CERTIFICATE COURSE ON

Data Analytics and Data Visualizations Using AI (DADVAI)

Capstone Project Report

Project Title: Northern Lights Air's Loyalty Programme Effectiveness Analysis

Submitted in partial fulfilment of the Final Exam of the Course DADVAI

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Submitted By:

Sagnick Mukherjee

Preface

We are pleased to present this capstone project titled "Loyalty Program Analysis of Northern Lights Air" as a culmination of our data analytics training journey. This project has provided us with an invaluable opportunity to apply analytical tools and business intelligence techniques to a real-world business scenario in the airline industry.

We would like to express our heartfelt gratitude to our respected instructors and mentors at Neotia Skill Development Academy, whose guidance, feedback, and encouragement played a pivotal role in shaping this project. Their dedication to practical learning and continuous improvement has been a source of inspiration throughout our learning journey.

We would also like to thank the academic team for providing the project structure, datasets, and support materials that laid the foundation for a meaningful analysis. The hands-on exposure to tools like Excel, Power BI, SQL, and statistical techniques has enhanced our analytical thinking and problem-solving capabilities.
This project represents not only an academic achievement but also a step forward in our professional development as a data analyst. We sincerely hope that the insights derived from this project reflect both the skills We have acquired and the potential for meaningful data-driven decision-making in business environments.

Sincerely,
Sagnick Mukherjee

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CHAPTER 1: INTRODUCTION

1.1 Background of the Capstone Project: -

In today's competitive airline industry, retaining loyal customers is more crucial than ever. Loyalty programs are strategic tools used by airlines to incentivize repeat behaviour, increase customer engagement, and maximize lifetime value. Understanding the underlying behaviour of loyal vs non-loyal customers – including how they respond to promotions and how frequently they travel- is essential for designing data-driven customer retention strategies.

1.2 Relevance of the project in AI: -

With the rapid advancement of data analytics and artificial intelligence (AI), organizations now rely heavily on historical customer data to drive business decisions. In this project, various analytics techniques were used — such as exploratory data analysis (EDA), statistical testing (e.g., skewness, standard deviations, correlation), and dashboard visualizations — to uncover patterns in customer behaviour. By leveraging tools like Excel, SQL, and Power BI, this capstone project aligns with core industry practices in customer analytics, segmentation, and campaign evaluation.

1.3 Scope of the project: -

This project explores the behavioural patterns of airline customers based on their flight activity, loyalty status, and demographic details. Special attention is given to the Enrolment and cancellation trends in a loyalty program, particularly during a promotional period (Feb–Apr 2018). The scope includes both quantitative metrics and visualization techniques that help explain customer decisions and loyalty outcomes.

1.4 Significance of the work: -

This study offers valuable insights into how different customer segments respond to loyalty programs and promotional campaigns. It helps answer critical business questions such as:

What factors drive customer cancellations?

Which Enrolment channels yield high retention?

How does customer behaviour change after joining the loyalty program?

The findings provide actionable intelligence to optimize loyalty program design, personalize marketing efforts, and improve customer retention.

CHAPTER 2: OBJECTIVES OF THE PROJECT PROBLEM

2.1 General Objective: -

To analyse airline customer behaviour using flight activity and demographic data to uncover insights about loyalty, retention, and promotional effectiveness — enabling data-driven decision-making for improving customer engagement.

2.2 Specific Objectives: -

1. To analyse trends in customer Enrolment and cancellation status
2. To evaluate the impact of the promotional period (Feb–Apr 2018) on Enrolment activity and retention
3. To segment customers by demographics and behavioural metrics
4. To compute and visualize key performance indicators (KPIs)
5. To build interactive Power BI dashboards to communicate findings effectively
6. To apply statistical techniques to support insight.

CHAPTER 3: PROBLEM STATEMENT AND KPIs

3.1 Problem Statement

Northern Lights Air, a fictional airline, operates a customer loyalty program designed to encourage repeat travel, improve customer retention, and increase customer lifetime value (CLV). Recently, the airline launched a promotional campaign from February to April 2018 to boost loyalty program Enrolments.

The airline now seeks data-driven answers to the following key business questions:

- ✓ How did customer Enrolment and retention respond to the promotional campaign?
- ✓ Which Enrolment channels contributed most to active and retained customers?
- ✓ How does customer behaviour differ before and after enrolling in the loyalty program?
- ✓ Which customer segments (e.g., age, gender, location) show higher retention or cancellation trends?
- ✓ What behavioural traits (e.g., travel frequency, points usage) are associated with loyalty outcomes?
- ✓ To address these, this project analyses flight activity, demographic data, and loyalty status using Excel, Power BI, and statistical techniques.

