Airport Management System

- *Group 14*

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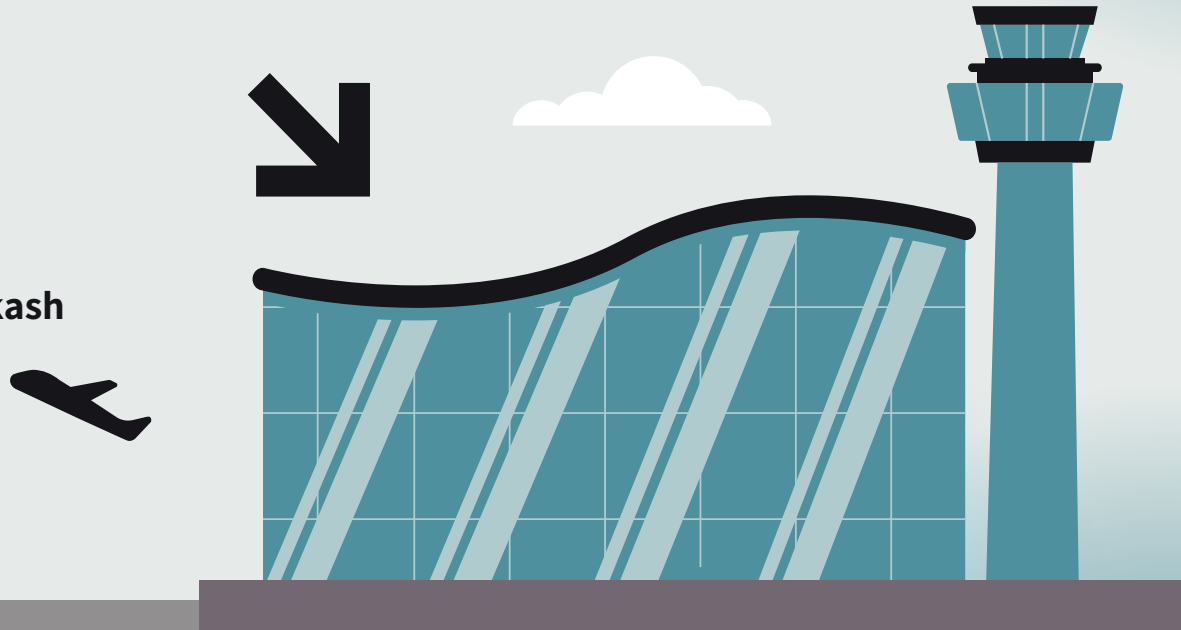


Overview

01

Comprehensive Software Solution: Manages and coordinates airport functions and operations.

02

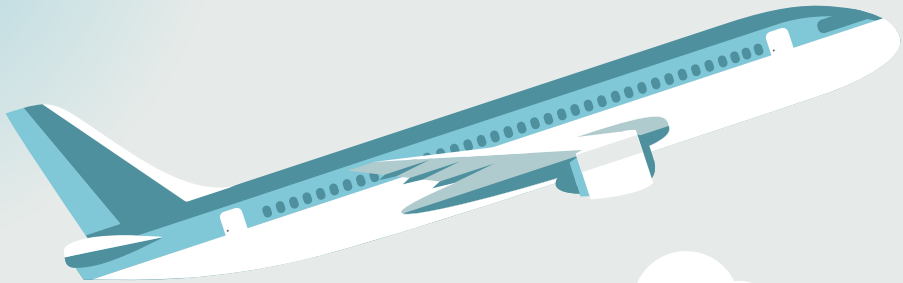
Flight Operations: Includes modules for scheduling flights and assigning gates.

03

Operational Efficiency: Aims to streamline airport operations for improved efficiency.

04

Essential for the smooth functioning and safety of airport activities.



Problem Statement

To implement an airport management system, which simulates various functions of an airport. This system is designed used to manage and coordinate the various functions and operations of an airport. Our system is designed to manage flight schedules, gate assignments, baggage handling, and passenger check-in and boarding.

Business Rules

The System is used to manage only a single airport.

Each passenger can purchase tickets individually or as a group and each booking is uniquely identified by a order_id.

Only the passenger traveling can book the ticket.

