# BRYCE BOWLES, MDA



# MDA PROJECTS, INFORMATION AND COURSE WORK

Virginia Commonwealth University
Master Of Decision Analytics (M.D.A.)

# How to Contact



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- [https://www.datacamp.com/profile/bowlesbe](https://www.datacamp.com/profile/bowlesbe)
- [Resume](Resume)

# Table of Contents

# Projects Completed
(https://github.com/bryce-bowles)

**Advanced Decision Analytics** (Machine Learning: Deterministic and Probabilistic Modeling, Optimization, Simulation)

⭐ Federal Reserve Bank of Richmond Optimization Model:  Won Optimization model class competition issued by Dr. Brooks (M.D.A. department chair and professor). Proposed Python, Pyomo and GLPK network optimization model approach with binary variables and logical constraints to simulate reorganization of 1700 workspaces across 17 floors, while allocating for changing project teams and requirements. Provided report to IT Vice President, Christine Holzem at the Federal Reserve Bank of Richmond.
(View Repository)

Optimization and Simulation Proposal for SCC Bureau of Insurance: Proposed optimization and simulation framework to benefit helpdesk request distribution and simulate future request volume.
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Mobile Munchies PDF: Mobile Munchies is deciding how much of each type of juice to prepare for the week. Given the ingredients and cost, a python model using Pyomo and GLPK determined the optimal amount of each type of lemonade to produce so the profits maximized subject to the constraints.
(View Repository)

Diet Problem and Manufacturing Problem: Decided how much of each of each dessert to consume per day so that taste index is maximized, and calories and grams of fat are minimized, subject to constraints (Algebraic Formulation).
(View Repository)

Red Tomato Gardening Tools and Sporting Goods Company:
- Demand forecast optimization problem model using Python, Pyomo and GLPK in Python. Multifactor objectives and constraints solved using algebraic formulation to allocate and minimize cost.
- Excel Solver used to allocate how much of each product to produce so that profit is maximized
- (View Repository)

**Business Data Analytics** (Machine Learning, Classification Trees, Regression, Random Forests, Support Vector Machines, etc.)

⭐ Alchemy Broker Analysis Project:  Performed segmentation analysis and predictive modeling on insurance broker performance to conclude a random forest model (highest AUC of 73%) predicted whether 2020 Gross Written Premium will increase or decrease from 2019 with a misclassification rate of 35%. Four classification models (classification trees, logistic regression, random forests, and support vector machines) were built, evaluated, and then tuned for prescriptive measures to analyze broker performance. Explored, visualized, and described five groups of brokers using principal component analysis.

⭐ ⭐ Lending Club Data Analytics in R: Topics include the analytics work flow, data preparation, visualization, cluster analysis, predictive modeling, and learning-enabled optimization. The Lending Club data is a mix of numeric, character, factor, and date data.
   i.   Importing the data | To an acceptable format to use in r.

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ii.  [Data Prep](#) | Slicing, summarizing, missing values, aggregating, descriptive statistics, histograms, log transformation due to skewedness, normalizing and box plot of interest rate for each loan status

iii. [Visualization](#) | Histograms, log transformation due to skewedness, normalizing, box and whisker plot, Mosaic Plot, scatter plot, 3D Scatter, time series

iv.  [Cluster_pca](#) - Cluster Analysis and Principal Component Analysis (PCA) in R (Cluster Dendrogram, silhouette plot, evaluating 3D clusters etc.) | (★[Lending Club Cluster and Principal Component Analysis](#) - Performed a Kmeans cluster analysis to identify 7 groups or clusters of the borrowers by income, loan amount, employment length, home ownership status, and debt-to-income ratio. Included Data Preprocessing and Removing Outliers.)

v.   [Classification](#) | Logistic Regression and Classification Trees

vi.  [Evaluating Classification Methods in R](#) - A/B testing or partitioning data, Logistic Regression, Classification Trees, ROC Curves, AUC, Categorical Variables with Many Levels | (★[Lending Club Classification Analysis](#) - Built a logistic regression model and a classification tree model for predicting the final status of a loan based on various variables available. Confusion matrix and misclassification rate for each model for a test dataset. Variables that appear to be important for predicting outcome. Plotted and described the ROC curves and AUC for the four models.)

vii. [Other Classification Methods in R](#) | Fitting Models, Random Forest, Support Vector Machine, Neural Networks and ROC Curves

viii. [Choosing the Best Classifier](#)

ix.  [Regression Models](#) | Linear Regression, Regression Tree

x.   [Optimization](#) | Calculating Estimated Return, Build Predictive Models and Determining an Optimal Portfolio

[Business Data Analytics Overview](#): Terms, classification models, test and training dataset splits, logistic regression models, classification tree models, ROC curves, AUC, confusion matrix, support vector machines, variance, bias, leakage, MAE and RMSE, R squared, LASSO approach (penalty on the coefficients) etc.

