

Executive Summary

This project focuses on estimating the required number of Airport Customer Experience Specialists (ACES) at DFW International Airport based on passenger demand and congestion. Checkpoint queue length data was used as a proxy for terminal demand to better reflect real-time conditions.

A data-driven decision-making model was developed to determine the number of ACES needed per hour at each terminal based on peak thresholds and overflow conditions. The model identifies peak demand periods and provides hourly staffing requirements to improve passenger assistance and operational efficiency.

Background

Overview

- ✦ DFW International Airport serves approximately 86 million passengers annually
- ✦ Operates across 5 terminals, 16 checkpoints, and 165 gates
- ✦ Passenger flow varies by terminal, checkpoint, and time of day

ACES Role

- ✦ Passenger assistance
- ✦ Terminal monitoring
- ✦ Operational support



Define

Goal Statement

The goal of this project is to develop a data-driven decision-making model that determines the minimum and optimal number of ACES per hour across all 5 terminals.

Stakeholders

- ✦ Airport Leadership
- ✦ ACES Management
- ✦ Passengers



DMAIC - Measure and Analyze

Measure

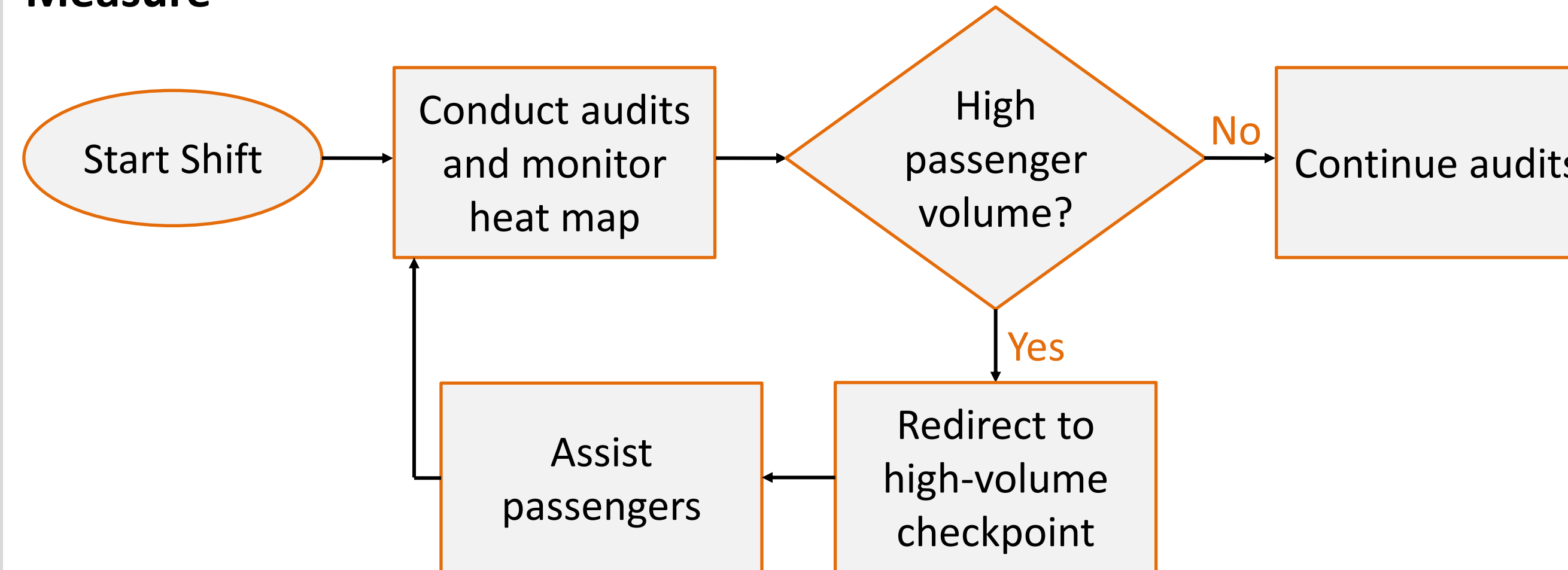


Figure 1. ACES Deployment Process

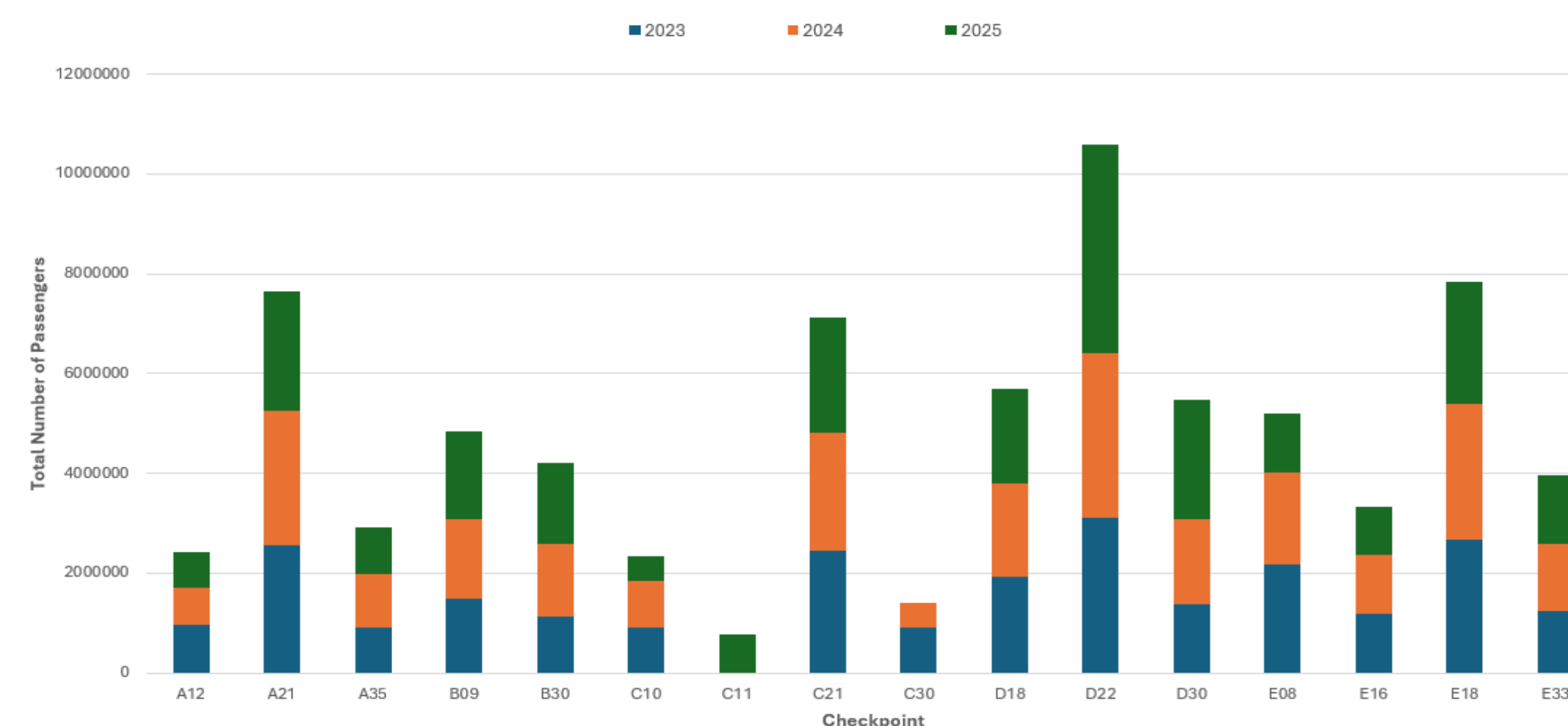


Figure 2. Passenger Throughput by Checkpoint and Year

Analyze

Queue Level Insights

- ✦ Peak months = June-July
- ✦ Peak hours = 6-9 AM and 3-5 PM
- ✦ Understaffed during peak times
- ✦ Lack of standardized staffing thresholds