Business Rules

Tickets are assigned to passengers and uniquely identified by a combination of order_id and ticket_id.

Each ticket is associated with 1 or more baggage and each piece of baggage is uniquely identifiable by a baggage_id.

All flights to and from the airport are tracked with each flight having a unique flight ID, source, and destination.

Business Rules

Flights are operated by airlines with specific airline_id and route numbers to track their corridors.

The airport is managed by airline staff who can be tracked by their staff_id. Their basic details like first name, last name, and email address must be given.

All the cities connected to the airport are managed by the airport_code to track which airport the flight is arriving from.

Entities

Airline	Terminal	Airport
Passenger	Orders	Airline Staff
Flight	Ticket	Baggage
Schedule	Airport Staff	Cleaning Schedule

Entity Relationship Diagram (ERD)

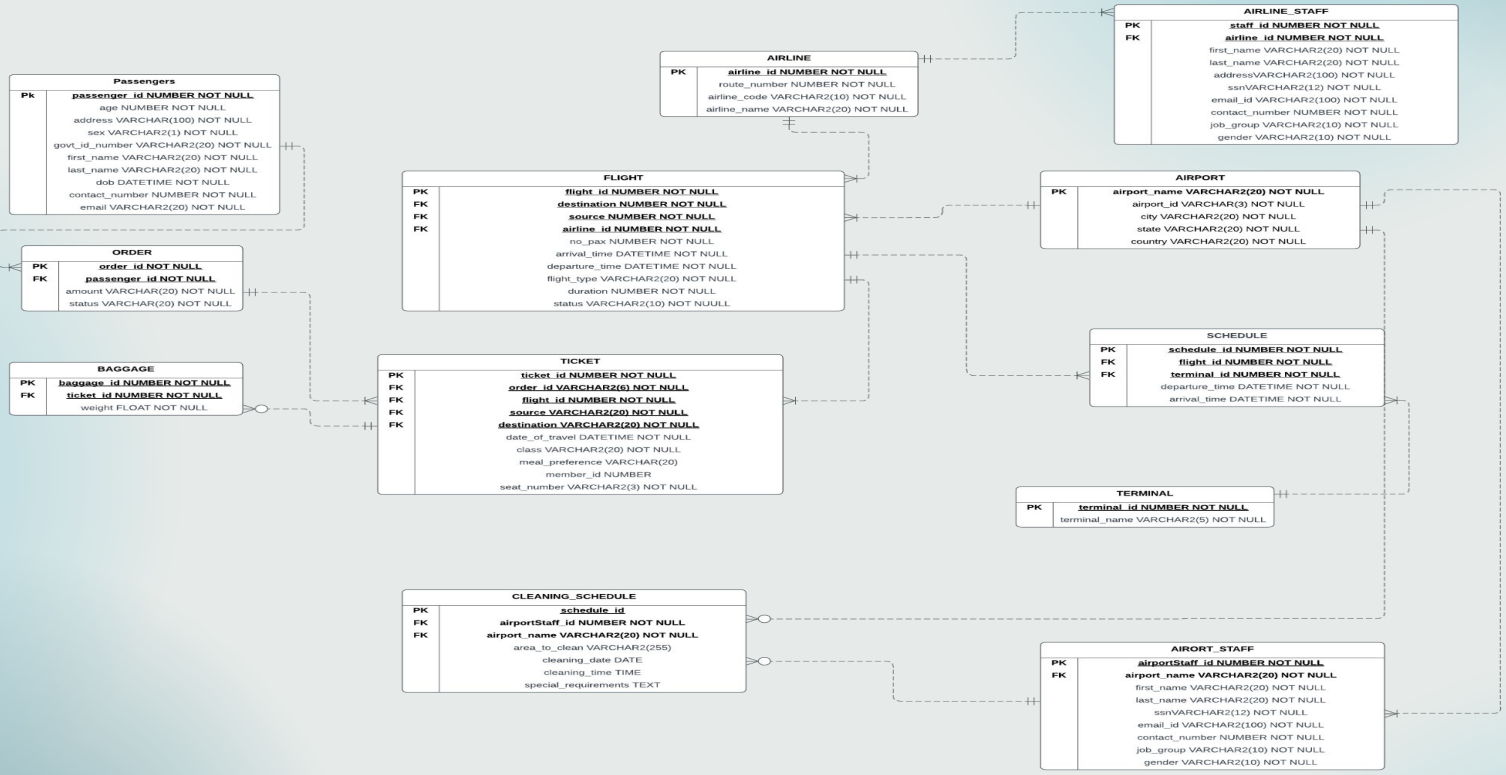


Table Level Check Constraints

Final-1 (2).sql - boyce.coe.neu.edu.AirportManagementSystem_Group14 (INFO6210 (83))* - Microsoft SQL Server Management Studio

```
EXEC sp_InsertFlight 1, 120, 'Commercial', '2023-12-01 08:00', '2023-12-01 10:00', 'JFK', 'LAX', 'On Time', 150, 1
EXEC sp_InsertFlight 2, 180, 'Commercial', '2023-12-01 09:00', '2023-12-01 12:00', 'LAX', 'ORD', 'Delayed', 200, 2
EXEC sp_InsertFlight 3, 90, 'Private', '2023-12-01 07:30', '2023-12-01 09:00', 'ORD', 'ATL', 'On Time', 50, 3