## Statistical Analysis and Modeling

Midterm Report: Descriptive statistics, Confidence intervals, z-test for two independent samples / Two-tailed test, scattergrams, box plots, Analysis of Variance, p-values, root mean square error, $R^2$, Akaike's AIC Best model, Multicollinearity Variance Inflation Factors, etc.
([View Repository](#))

Whiskey Analysis: Logistic regression model to predict the best and worst whiskeys using Confusion Matrix with training and validation samples. Correlation matrix, goodness of fit statistics, Hosmer-Lemeshow test, chi-squared, confusion matrix, Scatter plots, box plots etc.
([View Repository](#))

Other models using .R and R-Studio
- [TSPlots.R](#)
- [TSRegression.R](#)
- [TSDecomposition.R](#)
- [ExponentialSmoothing.R](#)
- [Differencing.R](#) - Must detrend before doing ARIMA
- [ARIMA.R](#)

**Database Management** (SQL/ PostgreSQL)

Taylor's Clothing DBMS: Business rules, user requirements, ER diagram, entity relationships etc. (Oracle APEX)
([View Repository](#))

Automated Systems DBMS: Completed and proposed an Automated Systems Database to Manager - also created a MS Power BI Version. Centralized Relational SQL Database to help produce the appropriate roles for a position, creating consistency throughout departments and job titles (with the exception of optional roles for additional access) and reduce the number of access roles that are kept when changing positions. The DBMS unifies and consolidates system access to improve data security.
([View Repository](#))

**Decision and Risk Analytics** (Decision Tree and Influence Diagram)
Decision Tree and Influence Diagram Scenarios: Probabilities, Decision Trees and Influence Diagram scenarios
([View Repository](#))

★ Project Proposal Decision Tree – Career Moves: Objectives, uncertainties, influence diagram, assumptions, decision tree model, probability and cumulative comparison node chart (supporting documents – proposal, excel analysis and presentation)
([View Repository](#))

**Business Intelligence** (Visuals)

Car Loan Negotiation: Used Excel Goal seek to negotiate a car purchased with variables such as Price, APR, Years, Payment/month.
([View Repository](#))

Norton Engines: Optimization analysis solved using Excel solver, sensitivity analysis, and slack. To optimally maximize profits, Norton Engines should produce 1000 Type A engines and 500 Type B engines for a total profit of $6,600,000.
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Airbnb: A couple is deciding where to rent at an Airbnb in New York. Our team helped evaluate factors we thought would help them choose the best location using a Tableau dashboard story.
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IRIS Flower Data: K-Means cluster analysis conducted using KNIME and Tableau
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Census Clustering: US Census Bureau data K-Means cluster analysis and Logistic Regression conducted using KNIME and Tableau
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**Lending Club Loan Analysis:** We are a group of investors, looking for the target group of people to give out a personal loan with expectations that it will be fully paid off. Used KNIME logistic regression and MS Excel data table to conclude our target group and focus factors.
([View Repository](#))

**Netflix Student Competition:** Netflix data, such as Average user rating score and average rating description, visualized via Tableau dashboard
([View Repository](#))

## Forecasting Methods

⭐ **Richmond Bank Total Core Deposit Forecasts:** Using MS Excel and R, accurately forecasted total core deposit data from a Richmond Bank. The Holt's Linear Exponential Smoothing had the overall lowest "Quick and Dirty" MAPE (1.2%), the lowest overall Maximum MAPE (3.49%), and consistently more accurate projections for each of the forecast horizons. Overall, the Unaided, Holts Linear Exponential Smoothing, and both regressions overestimated while the Naïve, 12 Month (M) Center Moving Average (CMA), 3M Moving Average (MA), 6M MA, Damped Trend Exponential Smoothing, and Simple Exponential Smoothing underestimated.
([View Repository](#))

**Richmond Casino Proposal Analysis:** Research analysis completed on the proposal of a Richmond, VA Casino presentation including history/background, economic/revenue impact, frustrations, process etc.
([View Repository](#))

