

# Project - Automated Passenger Boarding Kiosk

## Problem Definition and Solution Strategy

### Problem Definition:

The current manual passenger boarding process is inefficient and time-consuming. Passengers must wait in line to check their boarding pass and ID, which can lead to long delays. This is especially problematic at busy airports. An automated passenger boarding kiosk system would streamline the boarding process, reducing wait times and improving efficiency.

*Examples of typical manual passenger boarding process problems:*

- The manual boarding process is slow and inefficient. Passengers must wait in line to check their boarding pass and ID, which can take several minutes per passenger. This can lead to long delays, especially at busy airports.
- The manual boarding process is prone to errors. Passengers may accidentally give the wrong boarding pass or ID, or they may forget to check in altogether. This can lead to passengers missing their flights.
- The manual boarding process is not scalable. As the number of passengers increases, the delays and errors associated with the manual process will also increase.

### Project Objective:

The main objective of this project is to design and build an automated passenger boarding kiosk system.

*An automated passenger boarding kiosk system would address the aforementioned problems by:*

- Streamlining the boarding process. Passengers would be able to scan their boarding pass and ID at the kiosk, which would automatically check them in and print their boarding pass. This would eliminate the need to wait in line and reduce the risk of errors.
- Increasing efficiency. The automated boarding kiosk system would be able to process passengers much faster than the manual process. This would reduce wait times and improve the overall efficiency of the boarding process.
- Improving accuracy. The automated boarding kiosk system would be less prone to errors than the manual process. This would help to ensure that passengers are checked in correctly and do not miss their flights.
- Scalability. The automated boarding kiosk system is scalable, so it can be easily adapted to handle increased passenger traffic.

*The benefits of an automated passenger boarding kiosk system include:*

- Reduced wait times
- Improved efficiency
- Reduced errors
- Increased accuracy
- Scalability

*The following are some of the stakeholders who would be affected by the implementation of an automated passenger boarding kiosk system:*

- Passengers: Passengers would benefit from the reduced wait times and improved efficiency of the automated boarding process.
- Airports: Airports would benefit from the reduced congestion and improved efficiency of the boarding process.
- Airlines: Airlines would benefit from the reduced costs associated with the manual boarding process.

*The following are some of the challenges that need to be addressed in order to implement an automated passenger boarding kiosk system:*

- Cost: The cost of implementing an automated passenger boarding kiosk system can be high.
- Technology: The technology needs to be reliable and secure.
- Acceptance: Passengers may need to be educated about how to use the automated boarding kiosk system.

Overall, an automated passenger boarding kiosk system has the potential to significantly improve the efficiency and accuracy of the boarding process. The benefits of such a system outweigh the challenges, and it is a worthwhile investment for airports, airlines, and passengers.

## **Simulation - a sample project:**

In this sample project we will be using Azure Cognitive Services [Document Intelligence, Custom Vision, Video Indexer, Face, Vision], and our simulation scenario could be described as follows.

It is possible to think of the following simulated kiosk experience :

- A passenger manifest (list of passengers boarding in the plane) is created with a list of passengers with the following info
- Passports or other Digital IDs for all the passengers listed in the manifest
- Boarding passes for all the passengers
- A 15-30 seconds video of the passenger is used as the Kiosk face recognition system
- Restricted and Prohibited Items check. Passenger carry-on items are also scanned for prohibited items (e.g., lighter, sprays, electronic cigarettes, etc.) and if such items are present, the passenger is flagged for prohibited items in the carry-on baggage.
- The automated aircraft boarding procedure is simulated by processing all of this data using multiple Azure computer vision technologies.

## **Input Data Sources:**

- A video, 15-30 seconds, showing the passenger face (simulating a video captured and recorded by the Kiosk system's camera)
- Passenger Passport or other Digital ID card
  - First Name
  - Last Name
  - Gender

- Date of Birth
  - Face picture
- Passenger Boarding Pass
  - First Name
  - Last Name
  - Flight number
  - Seat
  - Origin
  - Destination
- Passenger carry-on items photo(s)
  - Passenger carry-on items are also scanned for restricted and prohibited Items check.
- Flight Manifest List for all passengers. All passengers' data are verified against this list, where all previous data are verified for each passenger
  - First Name
  - Last Name
  - Gender
  - Date of Birth
  - Facial identification and verification
  - Flight number
  - Seat
  - Origin
  - Destination
  - Luggage validation

### **The Solution Strategy:**

- A Machine Learning Model(s) will be trained to extract text from different documents, Mainly Azure AI Document Intelligence, for instance
  - An Azure Form recognizer custom model will be trained to extract passengers information from the boarding passes.
  - A prebuilt Document Intelligence Identity document (ID) model from Azure Form recognition will be used to extract the face and personal information from the passengers digital Passport or Digital ID.
- Azure Video Indexer will extract face photo from the passenger video, then the face photo extracted from the digital ID will be verified.
- The passenger information extracted from the boarding pass, will be validated from the manifest list.
- If person name exist in the manifest list then person identity will be validated from the personal ID.
- Azure AI Vision services will be used to build a custom object detection model, where the goal is to detect whether the passenger luggage contains any restricted items from the prohibited list.
- Once the boarding pass validation is done, then a final message of either successful or unsuccessful validation is displayed.