VELAMMAL COLLEGE OF ENGINEERING AND TECHNOLOGY

(Department of Electronics and Communication Engineering)

AIRLINES DATA ANALYTICS FOR AVIATION INDUSTRY

PROJECT REPORT

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ABSTRACT:

- Air travel has been increasingly preferred among travellers, mainly because of its speed and in some cases comfort. This has led to phenomenal growth in air traffic and on the ground.
- Data analytics is the process of analyzing raw data in order to draw out meaningful, actionable insights, which are then used to inform and drive smart business decisions.
- A data analyst will extract raw data, organize it, and then analyze it, transforming it from incomprehensible numbers into coherent, intelligible information. Having interpreted the data, the data analyst will then pass on their findings in the form of suggestions or recommendations about what the company's next steps should be.
- A data analyst collects and processes data; he/she analyzes large datasets to derive meaningful insights from raw data.
- Data analytics helps you to make sense of the past and to predict future trends and behaviors; rather than basing your decisions and strategies on guesswork, you're making informed choices based on what the data is telling you. Armed with the insights drawn from the data, businesses and organizations are able to develop a much deeper understanding of their audience, their industry, and their company as a whole—and, as a result, are much better equipped to make decisions and plan ahead.
- To provide better Airline and AirPort services and to avoid delays in Air Travel across different locations at Municipality level. The aim is to provide airports, airlines, and the travelling public with a neutral, third-party view of which airlines are delivering on their promise to get passengers from Point A to Point B on-time.

1.INTRODUCTION:

1.1Project Overview

The airline industry is undergoing massive changes. The impact of the Covid-19 pandemic and growing global warming requirements will change the entire industry tremendously and sustainably. Therefore, our products and services are designed to help airlines to respond to those immense challenges and ultimately turn them into strength.

I. *Digitalization:* Although the airline industry has explored comprehensive digital approaches, we strongly believe that this has been just the beginning of the story. Operational processes and supply chain communication still hold massive potential for further streamlining and efficiency improvements.
II. *Data-Driven Efficiency:* Big data, analytics, artificial intelligence ,we believe that data strategies must be more than buzzwords. Contrary, we are convinced that building a solid data foundation is the single most important asset for all future endeavours and ultimately driving an airline's efficiency.
III. *Information Redefinition*: The pandemic has changed the way airline employees consume information and the required information at the same time. Future technological solutions must more than ever address these aspects: Real-time information, de-centralized accessibility, competitor benchmarks.

1.2. PURPOSE:

Schedules and Routes :

1. Aircraft seat configuration
2. Minimum connect times

3. Fuel burn and CO2 emission

Flights:

1. Cancellation and diversion
2. Aircraft types and changes
3. Tail registration and numbers

Air Traffic:

1. FAA traffic management
2. FAA SWIM(TFMS)
3. FAA SWIM (SFDPS)
4. FAA SWIM (STDDS)
5. Weather-METARs,TAFs

2.LITERATURE SURVEY:

1.Application of Big data in airline Industry(Publication: JAAUTH,Vol.21 No 4,pp.73-108,2021)

AUTHOR - Dou, Lee, Nikolopoulous and Petropoulos

ABSTRACT:

With the advent of big data era, modern aviation industry can find solutions for their major challenges of safety and performance improvement because big data can provide multidimensional, adequate, and real-time information and improve the predictive and preventive capabilities of aviation flight risks. Big data will effectively improve the technical performance and operating conditions of aircraft, avoid various adverse external environmental conditions, and reduce manual errors, to enhance aviation safety. By adopting big data technology, fuel consumption, crew deployment, and flight operations could be optimized;

maintenance could anticipate when parts need replacing; air congestion could be reduced; flight routes could be altered well in advance of take-off to avoid storms and passengers could be kept informed about schedules from the minute they leave their home for the airport. The airline industry makes use of primary data sets that come from many different parameters such as flight tracking data, airport operations data, weather conditions, airline information, market information, passenger information, aircraft data and air safety reports.

2.A Machine Learning Approach to Predict Aircraft Landing Times using Mediated Predictions from Existing Systems
(Publications: AIAA AVIATION FORUM, 2024, 2021)

AUTHOR - Daniel Wesely, Andrew Churchill, John Slough,William J Coupe

ABSTRACT:
Developed a novel approach for predicting the landing time of airborne flights in real-time operations. The first step predicts a landing time by using mediation rules to select from among physics-based predictions (relying on the expected flight trajectory) already available in real time in the Federal Aviation Administration System Wide Information Management system data feeds. The second step uses a machine learning model built upon the mediated predictions. The model is trained to predict the error in the mediated prediction, using features describing the current state of an airborne flight. These features are calculated in real time from a relatively small number of data elements that are readily available for airborne flights. Initial results based on five months of data at six large airports demonstrate that incorporating a machine learning model on top of the mediated physics-based prediction can lead to substantial additional

improvements in prediction quality. 3.Prediction of runway configurations and airport acceptance rates for multi-airport system using gridded weather forecast
(Publication: Transportation Research Part C-Emerging Technologies 125, 103049, 2021)
AUTHOR - Yuan Wang, Yu Zhang

ABSTRACT:
Accurate prediction of real-time airport capacity, a.k.a. airport acceptance rates (AARs), is key to enabling efficient air traffic flow management. AARs are dependent on selected runway configurations and both are affected by weather conditions. Although there have been studies tackling on the prediction of AARs or runway configurations or both, the prediction accuracy is relatively low and only single airport is considered. This study presents a data-driven deep-learning framework for predicting both runway configurations and AARs to support efficient air traffic management for complex multi-airport systems. The two major contributions from this work are

1) the proposed model uses assembled gridded weather forecast for the terminal airspace instead of an isolated station-based terminal weather forecast,

2) the model captures the operational interdependency aspects inherent in the parameter learning process so that proposed modelling framework can predict both runway configuration and AARs simultaneously with higher accuracy. The proposed method is demonstrated with a numerical experiment taking three major airports in New York Metroplex as the case study. The prediction accuracy of the proposed method is compared with methods in current literature and the analysis results show that the proposed method outperforms all existing methods.