EXEC sp_InsertFlight 4, 210, 'International', '2023-12-01 15:00', '2023-12-01 18:30', 'ATL', 'DFW', 'Cancelled', 250, 4
EXEC sp_InsertFlight 5, 150, 'Commercial', '2023-12-02 10:00', '2023-12-02 12:30', 'DFW', 'DEN', 'On Time', 180, 5
EXEC sp_InsertFlight 6, 60, 'Private', '2023-12-02 06:00', '2023-12-02 07:00', 'DEN', 'SFO', 'Delayed', 40, 6
EXEC sp_InsertFlight 7, 140, 'International', '2023-12-02 20:00', '2023-12-02 22:20', 'SFO', 'LAS', 'On Time', 220, 7
EXEC sp_InsertFlight 8, 200, 'Commercial', '2023-12-03 09:00', '2023-12-03 12:20', 'LAS', 'MIA', 'Cancelled', 210, 8
EXEC sp_InsertFlight 9, 170, 'Private', '2023-12-03 08:00', '2023-12-03 10:50', 'MIA', 'SEA', 'Delayed', 60, 9
EXEC sp_InsertFlight 10, 130, 'Commercial', '2023-12-03 16:00', '2023-12-03 18:10', 'SEA', 'JFK', 'On Time', 160, 10

EXEC sp_InsertFlight 11, 130, 'Commercial', '2023-03-01 09:00', '2023-03-01 11:00', 'PHX', 'CLT', 'On Time', 160, 11;
EXEC sp_InsertFlight 12, 110, 'Private', '2023-04-01 08:30', '2023-04-01 10:30', 'CLT', 'PHX', 'Delayed', 70, 12;


select * from Flight




EXEC sp_InsertFlight 13, 100, 'Commercial', '2023-12-04 12:00', '2023-12-04 11:00', 'JFK', 'LAX', 'Delayed', 180, 1
```

Messages

```
Msg 547, Level 16, State 0, Procedure sp_InsertFlight, Line 14 [Batch Start Line 696]
The INSERT statement conflicted with the CHECK constraint "chk_FlightTimeValidity". The conflict occurred in database "AirportManagementSystem_Group14", table "dbo.FLIGHT".
The statement has been terminated.

Completion time: 2023-12-08T22:56:19.5003378-05:00
```

Query completed with errors.

