



COMSATS University Islamabad (CUI)

Project Proposal

for

Autonomous Store

Version 1.0

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Table Of Contents

Abstract	1
1. Introduction	2
2. Problem Statement	2
3. Problem Solution/Objectives of the Proposed System.....	3
3.1 Objectives.....	3
4. Related System Analysis/Literature Review	4
5. Vision Statement	5
6. Scope	5
7. Modules	6
7.1 Client Mobile Application.....	6
7.1.1 Module 1: User Registration and Authentication	6
7.1.2 Module 2: Shopper Entry and Recognition	6
7.1.3 Module 3: Seamless Shopping and Product Recognition	6
7.1.4 Module 4: Frictionless Checkout and Receipts	6
7.2 Admin Web Application	6
7.2.1 Module 5: Customer Behavior Analysis and Insights	6
7.2.2 Module 6: Planogram Control and Inventory Management	7
7.2.3 Module 7: Restocking Alert and Teams Communication:.....	7
7.2.4 Module 8: Admin Dashboard	7
7.2.5 Module 9: Data Analytics and Reporting	7
7.2.6 Module 10: Predictive Analytics and Forecasting	7
7.2.7 Module 11: Privacy and Security.....	8
8. System Limitations/Constraints	8
9. Data Gathering Approach.....	8
9.1 Experimentation	8
9.2 Brainstorming.....	8
9.3 Related System Analysis.....	8
10. Tools and Technologies	9
11. Project Stakeholders and Roles	9
12. Module based Work Division	9
13. WBS and Gantt Chart.....	11
14. Mockups	14
15. References	16
16. Plagiarism Report.....	16

Project Category:

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|--|---|---|
| <input type="checkbox"/> A -Desktop Application/Information System | <input type="checkbox"/> B -Web Application/Web Application based Information System | |
| <input type="checkbox"/> C -Problem Solving and Artificial Intelligence | <input type="checkbox"/> D -Simulation and Modeling | <input type="checkbox"/> E -Smartphone Application |
| <input type="checkbox"/> H -Image Processing | | |

Abstract

The proposed “Autonomous Store” project aims to address challenges in the retail industry by alleviating long checkout queues, streamlining in-store processes, and enhancing store management to meet the seamless shopping experiences demanded by consumers. The current traditional retail systems face challenges in providing efficient and secure services, often resulting in cumbersome checkout processes, potential privacy concerns and the lack of smart management capabilities diminishing the overall customer experience. The Autonomous Store addresses challenges by introducing smart store operations, encompassing customer behavior analysis, smart shelf management, and frictionless shopping experiences. Through anonymized shopper tracking and product recognition, the project eliminates traditional checkout, providing customers with a hassle-free experience and leaving the store completely check-out free, with receipts delivered instantaneously. The project stands out by employing 100% camera-only technology, ensuring scalability without the need for costly shelf sensors and providing higher tracking flexibility across various product categories. The project aims to enhance store efficiency, increase customer satisfaction, inventory management through complete staff control, analyzing customer behavior for optimized store layouts and ensure the competitiveness of retail operations in a rapidly evolving market. Additionally, it empowers store staff with complete control over planogram and inventory management. The Autonomous Store has potential to redefine the retail experience, offering a secure, efficient, and flexible solution that will not only benefit shoppers but also optimizes store operations for sustained success.

1. Introduction

In the realm of retail, customer satisfaction and operational efficiency stand as paramount goals. With the introduction of the "Autonomous Store" project, we endeavor to reshape the traditional retail landscape by addressing persistent challenges such as long checkout queues, cumbersome in-store processes, and limited management capabilities. This innovative project aims to streamline the entire shopping experience, offering a seamless journey for consumers through the incorporation of advanced technologies like AI-powered computer vision and 100% camera-only technology. By eliminating traditional checkout processes, introducing smart store operations, and prioritizing customer privacy, the "Autonomous Store" project not only aims to meet the evolving demands of modern shoppers but also strives to redefine the essence of retail by ensuring security, efficiency, and adaptability. As we navigate the dynamic retail environment, the "Autonomous Store" project emerges as a trailblazer, promising not only an enhanced shopping experience for customers but also optimized store operations for enduring success in the competitive retail landscape.

Fig 1.1: Virtual Basket



2. Problem Statement

In the contemporary retail landscape, traditional stores grapple with inefficiencies and privacy concerns, hindering the seamless and secure shopping experience for customers. The existing systems often result in prolonged checkout processes characterized by long queues and manual payment procedures, which creates frustration and inconvenience for customers, and potential privacy breaches, resulting in compromise the overall satisfaction and trust of shoppers. Shoppers face challenges in navigating stores efficiently, and traditional checkout procedures contribute to time-consuming experiences. Inventory management and planogram also poses a significant challenge for store operators aiming to enhance control for store staff are hindered by outdated systems, limiting their ability to optimize store layouts and product placements based on shopper behavior. This bottleneck not only diminishes overall customer satisfaction but also operational efficiency of stores.

The existing retail systems foster a reactive rather than proactive approach, limiting the potential for personalized customer experiences and efficient store operations. Traditional methods contribute to prolonged checkout times, inventory mismanagement, and an overall diminished shopping

experience. The need for a user-centric, accessible, and proactive retail solution becomes evident in the face of these challenges that overcome existing systems' limitations.