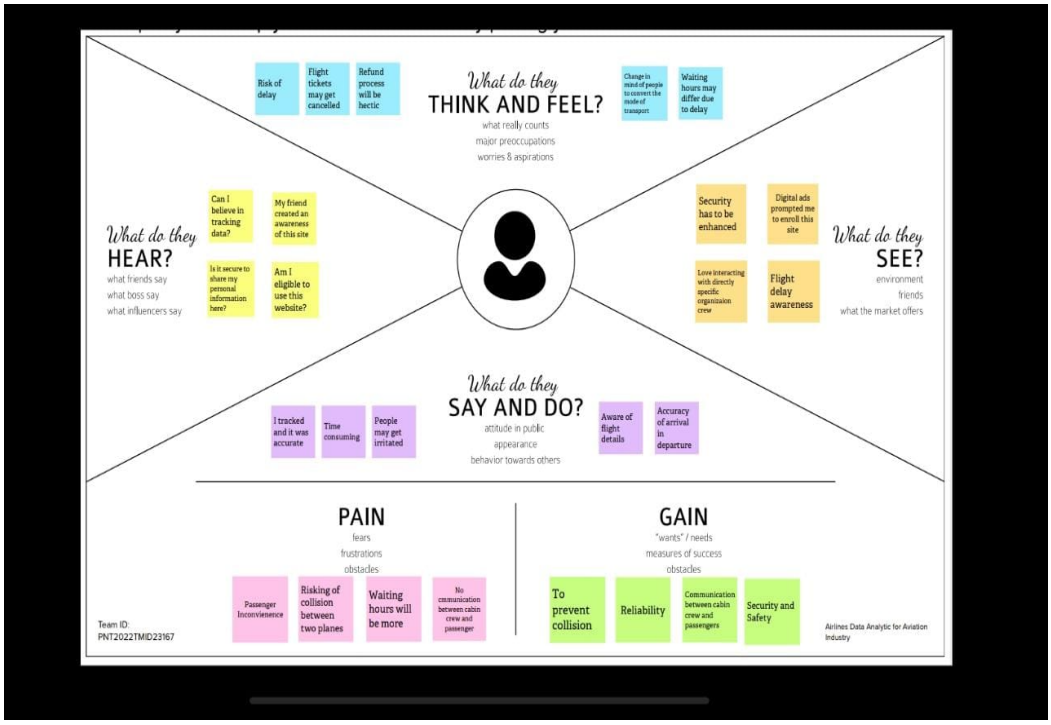
4.Airline Route Profitability Analysis And Optimization Using Big Data Analytics On Aviation Data Sets Under Heuristic Techniques(2016)

AUTHOR - Kasturi E, Prasanna Devi Sb, Vinu Kiran Sb,Manivannan Sc

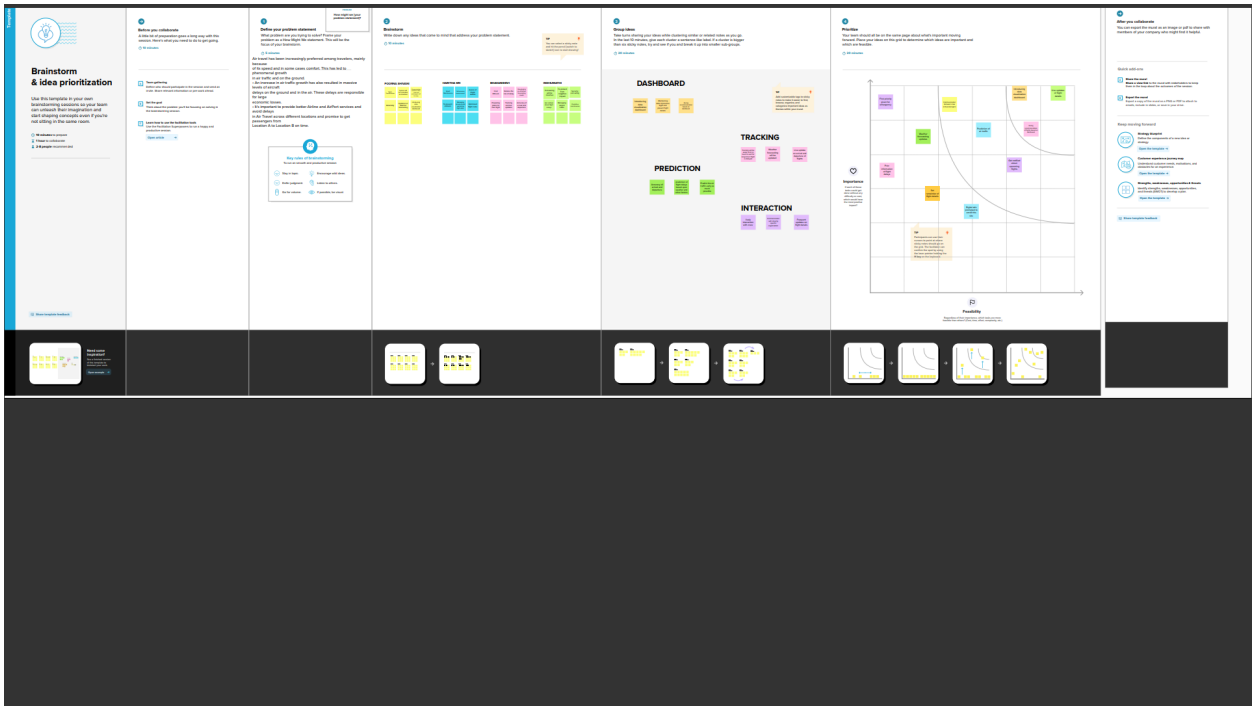
ABSTRACT:
Researchers in this article cited that ,applying vital decisions for new airline routes and aircraft utilization are important factors for airline decision making.For data driven analysis key points such as airliners route distance, availability on seats/freight/mails and fuel are considered. The airline route profitability optimization model is proposed based on performing Bigdata analytics over large scale aviation data under multiple heuristic methods, based on which practical problems are analysed. Analysis should be done based on key criteria, identified by operational needs and load revenues from operational systems e.g. passenger, cargo, freights, airport, country, aircraft, seat class etc. The result shows that the analysis is simple and convenient with concrete decision.

3.IDEATION AND PROPOSED SOLUTIONS:

3.1 EMPATHY MAP CANVAS



3.2 BRAINSTORMING



3.3 PROPOSED SOLUTION

1. Problem Statement (Problem to be solved)

Air travel has been increasingly preferred among travellers, mainly because of its speed and in some cases comfort. This has led to phenomenal growth in air traffic and on the ground.

• An increase in air traffic growth has also resulted in massive levels of aircraft delays on the ground and in the air. These delays are responsible for large economic losses.

• It's important to provide better Airline and AirPort services and avoid delays in Air Travel across different locations and promise to get passengers from Location A to Location B on time.