Check Constraint code

```
CREATE FUNCTION dbo.CheckDepartureBeforeArrival
(@departure_time DATETIME,
@arrival_time DATETIME)
RETURNS BIT
AS
BEGIN
	DECLARE @Result BIT
	IF @departure_time < @arrival_time
		SET @Result = 1 -- Valid case
	ELSE
		SET @Result = 0 -- Invalid case
	RETURN @Result
END
go
ALTER TABLE FLIGHT
ADD CONSTRAINT chk_FlightTimeValidity CHECK (dbo.CheckDepartureBeforeArrival(departure_time, arrival_time) = 1);
```

Calculated column

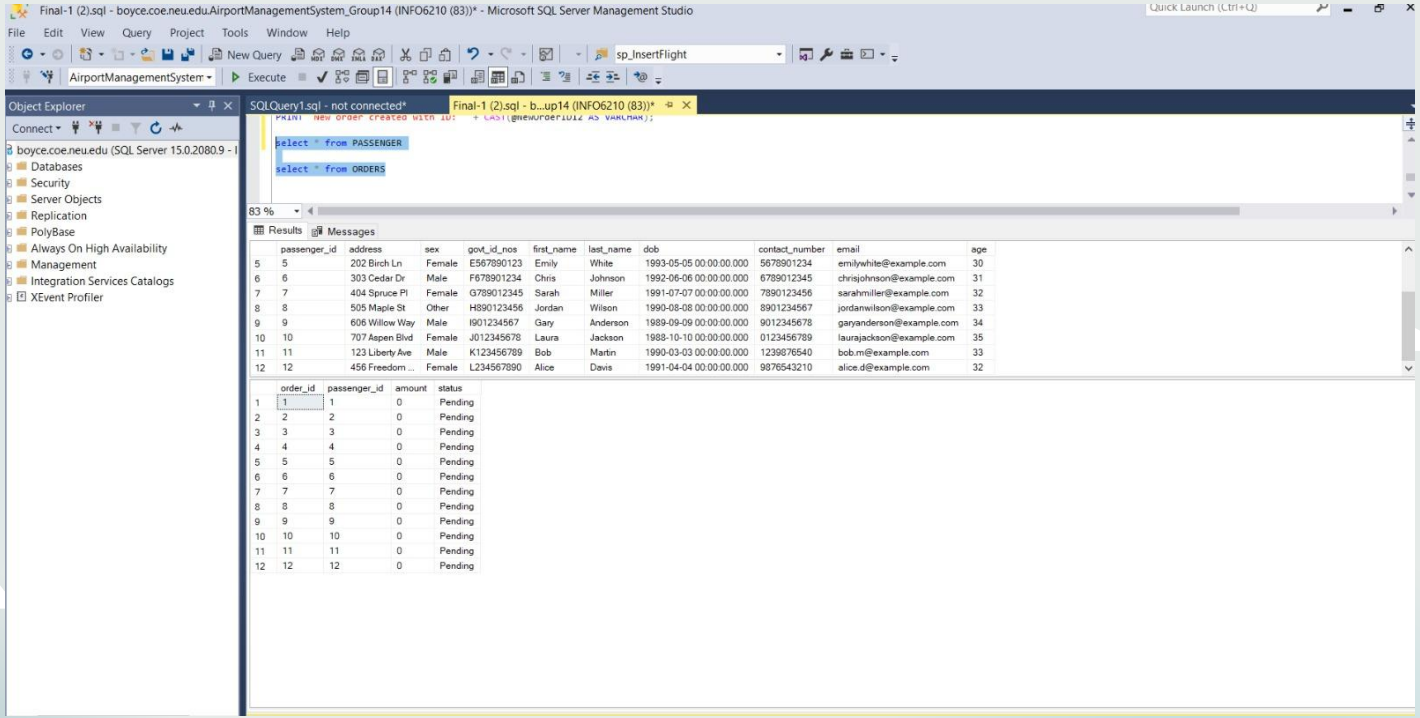
```
ALTER TABLE PASSENGER
ADD age AS DATEDIFF(YEAR, dob, GETDATE()) -
CASE
WHEN (MONTH(dob) > MONTH(GETDATE())) OR
(MONTH(dob) = MONTH(GETDATE()) AND DAY(dob) > DAY(GETDATE()))
THEN 1
ELSE 0
END;

go
```

Data consistency

```
Example :
ALTER TABLE FLIGHT
ADD CONSTRAINT fk_flight_airline
FOREIGN KEY (airline_id) REFERENCES AIRLINE(airline_id)
ON DELETE CASCADE,
ADD CONSTRAINT fk_flight_destination
FOREIGN KEY (destination) REFERENCES AIRPORT(airport_name)
ON DELETE CASCADE,
ADD CONSTRAINT fk_flight_source
FOREIGN KEY (source) REFERENCES AIRPORT(airport_name)
ON DELETE CASCADE;
```