3. Problem Solution/Objectives of the Proposed System

Recognizing the imperative for a revolutionary transformation in the retail landscape, the Autonomous Store project is introduced as a solution to significant inefficiencies and privacy concerns inherent in traditional stores. Challenges like prolonged checkouts and outdated inventory systems hinder optimal customer experiences and operational efficiency, necessitating a proactive approach to retail. The Autonomous Store addresses these issues by offering a frictionless, check-out free shopping experience through the implementation of AI-powered computer vision. This approach ensures privacy with anonymized shopper tracking while empowering administrators with real-time analytics for efficient inventory management. The project seeks to set new standards for accessibility, efficiency, and customer-centric experiences in retail, ushering in a paradigm shift. Through its user-centric design, the Autonomous Store aims to democratize the retail experience, empowering individuals and reshaping traditional processes for an enhanced and efficient shopping journey.

Fig 3.1: Customer Behavior Analysis

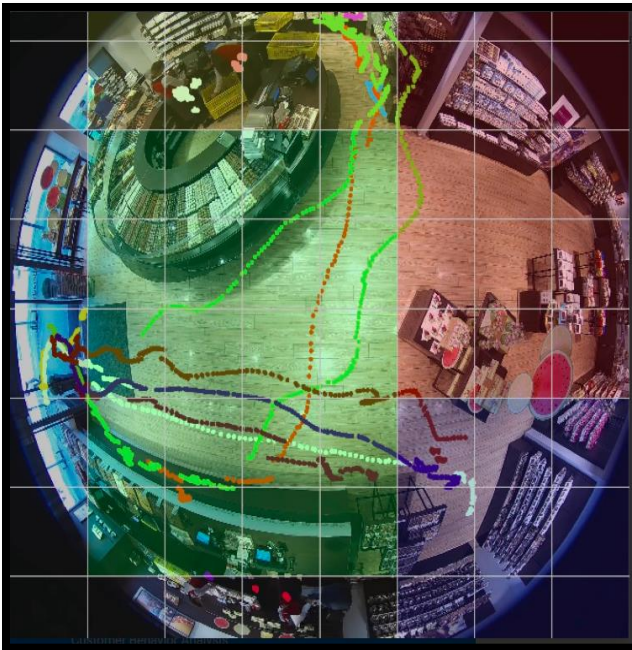


Fig 3.2: Customer Flow Analysis



3.1 Objectives

- ❖ **BO-1:** Enhance shopper entry efficiency in the Autonomous Store, aiming for a 20% reduction in entry time to streamline processes and elevate overall efficiency.
- ❖ **BO-2:** Achieve a frictionless and secure shopping experience in the Autonomous Store by eliminating checkout hassles, ensuring 100% check-out free transactions for customers.

- ❖ **BO-3:** Empower store staff in the Autonomous Store with advanced tools for efficient inventory management and planogram control, targeting a 30% increase in overall efficiency.
- ❖ **BO-4:** Optimize the shopping environment in the Autonomous Store by strategically placing products based on shopper behavior, aiming for a 15% increase in sales and customer satisfaction.
- ❖ **BO-5:** Revolutionize the retail experience in the Autonomous Store, offering a secure, efficient, and tailored solution to meet evolving customer and operational needs, striving for a 25% increase in overall customer satisfaction.
- ❖ **BO-6:** Improve inventory management accuracy in the Autonomous Store, reducing instances of stockouts and overstock by 20% for more efficient operations.
- ❖ **BO-7:** Increase shopper engagement in the Autonomous Store by displaying real-time insights like average check-out time and popular product pairings, aiming for a 30% boost in shopper interactions.
- ❖ **BO-8:** Reduce operational costs in the Autonomous Store by eliminating the need for costly shelf sensors through 100% camera-only technology, targeting a 15% reduction in overall operational costs.
- ❖ **BO-9:** Provide actionable insights for store staff in the Autonomous Store through a heat map depicting highly detailed interactions within the store, increasing the accuracy of decision-making by 20%.
- ❖ **BO-10:** Enhance overall store security in the Autonomous Store by eliminating the use of facial recognition or biometric data, ensuring privacy for shoppers with a security effectiveness rate of 99%.
- ❖ **BO-11:** Enhance shopper satisfaction in the Autonomous Store by providing personalized recommendations based on purchase history and preferences, targeting a minimum App Store rating of 4.5 within the first year of launch.

4. Related System Analysis/Literature Review

Table 1 Related System Analysis with Autonomous Store

Application Name	Weakness	Proposed Project Solution
AmazonGo	<ol style="list-style-type: none">1. AmazonGo relies on shelf sensors for inventory management, which can be costly to install and maintain.2. The dependence on these sensors may lead to inaccuracies, especially during high-traffic periods, and the need for physical installations limits scalability.	<ol style="list-style-type: none">1. Autonomous Store mitigates these weaknesses by adopting 100% camera-only technology. This eliminates the need for costly shelf sensors, reducing installation and maintenance expenses.2. The AI-powered computer vision ensures accurate and scalable inventory management, providing a cost-effective and efficient

		solution for the Autonomous Store.
Tesco Scan & Go	<ol style="list-style-type: none">1. Tesco Scan & Go, utilizing handheld barcode scanners on trolleys, faces maintenance issues and operational inefficiencies.2. User engagement with scanners may lead to longer checkout times during peak hours.	<ol style="list-style-type: none">1. The proposed Autonomous Store eliminates handheld scanners, adopting 100% camera-only technology for a seamless shopping experience.2. AI-powered computer vision enhances efficiency, overcoming maintenance concerns and optimizing the overall checkout process.