2. IDEA/ SOLUTION REQUIREMENTS

Our proposed system has the following Ideation:

- Prior information of flight delays
- Weather forecasting updates
- Giving recommendation of flights based on dashboard

3. NOVELTY/UNIQUENESS

Using priority selection algorithm, admin can identify the priority tags first among all other tags in its range and other tags are identified after that. So, the priority tag can get service immediately after they are identified where the other tags wait in a queue and get service later. If possible, maintain tie-up with passenger and cabin crew and send information about the details and condition of flight which makes

interaction with specific crew.

4. SOCIAL IMPACT/CUSTOMER SATISFACTION

Digital ads prompted to enrol the site and Live updates of flight details will boost our customers to use this site widely that bridges between Cabin crew and passengers.

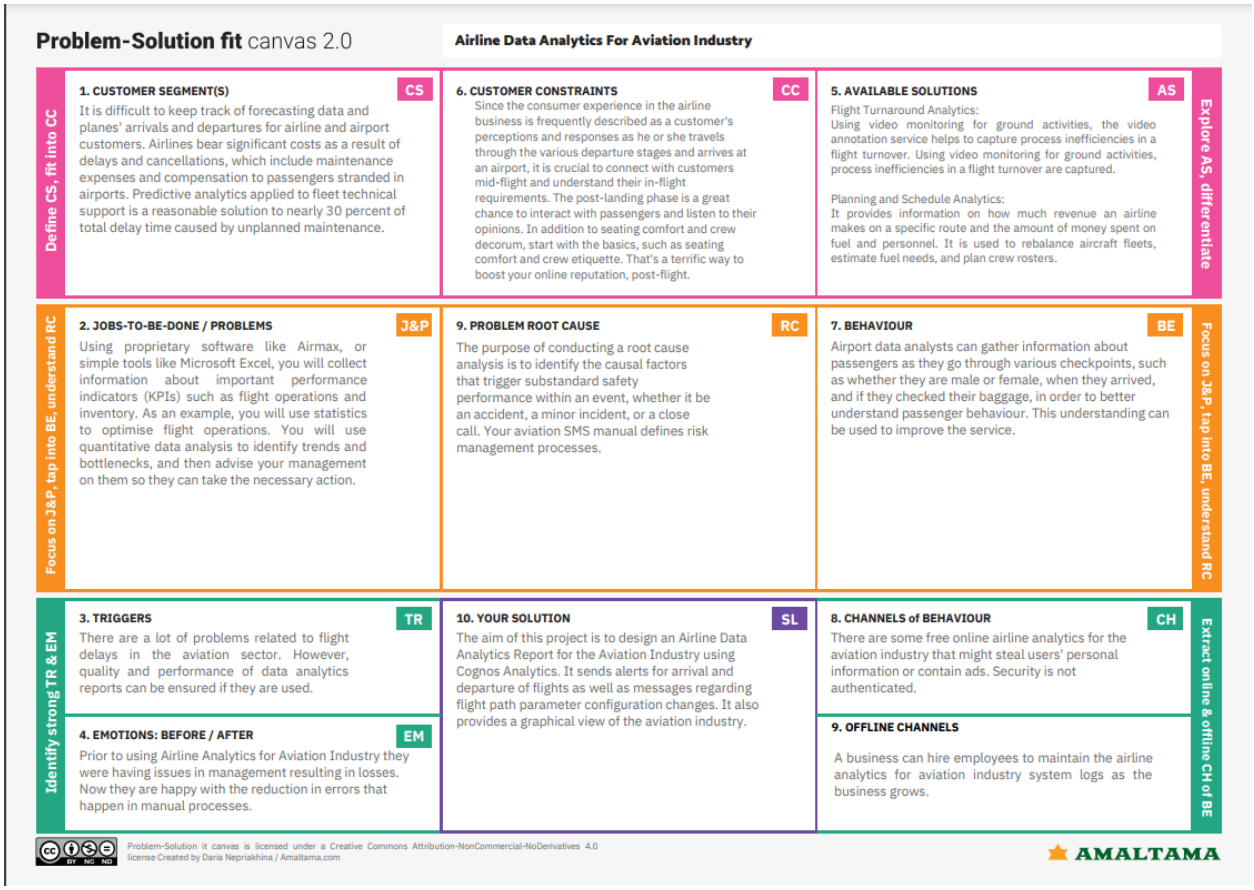
5. BUSINESS MODEL/REVENUE MODEL

There are many apps currently available in this regard. But our solution, once developed well, has enough possibility to safeguard the passenger to travel without delay due to air trafficking and they know the prior information of flight delay.

6. SCALABILITY OF THE SOLUTION

Our proposed solution is very scalable is that in future there are lots of rooms for evolving our present model by adding data analytics using data visualization and tools to enhance our system in upcoming years.

3.4 PROBLEM SOLUTION FIT



4. REQUIREMENT ANALYSIS

4.1 FUNCTIONAL REQUIREMENTS

1.Customer Registration

Customer can make Registration through Gmail .

2. User Confirmation

After the Registration the customer will get confirmation through mail.

3. Visualizing data

User can visualize the Regular trends of delay of flights Using IBM Cognos Analytics.

4.Generating Report

User can view the flight delay report.

4.2 NON FUNCTIONAL REQUIREMENTS

1. Usability

The application will have a simple and user-friendly graphical interface. Users will be able to understand and use all the features of the application easily. Any action has to be performed with just a few clicks.

2. Security

The main security concern is for users account hence proper login mechanism should be used to avoid hacking. The organization system should not disclose personal information of users and other organization details to public.

3. Reliability

When the system is disconnected or frozen due to over access at the same time, it should save all the process of the users made up to the point of abnormal happenings.

4. Performance

The system should require a fair amount of speed especially while browsing through the catalogue.

5. Availability

The system shall be available 24 hours a day 7 days a week. User

can access at anytime.