Flow

Insert passenger



	passenger_id	address	sex	govt_id_nos	first_name	last_name	dob	contact_number	email	age
5	5	202 Birch Ln	Female	E567890123	Emily	White	1993-05-05 00:00:00.000	5678901234	emilywhite@example.com	30
6	6	303 Cedar Dr	Male	F678901234	Chris	Johnson	1992-06-06 00:00:00.000	6789012345	chrisjohnson@example.com	31
7	7	404 Spruce Pl	Female	G789012345	Sarah	Miller	1991-07-07 00:00:00.000	7890123456	sarahmiller@example.com	32
8	8	505 Maple St	Other	H890123456	Jordan	Wilson	1990-08-08 00:00:00.000	8901234567	jordanwilson@example.com	33
9	9	606 Willow Way	Male	I901234567	Gary	Anderson	1989-09-09 00:00:00.000	9012345678	garyanderson@example.com	34
10	10	707 Aspen Blvd	Female	J012345678	Laura	Jackson	1988-10-10 00:00:00.000	0123456789	laurajackson@example.com	35
11	11	123 Liberty Ave	Male	K123456789	Bob	Martin	1990-03-03 00:00:00.000	1239876540	bob.m@example.com	33
12	12	456 Freedom ...	Female	L234567890	Alice	Davis	1991-04-04 00:00:00.000	9876543210	alice.d@example.com	32

	order_id	passenger_id	amount	status
1	1	1	0	Pending
2	2	2	0	Pending
3	3	3	0	Pending
4	4	4	0	Pending
5	5	5	0	Pending
6	6	6	0	Pending
7	7	7	0	Pending
8	8	8	0	Pending
9	9	9	0	Pending
10	10	10	0	Pending
11	11	11	0	Pending
12	12	12	0	Pending

Insert Ticket

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File Edit View Query Project Tools Window Help

New Query | sp_InsertFlight | AirportManagementSystem | Execute

Object Explorer

Connect

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- Integration Services Catalogs
- XEvent Profiler

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SQLQuery1.sql - not connected* | Final-1 (2).sql - b...up14 (INFO6210 (83))*

```
select * from Ticket

select * from Baggage
```

83 %

Results | Messages

	ticket_id	order_id	flight_id	seat_no	meal_preferences	source	destination	date_of_travel	class	payment_type	Member_id	Transaction_amount
1	1	1	1	1A	Vegetarian	JFK	LAX	2023-12-01 00:00:00.000	Economy	Credit Card	1	500
2	2	2	2	2B	Vegan	LAX	ORD	2023-12-01 00:00:00.000	Business	Debit Card	2	750
3	3	3	3	3C	Gluten-Free	ORD	ATL	2023-12-01 00:00:00.000	First Class	Credit Card	3	300
4	4	4	4	4D	No Preferences	ATL	DFW	2023-12-01 00:00:00.000	Economy	PayPal	4	450
5	5	5	5	5E	Halal	DFW	DEN	2023-12-02 00:00:00.000	Business Pro	Credit Card	5	600
6	6	6	6	6F	Kosher	DEN	SFO	2023-12-02 00:00:00.000	Economy	Cash	6	350
7	7	7	7	7G	No Preferences	SFO	LAS	2023-12-02 00:00:00.000	First Class	Debit Card	7	550
8	8	8	8	8H	Vegetarian	LAS	MIA	2023-12-03 00:00:00.000	Business	Credit Card	8	700

	baggage_id	ticket_id	weight
1	1	1	100
2	2	2	200
3	3	3	400
4	4	4	100
5	5	5	300
6	6	6	100
7	7	7	400
8	8	8	200

	order_id	passenger_id	amount	status
1	1	1	500	Success
2	2	2	750	Success
3	3	3	300	Success
4	4	4	450	Success
5	5	5	600	Success
6	6	6	350	Success
7	7	7	550	Success
8	8	8	700	Success
9	9	9	400	Success
10	10	10	500	Success
11	11	11	950	Success
12	12	12	1200	Success