Assumptions

- ✦ Break % = 12.5%
- ✦ Absenteeism % = 5%
- ✦ Overflow Ratio = 37 Passengers
- ✦ Audits are performed when ACES are not assisting passengers

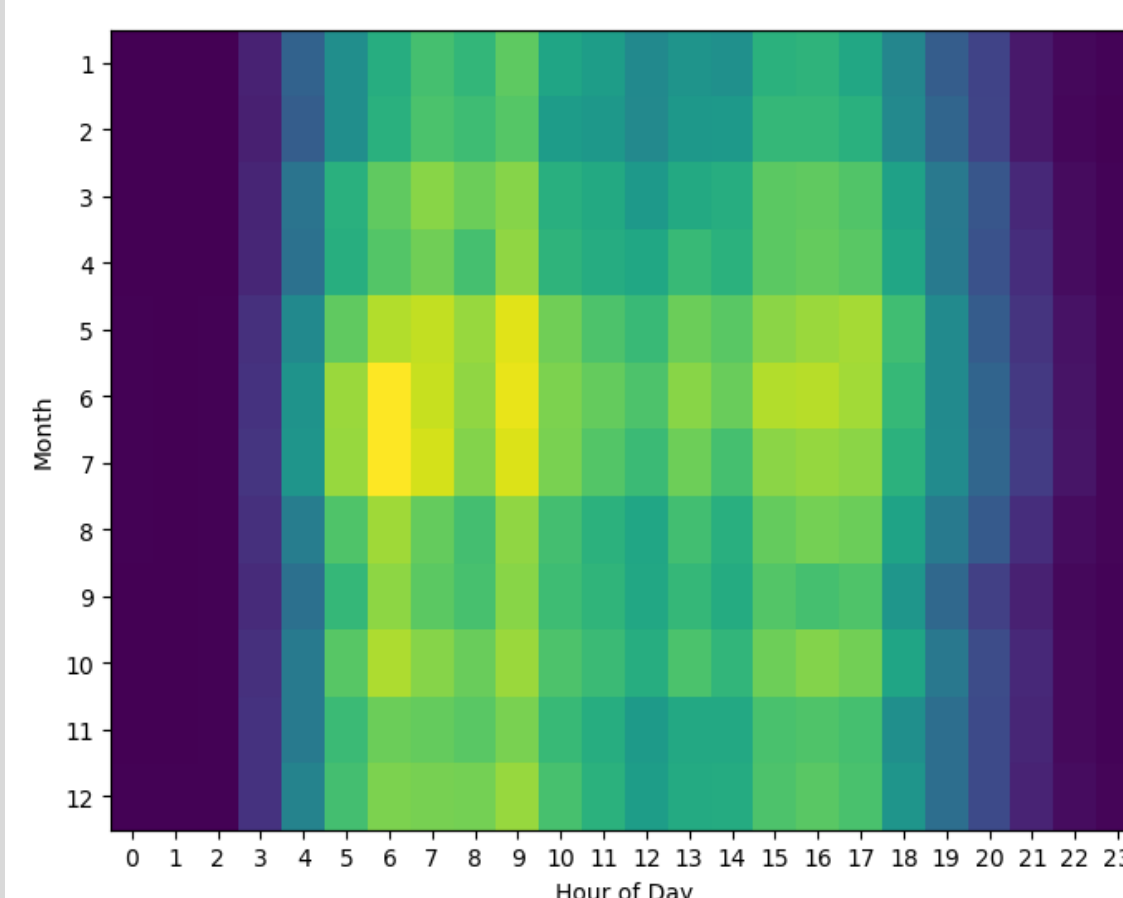


Figure 3. Seasonal and Hourly Passenger Demand Patterns (2023-2025)