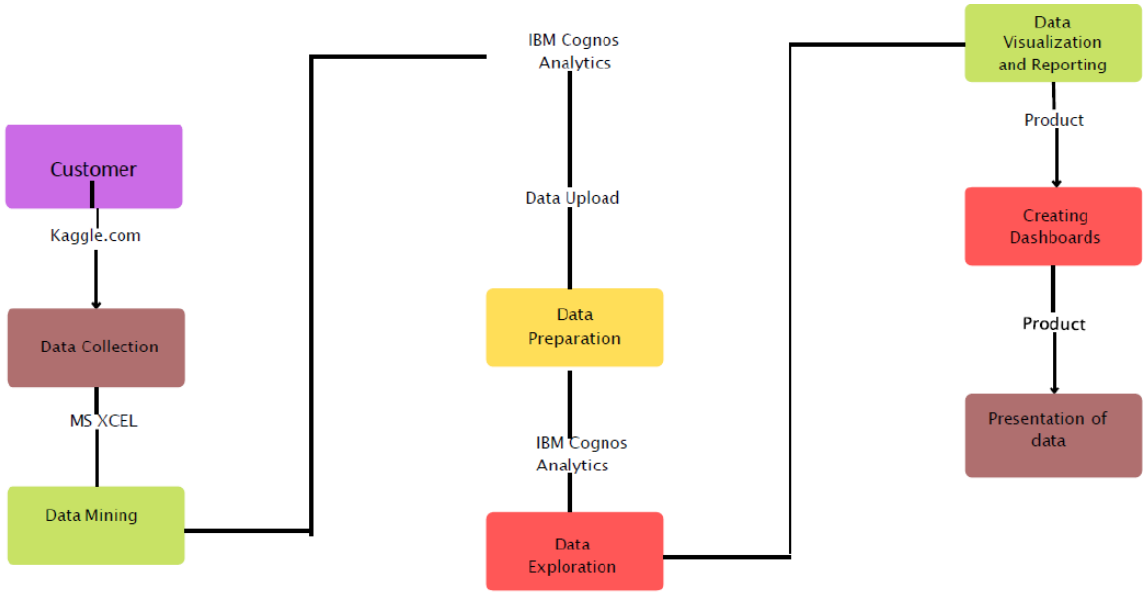
6. Scalability

Large Number of users can access the website.

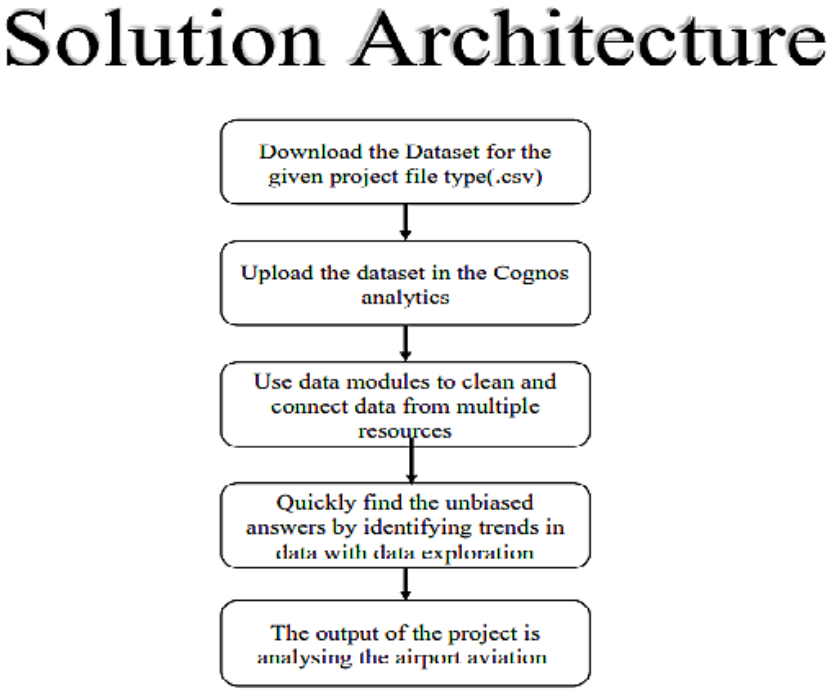
5. PROJECT DESIGN

5.1 DATA FLOW DIAGRAMS

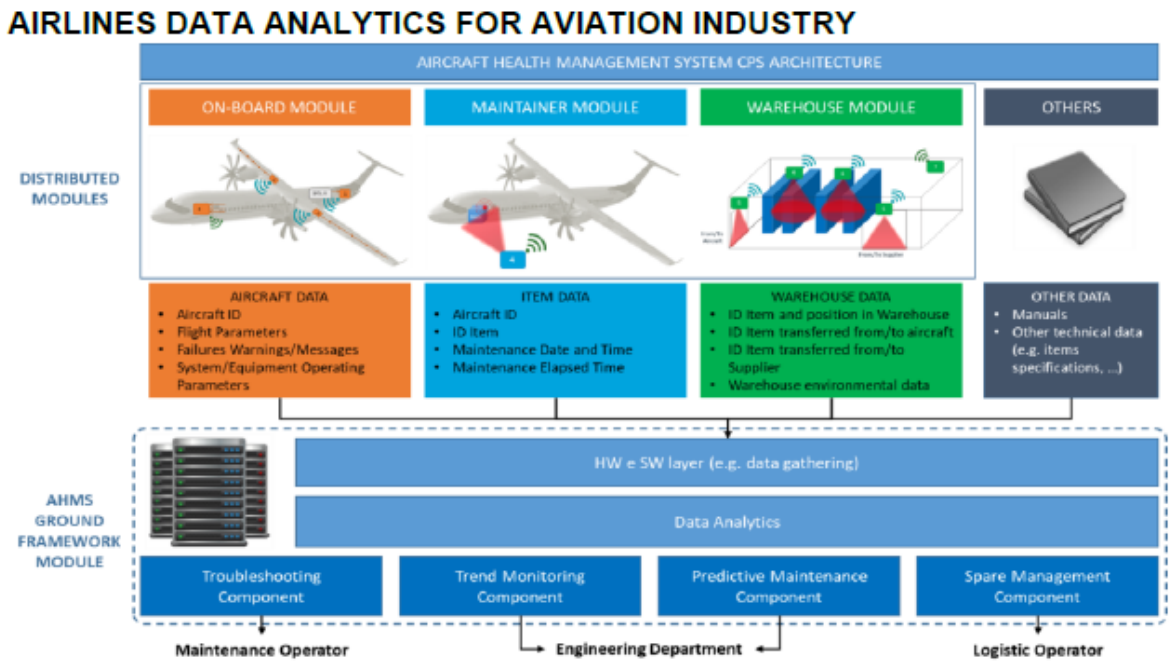
A Data Flow Diagram (DFD) is a traditional visual representation of the information flows within a system. A neat and clear DFD can depict the right amount of the system requirement graphically. It shows how data enters and leaves the system, what changes the information, and where data is stored.



