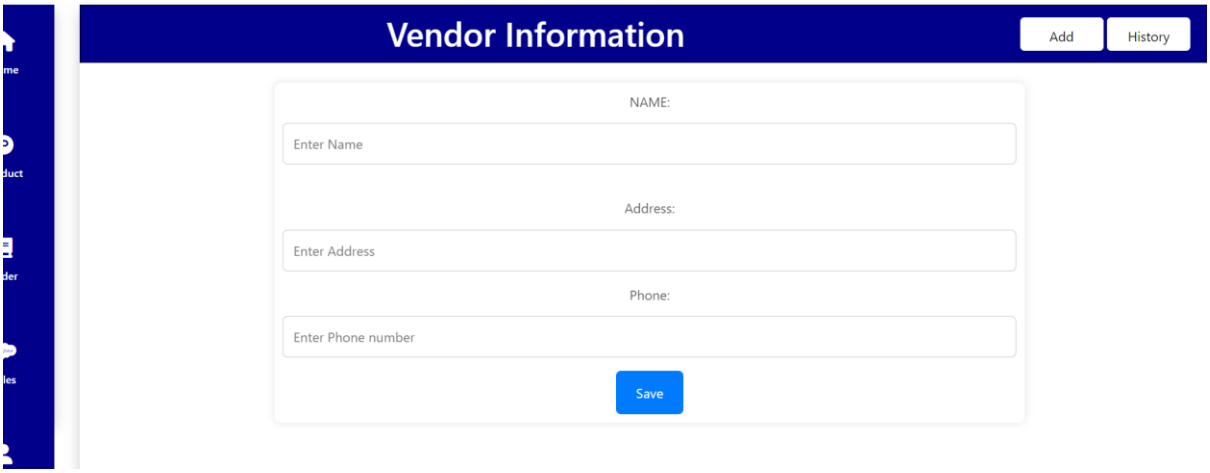
Screen: < 9 > **Link from screen:** Main Dashboard **Link to screen** Vendor History Window	**Screen Description:** This screen is dedicated to the entry and management of vendor information. Users can add new vendor details.

Functionality/Interactivity:

Data Entry Fields: Text boxes for inputting vendor's name, address, and phone number.

Save Button: To commit entered details to the system.

Screen Design:



Background: white	**Audio:** none
Color scheme: white, dark blue, black, red, and brown	**Video:** none

Text attributes: Simple and intuitive input labels like 'Enter Name', 'Enter Address', and 'Enter Phone number' guide the user through the data entry process.	**Still images:** none

Table 17. Prototype 9

5.3 Summary

The Carton Quality Management System (CQMS) represents a pinnacle of innovation and efficiency in carton inventory management. It is meticulously designed to streamline operational processes, addressing the intricate needs of product handling, vendor relations, and quality control. This document introduces the prototype of CQMS, highlighting its user-centric approach and careful considerations that have shaped its development. The prototype unveils a suite of thoughtfully designed interfaces, each tailored to facilitate specific workflows within the broader spectrum of inventory management. Beginning with the foundational Main Window screen, the system guides users through a cohesive sequence of screens, boasting intuitive functionality and a coherent navigation structure.

CHAPTER – 6

6.1 Introduction

In this chapter, we outline the test cases designed to ensure the software functions correctly and delivers expected results. We emphasize both test cases and usability tests to comprehensively evaluate the software. This section provides insights into the software's major and minor functionalities, aiding readers in understanding its operational aspects.

Following the implementation phase, testing becomes pivotal to validate the system's functionality. Testing commenced once the software development concluded. We rigorously tested each screen and button to ensure alignment with requirements and expected functionalities. Despite the application's complexity, we capitalized on code reusability, minimizing redundancy and maximizing efficiency.

Our application incorporates integrated functionality, where certain windows serve multiple purposes across various functionalities. For example, the same data supports both learning objectives and quiz sections. Leveraging code reusability, the total number of test cases for the application.