**New Product Forecasting:** New product forecasting concepts (such as Delphi method, Assumptions Based, ATAR model, and Sensitivity Analysis) used to forecast and present an innovative smart sticky note printer.
([View Repository](#))

**Forecasting with R.:** Forecasting described from the perspective of using R and R studio software.
([View Repository](#))

**KJ Manufacturing Company Case Scenario**
1. Discussed the forecasting process at KJ Manufacturing, any relevant factors about the company and industry that are pertinent to the new forecast and Ken's forecast.
2. Forecasted monthly revenues for KJ Manufacturing for the coming year. Used a variety of methods and graphically displayed them. Explained and supported the new forecasting approach as well as the choice of models and the rational for parameters selected.
3. Prepared a report to owner explaining/supporting the forecast.
([View Repository](#))

**Time Series Forecasting Final Exam:** Comprehensive review with questions and answers on all topics learned including a variety of forecasting methods and examples. Case scenarios to answer questions on topics such as confidence intervals, forecast adjustments, classical decomposition, exponential smoothing, Croston's method, holt's Exponential Smoothing, MSE, $\alpha$ and $\beta$, seasonal adjusted series, Damping Coefficient, difference Autocorrelation, MAPE, take-off points etc.
([View Repository](#))

## Business Policy and Strategy

[DoorDash Strategic Analysis](#) (Presentations)
- Industry Analysis
- Environmental Assessment
- Strategic Review
- Growth through Acquisition

**Uber's Failing Brand:** Uber Technologies Inc. brand analysis research report describing brand culture and change strategy. Historical strategic context of the brand, the role culture played in the performance decline of the brand, how the culture impacted financial performance, and how they are attempting to transform and renew the culture.
([View Repository](#))

**Lowe's Case Assessment:** Lowe's industry analysis for the market space, brand positioning, environmental assessment, and strategic opportunities/dilemmas.
([View Repository](#))

## Quality Management and Six Sigma

**Time Series Apple Watch Workout Analysis:** Time series health workout data was extracted from my Apple watch to analyze workout variables. A Scope, descriptive statistics, pivot tables, C-Chart and scatter plots were created to check workouts outside of control. Tableau work was used to display correlations.
([View Repository](#))

## Data Centric Reengineering

**Opioid Prescribing Rates Analysis:** Semester long project working with Virginia Department of Social Services to assist in data centric reengineer useful data into VA's major FAACT database. Tableau dashboard analysis and presentation created using data from 2016 to 2019 on Medicare Prescribing rates.
([View Repository](#))

**Children's Bureau Race and Ethnicity Analysis:** General statistics on the race and ethnicity of children in foster care analyzing statistics on variables such as Child Maltreatment, Children Waiting for Adoption, children adopted etc.
([View Repository](#))

# Skills and Tools Learned

- Python (python 3, Juypter Notebooks)
    - Pandas, NumPy, SciPy, Pyomo, GLPK, Matplotlib, Scikit Learn, Plotly
- R (R-Studio)
    - Dplyr, Ggplot2, Caret, Plotly, rpart, randomForest, data.table
- SQL (Postgres SQL, SQL Server, AQT, Oracle APEX)
- JSON (framework)
- MS Excel
    - Excel Goal seek
    - Excel solver
    - Palisade Decision Tools
        - Risk for Monte Carlo simulation
        - Precision Tree for decision trees
        - StatTools for statistical analysis and forecasting
- Tableau
- MS Power BI
- KNIME

# M.D.A. Program Overview

**Program goal** ([Graduate Bulletin link](#))

The Master of Decision Analytics provides students with knowledge of the statistical, mathematical and scientific skills and experience necessary to utilize advanced methods of data analysis for business decision-making.

**Student learning goals**

Students will be able to examine a situation/problem to determine a relevant data-driven analysis to provide valuable information for decision makers and apply advanced analytical and quantitative skills to the decision problems of businesses, organizations and society. Students will be able to communicate analysis information and recommended decisions in a clear, ethical and transparent manner.

1. **Database structures and query:** Students will have an understanding of basic database structures, be able to query databases and organize data for analysis.

2. **Quantitative skills:** Students will be able to identify appropriate data analysis approaches to address real-world problems. They will be able to perform the analysis using commercial software.