5.2 SOLUTION AND TECHNICAL ARCHITECTURE



TECHNICAL ARCHITECTURE



COMPONENTS AND TECHNOLOGIES

1. USER INTERFACE
   - How user interacts with application e.g.Web UI, Mobile App, Chatbot etc.
   - HTML, CSS, JavaScript ,Excel
2. APPLICATION LOGIC 1
   - Logic for a process in the application
   - IBM Watson STT service ,Python
3. APPLICATION LOGIC 2
   - Logic for a process in the application
   - IBM Watson Assistant

4. DATABASE
    - Data Type, Configurations etc.
    - MySQL, NSQL
5. CLOUD DATABASE
    - Database Service on Cloud
    - IBM DB2, IBM Cloudant
6. FILE STORAGE
    - File storage requirements
    - IBM Block Storage or Other Storage Service or Local File system
7. EXTERNAL API
    - Purpose of External API used in the application
    - IBM Weather API
8. EXTERNAL API-1
    - Purpose of External API used in the application
    - Aadhar API
9. INFRASTRUCTURE(SERVER/CLOUD)
    - Application Deployment on Local System/Cloud: Local Server Configuration, Cloud Server Configuration
    - Local, Cloud Foundry

APPLICATION CHARACTERISTICS

1. OPEN SOURCE FRAMEWORKS
    - List the open-source frameworks used
    - Technology of Open-source framework
2. SECURITY IMPLEMENTATIONS
    - List all the security / access controls implemented, use of firewalls etc.
    - e.g. SHA-256, Encryptions, IAM Controls, OWASP

3. SCALABLE ARCHITECTURE
   - Justify the scalability of architecture (3 – tier, Micro-services)
   - Cognos Used
4. AVAILABILITY
   - Justify the availability of application (e.g. use of load balancers, distributed servers etc.)
   - AWS used
5. PERFORMANCE
   - Design consideration for the performance of the application (number of requests per sec, use of Cache, use of CDN's) etc.
   - Dashboard ,Reports, stories

5.3 USER STORIES

User Stories

Use the below template to list all the user stories for the product.

User Type	Functional Requirement (Epic)	User Story Number	User Story / Task	Acceptance criteria	Priority	Release
Customer (Web user)	Registration	USN-1	As a user, I can register for the application by entering my email, password, and confirming my password.	I can access my account / dashboard	High	Sprint-1
		USN-2	As a user, I will receive confirmation email once I have registered for the application	I can receive confirmation email & click confirm	High	Sprint-1
		USN-3	As a user, I can register for the application through Gmail.		Medium	Sprint-1
	Login	USN-4	As a user, I can log into the application by entering email & password.	I can get to access my web portal	High	Sprint-1
	Dashboard	USN-5	As a user, I can get to know what my dashboard consists of.	I can my details of my registration.	Low	Sprint-2
Customer Care Executive	Organization	USN-6	The organization which owns this airplane analysis system will enable the option to customers to reach out the organization if • they have any problem with the organization's system of customer interaction or • airplane issues- delay, landing in a different location	The customer care workers will help out the customers in trouble.	High	Sprint-1
Administrator	Administration	USN-7	The organization takes in-charge of the administrative policies of different departments like: • registration • flight booking • delay visualization • generation of delay report	As an administrator, confirmation of user while registration is done.	High	Sprint-1

6. PROJECT PLANNING AND SCHEDULING

6.1 SPRINT PLANNING AND ESTIMATION

Activity Name	Activity Description	Tasks Assigned	Status
1.Preparation Phase	a) Access the resources in the project dashboard. b) Explore the dataset provided in the workspace. c) Create a GitHub account & collaborate with Project Repository in the project workspace. d) Set up the prerequisites for the project.	G POORNA SHIVANI B G BHAVANIDEVI S HARITHA SRI K V INDHUMATHI	Completed

2.Ideation Phase	a) Literature survey relevant to the selected project. b) Preparation of an Empathy Map to identify the user pros and cons. c) List the ideas by organizing the brainstorming session and prioritize the top 3 ideas based on their feasibility & importance.	G POORNA SHIVANI B G BHAVANIDEVI S HARITHA SRI K V INDHUMATHI	Completed

3. Project Design Phase-1			
3.1Proposed Solution	Preparation of proposed solutiondocument,which includes the problem statement, Idea description, novelty, feasibility of the idea, business model, social impact and scalability of the solution.	G POORNA SHIVANI B G BHAVANIDEVI S HARITHA SRI K V INDHUMATHI	Completed
3.2Proposed solution fit	Prepared problem solution fit document which has designed a value proposition that addresses the customers' job, pros and cons to the particular application.	G POORNA SHIVANI B G BHAVANIDEVI S HARITHA SRI K V INDHUMATHI	Completed
3.3Solution Architecture	Develop effective architecture for the proposed solution which provides ground for application development projects.	G POORNA SHIVANI B G BHAVANIDEVI S HARITHA SRI K V INDHUMATHI	Completed

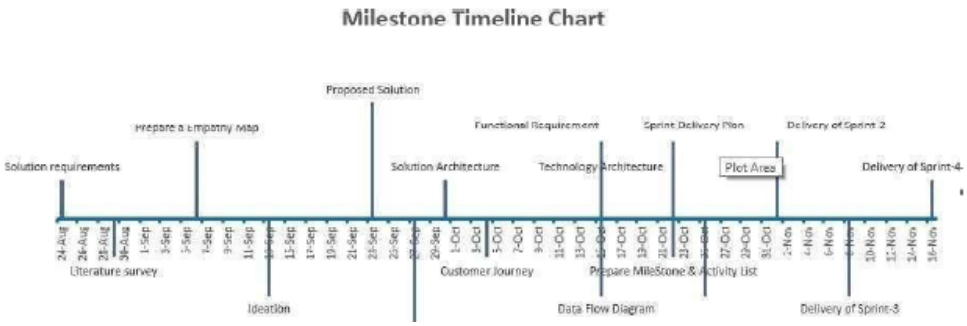
4. Project Design Phase-2			
4.1Solution Requirement	Identify the Functional and Non-Functional requirements of the proposed solution	G POORNA SHIVANI B G BHAVANIDEVI S HARITHA SRI K V INDHUMATHI	Completed
4.2Customer Journey	Preparation of customer journey map to understand the user interactions which describes the stages that the customer experiences over time.	G POORNA SHIVANI B G BHAVANIDEVI S HARITHA SRI K V INDHUMATHI	Completed
4.3 Data Flow Diagrams and User Stories	Generate Data flow diagram for the Project which maps out the flow of information for the application.	G POORNA SHIVANI B G BHAVANIDEVI S HARITHA SRI K V INDHUMATHI	Completed
4.4Technology Architecture	Develop effective technical architecture for the proposed solution which describes the logical software and hardware capabilities that are required to support the development of the application.	G POORNA SHIVANI B G BHAVANIDEVI S HARITHA SRI K V INDHUMATHI	Completed

