New Cases In Management Science

9B17E010

Mobile Blood Donor Clinic: A Discrete Event Simulation Model
Rasha Kashef; Felipe Rodrigues;

While donating blood on campus, a management science graduate student noticed that the mobile blood donor clinic set up at his university’s community centre was a congested tandem queuing system. Finding one-and-one-half hours too long for donors to wait, the student considered how the process could be reduced by at least half an hour. He needed to devise a reasonably precise model to represent the donor flow in the clinic. Using either the mode or the average service times supplied by the nurses, the student could build a relatively straightforward discrete-event simulation model to identify bottlenecks and improve the donor flow.

Publication Date: August 17, 2017
Discipline: Management Science;
Length: 4 pages
Issues: queuing models, simulation
Industry: Health Care Services;
Setting: Canada, Small organization, 2017
Difficulty: Undergraduate/MBA
Learning Objective: This case introduces decision tree analysis, specifically within a logistics set-up, to postgraduate students in management, industrial management, or industrial engineering courses. Students will utilize the data provided in the case to develop the decision tree and the expected payoffs. The case also provides insights on steel manufacturing and the challenges associated with that industry. After completion of the case, students will be able to understand decision-making under risk in logistics management; develop a decision tree from provided data and calculate the expected payoffs using the expected monetary value approach; analyze decision alternatives and their associated risks in decision-making; and evaluate the expected value of perfect information and associate the concept with decision-making.

9B17E008

JSW Steel Ltd.: A Logistics Dilemma
Amol Dhaigude; Debmallya Chatterjee; Vishnu Kumar;

The customer relationship manager at JSW Steel Ltd., a large steel manufacturer in India, needed to analyze his available transportation and logistics options to meet an urgent order for a long-time and valued client. The manager needed to decide whether to send the shipment through the customary rail route or, instead, to use the new sea route that his company had recently developed. His dual objective was to meet the customer’s requirements in time, while also delivering some financial benefit to boost his company’s quarterly results.

Publication Date: June 16, 2017
Discipline: Management Science;
Length: 7 pages
Issues: positioning strategy, multiple regression analysis
Industry: Other Services;
Setting: India, Small organization, 2015-16
Difficulty: MBA/Postgraduate
Learning Objective: This case is appropriate for graduate, postgraduate, and executive education courses in marketing management, business research methods, marketing research, and management science. After completion of the case, students will be able to describe positioning strategy and understand its relevance, and apply multiple regression analysis to design a positioning strategy that can provide a competitive positioning.
RBC: Social Network Analysis
Peter C. Bell; Ramasastry Chandrasekhar;

In October 2013, the Royal Bank of Canada (RBC), Canada’s largest bank, hired a new head of Enterprise Fraud Strategy, a department tasked with protecting RBC’s global customers from fraud. The department head’s immediate priority was to prevent fraudulent transactions by RBC’s own customers—a phenomenon called first-party fraud—by implementing a burgeoning technology called social network analysis (SNA). The technology used predictive analytics and big data to forecast the occurrence of first-party fraud. The head of Enterprise Fraud Strategy had three primary questions: First, how should SNA be used to bring down the ratio of fraud alerts to actual fraud at RBC? Second, how should the cost of maintaining SNA protocols be reduced? Finally, how should the issues around systemic performance of SNA be resolved?

Publication Date: June 13, 2017
Discipline: Management Science;
Length: 8 pages
Issues: big data, data analytics, fraud
Industry: Finance and Insurance;
Setting: Canada, Large organization, 2013
Difficulty: Undergraduate/MBA
Learning Objective: Students should take on the perspective of the case’s central figure to find out which rule (or combination of rules) provides the best fraud detection for RBC and how effect these rules would be if implemented for all RBC customers. After using the case, students will be able to do the following: Highlight the features of first-party fraud, particularly its “connected explosion.” Discuss the unique attributes of social network analysis. Demonstrate the importance of data analytics in detecting first-party fraud. Identify the important trade-offs in fraud detection. Use advanced analytical methods to test out various fraud detection rules and construct a “best” model for fraud detection.

9B17E001
Asian Grill: Finding the Optimal Table Mix
Kyle Maclean; Srinivas Krishnamoorthy;

In early December 2016, the owner of the Asian Grill restaurant in Henderson, Nevada, noticed that the restaurant had busy nights where customers left due to long wait times, yet there were empty seats due to small groups occupying large tables. She had a proposed new table layout before her and had to evaluate whether this would allow the restaurant to seat more customers on her busiest nights (Thursday to Saturday), or whether a different table layout would be even better.