Query executed successfully. | boyce.coe.neu.edu (15.0 RTM) | INFO6210 (83) | AirportManagementSyste... | 00:00:00 | 36 rows

Insert Cleaning Schedule

SQLQuery1.sql - bo...14 (INFO6210 (79))*

```
Use AirportManagementSystem_Group14;
Go

Select * from AIRPORT;
Select * from AIRPORT_STAFF;
Select * from CLEANING_SCHEDULE;
```

110 %

Results | Messages

	airport_id	airport_name	city	state	country
6	1	JFK	New York	NY	USA
7	8	LAS	Las Vegas	NV	USA
8	2	LAX	Los Angeles	CA	USA
9	9	MIA	Miami	FL	USA
10	3	ORD	Chicago	IL	USA
11	11	PHX	Phoenix	AZ	USA
12	10	SEA	Seattle	WA	USA
13	7	SFO	San Francisco	CA	USA

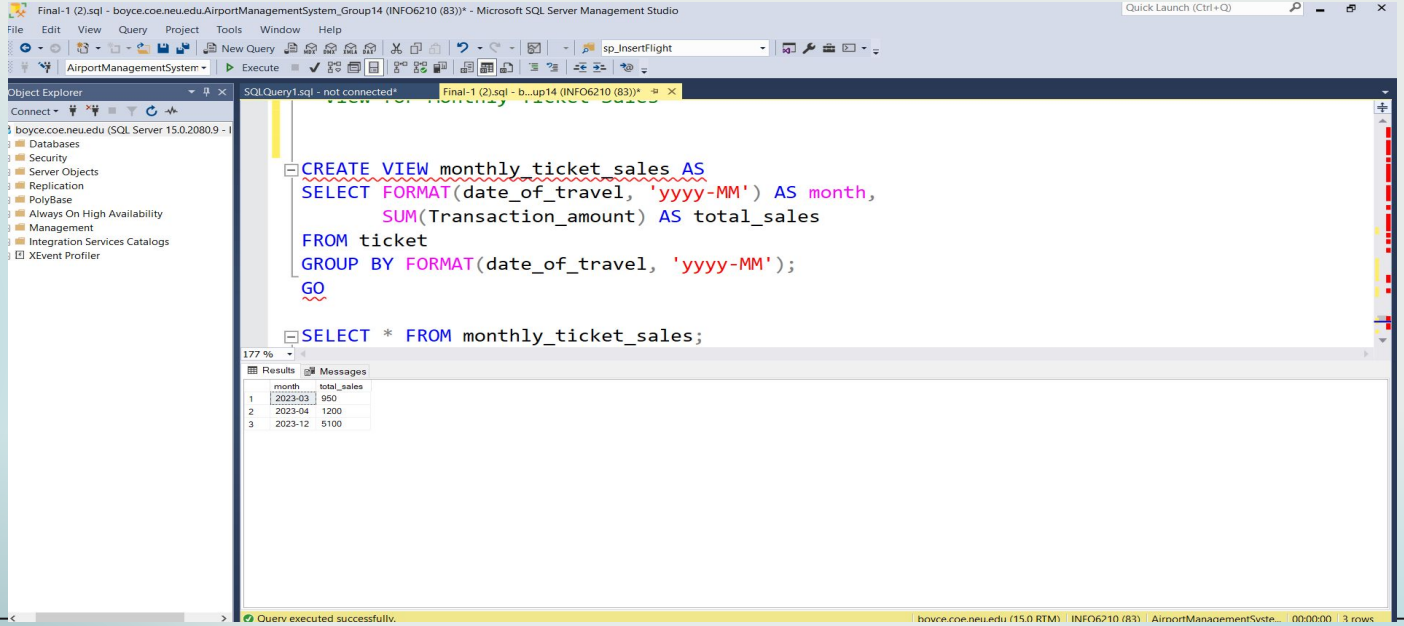
	airportStaff_id	airport_name	first_name	last_name	gender	job_group	ssn	contact_number	email	address
1	1	ATL	John	Doe	Male	Cleaning	123-45-6789	123-456-7890	john.doe@example.com	123 Example Street
2	2	DEN	John	Doe	Male	Cleaning	123-45-6789	123-456-7890	john.doe@example.com	123 Example Street
3	3	DFW	John	Doe	Male	Cleaning	123-45-6789	123-456-7890	john.doe@example.com	123 Example Street
4	4	JFK	John	Doe	Male	Cleaning	123-45-6789	123-456-7890	john.doe@example.com	123 Example Street
5	5	LAS	John	Doe	Male	Cleaning	123-45-6789	123-456-7890	john.doe@example.com	123 Example Street
6	6	MIA	John	Doe	Male	Cleaning	123-45-6789	123-456-7890	john.doe@example.com	123 Example Street
7	7	ORD	John	Doe	Male	Cleaning	123-45-6789	123-456-7890	john.doe@example.com	123 Example Street
8	8	SEA	John	Doe	Male	Cleaning	123-45-6789	123-456-7890	john.doe@example.com	123 Example Street