3.2 Key Performance Indicators (KPIs): -

The following KPIs were designed and measured to support analysis and decision-making:

KPI Name	Description
Total Enrolments	Count Of Customers who joined the loyalty program
Retention Rate	% of customers who remained active (not cancelled)
Cancellation Rate	% of customers who cancelled their loyalty membership
Promo Period Enrolments	Number of Enrolments between Feb-Apr 2018
Average Flights Per Customer	Mean number of flights per customer
Travel Frequency	Total flights per customer, categorized into bands (Low, Medium, High)
Customer Lifetime Value(CLV)	Total estimated value of each customer to the airline
Points Accumulated vs Redeemed	Behavioural indicator of engagement and usage of loyalty benefits.
Channel Contribution	% of Enrolments from each channel (e.g. App, Website, Email, In-store)
% Cancelled by Segment	Cancellation rate by Age, Gender, City, Travel Band etc.

CHAPTER 4: METHODOLOGY

4.1 Overall Approach

The project followed a structured, business-oriented data analysis workflow:

1.Data Understanding: Reviewed the structure and meaning of the three datasets provided.

2.Data Cleaning: Handled missing values, invalid records, and outliers. Converted data types (e.g., converting general columns to numeric), standardized date fields.

3. **Data Enrichment & Feature Engineering**: Several new columns such as Status, Enrolment Date, Travel Frequency, Travel Frequency Band etc where created.

4.Data Analysis: Behavioural analysis in Pre and Post Enrolment, Effectiveness of Promo Period (Feb-April 2018), Demographical analysis of People who remained active or cancelled their enrolment were analysed with the help of Power Bi. In Excel various statistical methods Mean, Median, Skewness, Correlation, Pivot analysis was done to derive statistical insights.

5. **Data Visualization**: Built three structured dashboards in Power BI:

- ✓ Dashboard 1: Enrolment trends and behavioural insights
- ✓ Dashboard 2: Enrolment Status Analysis: Active vs Cancelled
- ✓ Dashboard 3: Loyalty Programme and its Effectiveness

4.2 Tools and Technologies Used

Excel and Power Bi

4.3 Development Environment

- Microsoft Excel
- Power Bi Desktop
- Data Volume: 391015 flight records; 16738 loyalty profiles
- No programming or scripting languages used (Python/R excluded by project scope)

4.4 Methodological Considerations

- Used Pivot Table to align flight data with one-record-per-customer loyalty profiles.
- Simulated missing fields (e.g., channel) using DAX formula in Power BI.
- Created Synthetic Column (Age) in Customer Loyalty History Data.
- Split visuals into three dashboards for better clarity and visual performance.
- Applied statistical testing (e.g. Skewness, Standard deviation, Correlation) for added depth.

CHAPTER 5: DATA ANALYTICS

5.1 Overview of Dataset Structure

1. Customer Flight Activity: -

Contains monthly-level flight data for each customer.

2. Customer Loyalty History: -

Contains demographic and loyalty status information.

3. Calendar Dataset : -

Contains formatted date fields and flags for start of year/month/quarter.

5.2 Data Preparation and Cleaning (Excel & Power BI)

Data Preparation and Cleaning (Excel & Power BI)

Key data cleaning tasks included:

- Accurate data types of the fields were assigned.
- Replaced negative salaries and missing salaries with median values to avoid skewing analysis.
- Created full Enrolment Date and Cancellation Date in Customer Loyalty History data and Date in Customer Flight Activity data using YEAR and MONTH columns.
- Created a derived Status field using IF() logic:

=IF(Cancellation Year="", "Active", "Cancelled")

5.3 Feature Engineering

Column	Description
Status	"Active" or "Cancelled" based on cancellation year/month
Travel Frequency	Total flights per customer aggregated
Travel Frequency Band	Categorized as Low (<=20), Medium (<=50), High (<=106)
Promo Period Label	Customers who enrolled between 01-Feb-2018 and 30-Apr-2018
Enrolment Channel	Simulated channel source (App, Website, Email, In-Store)
Pre/Post Enrolment Label	Used to compare flight behaviour before and after joining.
Age Band	Categorized as Upto 35,36-50, More than 50 Years

Apart from that a table containing Total Enrolled People, Active People and Cancelled People is created in Power Bi to create A conversion funnel visualization.

5.4 Exploratory Data Analysis (Excel)

Several basic statistics and tests were used for Exploratory Data Analysis:

Skewness of fields like CLV, Total Flights, Point Accumulated and Age showed high positive skewness (e.g., CLV skewness = 3.07, Total Flights skewness=3.19, Points Accumulated skewness=6.69, Age skewness=0.14).

