# Project Problem Definition and Solution Strategy

## Problem Definition:

The goal of this project is to create an automated passenger boarding kiosk using computer vision and AI tools to make airport boarding quicker and more efficient. The kiosk aims to manage the passenger verification process entirely on its own, minimizing the need for manual checks by staff. Specifically, the system needs to:

- Scan and read passenger details from boarding passes and ID documents.
- Verify passenger identities by comparing real-time facial captures with the photos on their IDs.
- Identify prohibited items, especially lighters, in passengers' carry-on luggage.
- Provide clear and instant feedback regarding whether passengers are allowed to board.

## Data Sources:

We'll use a variety of fabricated datasets:

- Flight Manifest: A list created specifically for the project containing passenger information.
- Passenger Digital IDs: Simulated identification documents with personal data and face photos.
- Boarding Passes: Digitally generated boarding passes for test passengers.
- Facial Videos: Short (15-30 seconds) videos of passengers, including the project owner.
- Carry-on Baggage Images: Photos of luggage contents, including examples of prohibited items (such as lighters).

## Solution Strategy:

To develop this solution, we'll leverage specific Azure Cognitive Services tools, including:

- Azure Form Recognizer: This service will extract passenger data from boarding passes and IDs. The extracted information will then be cross-checked with the provided flight manifest.
- Azure Video Indexer: We'll use this tool for facial recognition, matching live-captured video with ID photos to confirm passenger identity accurately.
- Azure Custom Vision: We will create a custom-trained model to specifically detect prohibited items, like lighters, in baggage images.

## Data Validation Approach:

To ensure accuracy and reliability, we'll validate our data in multiple stages:

- Information Validation: Passenger details extracted from boarding passes and IDs will be cross-referenced against the flight manifest. The goal is high accuracy (targeting ≥95%) to ensure data correctness.
- Facial Recognition: Facial recognition accuracy must be reliable, setting a high similarity confidence threshold (≥90%) to maintain robust identity verification.
- Prohibited Items Detection: For detecting items like lighters, we'll measure the custom vision model’s performance using precision (aiming for ≥90%) and recall (≥85%). This helps minimize both false alarms and missed detections.

By using this comprehensive validation method, we aim to achieve a secure and efficient automated boarding experience. While these Azure tools are highly effective, ongoing tuning and adjustments will likely be required to handle real-world conditions like varying lighting or image quality.