Traffic Prediction: Use Of Optimization Techniques

1.0 Introduction

The goal of this report is to provide traffic prediction techniques and recommendations based on research. To forecast and estimate future traffic flow (Cargo and passenger) over a short term and long term period. Initially, to produce traffic forecast of passenger and freight is total “demand driven”. The ultimate goal is to balance the demand of traffic flow with the capacity of the airport to available resources.

2.0 Methodology

2.1 Long term Forecasting

Forecasting airport traffic can be broken down to two approaches: long term and short/medium term traffic. Long term traffic data can be acquired by surveys results from similar airport models aggregated by country and world region. Passenger traffic data of each country will be further broken down from country to region. Once these statistics have been simplified and be comparable it can be cross checked with historical trends. The results become considered in the finial inputs to the traffic prediction model.

2.2 Short term Forecasting

The short term traffic figures are done through monthly bottom up model; which is services offered compared to airport revenue. Based on calculated monthly airline capacity, the airport presumes a load factor to obtain traffic figures. The medium term traffic forecast is a mix of the bottom up model and regression surveys. Regression surveys are based on annual traffic data and economic standing. Generally speaking, if the surveys of the airport match the regression surveys they can be used, but if major differences occur reanalysis is conducted.

3.0 Forecasting for optimization

3.1 Forecasting with IT

There are three main ways to predict or forecast traffic; forecasting with IT, forecasting with intelligence and forecasting with facts. To begin, forecasting airport traffic for a domestic airport can not only be done with historical data and surveys but through using indicated software to produce future traffic. Different downloadable software builds estimated forecasts by adding other same/related airports passenger movements and take in account aircraft departure and arrivals. With this data matching it with our airport and applying a reporting pattern to the software. The software then takes this data to give us traffic prediction output. If this output is not accurate, we then can go back and input new altered data.

3.2 Forecasting with intelligence

Forecasting through intelligence is by using our knowledge, depending on location, airport operation capability and investment put into our airport. Because our airport is a domestic we cannot make our prediction as an international or a regional airport. Forecasting traffic with intelligence is not only through knowledge but also through experience and intuition, through this we are able to enhance the accuracy for out software program. To better our intelligence forecasting we can project recent trends ex. COVID-19 to take in account to produce finer data and produce what we believe is the most accurate forecast. Our experience and human knowledge allows us to consider in factors that the software cannot understand.

3.3 Forecasting with facts

More importantly, forecasting with facts is taking certainty in what we have that can't be mistaken and composing as a statistic. For example, we will have a few airlines flying in and out of our airport through this we receive a number of bookings to obtain information about passengers either traveling to our airport or connecting. We can then use factual data rather than historic trends, more of the factual data the better forecast accuracy.

4.0 Trend Projection

Forecasting done through routine trajectory projection through an enhanced traffic management system. There are several concepts in traffic management and prediction which involves the use of long term projection and aircraft movement as a way of ensuring efficient and conflict-free traffic at the airport. Trend projection is a different way of forecasting through known monitoring data to copy or mimic its pattern. Trend analysis always involves time as a variable. In our case, we can use annual data vs. monthly. For example, six years of a monthly data is 6*12 = 72 which will equal the total data. With this we will be able to examine trend. For example, the first-year monthly will be 1/72 which can be compared to see if the second or third-year tread will match: 13/72 or 25/72 respectively. A series of 72 entries for six years as a sample can be calculated with each series representing a month which is compared to same months in the future. The results can be broken down into variables of passenger traveling/interest to time.

The data can be used in trend functions:

- Linear: idea of the variable will continue to grow in a fixed pace. Passenger traffic will increase to grow in a fixed speed.
- Logarithm: is a best-fit curve line which is when the rate of chance in the data increases or decreases quickly and then levels out to linear trend-line. When the airport is new passenger traffic will be slow and will pick up to linear speed.
- Exponential: is a curve line that is when data values rise or fall at increasingly high rates. Either the airport passenger traffic will rise exceptionally or fall drastically.
- Gompertz: is when it describes growth as being slowest at the start and end of a given time period of time. Due to pandemics or time of the year traffic can fluctuate.

5.0 Econometric Models

Gaining econometric models using different data sets and variables gained from forecasting for optimization, can be developed and reviewed in terms of stats for reasonable forecasting.

These data most be followed by criteria and must be measurable and meaningful. One of the economic variable that can be used is GDP. GDP helps measure the market value of all the final goods and services produced in a specific time period in an industry. In our case, GDP can measure airport growth. It is generally acknowledged that the traffic flow at airports around the world grows at a rate of 1.5 times to that of worldwide GDP. Another two, econometric models that can be used are index of industrial production and net national disposable income. Index of industrial production shows the growth rate in a specific industry, for us it can show how the aviation industry is doing vs its impact. The IIP index is computed and published by the Central Statistical Organisation (CSO) on a monthly basis. Net national disposable income is worldwide net income available to invest, save or spend. Most of the time, airport traffic is derived from passenger will disposable income.

6.0 Conclusion

As the research has demonstrated, traffic prediction can be done through optimization techniques: IT, knowledge or known facts and observing trend projection and econometric models. With this gained information we are able to generate either a long term or short term traffic figure. It should be noted, that dependable predictions can be made with given past or present observations but it is nearly impossible to know future outcomes that may affect the aviation industry.