PREDICTIVE ANALYTICS TRANSFORMS THE TRAVEL AND TRANSPORTATION INDUSTRY

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DATA VISIBILITY: PAST, PRESENT, AND FUTURE

The travel and transportation industry today is constrained by a traditional approach to looking at data: namely, a business problem will be presented to the IT department, which will then navigate through a maze of information to generate a report. That report might be anything from an Excel spreadsheet to a visualization, but the constant factor is this: the report is obtained after the fact. It is purely backward-looking in nature.

There is limited visibility into real-time data in the industry, and basically no predictive analytics in common use to forecast information. As a result, businesses are making decisions about current events and future possibilities in the absence of critical data. This slows down the decision-making process in an industry built on speed. It also forces many decisions to be subjective rather than objective in nature, introducing a significant level of risk and uncertainty.

At Unisys, we believe that businesses in the travel and transportation industry should have clear visibility into how their network has performed in the past and is performing at the current moment, plus the benefit of reliable and detailed forecast data. The combination of past, present, and future data generates rich visualizations and deep insights that can provide a wealth of benefits to help businesses succeed and differentiate themselves in a competitive marketplace.

Focusing on the benefits of predictive data to the travel and transportation industry, Unisys performed a deep analytical dive into three areas of key interest: missed connections, air freight, and customer loyalty.

MISSED CONNECTIONS

Unexpected flight delays cause significant problems for airlines in terms of costs, brand damage, and customer satisfaction. Quickly accommodating affected passengers and deploying staff appropriately is supremely difficult in the tight time constraints caused by a delayed flight.

Unisys resolved to build predictive models that would determine the probability of losing connections in hub airports for specific airlines for the next day's flights, utilizing current weather predictions and past on-time performance of airline routes.

The Analytics

To develop the model, datasets of connecting flights were built using information on flights and flight delays from the U.S. Department of Transportation. The Minneapolis St. Paul (MSP) International Airport was selected as the hub airport for the connecting flights.

Flights arriving at MSP on a given date were paired with flights departing from MSP, with a scheduled departure time 60 to 240 minutes after the scheduled arrival time of the original flight. The dataset was then analyzed to determine which pairs of connecting flights represented good connections versus lost connections.

Simultaneously, Unisys collected historical weather data from the National Oceanic and Atmospheric Administration for the hub airport and fifteen origin airports. Hourly weather was added for a time period prior to and during the first flight's scheduled departure time from the origin airport as well as for a time period prior to and during the first flight's scheduled arrival time in MSP and the connecting flight's scheduled departure time from MSP.

The flight and weather information were combined to create a model for missed connections.

Variables included equipment information, flight schedules, total flight time, airport locations, and flight date, as well as hourly temperature, wind speed, precipitation, and air pressure for the origin and hub airports.

Several predictive models were explored, including bagging, Naïve Bayes, and boosting (C4.5). Bagging was the ultimate choice for the model, as it creates multiple decision trees and averages the results. This helps achieve better accuracy with datasets that contain variance. Since bagging creates multiple decision trees, many variables are considered and become part of the model. Additionally, Tableau software was used to explore the source data as well as to capture trends in the connecting flights data.

Prediction models were then built and tested in R and Amazon Machine Learning; the best model proved to be 95% accurate in predicting lost connections (Figure 1).

Figure 1: Chart showing the number of flights that were analyzed each day. The blue bars show the number of flights that were accurately predicted to be delayed or on time, and the orange bars show the number of flights that were incorrectly predicted.

The Benefits

By predicting likely flight delays, airlines can fix problems before they occur by:

- Identifying passengers who will likely miss their connections
- Prioritizing reaccommodation for the airline's best passengers
- Minimizing the disruption of the passengers' travel plans and the cost to the airline
- Notifying passengers via SMS, email, smart device, etc. of their reaccommodation, thereby maintaining the highest customer satisfaction levels during irregular operations (IROPS)

AirCore® Predictive Reaccommodation™ does all this and more, processing the impact of all canceled or delayed flights into and out of a station simultaneously, and providing the airline with an immediate visual representation of the number of affected passengers by station. Through interfaces to an airline's Passenger Service System, AirCore Predictive Reaccommodation obtains viable alternate flight availability to get affected passengers to their destinations.