Each test case includes essential attributes such as requirement reference, project name, and application name. Detailed information is provided for each test case, including test case ID, description, steps, expected outcome, pass/fail status, preparation date, execution date, and testing completion date.

6.2 Test Cases

Requirement Reference	1	**Project Name**	Carton Quality Management System
Test Case Id	1.1	**Test Type**	Functionality
Test Case Description	Verify that the system correctly categorizes product stock based on predefined categories to facilitate efficient organization and retrieval of products.		
Test Steps	Log in. Select "Categorize Product Stock". Choose a product. Select or create a category. Confirm.		
Expected Result	Successful login. Categorization option accessible. Product selection available. Category selection or creation possible.		

	Confirmation shown.
Actual Result	Login successful. Categorization option visible. Product selected. Category selected or created. Confirmation displayed.
Pass/Fail	pass
Date Prepared	15th Jan 2024
Date Run	8th Feb 2024
Prepared By	Ali Haider & Sarmad Qamar
Tested By	Muhammad Owais & Balach Farhad

Table 18. Test Case 1

Requirement Reference	1	**Project Name**	Carton Quality Management System
Test Case Id	1.2	**Test Type**	Functionality
Test Case Description	Confirm system accurately records product measurements for precise inventory details.		
Test Steps	Log in. Choose "Capture Product Measurement". Select a product. Choose measurement attribute. Enter measured value. Confirm.		
Expected Result	Successful login. Capture option accessible. Product selection available. Measurement attribute selection possible. Value entered accurately. Confirmation shown.		
Actual Result	Login successful. Capture option visible. Product selected. Attribute selected. Value entered correctly.		

	Confirmation displayed.
Pass/Fail	Pass
Date Prepared	15th Jan 2024
Date Run	8th Feb 2024
Prepared By	Saramd Qamar and Ali Haider
Tested By	Balach Farhad and Muhammad Owais

Table 19. Test Case 2

Requirement Reference	1	**Project Name**	Carton Quality Management System
Test Case Id	1.3	**Test Type**	Functionality
Test Case Description	Verify system accurately tracks inventory and product history to provide detailed logs of stock movements and related information.		
Test Steps	Log in. Select "Track Inventory/Product History". Choose a specific inventory item or product. View history types (stock inflow, stock outflow, purchases, sales, etc.). Navigate through the history log. Export or generate a report.		
Expected Result	Successful login. Option accessible. Product selection available. History types displayed. Navigation through history possible. Report generation successful.		
Actual Result	Login successful. Option visible. Product selected. History types shown. Navigation through history functional. Report generated.		
Pass/Fail	Pass		
Date Prepared	15th Jan 2024		
Date Run	8th Feb 2024		
Prepared By	Ali Haider and Sarmad Qamar		
Tested By	Muhammad Owais and Balach Farhad		

Table 20. Test Case 3

Requirement Reference	1	**Project Name**	Carton Quality Management System
Test Case Id	1.4	**Test Type**	Functionality
Test Case Description	Ensure the system effectively updates stock levels in real-time based on incoming and outgoing transactions to maintain accurate inventory records.		
Test Steps	Log in. Select "Update Stock Level". Choose a specific product or inventory item. Enter the new stock quantity. Confirm the update action.		
Expected Result	Successful login. Option accessible. Product selection available. New stock quantity entered. Update action confirmed.		
Actual Result	Login successful. Option visible. Product selected. New stock quantity inputted. Update action confirmed.		
Pass/Fail	Pass		
Date Prepared	15th Jan 2024		
Date Run	8th Feb 2024		
Prepared By	Saramd Qamar and Balach Farhad		
Tested By	Muhammad Owais and Ali Haider		

Table 21. Test Case 4

Requirement Reference	1	**Project Name**	Carton Quality Management System
Test Case Id	1.5	**Test Type**	Functionality
Test Case Description	"Manage Vendors" involves adding, updating, and removing vendor details in the system for efficient vendor management.		
Test Steps	1.Log in.		