Correlation was computed between:

- CLV and Points Accumulated (after aggregating data by customer)= (-0.008485) Negative Correlation but not good
- CLV and Total Flights(after aggregating data by customer)= (-0.008345) Negative Correlation but not good

Status	Active
Row Labels	Count of Loyalty Number
Female	7355
Male	7315
Grand Total	14670

Status	Active
Row Labels	Count of Loyalty Number
29-38	4289
39-48	8796
49-58	1572
59-69	13
Grand Total	14670
% Retained	88%

	CLV	Total Flights	Points Accumulated	Age
Mean	7988.896536	1.301252641	2037.137363	41.61128
Median	5780.18	0	0	42
Std.Dev	6860.777312	1.965384696	3879.025505	5.451448
Range	81427.37	28	100926	40
Skewness	3.07085394	3.192389044	6.695502087	0.143625

Correlation Between Points Accumulated and CLV	-0.008485	Negative Correlation But Not Good
Correlation Between Total Flights and CLV	-0.008345	Negative Correlation But Not Good

5.5 Key Metrics Calculated

- **Retention and cancellation rate: -**
  Retention Rate 87.65% Cancellation Rate 12.35%
- **Average flights per customer (overall, pre, and post Enrolment): -**
  Overall: - 30.40
  Pre: - Active: - 1.81 Cancelled: - 0.01
  Post: - Active: - 32.69 Cancelled: - 10.12
- **% Enrolment by channel: -**
  Mobile App: - 26.3% Website: - 25.39% Email: - 24.55% In-Store: - 23.77%
- **CLV distribution by status, age group, and travel band: -**
  - CLV distribution by status: -
    Active: - 7.97K Cancelled: - 8.13K
  - CLV distribution by age group: -
    Upto 35 Years: - 33.43% 36-50: - 33.29% More Than 50 Years: - 33.28%
  - CLV distribution by travel frequency band: -
    Low: - 33.67 Medium: - 32.83% High: - 33.5%
- **% of cancelled users by city, gender, and travel frequency: -**
  - % of cancelled users by city: -
    Charlottetwon:-16.67% Winnipeg: - 15.20% Sudbury:-14.98% St John's: - 14.73% Banff:-14.53%
  - % of cancelled users by gender: -
    Male: - 12.15% Female: - 12.54%
  - % of cancelled users by Travel Frequency Band: -
    Low: - 87.03% Medium: - 6.63% High: - 6.34%

CHAPTER 6: VISUALIZATIONS

6.1 Dataset Utilized for Visualization: -

The following three datasets formed the foundation of all visualizations:

1. Customer Flight Activity – Monthly-level flight behaviour per customer.
2. Customer Loyalty History – Demographics, enrolment/cancellation info, and CLV.
3. Calendar Dataset – Provided structured dates and time-related flags (e.g., start of month/quarter).

These datasets were selectively cleaned and enriched before being used in Power BI.

6.2 Data Preparation and Transformation: -

To support meaningful visual storytelling, several transformations were made using Excel formulas and Power BI DAX:

- Created full Enrolment Date and Cancellation Date from year/month fields.
- Derived Status (Active/Cancelled), Enrolment Channel, Travel Frequency Band, Age Band, Pre/Post Enrolment, Promo flag(for isolation of Feb-Apr 2018 Promotion Isolation)
- Aggregated data for important analysis (e.g., total flights per customer).
- Created a table to Create a Conversion Funnel of Customers (Enrolled, Active, Retained).

These transformations made the visual insights both accurate and segmental.

6.3 Key Dashboards and Visuals: -

The final report was split into three Power BI dashboards for clarity and readability:

📊 **Dashboard 1: Enrolment Trends and Behavioural Insights**

- **Cards**: -
  - ✓ Total Distance: - 763M
  - ✓ Average Flights Per Customer: - 30.40
  - ✓ Promo Period Retention Rate: - 88.16%
  - ✓ Avg CLV(Customer Lifetime Value) Promo Customers: - 8046.51(With a report page tooltips dedicated for CLV)
- **Overall Enrolment Trend During Promotional Period: -**

  Line chart was created by taking
  - ✓ X axis: - Enrolment Dates(Feb-April 2018)
  - ✓ Y axis: - Count of loyalty numbers.

  Gradual increase in Count of customers was observed in that period.
- **Average Flight Per Customer by Pre Post Enrolment : -**

  Area chart was created by taking
  - ✓ X axis: - Pre/Post Enrolment
  - ✓ Y axis: - Average Flights Per Customer

  Significant increase in average flights per customer was observed after enrolment.
- **Retention Rate by Enrolment Channel: -**

  A pie chart is created by taking

- ✓ Legend: - Enrolment Channel
- ✓ Values: - Percentage_Active

And it showed Mobile App has highest retention rate

- **Customers by Enrolment Channel and Promo Period: -**

  A stacked column chart is created by taking
  - ✓ X axis: - Enrolment channel
  - ✓ Y axis: - Count of loyalty numbers
  - ✓ Report Page Tool Tips: - Promo Period label

  And it shows Mobile App brought highest number of customers and in Email among all customers coming from Email most are coming during Promo Period.