By coupling predictive analytics with dynamic reaccommodation, weather delays move from the dreaded IROPS category to become calm and stress-free "business as usual."

Figure 2: Air Freight Predictive Analytics Model.

AIR FREIGHT

The primary value proposition for air freight is consistent, fast transport of time-sensitive goods. Air cargo carriers must be able to route high-value products as efficiently and successfully as possible. The industry measures on-time performance through consistent standards, with the average rate of success at about 80%.

All collection and analysis today is performed post-execution. Unisys therefore set out to build a predictive classification model, the objective of which was to use advanced analytics to predict the success rate at the time of booking based on set parameters.

The Analytics

Actual customer data was used to develop the model. The customers were divided into three groups: the first group contained a single "VIP customer" with a large number of records, the second group was composed of frequent customers, and the third group was comprised of all other customers.

The efficiency of the routes used by the three customer groups was analyzed using historical data. Classification algorithms were then applied to the results in order to predict future success rates.

The outcome of the predictive analysis could be readily viewed and understood via a user-friendly visualization map (Figure 2). Each arc represents a customer group, a place of origin, and a destination. By clicking onto a particular route in the computer model, the predicted success of each route can be viewed.

The Benefits

With customer- and route-specific predictive data, air freight companies can ensure that their best customers get the best routes – and the best experience possible. Efficient and reliable routes can also be identified for highly-sensitive cargo such as when delivering human organs, where time, temperature, and other environmental conditions must be precisely maintained.

Additionally, predictive analytics can support a graded price structure, such as charging premium fares for high-efficiency routes. In contrast, less efficient routes can be identified for lower pricing and targeted for improvement efforts. Overall, being able to predict air cargo delivery success can enhance customer satisfaction, increase revenue, and streamline operations.

Unisys' Predictive Freight solution was named Best Software Architecture at the ICMG 2017 Australasian & Asia Pacific Architecture Excellence Awards, which recognize achievements in the field of enterprise, business, and IT architecture. The awards were presented at ICMG's Architecture World Summit in Sydney on July 13-14, 2017.

A jury comprised exclusively of industry professionals honored Unisys' Predictive Freight solution for its modern, cloud-based architecture and ability to greatly improve supply chain visibility and route planning. Unisys Predictive Freight is an integral part of Digistics™ by Unisys, a holistic and integrated cargo logistics solution that enables carriers to streamline freight management and improve operational efficiencies.

"A critical role that digital transformation can play in the industry involves enabling a shift from reactive tracking and monitoring to being able to move to a more proactive, agile approach," said Eric Hutto, senior vice president and president, Enterprise Solutions, Unisys. "We are empowering businesses to make more informed decisions that can dramatically improve delivery performance and enhance customer service."

CUSTOMER LOYALTY

Customer loyalty programs are both popular and successful. But to gain the greatest advantage from them through informed and targeted campaigns and program planning, airlines need to have a good understanding of the spending behavior of their loyalty members – not just their spending behavior in the past, but their likely spending behavior in the future.

Unisys performed analytics on a client's customer loyalty system data with the objective of predicting the probability of spending for loyalty members within 30, 60, and 90 days, including what would be purchased and the level of spending.