Publication Date: January 30, 2017
Discipline: Management Science;
Length: 3 pages
Issues: queuing, simulation, restaurant industry, optimization, Excel, @RISK
Industry: Accommodation & Food Services;
Setting: United States, Small organization, 2016
Difficulty: Undergraduate/MBA
Learning Objective: This case provides students with an opportunity to model a complicated yet common service-industry problem. From a technical side, it presents a common, easy-to-understand situation that can be used for creating and developing a queuing simulation. The case is intended for use in either an advanced undergraduate business course or an MBA environment. The content requires familiarity with modelling and analytics content (queuing simulations). More advanced students can use this case to practice simulation optimization through the use of third-party software such as @RISK. After working through the case and assignment questions, students will be able to understand how modelling techniques can be used in operations; identify a variety of situations where modelling can be useful; and explain the benefits of variance-reduction techniques.

9B17E002
Linear Regression: A High-Level Overview
Gregory S. Zaric;

Linear regression is a common tool used in statistics and is considered the foundation for most predictive analytics. It creates a line of best fit in a data set and uses that line to explain the relationship between two quantities, which helps forecast future values. This note provides a high-level, non-technical overview of linear regression.

Publication Date: January 27, 2017
Discipline: Management Science;
Length: 5 pages
Issues: statistics, linear regression, analytics, forecasting, regression analysis;
**9B16E037**

**Risks and Rewards in Professional Tennis**
*Fredrik Odegaard;*

Founded in 1972, the Association of Tennis Professionals (ATP) was the governing body of three professional men’s tennis circuits: the ATP World Tour, the ATP Challenger Tour, and the ATP Champions Tour. In addition to the ATP World Tour tournaments, there were four highly coveted and extremely competitive Grand Slam tournaments, one of which was Wimbledon. In 2014, two professional tennis players sought to determine their respective odds of placing first at Wimbledon, by using an understanding of probability, stochastic modelling, and Markov chain application. Both players were ranked outside the top 100 and faced a momentous task.

**Publication Date:** December 22, 2016  
**Discipline:** International; Management Science;  
**Length:** 7 pages  
**Issues:** probability, stochastic process, Markov chain, sports analytics, tennis  
**Industry:** Arts, Entertainment, Sports and Recreation;  
**Setting:** United Kingdom, 2014  
**Difficulty:** Undergraduate/MBA  

**Learning Objective:** This case is suitable for undergraduate and MBA level courses on analytics. Using the case, students will learn how these can be applied in various business situations.

**9B16E030**

**Transfer Value of Soccer Players**
*Hubert Pun; Philip Kim;*

In 2016, a soccer fan closely followed the scores, standings, and transfers of players in the European soccer leagues. Having witnessed countless exchanges of players from one team to another, she wondered about the factors that team managers considered when determining the players’ market values. She gathered data on 77 notable soccer players in an effort to better understand the essential factors that made the players valuable. Could she use the variables she had collected to also build a functioning model that would predict a player’s market value?

**Publication Date:** October 12, 2016  
**Discipline:** Management Science; International;  
**Length:** 2 pages  
**Issues:** linear regression, statistics, sport, analytics  
**Industry:** Arts, Entertainment, Sports and Recreation;  
**Setting:** 2015  
**Difficulty:** Undergraduate/MBA  

**Learning Objective:** This case is suitable for a management science elective course focusing on linear regression at the MBA or undergraduate level. After completion of the case, students will be familiar with the following concepts and techniques: correlation and multicollinearity; continuous, binary, and categorical variables; the criteria for using linear regression; statistical significance and p-values; and using and interpreting the linear regression model.

**9B16E029**

**Food Truck Forecaster**
*Mehmet A. Begen; Jen Littleton; Samantha Wong; Rob Yellin;*

The owner of a food truck based in Hamilton, Ontario, was looking over the first year of her operations. In addition to working in Hamilton, she had tried to maximize her revenues by driving to several other cities and charging various prices for each burger, depending partly on the fresh ingredients available in each city. Besides location, the owner had collected data on a few other factors—the weather, the day of the week, the city’s population, and whether a festival was going on—that had had an impact on the demand for her product. She wondered whether analytics could help her decide where to sell and how much to charge on a daily basis. The owner also wondered whether this decision-making and data-collection process could be automated since she would be using it every day.

**Publication Date:** November 14, 2016  
**Discipline:** Management Science;  
**Length:** 4 pages  
**Issues:** regression, simulation, Excel VBA, prediction  
**Industry:** Accommodation & Food Services;  
**Setting:** Canada, Small organization, 2014  

**Difficulty:** MBA/Postgraduate  

**Learning Objective:** This note is intended as preparatory reading for a senior management-level workshop on big data or analytics. The note contains examples of graphs and formulae and explains how these can be applied in various business situations.