3. **Problem formulation:** Students will have the knowledge, skills and practice to take nonquantitative and perhaps ill-formed problems and issues and determine ways objective analysis can bring organization and insight to them. They will be able to determine data requirements and query available databases.

4. **Analytics applications:** Students will experience various applications of analytics in real situations.

5. **Technical communications and teamwork:** Students will be able to communicate analytical analysis and results effectively to nonquantitative audiences, and will develop skills in organizing, interacting and analyzing real problems as members of a team.

# VCU M.D.A. Courses

## Spring 2019

### INFO 364. Database Systems

Instructor:  Howard A. Brown   Brownha2@vcu.edu
Text book: Modern Database Management 12e
Material: Course Slides Link

Designed to prepare students for development of systems involving databases and database management.

Topics:
- The Database Environment and Development Process
- Modeling Data in the Organization
- The Enhanced E-R Model
- Logical Database Design and the Relational Model
- Physical Database Design and Performance
- Introduction to SQL
- advanced SQL

**Projects Completed:** Database Management (SQL/ PostgreSQL)

Taylor's Clothing DBMS: Business rules, user requirements, ER diagram, entity relationships etc. (Oracle APEX)
(View Repository)

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## MATH 200. Calculus with Analytic Geometry I

Instructor:  Cheri Doucette, doucettecc@vcu.edu
Textbook- Calculus: Early Transcendentals 3rd Edition

Math 200 is the first course in a two-semester sequence covering the calculus of one-variable functions.  This course covers functions, limits, derivatives, applications of the derivative, and integration.  All of this involves Chapters 1 through 5 of the text. Functions, limits, continuity, derivatives, differentials, antiderivatives and definite integrals.

Chapter 1 **Functions:** 1.1 Review of Functions, 1.2 Representing Functions, 1.3 Inverse, Exponential, and Logarithmic Functions, 1.4 Trigonometric Functions and Their Inverses. Elements of calculus: Algebra skills; the notion and terminology for various sets of real numbers; and the description of lines, circles and other basic sets in the coordinate plane. A review of this material is found in Appendix B, online at bit.ly/2y3Nck3. This chapter begins with the fundamental concept of a function and then presents the entire cast of functions needed for calculus: polynomials, rational functions, algebraic functions, exponential and logarithmic functions, and the trigonometric functions, along with their inverses.

Chapter 2 **Limits:** 2.1 The Idea of Limits, 2.2 Definitions of Limits, 2.3 Techniques for Computing Limits, 2.4 Infinite Limits, 2.5 Limits at Infinity, 2.6 Continuity. All of calculus if based on the idea of a limit. Not only are limits important in their own right but they also underlie the two fundamental operations of calculus: differentiation (calculating derivatives) and integration (evaluating integrals). Derivatives enable us to talk about the instantaneous rate of change of a function, which, in turn, leads to concepts such as velocity and acceleration, population growth rates, marginal cost, and flow rates. Integrals enable us to compute areas under curves, surface areas, and volumes. Because of the incredible reach of this single idea, it is essential to develop a solid understanding of limits. We first present limits intuitively by showing how they arise in computing instantaneous velocities and finding slopes of tangent lines. As the chapter progresses, we build more rigor into the definition of the limit and examine the different ways in which limits arise. The chapter concludes by introducing the important property of continuity and by giving the formal definition of a limit.

Chapter 3 **Derivatives:** 3.1 Introducing the Derivative, 3.2 The Derivative as a Function, 3.3 Rules of Differentiation, 3.4 The Product and Quotient Rules, 3.5 Derivatives of Trigonometric Functions, 3.6 Derivatives as Rates of Change, 3.7 The Chain Rule, 3.8 Implicit Differentiation, 3.9 Derivatives of Logarithmic and Exponential Functions, 3.10 Derivatives of Inverse Trigonometric Functions, 3.11 Related Rates. The first task is to introduce the fundamental concept of the derivative. Suppose a function f represents the quantity of interest – for example, the variable cost of manufacturing and item, the population of a country, or the position of an orbiting satellite. The derivative of f is another function, denoted f', that gives the slope of the curve y=f(x) as it changes with respect to x. Equivalently, the derivative of f gives the instantaneous rate of change of f with respect to the independent variable. We use limits not only to define the derivative but also to develop efficient rules for finding derivatives. The application of the derivative – which we introduce along the way – are endless because almost everything around us is in a state of change, and derivatives describe change.

