**Problem Statement:**

With the advent of modern shopping experiences, manual checkouts have become a point of friction for customers, causing delays and inefficiencies in our business operations. The traditional checkout process may not only hinder our business growth but also impact customer satisfaction levels.

**Project Objective:**

To design and implement a computer vision-based system that facilitates a "shop and go" experience, where customers can seamlessly pick products and exit the store without the need for manual checkout interventions.

**1. As-is State:**

- Checkout Process: Customers manually select items and queue at cashier counters or self-checkout stations.

- Customer Experience: Potential for long waiting times, especially during peak hours, leading to dissatisfaction.

- Operational Efficiency: Requires a significant number of staff for checkout processes and monitoring. Occasional errors in billing or missed items.

**2. To-be State:**

- Checkout Process: Automated "shop and go" experience where customers pick products and the system automatically recognizes and bills them without manual intervention.

- Customer Experience: Swift, seamless, and frictionless shopping experience.

- Operational Efficiency: Reduced staff requirement for checkout processes, increased accuracy in billing, and improved inventory tracking.

**3. Methodology:**

1. Data Collection: Install cameras in pilot store locations and gather image/video data of customer-product interactions.

2. Data Annotation: Manually label data to identify products and various customer interactions (e.g., picking up, adding to cart, returning).

3. Model Training: Use the annotated data to train computer vision models for product recognition and customer behavior analysis.

4. System Integration: Combine the computer vision model with inventory and billing systems.

5. Deployment and Testing: Launch in select store locations and gather feedback.

6. Iterative Improvement: Use real-world feedback and performance metrics to refine and optimize the model and system.

**4. Entity:**

- Products: Items available for purchase in the store.

- Customers: Individuals shopping in the store.

**5. Target Variable:**

- Product Interaction Label: A categorical variable indicating the type of interaction a customer has with a product (e.g., "picked up", "added to cart", "returned").

**6. Success Metrics:**

- Checkout Time Reduction: A significant decrease in average checkout times compared to the manual process.

- Billing Accuracy: The percentage of transactions where the automated system's billing matches the actual products picked by customers.

- Customer Satisfaction: Improved ratings or feedback on the shopping experience after the implementation of the system.

**7. Evaluation Metrics:**

- Model Accuracy: The percentage of correct predictions made by the computer vision model on test data.

- System Uptime: The percentage of time the system is operational without glitches or errors.

- False Positives/Negatives: The number of incorrect product recognitions or missed interactions.

- Feedback Loop: Mechanism for customers to report inaccuracies or provide feedback on their shopping experience.

**Descriptive Questions:**

**Product Interaction Distribution:**

How are different products interacted with by customers throughout the store? (e.g., Which products are most commonly picked up, added to carts, or returned?)

**Time Analysis:**

At what times of day or days of the week are interactions (like picking up or returning products) most prevalent in the store?

**Customer Behavior Patterns:**

Are there distinct patterns or sequences in which customers typically interact with products? (e.g., Do they first pick up one category of product before another?)

**Predictive Questions:**

**Product Purchase Likelihood:**

Based on initial interactions (like picking up a product or examining it for a certain duration), can we predict the likelihood of a customer actually purchasing that product?

**Customer Checkout Behavior:**

Can we predict when a customer is about to exit the store and finalize their purchases based on their interactions and time spent in the store?