5. Vision Statement

For shoppers **who** seek a seamless, secure, personalized shopping experience, **the** Autonomous Store is an internet based innovative and advanced application **that** transforms traditional shopping paradigms, encompassing seamless entry, frictionless checkout, advanced store operations, and inventory management **Unlike** conventional retail models with manual checkouts and limited tracking capabilities, **our product** leverages AI-powered, camera-only technology for a seamless, check-out free shopping journey. The Autonomous Store empowers users with real-time insights, personalized recommendations, and efficient inventory management, allowing them to proactively shape their shopping experiences for diverse consumers.

6. Scope

The scope of the Autonomous Store project is centered around revolutionizing the traditional retail landscape to offer a seamless and personalized shopping experience. The primary objectives involve introducing innovative technologies, such as AI-powered computer vision, for shopper tracking and product recognition, enabling frictionless entry and checkout processes. The project employs 100% camera-only technology, eliminating the need for costly shelf sensors, thereby ensuring scalability and flexibility across various product categories. Privacy is a priority, with keypoint tracking technology avoiding the use of facial recognition or biometrics.

Store staff gain complete control over planogram and inventory management, with the ability to analyze customer behavior and receive real-time insights. Administrative features cover metrics like daily customer count, average checkout time, and order volume, providing a comprehensive view of store performance. The project aims to optimize the shopping environment by offering insights and recommendations, facilitating restocking alerts, and promoting similar recommended products to customers based on their purchase history. The use of a heat map offers detailed interactions within the store, enabling strategic decisions for product placements and layout optimization. In essence, the Autonomous Store project envisions a future in which retail is redefined by combining cutting-edge

technology with a customer-centric approach, ensuring a secure, efficient, and tailored shopping experience for all customers.

7. Modules

7.1 Client Mobile Application

7.1.1 Module 1: User Registration and Authentication

- ❖ FE-1: Implement secure user profile registration ensuring privacy.
- ❖ FE-2: Enhance login security with two-factor authentication.
- ❖ FE-3: Ensure account security through email verification.
- ❖ FE-4: Enable account registration using credit card or other payment methods.
- ❖ FE-5: Provide options for account recovery with user-friendly methods.

7.1.2 Module 2: Shopper Entry and Recognition

- ❖ FE-1: Enable shoppers to enter the store seamlessly using the mobile app.
- ❖ FE-2: Provide a dedicated app for shoppers to facilitate easy entry into the store.
- ❖ FE-3: Integrate key-point recognition or other secure methods for user recognition.
- ❖ FE-4: Enhance entry security with two-factor authentication for app-based entry.
- ❖ FE-5: Ensure a frictionless entry process for a smooth and efficient shopping experience.

7.1.3 Module 3: Seamless Shopping and Product Recognition

- ❖ FE-1: Allow shoppers to enter the store using the mobile app.
- ❖ FE-2: Implement AI-powered computer vision for anonymized shopper tracking.
- ❖ FE-3: Recognize products taken by shoppers in real-time.
- ❖ FE-4: Detect and prevent potential shoplifting or product tampering.
- ❖ FE-5: Ensure seamless integration between the app and store infrastructure.

7.1.4 Module 4: Frictionless Checkout and Receipts

- ❖ FE-1: Implement frictionless checkout for a seamless, check-out free experience.
- ❖ FE-2: Automatically send receipts to shoppers instantaneously after leaving the store.
- ❖ FE-3: Provide receipt options such as digital or print based on customer preference.
- ❖ FE-4: Include a detailed breakdown of purchased items in the receipt.
- ❖ FE-5: Implement diverse payment options and checkout convenience.

7.2 Admin Web Application

7.2.1 Module 5: Customer Behavior Analysis and Insights

- ❖ FE-1: Track and analyze the length of time a person spends looking at displays or in specific areas.
- ❖ FE-2: Detect people in real-time inside a retail store using the videos of multiple cameras.
- ❖ FE-3: Estimate the number of customers in real-time to detect hot spots automatically.
- ❖ FE-4: Analyze the footfall by measuring time spent in specific areas (attention to shelves, queue times, and more).
- ❖ FE-5: Provide insights into customer engagement with specific products or sections.
- ❖ FE-6: Optimize store layout and product placement based on footfall patterns.

7.2.2 Module 6: Planogram Control and Inventory Management

- ❖ FE-1: Provide store staff with user-friendly tools to create and modify product layouts.
- ❖ FE-2: Analyze sales data to identify top-selling and underperforming items, informing inventory management strategies.
- ❖ FE-3: Optimize product placement based on shopper behavior data and heat map analysis.
- ❖ FE-4: Provide insights on items frequently bought together to optimize shelf placement and improve customer navigation.
- ❖ FE-5: Generate a detailed sales heat map for highly detailed interactions and informed shelf placement decisions.
- ❖ FE-6: Provide Floor Planning to customize Floor plans according to the Sales, Detailed Interactions and other.

7.2.3 Module 7: Restocking Alert and Teams Communication:

- ❖ FE-1: Maintain real-time inventory data and send restocking alerts for low-stock items.
- ❖ FE-2: Notification system for store staff.
- ❖ FE-3: Implement Efficient inventory management to avoid stockouts.
- ❖ FE-4: Facilitate seamless communication and collaboration between store and warehouse teams for efficient stock replenishment.
- ❖ FE-5: Streamline the process of requesting, tracking, and fulfilling stock replenishment requests.