Chapter 4 **Applications of the Derivative**: 4.1 Maxima and Minima, 4.2 Mean Value Theorem, 4.3 What Derivatives Tell Us, 4.4 Graphing Functions, 4.5 Optimization Problems, 4.6 Linear Approximation and Differentials, 4.7 L'Hôpital's Rule, 4.9 Antiderivatives. Much of the previous chapter was devoted to the basic mechanics of derivatives: evaluating them and interpreting them as rates of change. We now apply derivatives to a variety of mathematical questions, many of which concern properties of functions and their graphs. One outcome of this work is a set of analytical curve-sketching methods that produce accurate graphs of functions. Equally important, derivatives allow us to formulate and solve a wealth of practical problems. For example, an asteroid passes perilously close to Earth: At what point along their trajectories is the distance separating them smallest, and what is the minimum distance? An economist has a mathematical model that relates to the demand for a product to its price: What price maximizes the revenue? In

this chapter, we develop the tools needed to answer such questions. In addition, we begin an ongoing discussion about approximating functions, we present an important result called the Mean Value Theorem, and we work with a powerful method that enables us to evaluate a new kind of limit. The chapter concludes with two important topics: a numerical approach to approximating roots of functions, called Newton's method, and preview of integral calculus, which is the subject of Chapter 5.

Chapter 5 **Integration**: 5.1 Approximating Areas under Curves, 5.2 Definite Integrals, 5.3 Fundamental Theorem of Calculus, 5.4 Working with Integrals, 5.5 Substitution Rule. Cornerstone of calculus because it explains the relationship between the two processes of calculus: differentiation and integration. We begin by explaining why finding the area of regions bounded by the graphs of functions is such an important problem in calculus. Then you will see how antiderivatives lead to definite integrals, which are used to solve the area problem. You will also see the remarkable connection between derivatives and integrals, which is expressed in the Fundamental Theorem of Calculus. Develop key properties of definite integrals, investigate a few of their many applications, and present the first of several powerful techniques for evaluating definite integrals.

Test Material: Course Final Exam

# Fall 2019

## INFO 610. Analysis and Design of Database Systems

- Professor: Chris Fauerbach
- [Course Content Link](#) and (slides) https://chrisfauerbach.github.io/info610_fall_2019/

Development of information systems using modern databases and database management techniques.

- Write advanced SQL statements
- Understand how to model data
- Demonstrate SQL DDL principles to create database tables
- Understand basic concepts of indexes and how to select and create indexes
- Understand concepts of transactions and concurrency control
- Understand different types of databases: Relational, Document/Columnar, Key/Value, Document
- Insert, update and query data in a wide range of open-source database servers

Software used: PostgreSQL
Also learned:
- ACID Properties, Window Functions
- JSON, Python
- REST API (application program interface)
- 'flask' dependency
- Python

**Projects Completed:** Database Management (SQL/ PostgreSQL)

Automated Systems DBMS: Completed and proposed an Automated Systems Database to Manager - also created a MS Power BI Version. Centralized Relational SQL Database to help produce the appropriate roles for a position, creating consistency throughout departments and job titles (with the exception of optional roles for additional access) and reduce the number of access roles that are kept when changing positions. The DBMS unifies and consolidates system access to improve data security.
([View Repository](#))

## SCMA 524. Statistical Fundamentals for Business Management

Professor: Daniel G. Stephenson, stephensod@vcu.edu

Developed an ability to interpret and analyze business data in a managerial decision-making context. Applications were stressed in the coverage of descriptive statistics, contingency tables, probability, sampling, correlation, confidence interval estimation, hypothesis testing and regression analysis. Business-oriented computational software will be used for data visualization and analysis.

Software: R, RStudio

Topics: Probability, Univariate Distributions, Random Variables, Joint Distributions, Exploring Data, Computational Software, The Normal Distribution, Convergence, Sampling Distributions, Hypothesis Testing, Simple Regression, Multiple Regression

Course Documents:
- Course Slides
- Course Notes

# Spring 2020

## INFO 664 Information Systems for Business Intelligence

Professor
Shailesh Deshpande

Preferred Contact Channel
sdeshpande@vcu.edu (Primary)
get2shailesh@gmail.com (Alt)

Secondary Contact
804-714-5588

Good business decision making hinges on a few key ingredients – knowing how to structure and frame up a business problem, using appropriate analytic tools and making effective presentations and pitches. This course will refine your ability to clearly articulate and tackle diverse business problems ranging from the marketing, pricing, sourcing, credit risk, targeting and complex simulations. With each business case you will be introduced to a new business tool. Learn how to use it and more importantly when to use it.