- **Customers by City: -**

  A stack bar chart is created by taking
  - ✓ Y axis: - City
  - ✓ X axis: - Count of loyalty numbers
  - ✓ Reort Page Tool Tips:- Travel Frequency Band
  - ✓ A visual level filter was applied on city (top 5 cities by count of loyalty numbers)

  And it showed that in Toronto we have highest number of customers.

- **Average Of CLV by Enrolment Channel: -**

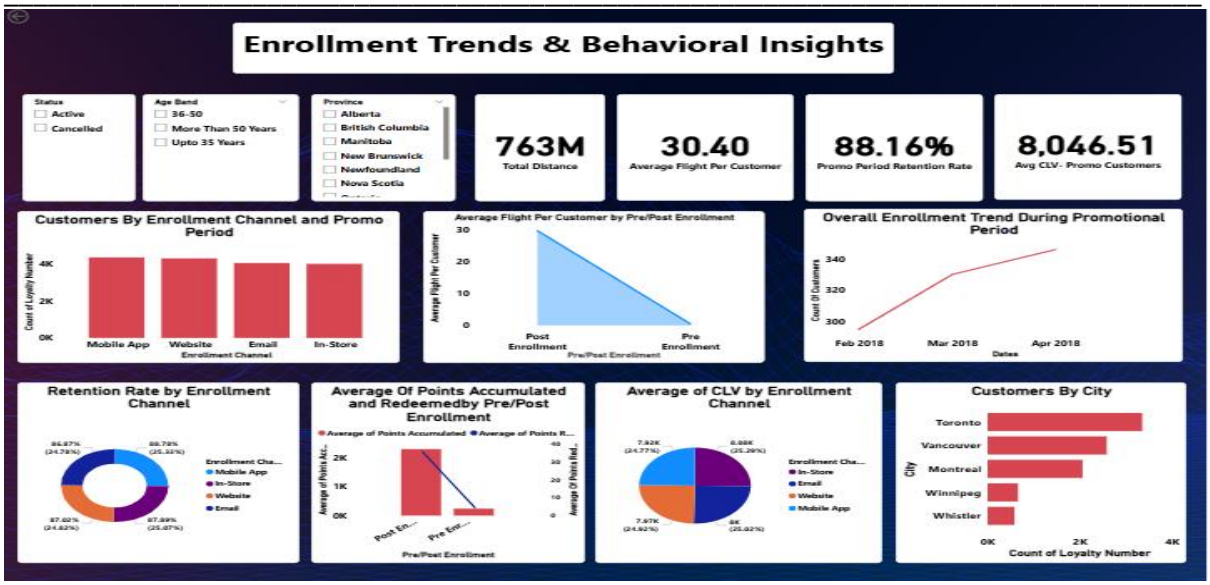
  A pie chart is created by taking
  - ✓ Legend: - Enrolment Channel
  - ✓ Values: - Average of CLV

  And it showed In-Store provided most number of valuable customers.

- **Average Of Points Accumulated and Points Redeemed by Pre/Post Enrolment: -**

  A Line and Stacked column chart was created by taking:
  - ✓ X axis: - Pre/Post Enrolment
  - ✓ Column Y axis: - Average of point accumulated
  - ✓ Line Y axis: - Average of point redeemed
  - ✓ By dividing Average of point accumulated and point redeemed we saw that during pre enrolment the point redeemed rate is higher(0.01835) as compared to post enrolment (0.01539).

There is an increase in Points accumulated and Points redeemed after enrolment(Post Enrolment).



📊**Dashboard 2: Enrolment Status Analysis: Active vs Cancelled:**

- **Cards: -**
  - ✓ Total Customers: - 16.74K
  - ✓ Percentage Active: - 87.65%
  - ✓ Percentage Cancelled: - 12.35%
- **Percentage Cancelled by Age-Band: -**

  A pie chart is created by taking:
  - ✓ Legend: - Age Band
  - ✓ Values: - Percentage Cancelled

  It shows with increase in age Percentage of cancellation increases.
- **Cities With High Cancellation Rate: -**

  A clustered bar chart was created by taking:
  - ✓ Y axis: - City
  - ✓ X axis: - Percentage cancelled
  - ✓ Tooltips:-Average of CLV

  Which shows cities like Charlottetown, Winnipeg, Sudbury, St.John's, Banff showed high percentage of cancellation.
- **Cities With High Retention Rate by Status: -**

  An area chart was created by taking:
  - ✓ Y axis: - City
  - ✓ X axis: - Percentage active
  - ✓ Report Page Tool Tips: - Status

  It showed Cities like Kelowna, Fredericton, Quebec City, Ottawa, Moncton with high number of active people.
- **Percentage Cancelled by Gender: -**

  A stacked column chart was created by taking: -
  - ✓ X axis: - Gender
  - ✓ Y axis: - Percentage cancelled

  And it showed that percentage of cancellation is more in females as compared to males.