7.2.4 Module 8: Admin Dashboard

- ❖ FE-1: Centralized dashboard providing real-time insights for quick decision-making.
- ❖ FE-2: Provide comprehensive control for store staff over planogram and inventory management.
- ❖ FE-3: Access and manage customer metrics, user profiles, and store data with advanced filtering and search capabilities.
- ❖ FE-4: Segment customer data through machine learning based on shopping behavior, demographic information, and purchase history.
- ❖ FE-5: Get updates on unusual behaviors or discrepancies in store data.
- ❖ FE-6: Analyze customer satisfaction scores and feedback to identify areas for improvement and enhance the overall shopping experience.

7.2.5 Module 9: Data Analytics and Reporting

- ❖ FE-1: Visualize store performance metrics, including sales trends and product placement effectiveness.
- ❖ FE-2: Display metrics such as average check-out time, daily customer statistics, and checkout details for store operations.
- ❖ FE-3: Generate reports on average daily customers, total items sold, and inventory levels.
- ❖ FE-4: Create heat maps and geographical reports, highlighting areas with high customer traffic for targeted interventions.
- ❖ FE-5: Track progress, visualizing improvement metrics and shelf placement efficacy over time, helping assess the effectiveness of product placement.
- ❖ FE-6: Customize report parameters and automate scheduling.
- ❖ FE-7 Export reports in various formats, including PDF, CSV, and Excel.

7.2.6 Module 10: Predictive Analytics and Forecasting

- ❖ FE-1: Use predictive models for customer trends, product sales outcomes, and store behavior forecasting.
- ❖ FE-2: Generate detailed forecast reports for future trends in store performance.

- ❖ FE-3: Simulate various scenarios in customer behavior and product sales outcomes.
- ❖ FE-4: Analyze market and demographic data to predict store needs and customer preference shifts.

7.2.7 Module 11: Privacy and Security

- ❖ FE-1: Ensure privacy by design with shopper anonymity using key point tracking technology.
- ❖ FE-2: Define roles and permissions for store staff control of planogram and inventory management.
- ❖ FE-3: Acquire detailed audit records recording all access and changes to data.
- ❖ FE-4: Ensure routine data backup and restoration protocols to minimize the risk of data loss.
- ❖ FE-5: Manage real-time security alert analysis using advanced threat detection and incident response protocol.

8. System Limitations/Constraints

- ❖ **LI-1:** The camera-only technology used for shopper tracking in the Autonomous Store Project may face limitations in certain lighting conditions, potentially affecting the accuracy of product recognition.
- ❖ **LI-2:** Technological Barriers - The effectiveness of the AI-powered computer vision system is contingent on the available technology, and disruptions such as power outages or system failures may hinder its functionality.
- ❖ **LI-5:** Staff Training and Adaptation - Store staff may require comprehensive training to effectively utilize the control features for planogram and inventory management, potentially causing a learning curve and initial operational challenges.

9. Data Gathering Approach

9.1 Experimentation

Our data gathering approach for the autonomous store project involves experimentation. This method allows us to test and validate potential solutions in a controlled environment, enabling us to gather valuable insights into the effectiveness and feasibility of various approaches.

9.2 Brainstorming

Utilizing brainstorming sessions as a data gathering method, we encourage collaborative idea generation. These sessions serve as a platform for team members to share diverse perspectives, fostering innovation and helping identify key project requirements through open discussion.

9.3 Related System Analysis

A critical component of our data gathering strategy is the analysis of related systems. By thoroughly examining existing solutions within the autonomous store domain, we aim to gain a comprehensive understanding of industry standards and user expectations. This analysis informs the development process and ensures alignment with established practices in the field.

10. Tools and Technologies

Table 2: Tools and Technologies for Autonomous Store

Tools And Technologies	Tools	Version	Rationale
	Visual Studio Code	2022. 17.8	IDE
	Android Studio	2023.	IDE
	Figma	2023	Design Work
	MongoDb	5.0	DBMS
	My SQL	8.0	DBMS
	MODEL.IO	2022	DIAGRAMS
	MS VISIO	2023	DIAGRAMS
	MS PROJECT	365	PLANNING
	MS OFFICE	365	DOCUMENTATION
	GIT	2.42	VERSION CONTROL
	Technology	Version	Rationale
	Python	3.2.0	Programming language
	Mean Stack	18.2.0	Web Development
	React Native	3.16.0	Front-end Development
	Node.js	21.2.0	API Development
	Python	3.11.0	Data Processing

11. Project Stakeholders and Roles

Table 3 Project Stakeholders for Autonomous Store

Project Sponsor	<ul style="list-style-type: none"> COMSATS University Islamabad, Islamabad Campus
Stakeholder	<ul style="list-style-type: none"> Student 1: Huraira Asad Student 2: Maqbool Ahmed Project Supervisor: Dr. Tahir Mustafa Madni Project Co-Supervisor: Dr. Uzair Iqbal Janjua Final Year Project Committee: Evaluation of the project

12. Module based Work Division

Table 4 Team Member Work Division for Autonomous Store

Student Name	Student Registration Number	Responsibility/ Module / Feature
Huraira Asad	SP21-BSE-035	Module 1: Features 1, 4, 5 Streamline user authentication process. Module 2: Features 1, 2, 4 User Recognition. Module 3: Features 1, 2, 3