One of the most commonly seen pitfalls in the analytic world is sound technical analysis hamstrung by meandering, incoherent or overly complicated story telling. If the presentation is not effective, everything else accomplished prior to that becomes diluted or even moot.  A consistent emphasis across all 4 project modules (see schedule below) will be the ability to convey your insights and sell your recommendations in an effective manner. The rest of the students and the professors will roleplay as 'management' in class – asking for clarifications and probing deeper.

Software Used: Microsoft Excel and PowerPoint, Tableau, KNIME (open-source analytic software), AWS (cloud computing)

| Concepts | Analytical Tool Covered |
|---|---|
| Data manipulation in Excel; the importance of data disaggregation; data visualization and good story telling with data | Excel (Pivot tables and advanced functions) / PowerPoint |
| Data visualization using Tableau | Tableau |
| Supervised and unsupervised clustering and the relevance of segmentation to decision making using linear and logistic regression | KNIME |
| Real world examples for cloud computing | AWS |
| Final Capstone project – details will be provided in the class | ALL OF THE ABOVE |

### Projects Completed: Business Intelligence (Visuals)

Car Loan Negotiation: Used Excel Goal seek to negotiate a car purchased with variables such as Price, APR, Years, Payment/month.
(View Repository)

Norton Engines: Optimization analysis solved using Excel solver, sensitivity analysis, and slack. To optimally maximize profits, Norton Engines should produce 1000 Type A engines and 500 Type B engines for a total profit of $6,600,000.
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Music Sales: Music sales displayed in a Tableau dashboard with a variety of graphs
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IRIS Flower Data: K-Means cluster analysis conducted using KNIME and Tableau
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Census Clustering: US Census Bureau data K-Means cluster analysis and Logistic Regression conducted using KNIME and Tableau
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Lending Club Loan Analysis: We are a group of investors, looking for the target group of people to give out a personal loan with expectations that it will be fully paid off. Used KNIME logistic regression and MS Excel data table to conclude our target group and focus factors.
([View Repository](#))

Netflix Student Competition: Netflix data, such as Average user rating score and average rating description, visualized via Tableau dashboard
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# SCMA 645 Advanced Decision Analytics / Management Science

Paul Brooks, Phone: 828-1540, Email: jpbrooks@vcu.edu
Text: Albright, S.C. and Winston, W.L. Business Analytics: Data Analysis and Decision Making, 6th Edition. Cengage, 2017.

Examines the formulation, analysis and solution of quantitative models for business problems. Problems addressed include the allocation of resources, making decisions and dealing with uncertainty. Applications relevant in diverse business disciplines will be investigated, and the models may include linear programming, simulation and other management science tools. Current computer solution methods will be utilized.

Course Software: Microsoft Excel, Python, Pyomo, Jupyter Notebook, GLPK

Skills Targeted for Improvement:
- Problem solving skills: Ability to extract relevant data from a word problem, produce a valid model and convey results.
- Modeling skills: Ability to construct models that aid in decision-making and evaluate
- the output.
- Computer software skills: Ability to organize data and implement spreadsheet models. Ability to use a programming language to build models.
- Technical communication: Ability to summarize and communicate results of mathematical models.

Tentative Course Outline:
Relevant book chapters are in parentheses.

- Introduction to management science (1, 13.1-13.2)
- Deterministic Modeling
  o Solving linear programs with a spreadsheet (13.1-13.3)
  o Steps in optimization modeling (13.3, 13.7-13.8)
  o Properties of optimization problems and more LP formulations (13.5-13.6, 14.1-14.3, 14.5-14.6)
  o Solving LPs with a modeling language (13.8-13.10)
  o Production planning, the simplex method, duality, and sensitivity (13.8, 13.4)
  o Data envelopment analysis (http://people.brunel.ac.uk/~mastjjb/jeb/or/dea.html )
  o Network optimization (13.8, 14.4) and Integer programming (14.7)
  o  Integer programming (cont.) (14.7)
- Probabilistic Modeling
  o Probability (15.1-15.2)
  o Monte Carlo simulation (15.3-15.6)
  o Probability distributions for Monte Carlo simulation (15.3-15.6)
  o Monte Carlo simulation (15.3-15.6, 16)
  o Advanced newsvendor problems (15.3-15.6, 16)