- **People Stayed Enrolled VS Cancelled By Gender: -**

  A clustered column chart was created by taking: -

  - ✓ X axis: - Gender
  - ✓ Y axis: - Count of loyalty numbers
  - ✓ Legend: - Status

  And it showed that numbers of active and cancelled female customers are higher than males.

- **Percentage Cancelled by Travel Frequency Band: -**

  A pie chart was created by taking:

  - ✓ Legend: - Travel Frequency Band
  - ✓ Values: - Percentage Cancelled

  And it showed that people with low travel frequency have high percentage cancellation rate.

- **Active People by Province: -**

  A map visual was created by taking:

  - ✓ Location: - Province
  - ✓ Bubble Size: - Active People
  - ✓ A visual level filter which is Top 5 Provinces by Number Of Customers
  - ✓ A report page tool tip is also added for male-female ratio.

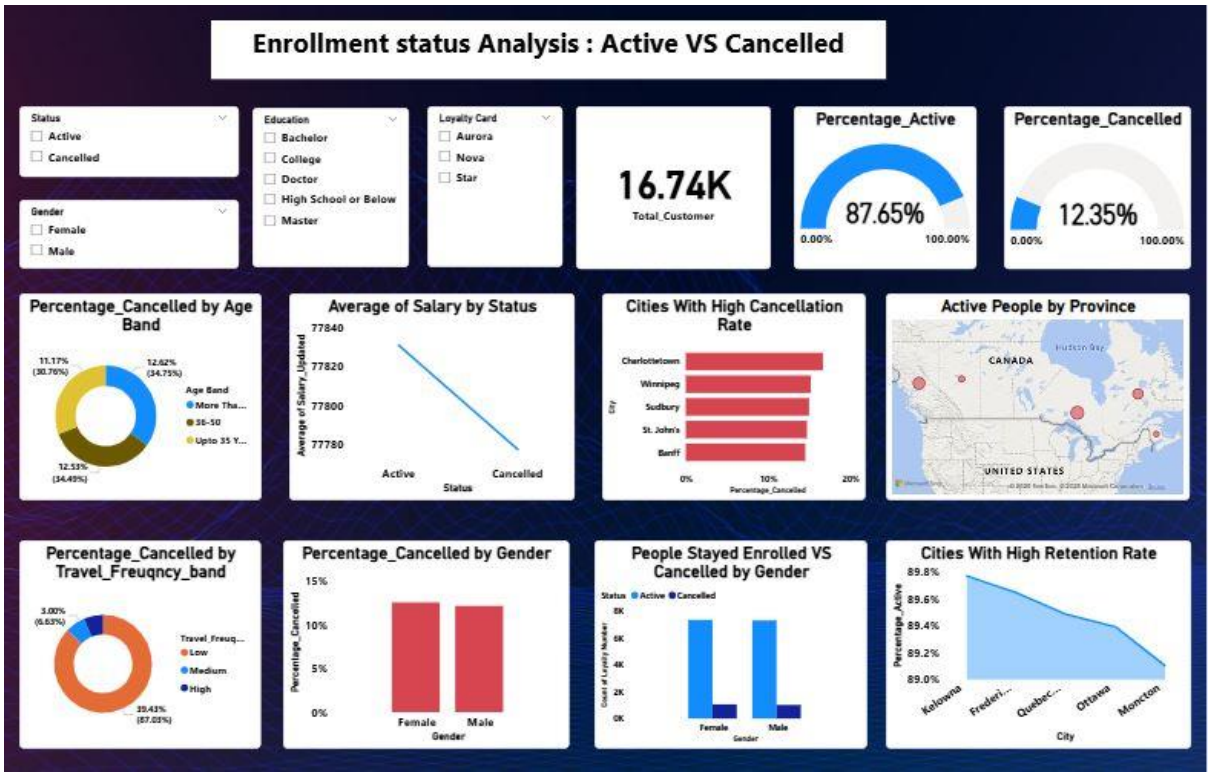
  And it showed that provinces like Ontario, British Columbia, Quebec, Alberta, New Brunswick have high number of active peoples.