The Analytics

The Unisys Customer Loyalty System (CLS) tracks activity of all registered frequent flyers. CLS can also track anonymous passengers by analytical means, using a de-anonymizing process. By analyzing historical data, predictive propensity scoring models were developed (Figure 3).
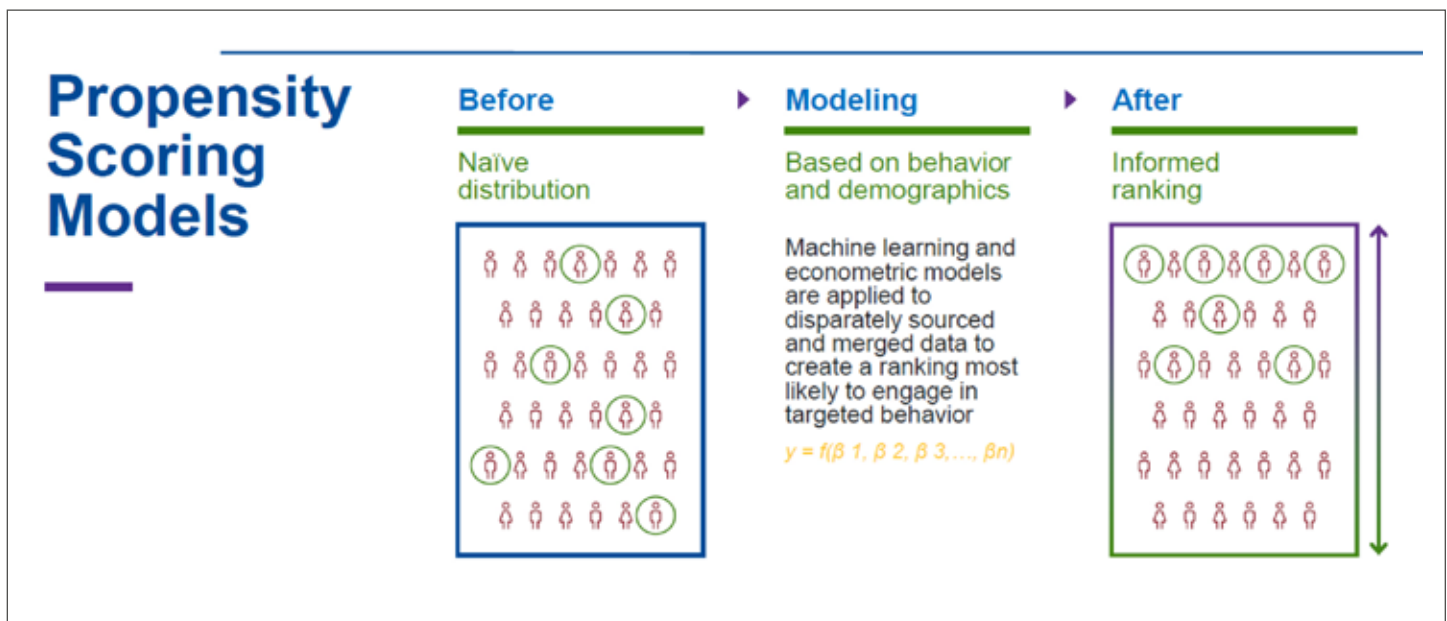

Figure 3: Propensity Scoring Models.

This informed ranking within the propensity scoring models was then used to generate analytics, including predicted purchase rate (Figure 4) and predicted credit (Figure 5). The red line in each chart shows the predicted value, and the blue dots show the actual loyalty member spending behavior.
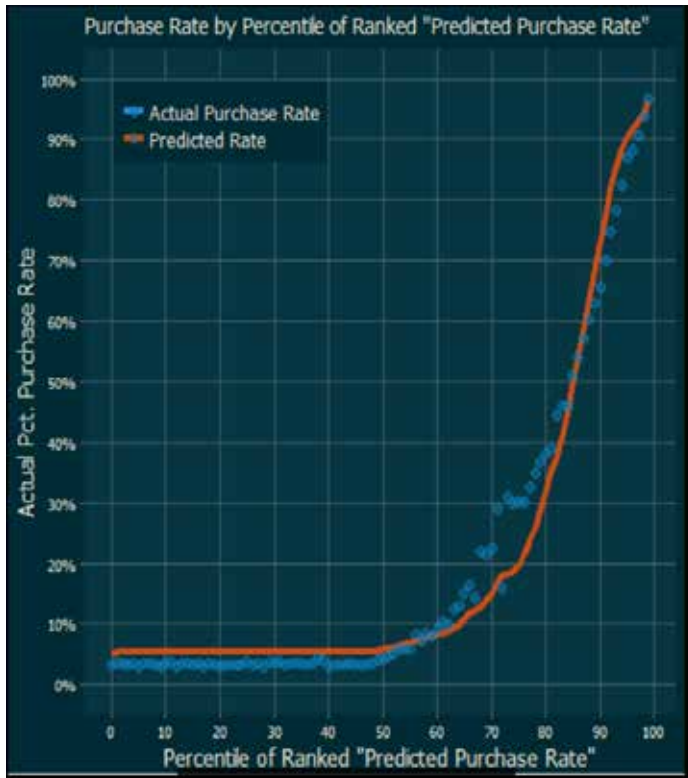

Figure 4: Predicted Purchase Rate – shows the predicted vs. actual rates of loyalty members making purchases based on their informed ranking.

