

## Sustainability

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### **RENEWABLE PORTFOLIO SELECTION (GENERAL MOTORS)**

*Selection of renewable power generation sources for a manufacturing plant*

Large manufacturing facilities have a flexibility to install on-site renewable power generation such as solar panels, wind turbines, land-fill gas, etc. There are many uncertainties with such a portfolio: regulations, technology advancements, and commodity prices. We employ a portfolio approach for such a selection.

### **GREEN LOGISTICS DESIGN (CH2M HILL)**

*Design of logistics operations to balance cost and emissions*

It is imperative for logistics to remote locations to minimize emissions, yet cost must be kept under control. We apply analytics to design logistics and site operations by balancing cost and emissions.

### **MONTHLY PRODUCTION QUOTAS (VEOLIA WATER)**

*Determine monthly production quotas and perform root cause analyses for excess capacity*

A waste water treatment facility uses chemical processes to produce fertilizers from waste water. For sales planning, a monthly production quota must be established based on demand, cost considerations, and supply availability.

## Logistics

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### **PRICE ESTIMATION (RYDER INTEGRATED LOGISTICS)**

*Forecasting rates for future shipments*

This project is about designing a system for estimating future rates for full- and less-than-truckload shipments and offering it a subscription service.

### **DATA CLEANSING (RYDER INTEGRATED LOGISTICS)**

*Data cleansing tool for freight data resulting from various clients*

Ryder's Supply Chain Services division maintains data from its clients. The data is used to streamline network planning and execution. One of the main obstacles is data quality. This project is about improving data quality and provide data cleansing tools.

### **CONSOLIDATION IN OUTBOUND LOGISTICS (W.W. GRAINGER)**

*Feasibility of full truckload shipments*

Less-than-truckload shipments are a predominant mode of transportation for many companies that have to regularly ship small quantities. We analyze cost and service level implications of possibly using full truckload shipments.

### **INTERPLANETARY SUPPLY CHAIN MANAGEMENT AND LOGISTICS (NASA)**

*Long-term planning for interplanetary logistics activities*

Interplanetary supply chain management and logistics possesses unique challenges, several of them drastically different from their terrestrial counterparts. As a result, in designing strategic plans, the underlying modeling and optimization concepts require new novel frameworks, techniques, and methodologies.

### **EXPRESS PACKAGE LOGISTICS (FEDEx EXPRESS)**

*Decision support system for express package logistics in a single market*

Express package carriers move large quantities of packages from several stations to the ramp with various conveyance types such as containerized or bulk trucks and aircraft. Packages are first sorted at each station and then many of them are resorted at the ramp based on the destination. From the ramp the packages are then moved with larger aircraft to their hubs and then to the final. In this project we streamline the transportation and sorting costs. Large cost savings can be obtained by appropriately forming containers at stations in order to bypass resorting at the ramp. On the other hand, transportation costs must be kept low.

## Airline Industry

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### **CARGO REVENUE MANAGEMENT (JDA SOFTWARE, CATHAY PACIFIC)**

*Allotment acceptance rules for cargo revenue management and developing a set of KPIs*

Airlines face a daunting task of accepting typically six-month-long bids and allocating the appropriate space on flights. We propose an optimization based algorithm for such an acceptance policy. As part of the evaluation process, a set of KPIs is developed and a BI reporting tool.

### **CODE SHARING (SABRE HOLDINGS)**

*Determine flights to code share with a partner*

An airline from an alliance faces the daunting task of code sharing its flights. The challenge mainly lies in the sheer size of the itineraries that can be sold on the entire network of all alliance partners. We designed a strategy to select flights to code share based on discrete choice modeling of passengers' utilities.

### **BAGGAGE FORECASTING (AIR CANADA)**

*Forecast bagging weight and volume for each flight during the booking process*

Fuel prices and the economic downturn have a tremendous impact on the airline industry. We have all heard and experienced the new baggage rules. For operational efficiency and revenue planning, it is important to forecast baggage loads on flights. We developed and implemented a baggage forecasting model, which will allow the airline to better balance the passenger and baggage revenue.

### **CAPACITY PLANNING (NORTHWEST AIRLINES)**

*Capacity planning for each scheduled flight*

Deciding how many seats to offer on each flight needs to trade-off revenue and cost, and it has to capture uncertainties around future passenger demand. An analytical tool is developed to assist such decision making.

### **AIRLINE RECOVERY (SABRE HOLDINGS)**

*A computer based automated systems for handling irregular operation*

This project is about designing models, algorithms, and solution methodologies for irregular operations.

### **SCHEDULE RETIMING AND CREW MANAGEMENT (UNITED AIRLINES)**

*Analytics based on optimization to retime flights while considering passenger connections and crew requirements*

United Airlines implemented our approach and attained savings in millions of dollars. The approach is now part of several commercial software packages.

## ***Miscellaneous***

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### **RESOURCE ALLOCATION FOR HEALTHCARE SERVICES (MEDAVANTE INC.)**

*Decision support system for long-term workforce management of physicians*

Healthcare service providers must plan their long-term operations based on the anticipated activities. We design a decision support system based on simulation and optimization to assist them with such decision making.

### **DEPLOYMENT OF MULTIPLEXING DEVICES IN OPTICAL CABLE NETWORKS (LEVEL 3 COMMUNICATIONS)**

*Decision support system to assist a telecommunication company deploying multiplexing devices*

As technology advances, new devices become cost beneficial. Multiplexing devices are such an example. We design an optimization based system in support of a deployment of these devices.

### **INFORMATION SYSTEM FOR GANG SCHEDULING (NORFOLK SOUTHERN CORPORATION)**

*Decision support system for budget allocation in multi-unit library system*

Gangs are groups of track maintenance workers. A railway employs several gangs through the year. Gangs move along track sections in order to complete a sequence of tasks spanning an entire year. This project is about efficient scheduling of gangs at the tactical and operational level.

### **BI FOR PROMOTIONS PLANNING (PREDICTIX INC.)**

*Forecast sales implications of promotions*

Many retailers struggle in correlating future sales with various promotion types. We provide assistance and guidance in developing a regression model that correlates seasonal effects and promotions to future sales.

**BUDGET ALLOCATION AT AN ACADEMIC LIBRARY (THE UNIVERSITY OF ILLINOIS AT URBANA-CHAMPAIGN LIBRARY)**

*Decision support system for budget allocation in multi-unit library system*

The University of Illinois library has a single budget, called the collections budget, for material acquisitions and it has several library units. We address the problem of allocating the collections budget to these library units. We developed a collections budget allocation model relying on forecasting that takes into account the interaction among the library units. Through a well designed graphical user interface, the users have options in giving preferences to specific items and units.