- **Average Of Salary By Status: -**

  A line chart was created by taking:

  - ✓ X axis: - Status
  - ✓ Y axis: - Average of salary

  And it showed that people with high salary have higher tendency to remain active.



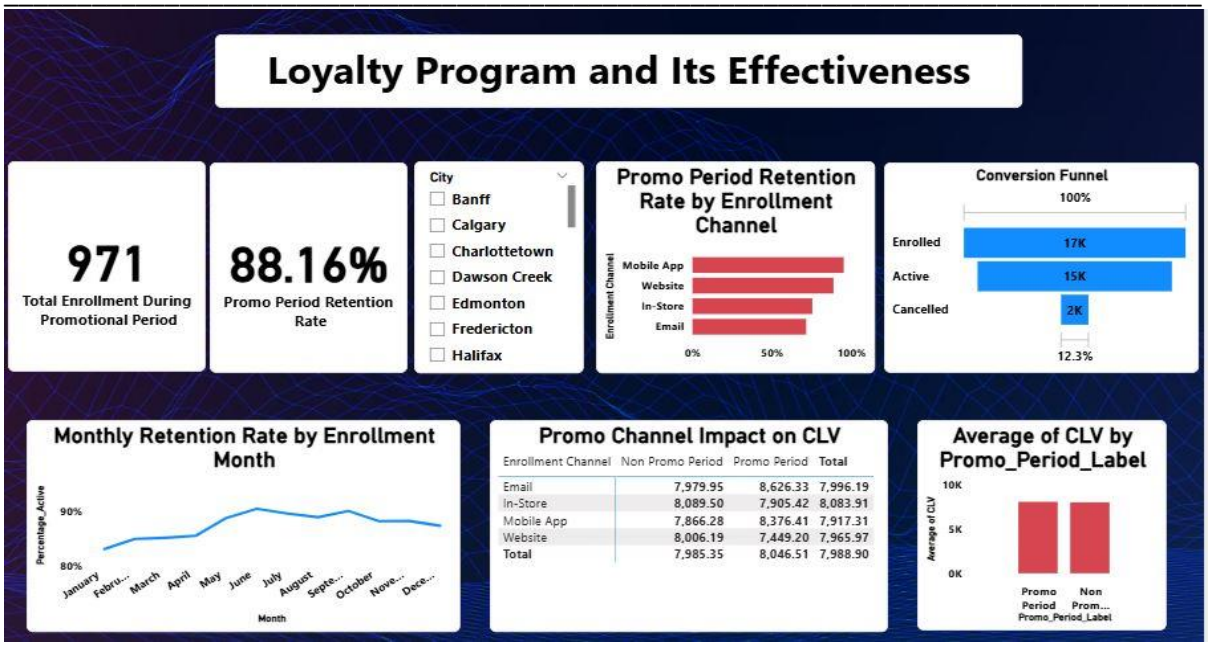
📊 **Dashboard 3: Loyalty Programme and Its Effectiveness:**

- **Cards**: -Total Enrolments During Promotional Periods:-971, Promo Period Retention Rate: - 88.16%
- **Average Of CLV by Promo Period Label**: -
  A stacked column chart was created by taking: -
  - ✓ X axis: - Promo Period Level
  - ✓ Y axis: - Average of CLV

  It showed that Enrolments during promo period brought more valuable customers than Enrolments before promo period.
- **Promo period Retention Rate by Enrolment Channel: -**
  A stacked bar chart was created by taking: -
  - ✓ Y axis: - Enrolment Channel
  - ✓ X axis: - Promo Period retention rate

  It showed during promo period Enrolment Channels like Mobile Apps and Website provide People with high retention rate.
- **Conversion Funnel: -**
  A conversion funnel was created to show number of enrolled people who remain active and who cancelled.
  - ✓ Enrolled: - 16737
  - ✓ Active: - 14670
  - ✓ Cancelled: - 2067
- **Monthly Retention Rate by Enrolment Month: -**
  A line chart was created by taking:
  - ✓ X axis: - Enrolment Date Month
  - ✓ Y axis: - Percentage Active

  And it showed in **June** the retention rate is highest and in **January** the retention rate is lowest.
- **Promo Channel Impact on CLV: -**
  A matrix is created by taking:
  - ✓ Rows: - enrolment channel
  - ✓ Columns: - promo period label
  - ✓ Values: - Average of CLV
  - ✓ During Promo Period Email is generating more valuable customers and during Non Promo Period Instore is generating more valuable customers and overall In-Store.