	schedule_id	airport_name	airportStaff_id	area_to_clean	cleaning_date	cleaning_time	special_requirements
1	1	ATL	1	Lounge Area	2023-12-02	09:00:00.0000000	Deep Clean Required
2	2	DEN	2	Lounge Area	2023-12-02	09:00:00.0000000	Deep Clean Required
3	3	DFW	3	Lounge Area	2023-12-02	09:00:00.0000000	Deep Clean Required
4	4	JFK	4	Lounge Area	2023-12-02	09:00:00.0000000	Deep Clean Required

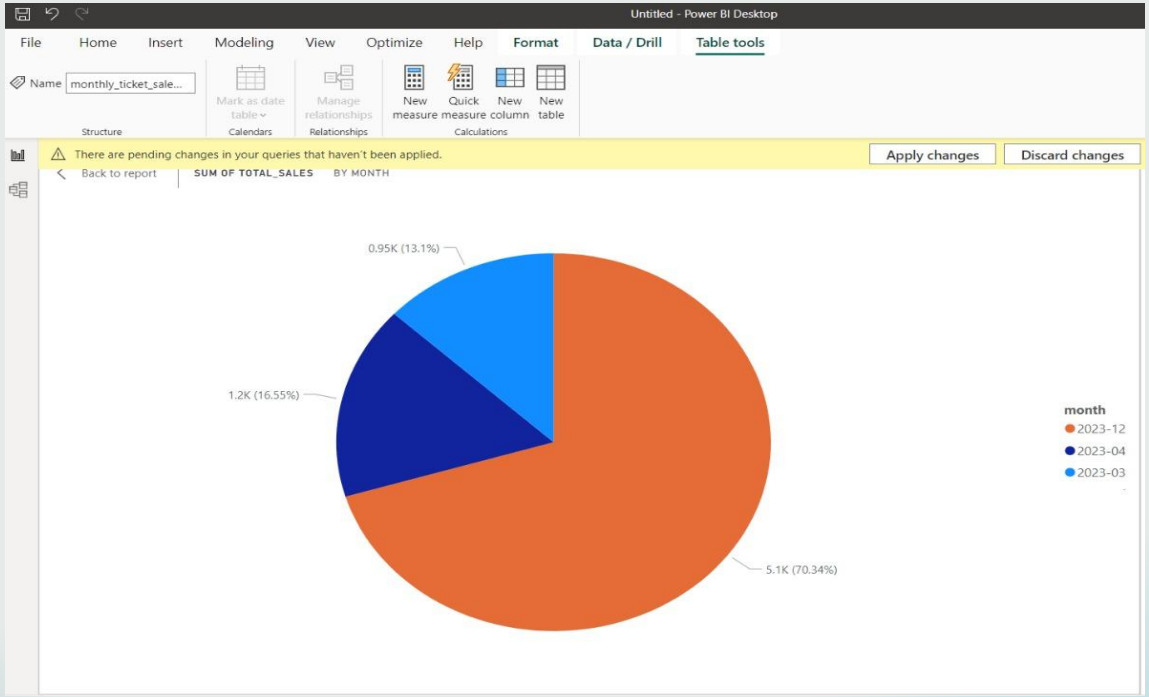
Query executed successfully. | boyce.coe.neu.edu (15.0 RTM) | INFO6210 (79) | AirportManagementSyste... | 00:00:00 | 33 rows