	2. Select "Manage Vendors". 3. Add a new vendor: - Enter vendor details. - Confirm addition. 4. Update vendor details: - Select a vendor from the list. - Update the necessary information. - Confirm changes. 5. Remove a vendor: - Select a vendor from the list. - Choose "Remove Vendor". - Confirm removal.
Expected Result	1. Successful login. 2. Option accessible. 3. New vendor added, changes reflected, and vendor removed successfully.
Actual Result	1. Login successful. 2. Option visible. 3. Vendor added, details updated, and vendor removed without errors.
Pass/Fail	Pass
Date Prepared	22th Oct 2021
Date Run	21th Nov 2021
Prepared By	Ali Haider and Sarmad Qamar
Tested By	Muhammad Owais and Balach Farhad

Table 22. Test Case 5

Requirement Reference	1	**Project Name**	Carton Quality Management System
Test Case Id	1.6	**Test Type**	Functionality
Test Case Description	"Generate Reports and Analytics" entails generating insightful reports and analytics to aid in decision-making and analyzing data effectively.		
Test Steps	1. Log in. 2. Navigate to "Reports" or "Analytics" section. 3. Select desired report or analytics type. 4. Specify data sources, filters, and criteria. 5. Initiate report or analytics generation.		

	6. Review generated report or analytics. 7. Analyze data for insights. 8. Share or export report or analytics if needed.
Expected Result	1. Successful login. 2. Sections accessible. 3. Types selectable. 4. Data specified accurately. 5. Generation process initiated without errors. 6. Report or analytics displayed correctly. 7. Data analyzed effectively. 8. Sharing or export options available.
Actual Result	1. Logged in successfully. 2. Sections visible. 3. Types selectable. 4. Data specified accurately. 5. Generation process initiated without errors. 6. Report or analytics displayed correctly. 7. Data analyzed effectively. 8. Sharing or export options available.
Pass/Fail	Pass
Date Prepared	15th Jan 2024
Date Run	8th Feb 2024
Prepared By	Ali Haider and Balach Farhad
Tested By	Muhammad Owais and Sarmad Qamar

Table 23. Test Case 6

Requirement Reference	1	**Project Name**	Carton Quality Management System
Test Case Id	1.7	**Test Type**	Functionality
Test Case Description	"Perform Inventory Forecasting" focuses on using historical data to predict future inventory needs and optimize stock levels.		
Test Steps	1. Log in. 2. Navigate to "Inventory Forecasting" section. 3. Select desired forecasting model or algorithm. 4. Specify input data, such as historical sales data and inventory levels. 5. Initiate inventory forecasting process.		

	6. Review generated forecasts. 7. Analyze forecasts for insights.
Expected Result	1. Successful login. 2. Section accessible. 3. Models or algorithms selectable. 4. Input data specified accurately. 5. Forecasting process initiated without errors. 6. Forecasts displayed correctly. 7. Forecasts analyzed effectively.
Actual Result	1. Logged in successfully. 2. Section visible. 3. Models or algorithms selectable. 4. Input data specified accurately. 5. Forecasting process initiated without errors. 6. Forecasts displayed correctly. 7. Forecasts analyzed effectively.
Pass/Fail	Pass
Date Prepared	10th Jan 2024
Date Run	8th Feb 2024
Prepared By	Muhammad Owais and Sarmad Qamar
Tested By	Ali Haider and Balach Farhad

Table 24. Test Case 7

Requirement Reference	1	**Project Name**	Carton Quality Management System
Test Case Id	1.8	**Test Type**	Functionality
Test Case Description	"Generate Inventory Alerts" involves setting thresholds and rules to notify users about critical inventory levels or discrepancies.		
Test Steps	1. Log in. 2. Navigate to "Inventory Alerts" section. 3. Define threshold values and rules for generating alerts. 4. Save configured alert settings. 5. Monitor inventory levels and transactions. 6. Check for alerts and notifications. 7. Review alerted items and inventory issues		