6.4 Interactivity and Filters: -

Power BI interactivity was used extensively:

- ✓ Slicers for Age Group, Gender, Enrolment Status.
- ✓ Visual-level filters for date-specific analysis
- ✓ Several-Report Page Tool Tips were created like status ,Travel Frequency Band,Promo Period Level

6.5 Design Considerations:-

- ✓ Dashboards were divided into three parts to avoid clutter and improve focus.
- ✓ Data labels and tooltips were added for business clarity.

CHAPTER 7: RESULTS AND EVALUATION

7.1 Findings and Solutions as per the Project Problems

The project aimed to analyse and evaluate the effectiveness of Northern Lights Air's customer loyalty program, with a particular focus on customer behaviour, retention trends, promotional impact, and channel performance. Below are the key findings aligned with the original project objectives:

1. Enrolment Trends During Promotion: Enrolments significantly increased during the promotional period (Feb–Apr 2018), confirming that the campaign was successful in attracting new customers.

2. Retention and Cancellation Rate: The overall retention rate was approximately 87.65%, while the cancellation rate stood at 12.35%. Customers enrolling during the promotional period had an even higher retention rate of 88.16%.

3. Channel Effectiveness: Enrolment channels like Mobile App, Website were most successful, especially during the promotion in acquiring loyal customers and mobile app and instore stands in retaining loyal customers and In-store and Email brought customers with high CLV.

4. Customer Behaviour Before and After Enrolment: Post-Enrolment behaviour showed a sharp increase in total flights, points accumulated, and distance travelled, indicating that loyalty members became more engaged with NLA services.

5. City-Wise Loyalty Trends: Percentage-based analysis of cancellations by city was used to avoid bias from cities with large populations. Instead of focusing on total cancellations, we measured the cancellation rate per city (i.e., cancellations divided by total Enrolments in that city). This revealed that some cities with high total cancellations actually had strong loyalty performance when normalized by Enrolment volume.

7.2 Visualization of Results Using Dashboard

Dashboard 1: Enrolment Trends and Behavioural Insights

- ✓ Enrolment trend over time with a focus on the promotional period
- ✓ Average flights per customer by pre/post-Enrolment status
- ✓ Points accumulated vs redeemed by pre/post-Enrolment status
- ✓ Channel-wise customer acquisition and retention performance
- ✓ Top 5 Customers by City

Dashboard 2: Active vs Cancelled Status Analysis

- ✓ Retention and cancellation rate overall and by demographic segments
- ✓ Top 5 cities by cancellation and retention
- ✓ Travel frequency bands vs cancellation rate
- ✓ Average Of Salary by Status

Dashboard 3: Loyalty Programme and Its Effectiveness

- ✓ Avg. Of CLV by Promo Period Label.
- ✓ Promo Period Retention Rate by Enrolment Channel.
- ✓ Monthly Retention Rate by Enrolment Month.
- ✓ Promo Channel Impact on CLV
- ✓ Conversion Funnel (Enrolled, Active, Cancelled)

These dashboards effectively address all capstone objectives by combining statistical analysis with clear, dynamic visual storytelling. The insights are actionable and provide a roadmap for improving the loyalty program's reach and impact.

CHAPTER 8: CHALLENGES FACED

8.1 During the execution of the capstone project, several technical and data-related challenges were encountered and addressed:

Data Quality Issues: Some columns, such as Salary contained negative or missing values. These were cleaned by using imputation techniques like median replacement to avoid skewed averages.

Date Construction: Since actual flight dates, enrolment dates, Cancellation dates were missing and only month/year were available, synthetic date fields had to be created for proper time-based analysis.

Data Type Inconsistencies: Many text fields were formatted as numeric fields. This required conversion in Excel and Power BI to enable aggregation and calculation.

Duplicated Columns Removal: Only Unique records where kept to avoid skewness of the analysis

Data Merging Complexity: Given the size and structure of the datasets, full merging was avoided. Instead, selective and performance-optimized relationships were applied in Power BI.

Channel Attribution: Since the original dataset lacked an Enrolment channel field, a synthetic 'Enrolment Channel' column was created using randomized logic based on business rules.

8.2 How Challenges Were Overcome:

- ✓ Systematic preprocessing in Excel and Power BI helped clean and prepare the data.
- ✓ Custom DAX measures and calculated columns were created to simulate missing data points and correct analytical flow.
- ✓ Power BI's filtering features were leveraged to simplify and enhance visuals. Basic tooltip functionality was used to show detailed values on hover, also help of report page tooltips was taken to provide more detailed insights.
- ✓ Discussions and research into airline loyalty programs helped validate synthetic assumptions.