		<p>Streamline Seamless Shopping Process.</p> <p>Module 4: Features 2, 4</p> <p>Implementing frictionless check-out process.</p> <p>Module 5: Features 1, 2, 4</p> <p>Analyzing Customer Behavior.</p> <p>Module 6: Features 2, 3, 6</p> <p>Providing planogram control and inventory control.</p> <p>Module 7: Features 1, 3, 4</p> <p>Manage Restocks and build communication channel.</p> <p>Module 8: Features 2, 3, 4</p> <p>Manage and control user data.</p> <p>Module 9: Features 1, 2, 3</p> <p>Generate data analysis reports.</p> <p>Module 10: Features 1, 2</p> <p>Predictive modeling for Store performance</p> <p>Module 11: FEATURES 1,2</p> <p>Data security and recovery.</p>
Maqbool Ahmed	SP21-BSE-043	<p>Module 1: Features 2, 4</p> <p>Enhance account security.</p> <p>Module 2: Features 3, 5</p> <p>Protection from anti-theft pr security concerns.</p> <p>Module 3: Features 4, 5</p> <p>Integration between app and store.</p> <p>Module 4: Features 1, 3, 5</p> <p>Receipt handling and payments.</p> <p>Module 5: Features 3, 6</p> <p>Real time shopper detection and providing layouts.</p> <p>Module 6: Features 1, 4, 5</p> <p>providing tools and recommendations.</p> <p>Module 7: Features 2, 4</p>

		Implementing notification and alerts for restock.
		Module 8: Features 1, 5
		User Interface of Dashboard and visualization of data.
		Module 9: Features 4, 5, 6
		Heat map and data visualization
		Module 10: Features 1, 3, 5
		Simulation and analyzing market data.
		Module 11: FEATURES 1,2
		Enhance Data security and privacy.