Reports & Visualisation

View 1: Monthly sales



Power BI Pie chart



Reports & Visualisation

View 2:Earning of each Airline

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New Query | sp_InsertFlight | AirportManagementSystem | Execute

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SQLQuery1.sql - not connected* | Final-1 (2).sql - b...up14 (INFO6210 (83))*

```sql
--View for calculating flight revenue per airline
CREATE VIEW flight_revenue AS
SELECT SUM(o.amount) AS Revenue, al.airline_name
FROM ORDERS o
JOIN TICKET t ON t.order_id = o.order_id
JOIN FLIGHT f ON f.flight_id = t.flight_id
JOIN AIRLINE al ON al.airline_id = f.airline_id
GROUP BY al.airline_name;
GO

SELECT * FROM flight_revenue;
```

146 %

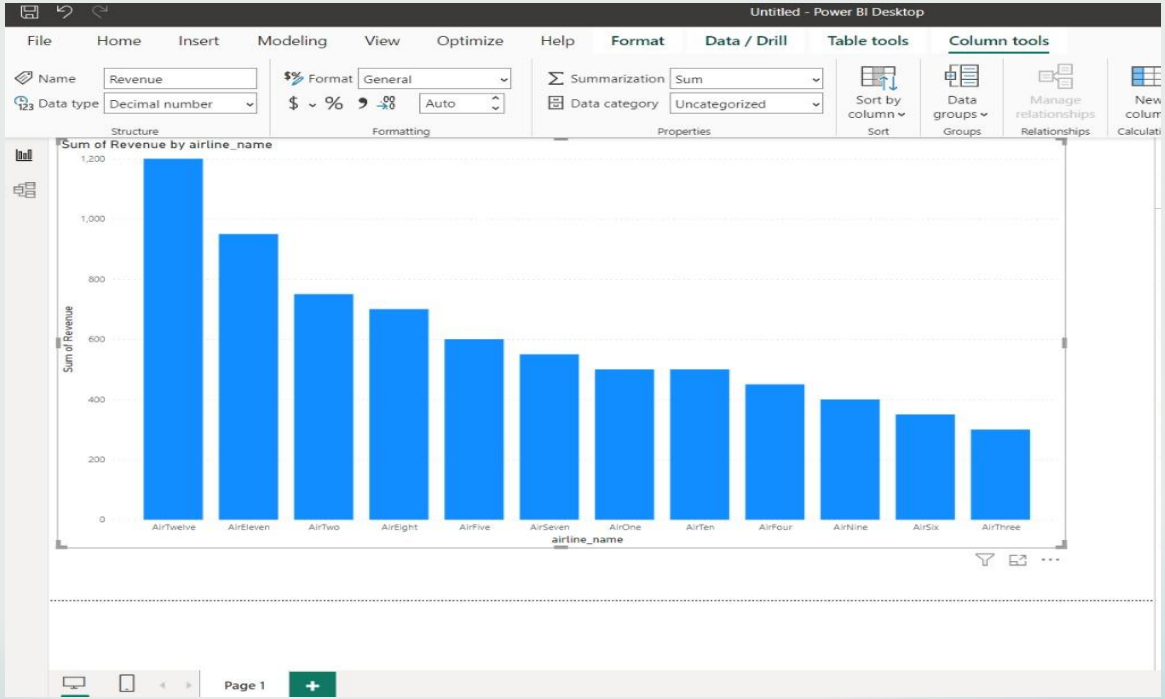
Results | Messages

	Revenue	airline_name
1	700	AirEight
2	950	AirEleven
3	600	AirFive
4	450	AirFour
5	400	AirNine
6	500	AirOne
7	550	AirSeven
8	350	AirSix
9	500	AirTen
10	300	AirThree
11	1200	AirTwelve
12	750	AirTwo

Query executed successfully. | boyce.coe.neu.edu (15.0 RTM) | INFO6210 (83) | AirportManagementSyste... | 00:00:00 | 12 rows

Ready | Ln 959 | Col 1 | Ch 1 | INS

Power BI Bar Graph



THANK YOU

Any Questions?