CHAPTER 9: CONCLUSION

9.1 Summary of Findings

The analysis of Northern Lights Air's customer loyalty program produced several data-driven insights:

- ✓ The promotional period (Feb–Apr 2018) successfully boosted Enrolments, indicating strong marketing effectiveness.
- ✓ A high retention rate (88.16%) among promo-period enrolees suggests that short-term campaigns can lead to long-term loyalty.
- ✓ Demographic factors such as age and income influenced customer loyalty, with younger and higher-income customers showing greater retention.
- ✓ Mobile App ,Website channels proved to be the most effective in acquiring and in retaining customers mobile app and instore are most effective. Instore brings customer with highest average CLV.
- ✓ Behavioural changes post-Enrolment — such as increased travel frequency and points accumulation — highlighted greater engagement among loyalty members at the same time decline in points redemption shows customer feel less rewarded .
- ✓ Cancelled Customers actually giving more CLVs than active and in cities like Winnipeg , Sudbury, St.Jhones cancelled people generates more CLVs than average CLV.
- ✓ Low travel frequency band customer showed highest average CLV. Even in their strongest markets (high-number of customer-cities), the loyalty program is mainly serving low/medium frequency travelers. High frequency customers are fewer, which aligns with the earlier finding that lower frequency customers are driving higher CLV. This shows the program is more effective at engaging occasional travelers than frequent ones.
- ✓ Normalized cancellation analysis revealed that absolute cancellations alone do not indicate loyalty strength — city-level performance varied when adjusted for Enrolment volume.

9.2 Impact of the Project

This capstone project demonstrates the strategic value of customer data analytics in airline loyalty programs. It shows how targeted promotional efforts, channel selection, and customer segmentation can significantly influence Enrolment and retention outcomes.

The project's dashboards and insights provide Northern Lights Air with a foundation to:

- ✓ Improve future marketing campaigns
- ✓ Allocate resources to the most effective acquisition channels
- ✓ Monitor loyalty KPIs over time for continuous optimization
- ✓ Overall, the project equips decision-makers with clear, actionable intelligence to enhance customer engagement and drive long-term value from loyalty program investments.

REFERENCES

1. **Datasets**:

Northern Lights Air Loyalty Dataset (Provided by Institution)

- Customer Loyalty History
- Customer Flight Activity
- Calendar
- Airline Loyalty Data Dictionary

APPENDICES

11.1 Appendix A: Dataset Overview

- Customer Loyalty History Dataset: Contains demographic, Enrolment, and cancellation information for each customer.
- Customer Flight Activity Dataset: Includes monthly data on flight counts, miles, and loyalty points earned and redeemed.
- Calendar Dataset: Marks key dates like start of month/quarter/year used for time-based filtering and visualizations.

11.2 Appendix B: Key DAX Measures Used in Power BI

- **Percentage_Cancelled** = divide(CALCULATE(DISTINCTCOUNT(Customer_Loyalty_History_With_Age[Loyalty Number]),Customer_Loyalty_History_With_Age[Status]="Cancelled") ,COUNTROWS('Customer_Loyalty_History_With_Age'))
- **Travel_frequency** = calculate(sum('Customer Flight Activity'[Total Flights]),ALLEXCEPT(Customer_Loyalty_History_With_Age,Customer_Loyalty_History_With_Age[Loyalty Number]))
- **Travel_Freuqncy_band** = switch(true(),'Customer_Loyalty_History_With_Age'[Travel_frequency]<=20,"Low",'Customer_Loyalty_History_With_Age'[Travel_frequency]<=50,"Medium",'Customer_Loyalty_History_With_Age'[Travel_frequency]<=106,"High")
- **Enrolment Channel** =

```
VAR EnrolmentDate = Customer_Loyalty_History_With_Age[Enrolment Date]
VAR PromoStart = DATE(2018, 2, 1)
VAR PromoEnd = DATE(2018, 4, 30)
VAR Random = RANDBETWEEN(1,100)

RETURN
SWITCH(
 TRUE(),

 // Promo period + active: weighted distribution
 EnrolmentDate >= PromoStart && EnrolmentDate <= PromoEnd && 'Customer_Loyalty_History_With_Age'[Status] = "Active" && Random <= 50, "Mobile App",
 EnrolmentDate >= PromoStart && EnrolmentDate <= PromoEnd && 'Customer_Loyalty_History_With_Age'[Status] = "Active" && Random <= 80, "Website",
 EnrolmentDate >= PromoStart && EnrolmentDate <= PromoEnd && 'Customer_Loyalty_History_With_Age'[Status] = "Active" && Random <= 90, "Email",
 EnrolmentDate >= PromoStart && EnrolmentDate <= PromoEnd && 'Customer_Loyalty_History_With_Age'[Status]= "Active", "In-Store",
 // Outside promo or inactive: uniform distribution
 Random <= 25, "Mobile App",
 Random <= 50, "Website",
 Random <= 75, "Email",  "In-Store")
```