13. WBS and Gantt Chart

Fig 13.1 Gantt Chart for Autonomous Store

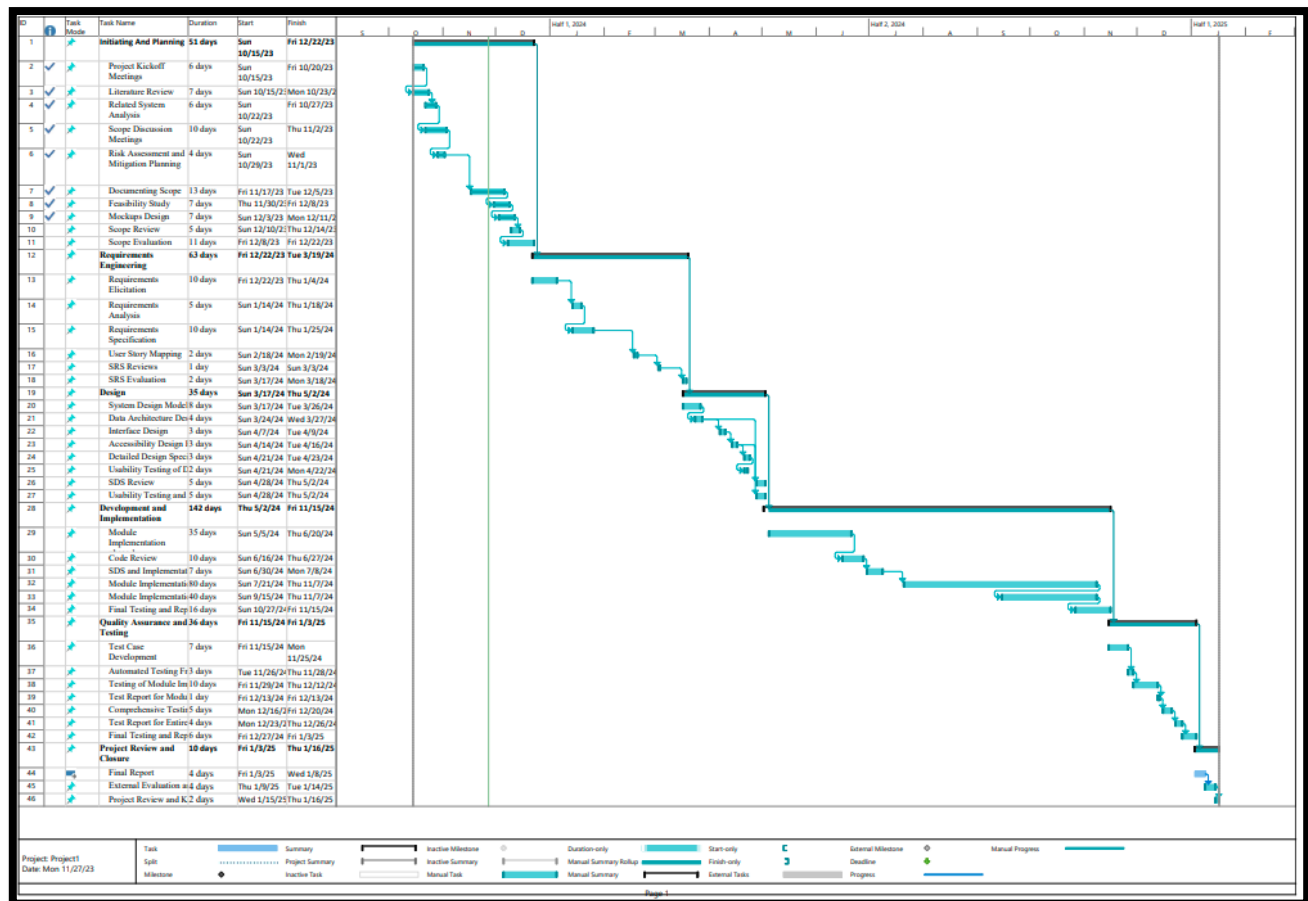


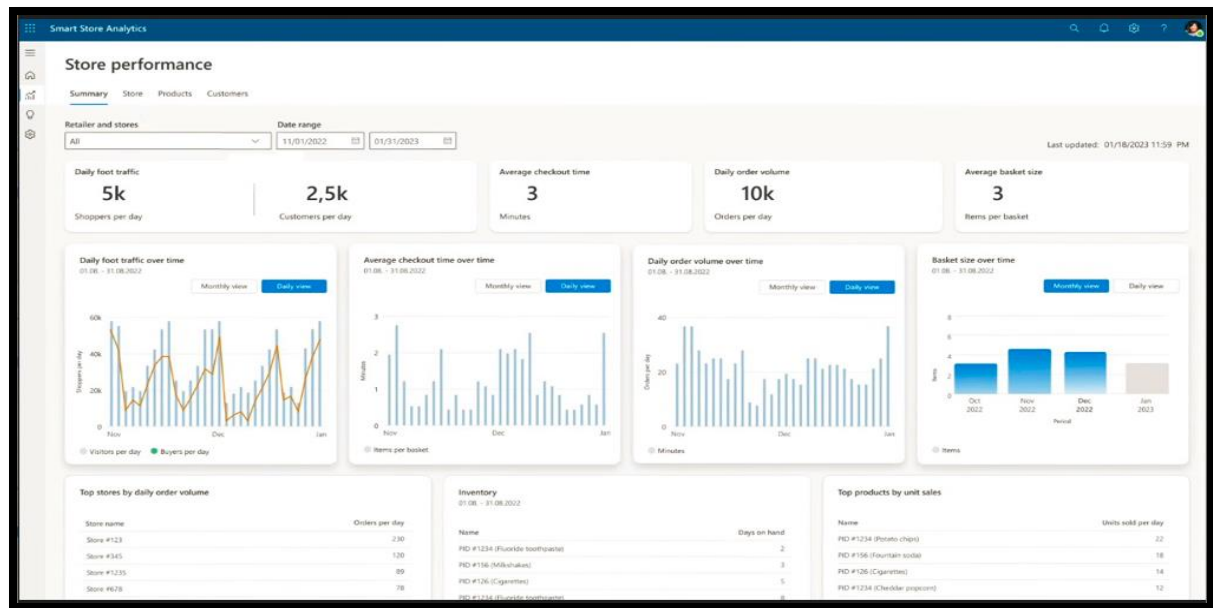
Table 5: WBS for Autonomous Store

ID		Task	Duration	Resources
1		Initiating	51 d	Huraira Asad, Maqbool Ahmed, Supervisor, Co-supervisor
2		Project Kickoff Meetings	6 d	Huraira Asad, Maqbool Ahmed
3		Literature Review	7 d	Huraira Asad, Maqbool Ahmed
4		Related System Analysis	6 d	Huraira Asad, Maqbool Ahmed
5		Scope Discussion Meetings	10 d	Huraira Asad, Maqbool Ahmed, Supervisor
6		Risk Assessment and Mitigation Planning	4 d	Huraira Asad, Maqbool Ahmed
7		Documenting Scope	13 d	Huraira Asad, Maqbool Ahmed
8		Feasibility Study	3 d	Huraira Asad, Maqbool Ahmed
9		Mockups Design	7 d	Huraira Asad, Maqbool Ahmed
10		Scope Review	5 d	Huraira Asad, Maqbool Ahmed, Supervisor, Co-supervisor
11		Scope Evaluation	11 d	FYP Committee
12		Requirements Engineering	115 d	Huraira Asad, Maqbool Ahmed, Supervisor, Co-supervisor
13		Requirements Elicitation	42 d	Huraira Asad, Maqbool Ahmed, Supervisor
14		Requirements Analysis	23 d	Huraira Asad, Maqbool Ahmed
15		Requirements Specification	35 d	Huraira Asad, Maqbool Ahmed
16		User Story Mapping	8 d	Huraira Asad, Maqbool Ahmed
17		SRS Reviews	9 d	Huraira Asad, Maqbool Ahmed, Supervisor, Co-supervisor
18		SRS Evaluation	5 d	Huraira Asad, Maqbool Ahmed, FYP Committee
19		Design	35 d	Huraira Asad, Maqbool Ahmed, Supervisor
20		System Design Models	10 d	Huraira Asad, Maqbool Ahmed, Supervisor
21		Data Architecture Design	6 d	Huraira Asad, Maqbool Ahmed, Supervisor
22		Interface Design	5 d	Huraira Asad, Maqbool Ahmed, Supervisor
23		Accessibility Design Review	4 d	Huraira Asad, Maqbool Ahmed
24		Detailed Design Specification	4 d	Huraira Asad, Maqbool Ahmed
25		Usability Testing of Design	3 d	Huraira Asad, Maqbool Ahmed