Figure 5: Predicted Credit – shows the predicted vs. actual amount of credit loyalty members spend based on their informed ranking.

An accuracy of 88% was achieved in these predictive analytics regarding propensity to spend. Overall, the model increased in accuracy for high-spending loyalty members.

The Benefits

Through the propensity-to-spend model and predictive analytics, airlines can:

- Identify their most important customers and their spending behavior for optimized engagement
- Increase customer satisfaction
- Target programs to specific customers based on predicted expenditure to increase sales
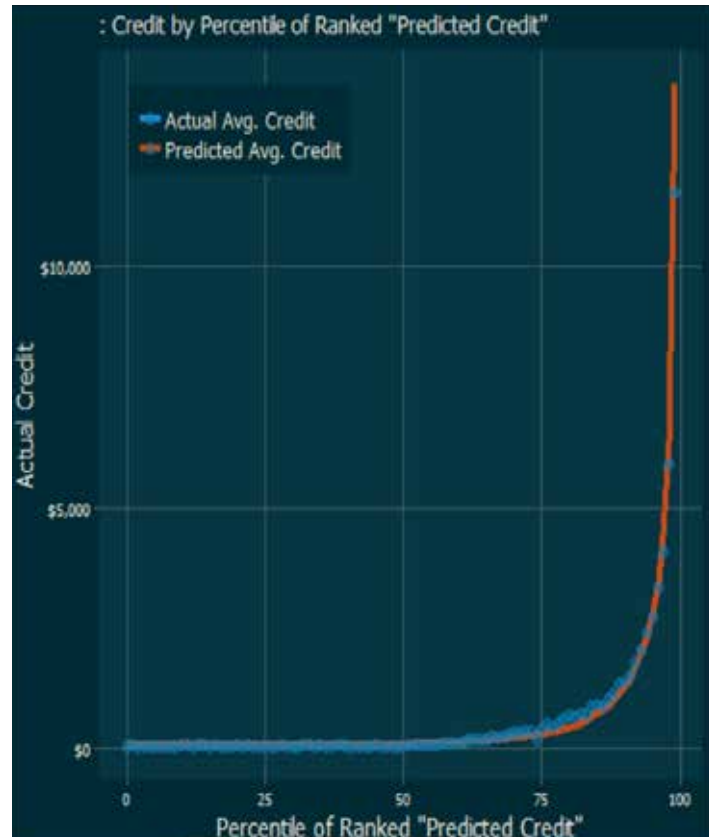- Offer incentives to attract and maintain customers at a VIP level

- Determine the value to the airline of individual customers
- Calculate the likelihood of an individual customer to spend within a defined timeframe
- Identify the likely category of spend for an individual customer
- Categorize the likely spend amount (high, medium, low) for an individual customer
- See where and how top customers spend their money, including popular routes, hotels, and trends

Rather than only looking backward at who has been their best customers, airlines can also look forward to anticipate who can be their best customers – and plan engagement and interaction accordingly.

PREDICTIVE ANALYTICS: RELEVANT, PROACTIVE, POWERFUL

With predictive analytics in place, passengers who would likely be affected by missed connections are reaccommodated so that their travel plans proceed without interruption. Air freight is re-directed to the most efficient routes, ensuring on-time delivery of time-sensitive cargo for an important client. Valued customer loyalty members are given targeted incentives to ensure their continued satisfaction with the airline.

Predictive analytics does not just generate data: it generates relevant insights that can automatically initiate processes to proactively limit the exposure or maximize the opportunity for a travel and transportation business. By combining past, present, and future data, companies can aggressively strengthen their position in the marketplace and their reputation with customers.

To find out more about creating a comprehensive, holistic view of the travel ecosystem, contact your Unisys representative or email us at advancedanalytics@unisys.com

For more information visit www.unisys.com