5.Project Planning Phase			

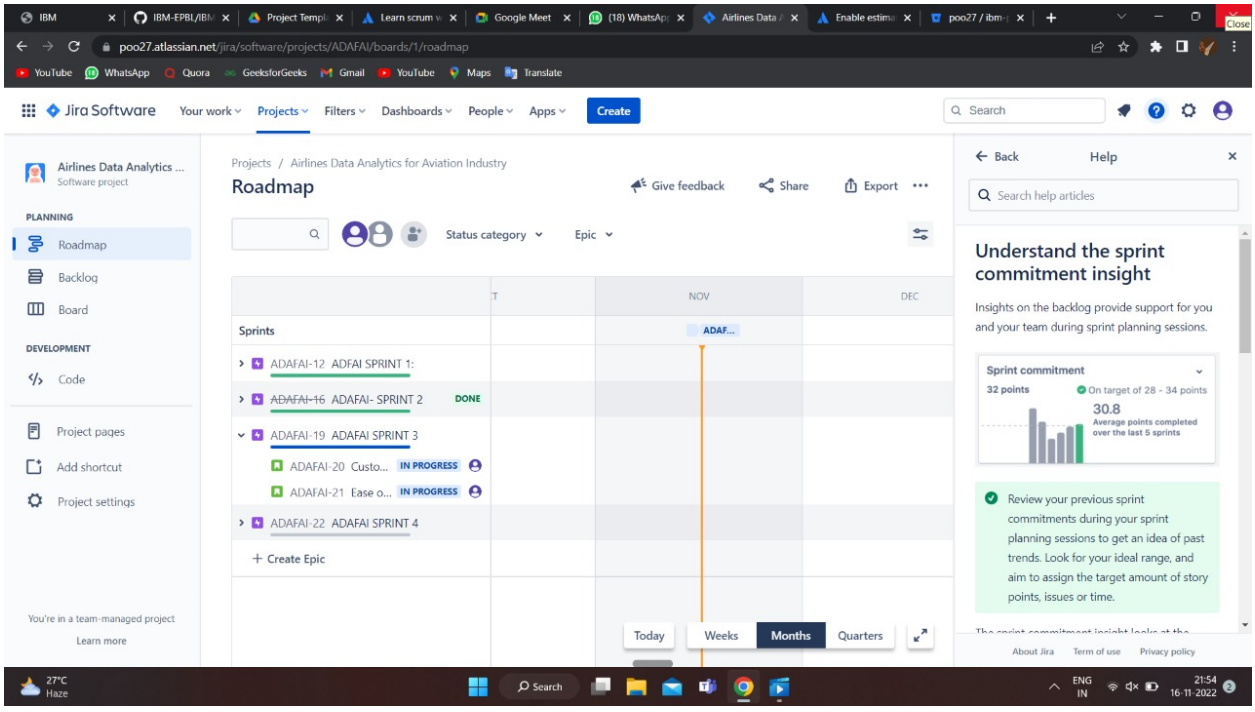
5.1Prepare milestone and activity list	Prepare Milestone and Activity list of the project.	G POORNA SHIVANI B G BHAVANIDEVI S HARITHA SRI K V INDHUMATHI	Completed
5.2 Sprint Plan	Prepare Sprint Delivery plan of the project	G POORNA SHIVANI B G BHAVANIDEVI S HARITHA SRI K V INDHUMATHI	Completed
6.Project Development			
6.1 Delivery of Sprint-1	Implement the coding phase of Sprint-1	G POORNA SHIVANI B G BHAVANIDEVI S HARITHA SRI K V INDHUMATHI	In Progress
6.2 Delivery of Sprint-2	Implement the coding phase of Sprint- 2	G POORNA SHIVANI B G BHAVANIDEVI S HARITHA SRI K V INDHUMATHI	In Progress

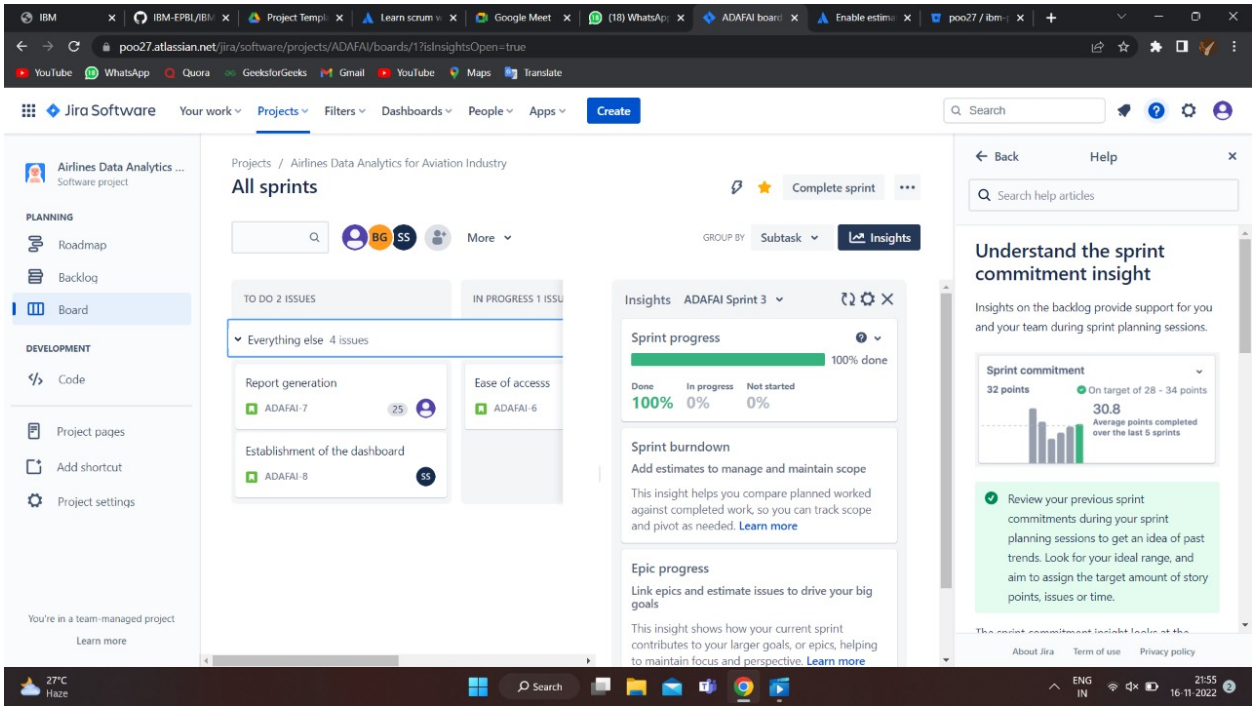
6.2 Sprint Delivery Schedule

A milestone schedule, or milestone chart, is a timeline that uses milestones to divide a project schedule into major phases. A milestone chart is a way to visualize the most important steps of our project. Each milestone the team achieves brings us closer to completing the project. As a result, milestones provide a sense of accomplishment and show the team how the work they're doing contributes to the overarching project objective.