26		SDS Review	5 d	Huraira Asad, Maqbool Ahmed, Supervisor
27		Usability Testing and Feedback Incorporation	10 d	Huraira Asad, Maqbool Ahmed,
28	Development and Implementation		150 d	Huraira Asad, Maqbool Ahmed, Supervisor, FYP Committee
29		Module Implementation phase 1	35 d	Huraira Asad, Maqbool Ahmed
30		Code Review	10 d	Huraira Asad, Maqbool Ahmed, Supervisor, FYP Committee
31		SDS and Implementation Validation	7 d	Huraira Asad, Maqbool Ahmed
32		Module Implementation Phase 2	80 d	Huraira Asad, Maqbool Ahmed, Supervisor, FYP Committee
33		Module Implementation Phase 3	40 d	Huraira Asad, Maqbool Ahmed
34		Final Testing and Report Generation	11 d	Huraira Asad, Maqbool Ahmed, FYP Committee
35	Quality Assurance and Testing		108 d	Huraira Asad, Maqbool Ahmed, Supervisor, FYP Committee
36		Test Case Development	18 d	Huraira Asad, Maqbool Ahmed
37		Automated Testing Framework Implementation	6 d	Huraira Asad, Maqbool Ahmed
38		Testing of Module Implementations	42 d	Huraira Asad, Maqbool Ahmed
39		Test Report for Module Implementations	4 d	Huraira Asad, Maqbool Ahmed, FYP Committee
40		Comprehensive Testing and Report Evaluation	4 d	Huraira Asad, Maqbool Ahmed
41		Test Report for Entire System	5 d	Huraira Asad, Maqbool Ahmed
42		Final Testing and Report Evaluation	9 d	Huraira Asad, Maqbool Ahmed, FYP Committee
43	Project Review and Closure		10 d	Huraira Asad, Maqbool Ahmed, Supervisor, Co-supervisor, External Evaluator
44		Final Report	4 d	Huraira Asad, Maqbool Ahmed, Supervisor, Co-supervisor
45		External Evaluation and feedback	4 d	External Evaluator
46		Project Review and Knowledge Transfer	2 d	External Evaluator, Huraira Asad, Maqbool Ahmed, FYP Committee

14. Mockups

Fig 14.1: The Store Performance Summary.



Description: The store performance summary mockup presents a comprehensive overview of key metrics and analytics, providing administrators with a quick snapshot of the store's operational health. The main screen displays essential data, including daily customer traffic, average checkout times, and total items sold.

Fig 14.2: Store Performance in terms of Customers.

