

Heathrow



Mango Solutions helps ease congestion for Heathrow's baggage operations



As Europe's busiest airport, Heathrow safely carries hundreds of thousands of passengers through its terminals and onto their flights every day. Its busiest terminal, T5, carries over 30 million passengers each year. For this reason, even small advancements in planning and passenger efficiency can have enormous impact on total capacity for the airport as a whole. One such area is preparing for baggage that moves through the terminals, both from passengers travelling to/from London and passengers transferring onto onward flights.

The baggage operations team is responsible for monitoring and planning baggage flows through the airport and, in order to do so successfully, was working from a baggage demand forecast written in the Perl programming language. This forecast brought together flight schedules, predicted passenger numbers, and other airport information, which enabled the team to then put together a "prepared schedule file" and from this, the team could produce statistics on the expected baggage flows throughout the airport, and generate further outputs from models written in Excel that allowed predictions to be made for future travel and baggage demands. These demand predictions allowed planners at Heathrow to adjust resources accordingly to cope with future demand.

"We have been delighted with the results," explained Stirling. "We are seeing real, tangible benefits and enabled us to ask further questions around financial planning, for example. The modelling has helped us plan our IT infrastructure and capital expenditure better by understanding at what point we will truly need the next system upgrade."

"It has been a win-win solution all round: a more cost effective, efficient service making every journey better for our passengers and a better business outcome for the company."



Challenge:

Some stages of this process, however, were input manually which meant that the Perl model was occasionally fragile in terms of input that it could cope with and, in addition, was difficult to maintain without experienced Perl developers available in-house, and errors difficult to interpret.

In order to better understand and interpret future scenarios, therefore, Heathrow needed a solution with increased automation in order to reduce error, while still having the ability to flag any problems with baggage thresholds.

Solution:

Data analytics consultancy, Mango Solutions, was invited to talk to members of Heathrow's Baggage Architecture team who are part of the airport's data analytics community of around 80-90 analysts about how they might address the challenge of increased efficiency.

Following discussions about the challenge, it was concluded that Heathrow would derive the most value from converting the existing Perl model code into R in order to automate the entire process to the point where little, or no, human intervention was required to produce outputs. This would then open up opportunities to increase the granularity - and therefore accuracy - of forecasting.

Using R, Mango helped Heathrow to build a modelling forecast for future baggage handling requirements based on historical patterns and future flight schedules. So, for example, Heathrow could look at historical data for a typical Monday in a given month in terms of types of passengers, the percentage of passengers that would likely check in baggage and the percentage split of business vs leisure travellers and marry that with forecasted passenger numbers for 5, 10 or more years hence. The option to model unplanned events and variants such as weather, air traffic control issues system problems and the impact these would have on flight schedule punctuality were also included in the model in order to help calculate the degree of baggage error that should be allowed.

A predictive model could now be built in order to understand what the future might look like for a particular terminal on a certain day in a month. Predicted numbers of passengers using check-in could be calculated along with the volumes of luggage likely on a flight and plans could be made for any physical constraints.

Mango also introduced random, unpredicted events into the schedule prompted by a 'punctuality' parameter, the aim of which was to simulate what would happen if flights were being delayed from a particular origin because of adverse weather conditions, for example, and how this event may affect incoming baggage.

"Automating multi-day forecasts, being able to test multiple scenarios and using simulations approaches to predict demand levels are small changes that will have an enormous knock-on effect on our airport. This new approach helps our teams to understand overall demand at Heathrow, giving us more accurate management of capacity as well as be proactive instead of reactive," explained Mitchell Stirling, Capacity & Modelling Manager for Baggage Operations at Heathrow.

Results:

Since working with Mango to switch its strategic analytics language from Perl to R, Heathrow has begun to see tangible improvements and there is now a better understanding of future demand and capacity which will make the baggage operation more efficient and resilient, thanks to the inclusion by Mango of QC and diagnostics algorithms.

In the model demand between the arriving vs departing flights is more balanced than before. Heathrow can now read all input files, bring everything together and merge information based on their common identifiers to model future baggage demand throughout the day, attributed to direct flights and flight transfers.

In addition, by being better able to model future demand, Heathrow now has the ability to make the baggage handling process more efficient by targeting, resourcing or development more appropriately in its strategic Baggage roadmap and this, in turn, prevents unnecessary strain on onwards resources, such as security.