6.3 REPORT FROM JIRA





7. CODING & SOLUTION

7.1 Feature 1

The user can enter the Elevation feet of the flight to predict whether the delay has occurred or not.

CODE:

```
from flask import render_template,Flask,request
import pickle

appl=Flask(__name__)
file=open("model.pkl","rb")

knn=pickle.load(file)
file.close()
@appl.route("/", methods=["GET","POST"])
```

```
def index():
  if request.method=="POST":
     myDict = request.form
     type1= myDict["elevation_ft"]
     pred = [type1]
     res=knn.predict([pred])[0]
    return render_template('result.html',elevation_ft=type1,res=res)
 return render_template('index.html')
 return 'OK'
if __name__ == "__main__":
 appl.run(debug=True)
```

7.2 Feature 2

If a delay occurred, the delay is predicted using the Elevation_ft parameter given in the dataset which provides the delay, in minutes.

CODE:

```
from sklearn.neighbors import KNeighborsClassifier
from sklearn.model_selection import train_test_split
import pandas as pd
import numpy as np
import pickle
dt = pd.read_csv(r"C:/Users/Anjana/Downloads/airports.csv")
dt = dt.dropna()

dt=dt.replace('NaN',0)
dt=dt.replace('OC',1)
dt=dt.replace('AF',2)
```

```
dt=dt.replace('AN',3)
dt=dt.replace('EU',4)
dt=dt.replace('AS',5)
dt=dt.replace('SA',6)

#feature and target arrays
train=dt['elevation_ft']
target=dt['elevation_ft']
train=np.array(train)
target=np.array(target)
X_train, X_test, y_train, y_test = train_test_split(train,target, test_size = 0.2,
random_state=42)
knn = KNeighborsClassifier(n_neighbors=5)
knn.fit(X_train.reshape(-1,1), y_train)
file = open("model.pkl","wb")
pickle.dump(knn,file)
file.close()
```

8. TESTING

8.1.Test Cases

				Maximum Marks	4 marks				
Test case ID	**Feature Type**	**Component**	**Test Scenario**	**Pre-Requisite**	**Steps To Execute**	**Test Data**	**Expected Result**	**Actual Result**	**Status**
Main Page	UI	Home Page	User can explore the Web App .		Visit the web page URL and click GO		Elevation details entries should be displayed.	Working as expected	Pass
Entering parameter_TC_001	Functional	Home Page	Verify the UI elements in the main page.		1.Click on the CHECK button displayed on the bottom of the application to check the delay.		Application should show below UI elements: a.Elevation feet Entry Area b.Checking the delay by CHECK button.	Working as expected	Pass
Navigation to Resultpage_TC_002	Funtional	Home Page	Results will displayed with the analysed delay.		Delay analysis is done if occurs.	Elevation_ft ID: 200 Delay predicted: 10 mins	Application should show correct delay time in minutes.	Working as expected	Pass
Return to Homepage_TC_001	Functional	Second page	To check the delay for another elevation feet .		1.Click on the CHECK button displayed on the bottom of the application to check the delay.	Elevation_ft ID: 2391 Delay predicted: 100 mins	User should be navigated from the loginpage to the dashboard. The Dashboard displayes the User Name.	Working as expected	Pass

8.2 User Acceptance Testing:

1)Purpose of Document

The purpose of this document is to briefly explain the test coverage and open issues of the [ProductName] project at the time of the release to User Acceptance Testing (UAT).

2)Defect Analysis

This report shows the number of resolved or closed bugs at each severity level, and how they were resolved

Resloution	Severity 1	Severity 2	Severity 3	Severity 4	Subtotal
By Design	10	4	3	3	20
Duplicate	0	2	0	3	5
External	2	3	0	1	6
Fixed	0	2	4	10	16
Not Reproduced	0	0	0	2	1
Skipped	0	0	0	2	2
Won't Fix	0	0	0	1	1
Total	12	11	7	14	55

3) Test Case Analysis

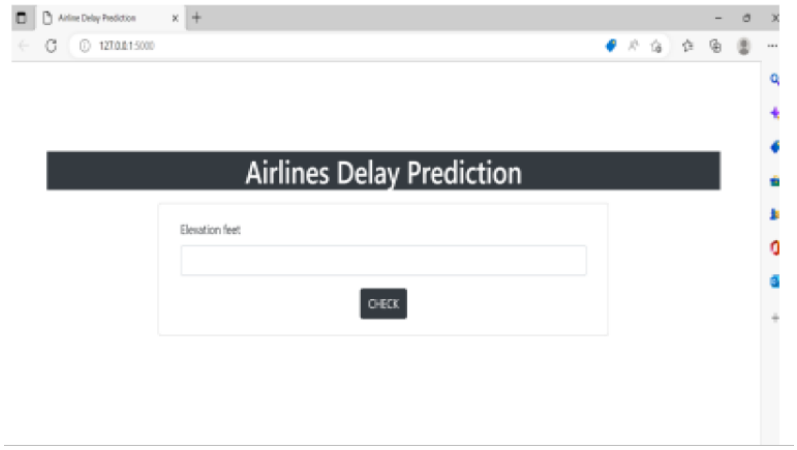
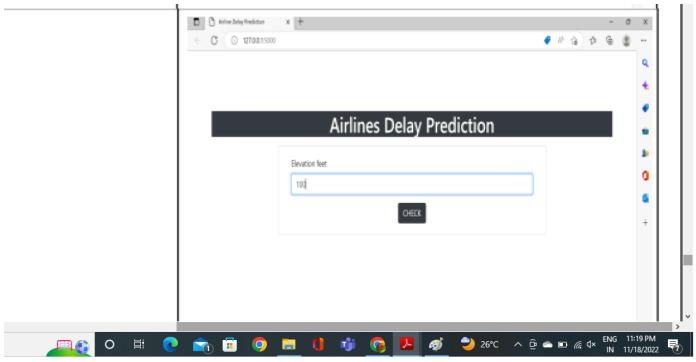
This report shows the number of test cases that have passed, failed, and untested.