**9B16E033**

**HomeZilla: Attracting Homebuyers through Better Photos**
*Gregory S. Zaric; Hongmei Sun;*

In November 2014, the founder and chief executive officer of HomeZilla, in Toronto, Canada, was considering how to provide value-added services to his business. One of the company’s main services was to work with real estate agents to provide web listings to attract home shoppers. Many Internet companies were analyzing web-browsing data in an effort to better understand user behaviour and thus improve their business. Inspired by this trend, the founder considered how his company could use web-browsing data to better attract home shoppers on the company’s website and thereby add value to his business.

**Publication Date:** September 27, 2016  
**Discipline:** Management Science;  
**Length:** 6 pages  
**Issues:** statistics, data science, regression, big data  
**Industry:** Other Services;  
**Setting:** Canada, Small organization, 2014  
**Difficulty:** Undergraduate/MBA  

**Learning Objective:** After completion of the case, students will have a familiarity with several Microsoft Excel tools and concepts, including data cleaning, descriptive data analysis, exploratory
analysis, pivot tables, hypothesis tests, logistic regression, principal component analysis, statistical analysis using R, and survival models, including the proportional hazards model. The case is accompanied by a Microsoft Excel file of a large data set with more than 29,000 rows of page views.

9B16E023
Lucas Wang: Stop-Loss Strategy
Hubert Pun; Hongmei Sun;

On February 29, 2016, an investor, who was a business school graduate, purchased one share of Tesla Motors, Inc. stock for $191.93. In doing so, the investor wondered what trading strategy should be followed over the next six months to maximize returns while minimizing risk. In choosing a strategy, he wanted to make good use of the knowledge gained from his financial analytics classes. To that end, he did not know if he should choose a buy and hold, or a stop-loss strategy with an optimal stop-loss threshold. The investor wondered how he would make this decision. Would a six month comparison of the stop-loss strategy with thresholds from 1 per cent to 99 per cent versus the buy and hold strategy resolve his dilemma?

Publication Date: July 07, 2016
Discipline: Management Science;
Length: 4 pages
Issues: efficient frontier; simulation; @RISK

Setting: Canada, 2016
Difficulty: Undergraduate/MBA
Learning Objective: This case is suitable for use in MBA and other graduate-level programs in courses on financial analytics and stock trading strategies. After completion of the case, students will be able to:
evaluate stop-loss and buy and hold strategies;
calculate the lognormal model for a stock price;
determine an efficient frontier for stop-loss strategies;
use simulation to evaluate trading strategies and risk preference; and
use @RISK software to calculate returns.

9B16E011
Absolute and Relative References In Microsoft Excel
Kyle Maclean; Lauren E. Cipriano; Gregory S. Zaric;

The purpose of this note is to illustrate how to use cell references in Microsoft Excel. References are necessary when using functions and building models. This teaching note provides students with practice exercises and a supporting Excel workbook.

Publication Date: June 30, 2016
Discipline: Management Science;
Length: 11 pages
Issues: Excel, spreadsheet, modelling, analytics

Difficulty: Undergraduate/MBA
Learning Objective: Upon completion of this note and its associated activities, students will be able to:
Understand the difference between absolute and relative referencing.
Know when it is appropriate to use each type of referencing.
Know the keyboard shortcuts to quickly implement each type of referencing.

9B16E016
Advanced Logic Functions in Microsoft Excel
Kyle Maclean; Lauren E. Cipriano; Gregory S. Zaric; John Lyons;

The purpose of this technical note is to introduce and illustrate the use of Microsoft Excel’s built-in advanced logic functions. Excel’s advanced logic functions add logical capabilities to normal descriptive statistics functions. The note includes practice exercises and their solutions, and a supporting Excel workbook for students.

Publication Date: June 30, 2016
Discipline: Management Science;
Length: 12 pages
Issues: spreadsheet, modelling, analytics, Excel

Difficulty: Undergraduate/MBA
Learning Objective: After completing this technical note, students will be able to do the following:
Use advanced logic functions in Microsoft Excel (SUMIF(S),COUNTIF(S),AVERAGEIF(S))
Recognize situations when these functions may be useful
Basic Mathematical Operations in Microsoft Excel
Kyle Maclean; Lauren E. Cipriano; Gregory S. Zaric;

This teaching note provides step-by-step illustrations and practice problems to assist students in learning how to use basic mathematical functions in Microsoft Excel. These functions are the necessary building blocks for many spreadsheet models. This teaching note includes practice exercises, answers, and a supporting Excel workbook for students.