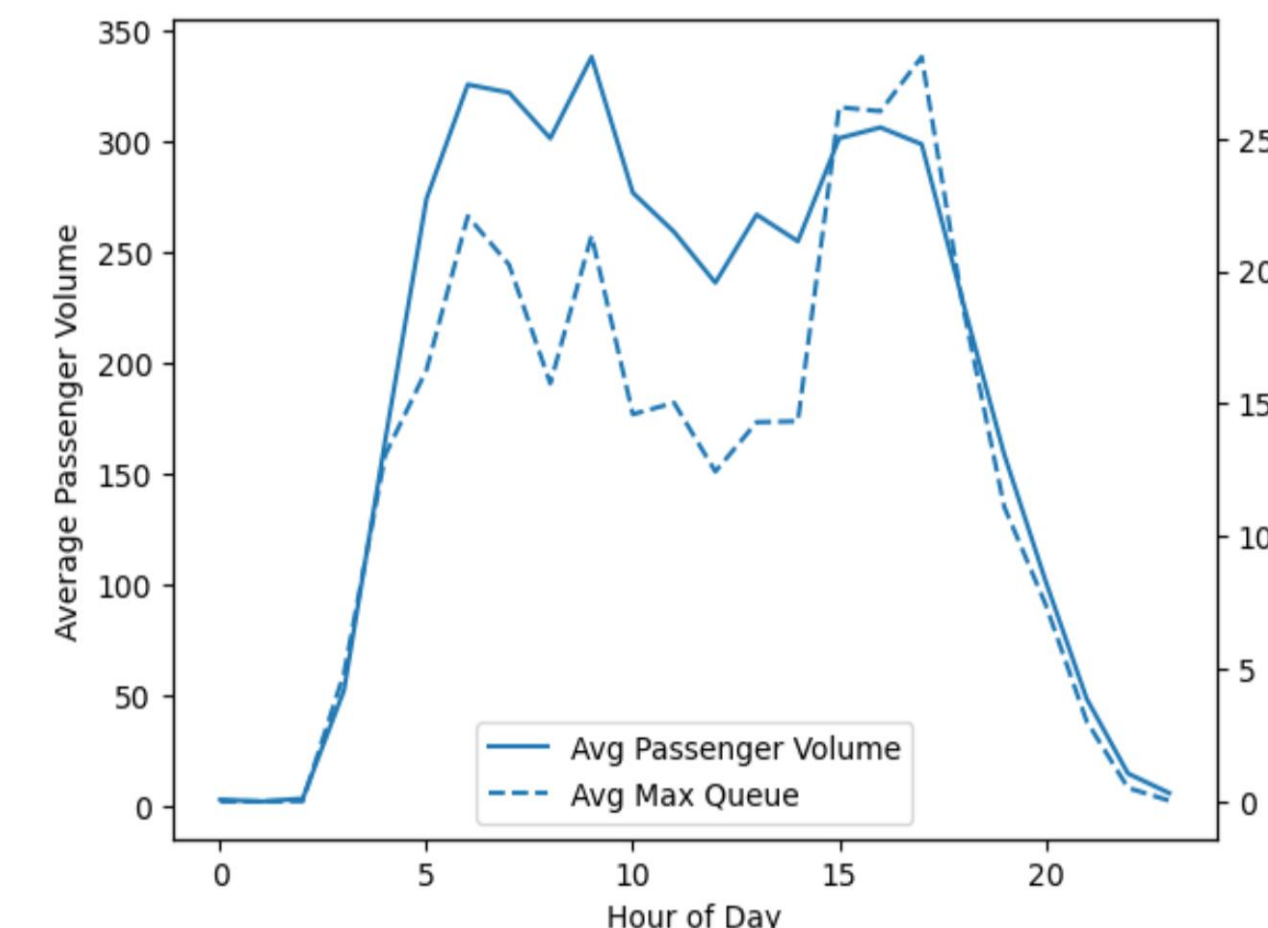


Figure 4. Daily Passenger Demand and Congestion (2023-2025)

DMAIC – Improve & Control

Improve

An optimized data-driven decision-making model was generated that determines the minimum and optimal number of ACES per hour.