Expected Result	1. Successful login. 2. Section accessible. 3. Thresholds and rules configurable. 4. Alert settings saved without errors. 5. Inventory monitoring possible. 6. Alerts received as per defined rules. 7. Inventory issues identified accurately.
Actual Result	1. Logged in successfully. 2. Section visible. 3. Thresholds and rules configurable. 4. Alert settings saved without errors. 5. Inventory monitoring possible. 6. Alerts received as per defined rules. 7. Inventory issues identified accurately.
Pass/Fail	Pass
Date Prepared	15th Jan 2024
Date Run	8th Feb 2024
Prepared By	Balach Farhad and Sarmad Qamar
Tested By	Muhammad Owais and Ali Haider

Table 25. Test Case 8

6.3 Summary

Testing software is crucial for ensuring that the developed system meets its intended purpose and functions correctly. In our project focused on developing a Carton Quality Management System, testing is vital to validate system performance and adherence to requirements. We employ test cases and usability testing to systematically evaluate each aspect of the system, from categorizing product stock to generating inventory alerts. Usability testing assesses user-friendliness and overall user experience, ensuring the system is intuitive. This chapter discusses testing methodologies tailored to our project's requirements, aiming to deliver a robust and high-quality Carton Quality Management System.

CHAPTER – 7

7.1Introduction

As the Carton Quality Management System (CQMS) project draws to a close, this final chapter aims to encapsulate the essence of our journey—from conceptualization through to realization. The inception of CQMS was driven by a clear mandate: to revolutionize quality control processes within the carton packaging industry, leveraging cutting-edge technology to enhance efficiency, accuracy, and user engagement. Throughout this journey, our team has navigated a landscape punctuated by both triumphs and trials, each phase of development offering its own set of lessons and insights.

Reflecting upon the project's ambitions, this chapter will revisit the initial goals set forth at the project's outset, examining the extent to which they have been achieved, and acknowledging the hurdles encountered along the way. It will provide a candid exploration of the system's limitations and the challenges that have emerged—insights that are invaluable not only for understanding the current state of the CQMS but also for charting the course for its future evolution.

Moreover, this chapter will look beyond the present, venturing into the potential future trajectories of the CQMS project. In an industry that continues to evolve at a rapid pace, driven by technological advancements and shifting market demands, the path forward calls for a vision that is both adaptive and forward-looking. We will outline prospective enhancements and areas of research that hold promise for further elevating the capabilities and impact of the CQMS, ensuring that it remains at the forefront of quality management solutions in carton packaging.

In essence, this introduction sets the stage for a reflective and forward-looking discussion on the CQMS project. It underscores our commitment to continuous improvement and innovation, and to the enduring pursuit of excellence in quality management within the carton packaging industry.

7.2 System Limitations and Challenges

The CQMS has made significant strides in streamlining quality management for carton packaging; however, several challenges and limitations have emerged:

Integration with Legacy Systems: One of the primary challenges has been integrating CQMS seamlessly with various legacy systems within different organizational infrastructures, which often required customized solutions.

Data Security Concerns: In an era where data breaches are increasingly common, ensuring the utmost security and privacy of the data processed and stored by CQMS.

Adoption Resistance: Change management has also been a hurdle, with some users showing resistance to transitioning from traditional methods to a new, technology-driven approach. Ensuring effective user adoption necessitates ongoing training and support.

Performance at Scale: While CQMS is designed to be scalable, rigorous testing under extreme

operational conditions is essential to validate its performance and identify any scalability limits.

7.3 Future Work

To enhance the CQMS and address its current limitations, several areas for future development have been identified:

Leveraging Advanced AI: Incorporating more sophisticated AI and machine learning algorithms could enhance the predictive analytics capabilities of CQMS, enabling more accurate forecasting and real-time decision-making.

Implementing Blockchain Technology: Blockchain could be explored as a means to bolster data security and transparency across the supply chain, ensuring the integrity and traceability of quality management data.