Publication Date: June 30, 2016
Discipline: Management Science;
Length: 14 pages
Issues: Excel, spreadsheet, modelling, analytics

Difficulty: Undergraduate/MBA
Learning Objective: This case is suitable for use in MBA and other business related courses that require students to develop spreadsheets using Excel. After completion, students will be able to:
- Perform basic mathematical operations in a spreadsheet using +, −, *, /, and ^.
- Understand the structure of Excel's built-in functions.
- Use built-in functions to perform the mathematical operations SUM, PRODUCT, SQRT, EXP, LN, and SUMPRODUCT.

Data Tables in Microsoft Excel
Kyle Maclean; Lauren E. Cipriano; Gregory S. Zaric;

The purpose of this note is to illustrate the use of Data Tables in Microsoft Excel. Data Tables are commonly used for performing sensitivity analyses, sometimes called “What If?” analyses, and for preparing data for graphs. Data Tables can also be used to enable a Monte Carlo simulation in a spreadsheet in more advanced models. The technical note includes practice exercises and their solutions, and a supporting Excel workbook for students.

Publication Date: June 30, 2016
Discipline: Management Science;
Length: 22 pages
Issues: Excel, spreadsheet, modelling, analytics

Difficulty: Undergraduate/MBA
Learning Objective: After completion of this note and its associated activities, students should be able to do the following:
- Use the Microsoft Excel functions that identify the minimum, maximum, rank, average, median, variance, and standard deviation of a single continuous variable data set.
- Use the Microsoft Excel functions for computing the covariance and the correlation between two continuous variables in a data set.

Descriptive Statistics in Microsoft Excel
Kyle Maclean; Lauren E. Cipriano; Gregory S. Zaric;

The purpose of this note is to illustrate the use of Microsoft Excel functions for generating descriptive statistics for continuous data. These functions are common when analyzing data to provide insights for decision making. The note includes practice exercises and their solutions, and a supporting Excel workbook for students.

Publication Date: June 30, 2016
Discipline: Management Science;
Length: 13 pages
Issues: Excel, spreadsheet, modelling, analytics

Difficulty: Undergraduate/MBA
Learning Objective: After completion of this note and its associated activities, students should be able to do the following:
- Use the Microsoft Excel functions that identify the minimum, maximum, rank, average, median, variance, and standard deviation of a single continuous variable data set.
- Use the Microsoft Excel functions for computing the covariance and the correlation between two continuous variables in a data set.

Goal Seek in Microsoft Excel
Kyle Maclean; Lauren E. Cipriano; Gregory S. Zaric;

The purpose of this note is to illustrate the use of Microsoft Excel’s Goal Seek feature. The technical note includes practice exercises and their solutions, and a supporting Excel workbook for students.

Publication Date: June 30, 2016
Discipline: Management Science;
Length: 8 pages
Issues: Excel, spreadsheet, modelling, analytics

Difficulty: Undergraduate/MBA
Learning Objective: After completion of this note and its related activities, students will be able to do the following:
- Perform an analysis using Excel’s Goal Seek feature.
- Recognize situations when Goal Seek would be useful.

Good Modelling Practices in Microsoft Excel
Kyle Maclean; Lauren E. Cipriano; Gregory S. Zaric;

The purpose of this note is to illustrate the use of good modelling practices in Microsoft Excel. An effective spreadsheet model can be a valuable decision-making tool for businesses wanting to improve or expand their operations. To do so, a model must provide information relevant to the decision maker.

Publication Date: June 30, 2016
Discipline: Management Science;
Length: 19 pages
Issues: Excel, spreadsheet, modelling, analytics

Difficulty: Undergraduate/MBA
Learning Objective: Upon completion of this note, students will be
Introduction to Logic Functions in Microsoft Excel
Kyle Maclean; Lauren E. Cipriano; Gregory S. Zaric; John Lyons;

The purpose of this note is to introduce the concept of logical statements in Microsoft Excel and to illustrate the use of Excel's built-in logic functions. The note includes practice exercises and their solutions, and a supporting Excel workbook for students.

Publication Date: June 30, 2016
Discipline: Management Science;
Length: 12 pages
Issues: Excel, spreadsheet, modelling, analytics

Difficulty: Undergraduate/MBA
Learning Objective: After completion of this note and its associated activities, students should be able to:
- Understand the difference between categorical, ordinal, discrete, and continuous data,
- Read and interpret a histogram,
- Build a histogram using the Microsoft Excel functions COUNTIF and FREQUENCY, and
- Estimate probabilities from a histogram and from a Normal distribution.