General														
Date	Month	Day	Hour	Terminal	Checkpoint	Queue Le	Capacity	PEAK	Overflow	Minimum	Audit Per	Minimum	Total Min	Optimal M
1/1/2025	Jan	Wed	0	D	D22	0	132	66	0	0	Yes	0	0	0
1/1/2025	Jan	Wed	1	D	D22	0	132	66	0	0	Yes	0	0	0
1/1/2025	Jan	Wed	2	D	D22	0	132	66	0	0	Yes	0	0	0
1/1/2025	Jan	Wed	3	D	D22	0	132	66	0	0	Yes	0	0	0
1/1/2025	Jan	Wed	4	D	D22	0	132	66	0	0	Yes	0	0	0
1/1/2025	Jan	Wed	5	D	D22	8	132	66	0	0	Yes	0	0	0
1/1/2025	Jan	Wed	6	D	D22	25	132	66	0	0	Yes	0	0	0
1/1/2025	Jan	Wed	7	D	D22	32	132	66	0	0	Yes	0	0	0
1/1/2025	Jan	Wed	8	D	D22	200	132	66	68	2	No	0	2	3
1/1/2025	Jan	Wed	9	D	D22	272	132	66	140	4	No	0	4	5
1/1/2025	Jan	Wed	10	D	D22	184	132	66	52	2	No	0	2	3
1/1/2025	Jan	Wed	11	D	D22	207	132	66	75	3	No	0	3	4
1/1/2025	Jan	Wed	12	D	D22	87	132	66	0	1	No	0	1	2
1/1/2025	Jan	Wed	13	D	D22	3	132	66	0	0	Yes	0	0	0
1/1/2025	Jan	Wed	14	D	D22	31	132	66	0	0	Yes	0	0	0
1/1/2025	Jan	Wed	15	D	D22	234	132	66	102	3	No	0	3	4
1/1/2025	Jan	Wed	16	D	D22	168	132	66	36	1	No	0	1	2
1/1/2025	Jan	Wed	17	D	D22	138	132	66	6	1	No	0	1	2
1/1/2025	Jan	Wed	18	D	D22	136	132	66	4	1	No	0	1	2
1/1/2025	Jan	Wed	19	D	D22	89	132	66	0	1	No	0	1	2
1/1/2025	Jan	Wed	20	D	D22	89	132	66	0	1	No	0	1	2
1/1/2025	Jan	Wed	21	D	D22	0	132	66	0	0	Yes	0	0	0
1/1/2025	Jan	Wed	22	D	D22	0	132	66	0	0	Yes	0	0	0
1/1/2025	Jan	Wed	23	D	D22	0	132	66	0	0	Yes	0	0	0

Figure 5. Data Driven Decision Making Model

Control

Establish standardized staffing thresholds, continuously monitor demand, track KPIs such as coverage and utilization, and regularly update the model with new data to ensure accurate and efficient staffing decisions.

Conclusions and Future Work

Conclusion

The results demonstrate that congestion-based staffing can better identify peak demand periods and enhance passenger needs across terminals at DFW International Airport. These findings help reduce wait times and improve passenger experience.

Future Work

Future work will focus on expanding the model to include all terminals and checkpoints. Additional efforts may include validating the model with operational data and stakeholder feedback. Further refinement of assumptions and audit activities can enhance the accuracy and applicability of the model.

References

Courses: IE 4305 Engineering Decision Making with Data using Python, IE 4340 Engineering Project Management, IE 4350 Capstone Design
Engineering Standards: ISO 9241-11: Usability Definitions & Concepts
DFW Airport Operational Data (2023–2025)