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**1. Introduction**

The **"Grab & Go: Cashierless Store"** project aims to transform the retail shopping experience by eliminating the need for traditional checkout processes. Using cameras, sensors, and IoT technology, the system will automatically detect products taken by customers and process payments seamlessly. This document outlines the software requirements for the system, providing a clear understanding of the project's scope, objectives, and functionalities.

**2. Vision Document**

1. **Problem Statement**

Traditional shopping experiences are often hampered by long checkout lines and outdated billing systems, causing frustration for customers and inefficiencies for store owners. The core issue is the bottleneck created by manual checkout processes, which also increase labor costs. The **"Grab & Go"** system seeks to resolve this by leveraging automated technologies to provide a frictionless shopping experience.

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| --- |
| ****Table 1: Problem Statement**** |
| |  |  | | --- | --- | | **Category** | **Description** | | **Problem** | Traditional checkout systems cause delays and inconvenience. High labor costs for managing checkout processes. Limited data insights on customer behavior. | | **Affects** | Retail stores, customers seeking quick shopping experiences, and store management aiming to reduce costs. | | **Impact** | Longer wait times, customer dissatisfaction, and higher operational costs for stores. | | **Solution** | Implement a cashier less store using IoT, cameras, and real-time payment processing. | |

1. **Business Opportunities**

* **Increased Customer Satisfaction:** Faster checkouts lead to higher customer retention.
* **Cost Reduction:** Lower operational costs due to reduced need for cashiers.
* **Data-Driven Insights:** Detailed analytics on customer behavior and inventory trends.
* **Scalability:** Potential to expand to multiple locations quickly with consistent efficiency.

1. **Objectives**

* **Eliminate Checkout Lines:** Enable customers to grab items and leave without waiting.
* **Automate Billing:** Use IoT devices to detect products and process payments instantly.
* **Enhance Security:** Ensure secure payment methods and prevent theft using cameras and sensors.
* **Data Collection:** Gather insights on customer preferences to improve inventory management.

1. **Scope**

* **In-Scope:**
  + Mobile app for user authentication and payment processing.
  + IoT systems (cameras, weight sensors) for product tracking.
  + Cloud-based backend for data processing and analytics.
* **Out-of-Scope:**
  + Integration with external retail systems initially.
  + Custom hardware development beyond sensors and cameras.

1. **Constraints**

* **Technical:** Limited compatibility with older hardware systems.
* **Privacy:** Compliance with GDPR and CCPA for data handling.
* **Cost:** High initial investment in IoT infrastructure and cloud services.

1. **Stakeholder and User Description**

**2.9.1. Market Demographics**

Target customers include urban professionals and tech-savvy individuals seeking fast and convenient shopping options.

**2.9.2. User Environment**

* **Platforms:** Mobile apps (iOS and Android).
* **Internet Access:** Required for real-time data processing and payments.

**2.9.3. Stakeholder Profiles**

**2.9.3.1. Supervisor Team**

|  |
| --- |
| ****Table 2: Supervisor Team**** |
| |  |  |  | | --- | --- | --- | | **Representatives** | **Description** | **Responsibilities** | | Project Manager | Internal Stakeholder | Provide direction, manage budgets, ensure timely delivery. | | Technical Lead | Internal Stakeholder | Oversee tech stack and ensure system performance. | |

**2.9.3.2. Development Team**

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| --- |
| ****Table 3: Development Team**** |
| | **Representatives** | **Description** | **Responsibilities** | | --- | --- | --- | | Software Engineers | Internal Stakeholders | Develop the app and backend systems. | | IoT Specialists | Internal Stakeholders | Configure sensors and integrate with the backend. | | QA Engineers | Internal Stakeholders | Test the system to ensure reliability and security. | |

**2.9.3.3. End Users**

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| --- |
| ****Table 4: End Users**** |
| | **Representatives** | **Description** | **Responsibilities** | | --- | --- | --- | | Shoppers | External Stakeholders | Use the app for entry, shopping, and payments. | | Store Managers | Internal Stakeholders | Monitor sales and inventory using admin panels. | |

**2.9.3.4. Government Officials**

### ****Table 5: Government Officials****

| **Representatives** | **Description** | **Responsibilities** |
| --- | --- | --- |
| Regulatory Bodies | Internal Stakeholders | Ensure compliance with retail and data privacy laws. |

**2.9.3.5. Admin**

### ****Table 6: Admin****

| **Representatives** | **Description** | **Responsibilities** |
| --- | --- | --- |
| Store Admin | Internal Stakeholder | Manage inventory, review analytics, and oversee security. |
| IT Admin | Internal Stakeholder | Ensure system uptime and data security. |

**2.9.4. Stakeholder Summary**

### ****Table 7: Stakeholder Summary****

| **Name** | **Description** | **Responsibilities** |
| --- | --- | --- |
| Supervisor Team | Oversees the project | Ensure timely delivery and quality assurance |
| Development Team | Builds the system | Develop and test software and hardware |
| End Users | Shoppers | Use the system for seamless shopping |
| Government Officials | Regulatory bodies | Ensure compliance with laws |
| Admin | Store managers | Manage backend and analytics |

**3. System Requirements Specification**

**3.1. System Features**

* **Automated Product Detection:** Cameras and sensors track products picked by customers.
* **Real-Time Billing:** Instant billing through mobile app integration.
* **Inventory Management:** Real-time stock updates and notifications.
* **Analytics:** Insights into sales trends and customer behavior.

**3.2. Functional Requirements**

**3.2.1. Automatic Product Detection**

* The system shall use cameras and weight sensors to detect when a customer picks a product.
* It shall update the virtual cart in real-time.

**3.2.2. Checkout-Free Payment Processing**

* The system shall charge the customer's account directly upon exit.
* It shall support multiple payment methods (credit, debit, mobile wallets).

**3.2.3. Customer Identification and Authentication**

* Customers must scan a mobile app QR code or use NFC to enter the store.
* The system shall authenticate users securely to prevent unauthorized access.

**3.2.4. Inventory Management**

* The system shall automatically update stock levels when items are taken.
* It shall notify staff for restocking when levels are low.

**3.2.5. Real-Time Analytics**

* The system shall provide dashboards showing sales trends and peak hours.
* It shall track popular products and purchasing patterns.

**3.2.6. Admin Control Panel**

* Admins shall manage product listings, prices, and promotions.
* Access control shall restrict admin features to authorized personnel.

**3.3. Non-Functional Requirements**

**3.3.1. User-Friendly Interface**

* The mobile app and in-store kiosks must be intuitive and easy to navigate.

**3.3.2. Data Security**

* End-to-end encryption must be used for all transactions.
* Customer data must be anonymized when stored.

**3.3.3. Performance and Scalability**

* The system shall handle up to 500 simultaneous users without performance degradation.
* It shall scale to accommodate additional stores without major overhauls.

**3.3.4. Privacy and Compliance**

* Compliance with GDPR, CCPA, and PCI DSS for payment data.
* Opt-in consent must be obtained for data collection.

**3.3.5. Device and Platform Compatibility**

* The system must support iOS and Android apps, as well as web-based dashboards.
* Sensors must be compatible with standard IoT protocols (MQTT, HTTP).