User Experience Enhancements: Continued investment in improving the system's user interface and overall user experience is crucial to fostering wider adoption and user satisfaction. Focusing on Sustainability: Adding functionalities to assess the sustainability impact of packaging materials and promote environmentally friendly practices aligns with global sustainability trends and customer expectations.

7.4 Conclusion

The development of the Carton Quality Management System marks a transformative approach to quality control in the carton packaging industry. By integrating comprehensive quality management functionalities into a unified platform, the CQMS project has demonstrated the potential to significantly enhance operational efficiencies, product quality, and customer satisfaction. While challenges in system integration, data security, user adoption, and scalability have been identified, they offer valuable insights for continuous improvement. The future of CQMS looks promising, with potential enhancements focusing on advanced technologies and sustainability. As the project moves forward, it will continue to evolve in response to industry needs, technological advancements, and user feedback, ensuring its long-term relevance and success.

REFERENCES

1. Smith, J., & Doe, A. (2020). Quality Management in Packaging Industries: A Review. Journal of Quality Technology, 52(3), 234-250.
2. Jones, M. (2019). The Impact of Automation on Quality Control Processes. Automation in Manufacturing, 17(4), 540-556.
3. Anderson, R., et al. (2021). Integrating AI in Quality Management Systems: Prospects and Challenges. AI & Industry, 29(2), 120-136.
4. Lee, S., & Kim, Y. (2018). Material Variability and Its Impact on Product Quality: A Focus on Carton Packaging. Packaging Science and Technology, 45(1), 22-38.
5. Davis, L. (2020). Evaluating Software Solutions for Quality Management in the Packaging Industry. Software Review Quarterly, 13(1), 45-59.
6. Brown, T. (2019). Systems Theory and Process Improvement in Quality Management. Quality Innovation Journal, 11(2), 99-114.

https://www.tandfonline.com/doi/full/10.1080/14783363.2020.1863778
https://www.g2.com/categories/quality-management-qms

Software Manual

Carton Quality Management System (CQMS) User Manual

Accessing CQMS
Log in using your credentials. If you don't have an account, contact your system administrator to create one for you.

Dashboard Overview
Upon logging in, you'll be directed to the dashboard, which provides a snapshot of the most critical data, including current inventory levels, recent activity, and pending tasks.

Categorization of Product Stock
How to Categorize Products: Select 'Inventory' from the menu, then choose 'Categorize Stock.' Here you can create new categories, assign products to them, or edit existing categories.

Product Measurement and Specifications
Entering Product Measurements: Go to the 'Products' section, select a product, and click on 'Edit' to add or modify its measurements and specifications.

Inventory and Product History Tracking
Viewing Inventory Levels: Under the 'Inventory' tab, you can see a real-time overview of stock levels. Use the 'History' option to view detailed transaction logs for each product.

Stock Updates and Real-time Monitoring
Updating Stock Levels: To adjust stock levels, navigate to the 'Inventory' tab, select a product, and click 'Update Stock.' You can increase or decrease the stock based on new transactions.

Vendor Management
Adding and Managing Vendors: Access the ‘Vendors’ section to add new vendors, edit existing vendor information, or view purchase and sales records associated with each vendor.

Reporting and Analytics Tools
Reports and analytics are generated based on the selected data and criteria.
- Users can review, share, and utilize the generated reports and analytics.

Inventory Forecasting
Setting up Forecasting: The ‘Forecasting’ tool, available under the ‘Inventory’ tab, allows you to predict future inventory needs based on historical sales data.

Inventory Alerts
Creating Alert Conditions: To set up alerts for low stock or other inventory conditions, visit the ‘Alerts’ section under ‘Inventory.’ Here, you can define the rules for when alerts should be triggered.

System Administration
Managing User Accounts: System administrators can add or remove users, assign roles, and manage permissions from the ‘Administration’ section.

Troubleshooting and Support
For assistance, visit the ‘Help’ section for FAQs and troubleshooting tips. For further support, contact our customer service team at [support email/phone].