Section	Total cases	Not Tested	Fail	Pass
Print Engine	20	0	0	20
Client Application	40	0	0	40
Security	2	0	0	2
Outsource Shipping	3	0	0	3
Exception Reporting	9	0	0	9
Final Report Output	4	0	0	4
Version Control	2	0	0	2

9. RESULTS

9.1 PERFORMANCE METRICS

S.No	Parameter	Screenshot

1.	Dashboard design	
2.	Data Entry	
3.	Data responsiveness	The Delay rate is 67.0 minutes

4.	Descriptive report of delay analysis	

10.ADVANTAGES AND DISADVANTAGES

ADVANTAGES:

- Analytics can help aviation players save significantly on costs by allowing them to address failure mechanisms proactively.
- With the right information, MROs can minimize the risks associated with overstocking or stock outs by planning their inventory wisely.
- With reduced AOG (aircraft on ground) events, the airworthiness of the aircraft increases.
- It ensures higher safety for passengers by reducing the risk of safety incidents.
- Analytics helps businesses achieve true collaboration by bringing together different stakeholders onto a single platform allowing them to “talk” to each other in real-time. Analytics is instrumental in ensuring greater airworthiness.
- Analytics makes it possible to enhance fleet reliability, ultimately trickling down into reduced delays and cancellations for passengers.

DISADVANTAGES:

- One of the biggest limitations of data analytics is lack of access to quality data.
- Sometimes, data collection might breach the privacy of the customers as their information such as purchases, online transactions, and subscriptions are available to companies whose services they are using.
- There is a lack of alignment between different teams or departments within an organization.
- Analytics solutions are not difficult to implement, however, they are costly, and the ROI is not immediate.
- Some of the analytics tools developed by companies are more like a black box model. What is inside the black box is not clear or the logic the system uses to learn from data and create a model is not readily evident.
- Organizations need to be cautious of what sort of data they are collecting from customers and ensure the security and confidentiality of the data. Only the data required for the analysis needs to be captured and if there is sensitive data, it needs to be anonymized so that sensitive data is protected. Data breaches can cause customers to lose trust in the organizations which may result in a negative impact on the organization.

11.CONCLUSIONS

The aim of this review was to provide an exhaustive summary of the most relevant studies published in the last ten years in the field of the evaluation of air transport service quality on the basis of passengers' perceptions. We selected a series of papers published in the most important journals of the transportation sector, divided between studies

investigating services managed by the airport companies and studies analyzing services managed by airlines. The literature review was structured by three main criteria: the service attributes analyzed in the various studies; the methods adopted for collecting the data; the methods used for analyzing the data. The reason why we selected these criteria is linked to the aim to create a picture of the studies by providing the most important information for researchers and practitioners, which are just the analyzed service aspects and the methodologies adopted for discovering the most relevant ones. From our literature review study, it can be concluded that there is a large variety of methods both for collecting and analyzing data, even if some of them were adopted by several researchers, whereas others were adopted only in few cases (e.g., SEM as data analysis method). Anyway, the suitability of each method depends on the objectives of the study, as well as other practical aspects, linked to the types of available data or the opportunity to collect certain data rather than others.

Definitively, we retain that it is important to investigate much more on the issue of air transport service quality, which is an emerging sector in the public transport service quality analysis. In fact, although in the last 20 years the research works in the field of air transport service quality have become increasingly numerous, this topic is still largely unexplored and requires a thorough investigation and further developments.

12.FUTURE SCOPE:

Living in the 21st century, you might have often come across the word ‘data analytics. Currently, it is one of the most buzzing terminologies. Companies around the globe generate vast volumes of data daily, in the form of log files, web servers, transactional data, and various customer-related data. In addition to this, social media websites also generate enormous amounts of data.

Companies ideally need to use all of their generated data to derive value out of it and make impactful business decisions. Data analytics is used to drive this purpose. Data analytics is the process of exploring and analyzing large datasets to find hidden patterns, unseen trends, discover correlations, and derive valuable insights to make business predictions.

It improves the speed and efficiency of your business. Businesses use many modern tools and technologies to perform data analytics. This is data analytics for beginners, in a nutshell.

According to a survey by Oliver Wyman, the global fleet of commercial aircraft could generate 98 million terabytes of data per year by 2026. In-flight recorders, operation systems, and staff all generate a vast amount of data. However, such data is no good if users cannot access it in a timely manner or are unable to use it to derive meaningful insights.

Apart from the data from the Flight Data Recorder, Engine Health Management data or Airplane Health Management data, maintenance-related data of the components/ aircraft recorded in their MRO platforms provides another data stream for predictive maintenance – for instance, non-routines, removals, no fault found and minimum equipment list occurrences, operator maintenance program and part reliability. Analyzing both the operational data from the sensors and the MRO data with the right statistical tools will be the key to a high accuracy prediction.

Three types of analytics can help MROs deal with the problem of unpredictability in the area of maintenance and repair of their fleet –

1. Descriptive and diagnostic analysis

Descriptive and diagnostic analytics helps users analyze information based on past events. They answer questions like “What happened?” Alerts, notifications, and standard reports are some key features of descriptive analytics.

2. Predictive analytics

Predictive models/analytics is more sophisticated and lets users know why something happened and what is likely to happen next. Using predictive analytics and modelling, users can study emerging trends to predict where they are headed. The effectiveness of predictive maintenance is in its ability to leverage the historical data alongside the live operational data to make predictions. This is purely aided by the latest developments on the processing of a high volume of dynamic data feeds and analyzing with sophisticated statistical tools.

3. Prescriptive analytics

Prescriptive analytics lets users know what will happen in the future as well as the possible impact it could have on the business. It also prescribes the best next actions to take in order to minimize adverse impacts.

13. APPENDIX

SOURCE CODE:

https://colab.research.google.com/drive/1AVhXY_tG-RuR77oxViD1soW6TgU9Y8lj?usp=share_link

GITHUB LINK:

https://github.com/IBM-EPBL/IBM-Project-54652-1662373463