Introduction to Microsoft Excel
Lauren E. Cipriano; Gregory S. Zaric;

The purpose of this note is to introduce students to the basic use and vocabulary of Microsoft Excel. Excel is commonly used to do quantitative analysis in business. Students will encounter Excel applications in just about every area of business, including finance, accounting, operations management, marketing, and analytics.

Publication Date: June 30, 2016
Discipline: Management Science;
Length: 11 pages
Issues: Excel, spreadsheet, modelling, analytics

Difficulty: Undergraduate/MBA
Learning Objective: Upon completion of this note, students will be able to:
- Understand some Excel specific vocabulary.
- Enter and format data in a spreadsheet.
- Use keyboard navigation in Excel.
- Copy and paste data.
- Sort data.

Ratnagiri Alphonso Orchard: Bayesian Decision Analysis
Debdatta Pal;

In late 2012, the owner of the Ratnagiri Alphonso Orchard considered whether or not to purchase information from a climatology firm regarding the probability of unseasonable rains that could damage some or all of his family’s mango harvest. The owner needed to decide whether or not he should lease the orchard to a fruit merchant or keep the orchard for his family to harvest, despite the possibility of rain. Would the climatology firm provide helpful information, or should he make an independent decision? Regardless of whether he purchased information from the climatology firm, what was the best informed decision he could make?

Publication Date: April 12, 2016
Discipline: Entrepreneurship; International; Management Science;
Length: 2 pages
Issues: Decision analysis, statistics, probability, agribusiness, agriculture, lease, empirical analysis, risk tolerance, bayesian, a priori, Bayes decision rule, conditional probability, joint probability, unconditional probability, posterior probability, uncertainty, prior probability
Industry: Agriculture, Forestry, Fishing and Hunting;
Setting: India, Small organization, 2012
Difficulty: Undergraduate/MBA
Learning Objective: This case is suitable for graduate or undergraduate business courses in statistics and quantitative techniques, management science, or risk management and agri-business. Students are provided with the data needed to calculate the value of information and develop a decision tree. As a result of discussing this case, students will be able to:
- Understand the concepts of probability theory and apply those concepts to calculate probabilities;
- Formulate a payoff table from a problem description;
- Apply Bayes’ decision rule for decision analysis;
- Formulate and solve a decision tree;
At a Jilltronics Systems board meeting in 2015, the chief executive
officer (CEO) indicated an interest in reviewing the firm’s supply
chain strategy in light of increasing product and service demand.
Jilltronics, a regional player in the U.S. home security market with
sales approaching $100 million annually, had experienced
significant growth in both the new housing and retrofit markets.
The CEO expressed his desire to take a more analytical approach in
developing the supply chain strategy that might include expanding
the number of vendors. He reported to the board that this
initiative could pose some risks due to the challenges associated
with managing multiple suppliers. The board meeting concluded
with the CEO tasking the chief analytics officer with developing a
vendor selection assessment plan and reporting her findings at the
next board meeting.

Publication Date: March 21, 2016
Discipline: Management Science; Operations Management;
Length: 3 pages
Issues: Vendor selection, multi-attribute analysis, sensitivity
analysis, benefit-cost analysis, electronic security
Industry: Manufacturing;
Setting: United States, Medium organization, 2015
Difficulty: Undergraduate/MBA
Learning Objective: This case can be used in a graduate-level core
analytics or operations management course. The case focuses on
the use of multi-factor analysis in selecting qualified vendors. It can
be used as an in-class activity (70 to 90 minutes) or as an
out-of-class team exercise. After completion of this case, students
should be able to:
- Appreciate the basic concepts behind multi-criteria decision
  analysis.
- Recognize the trade-offs associated with vendor selection.
- Comprehend the fundamentals of benefit-cost analysis.
- Understand how to conduct sensitivity analysis on key model factors.

Jilltronics Security Systems: Vendor Selection Using
Multi-Factor Analysis
Owen P. Hall; Kenneth Ko;

In July 2015, PT Trias Indra Saptura (TRIAS), Indonesia’s leading
welded cable ladder producer, had just won its largest-ever tender
bid. The news could get even better if it adopted alternative
materials that were potentially more profitable. The production
director was tasked with weighing whether TRIAS should fulfill the
tender using its traditional supplier or the new materials. While
more expensive, the new materials would cut out several
production processes and associated costs. However, using the
new suppliers presented significant risks. Only two mills, in Korea
and Japan, supplied the appropriate material, and both companies
presented different prices and import costs. Since TRIAS could be
penalized if it did not supply the goods on time, the production
manager also had to calculate the likelihood that each company
could be delayed in supplying the order and how much that would
reduce profits if it happened.

Publication Date: February 22, 2016