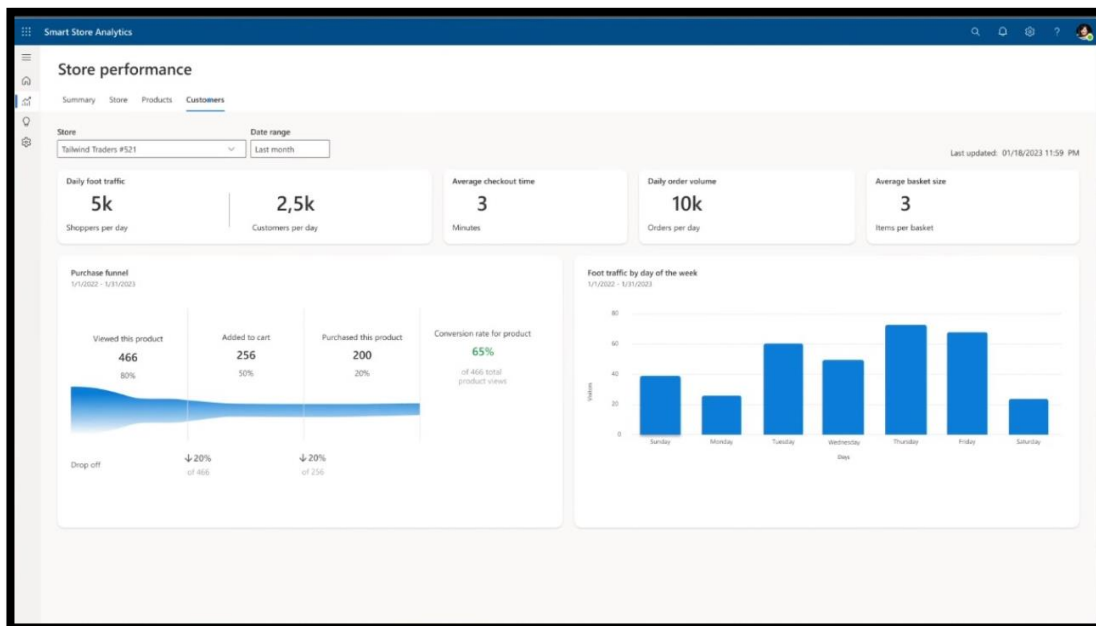
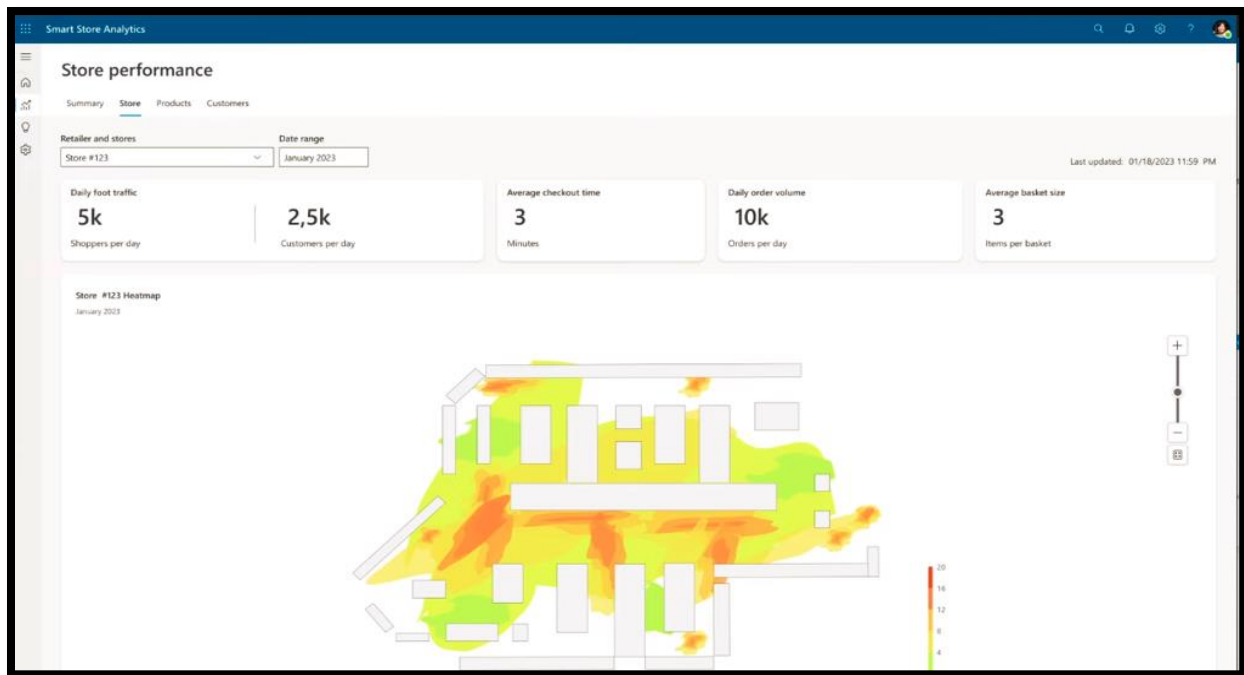
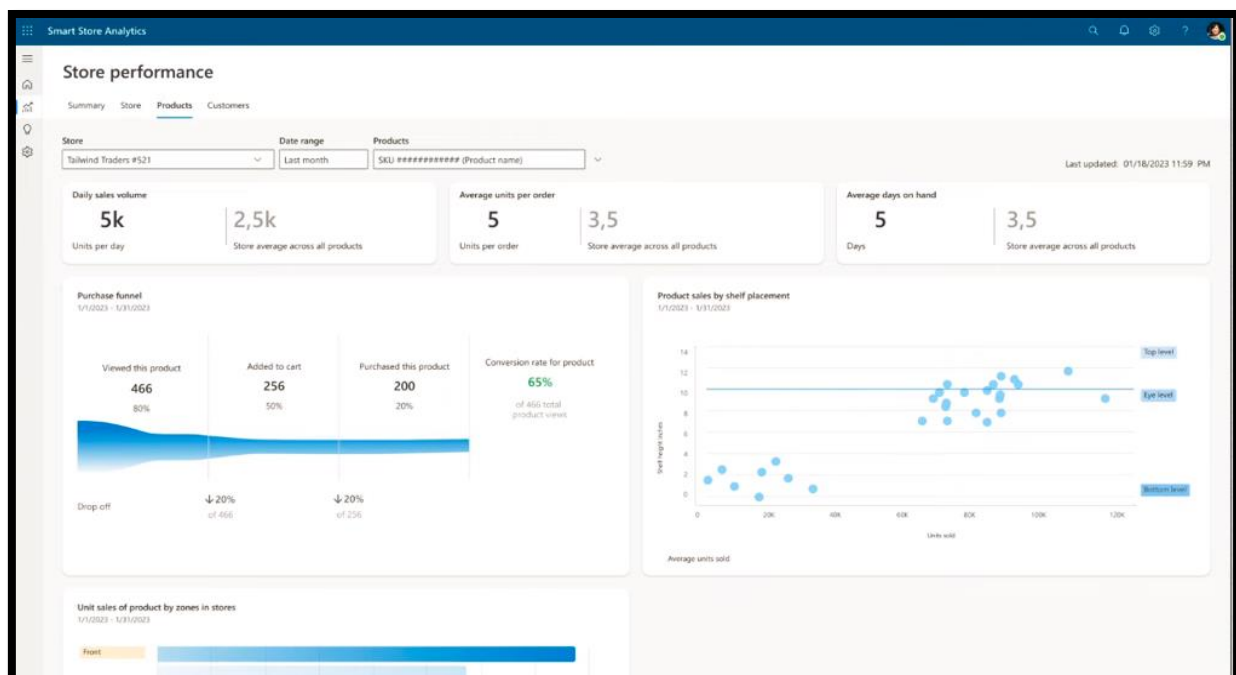


Fig 14.3: The Store Analytics.



Description: The dashboard highlights key metrics such as customer satisfaction ratings, average time spent in the store, and personalized purchase history Description: This heatmap mockup provides a visual representation of customer interactions with products within the store environment. The screen displays a dynamic heatmap showcasing varying intensities of customer engagement with different products.

Fig 14.4: The dashboard highlights key metrics For Products.



15. References


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16. Plagiarism Report

11/24/23, 8:23 PM

Turnitin Originality Report

**Turnitin Originality Report**

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