**Projects Completed:** Advanced Decision Analytics (Machine Learning: Deterministic and Probabilistic Modeling, Optimization, Simulation)

Federal Reserve Bank of Richmond Optimization Model:  Won Optimization model class competition issued by Dr. Brooks (M.D.A. department chair and professor). Proposed Python, Pyomo and GLPK network optimization model approach with binary variables and logical constraints to simulate reorganization of 1700 workspaces across 17 floors, while allocating for changing project teams and requirements. Provided report to IT Vice President, Christine Holzem at the Federal Reserve Bank of Richmond.
(View Repository)

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Optimization and Simulation Proposal for SCC Bureau of Insurance: Proposed optimization and simulation framework to benefit helpdesk request distribution and simulate future request volume.
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Mobile Munchies PDF: Mobile Munchies is deciding how much of each type of juice to prepare for the week. Given the ingredients and cost, a python model using Pyomo and GLPK determined the optimal amount of each type of lemonade to produce so the profits maximized subject to the constraints.
([View Repository](#))

Diet Problem and Manufacturing Problem: Decided how much of each of each dessert to consume per day so that taste index is maximized, and calories and grams of fat are minimized, subject to constraints (Algebraic Formulation).
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Red Tomato Gardening Tools and Sporting Goods Company:
- Demand forecast optimization problem model using Python, Pyomo and GLPK in Python. Multifactor objectives and constraints solved using algebraic formulation to allocate and minimize cost.
- Excel Solver used to allocate how much of each product to produce so that profit is maximized
- ([View Repository](#))

Fall 2020

# SCMA 632 Statistical Analysis and Modeling

Professor: Dr. Jason Merrick, jrmerric@vcu.edu
Text: Business Analytics: Data Analysis & Decision Making, 7th Edition - S. Christian Albright and Wayne L. Winston (Cengage Unlimited ISBN: 9780357692677)

Statistical analysis and modeling for decision analytics. Topics covered have an applied focus and may include logistic regression, bootstrap estimation, permutation tests, categorical data analysis, model selection, sparse methods and Bayesian methods. Statistical analysis of data will be conducted using business-oriented computational software.

Learning Objectives, Each student should be able to:
- Visualize and explore data
- Compare groups in a population
- Build complex regression models and use them to make predictions
- Perform clustering and classification analysis

Software: Tableau, Excel and XLSTAT, R and RStudio

Topics: Data Visualization in Tableau, Confidence Intervals, Hypothesis Testing, XLSTAT and R, One-way Analysis of Variance, Two-way Analysis of Variance, Designed Experiments, scatter plots and correlations simple linear regression, Introduction to multiple regression, Dummy variables, Interaction Terms, Inference for multiple regression, Testing for and fixing problems, multicollinearity, outliers, heteroscedasticity, non-normality, Stepwise regression, Prediction, Cross-validation, Sparse Methods, Lasso regression, Correlated predictors, Ridge regression, Classification Methods, Logistic regression, Neural networks, Classification trees, Clustering, K-means clustering, Hierarchical clustering, Normal mixtures, Bootstrap methods, Forecasting, Diagnostic tools, Testing for randomness, Linear and exponential trends, Dummy seasonality variables, Moving averages and decomposition, Forecasting, Exponential smoothing, ARIMA models, Time Series Forecasting, Other Text used: Forecasting: Principles and Practice, 3rd edition, Rob J Hyndman and George Athanasopoulos, OTexts, 2019

## Projects Completed: Statistical Analysis and Modeling

Midterm Report: Descriptive statistics, Confidence intervals, z-test for two independent samples / Two-tailed test, scattergrams, box plots, Analysis of Variance, p-values, root mean square error, $R^2$, Akaike's AIC Best model, Multicollinearity Variance Inflation Factors, etc.
(View Repository)

Whiskey Analysis: Logistic regression model to predict the best and worst whiskeys using Confusion Matrix with training and validation samples. Correlation matrix, goodness of fit statistics, Hosmer-Lemeshow test, chi-squared, confusion matrix, Scatter plots, box plots etc.
(View Repository)

Other models using .R and R-Studio
- TSPlots.R
- TSRegression.R
- TSDecomposition.R
- ExponentialSmoothing.R
- Differencing.R - Must detrend before doing ARIMA
- ARIMA.R

## SCMA 648 Business Data Analytics

Professor: Dr. Paul Brooks, Phone: 828-1540, Email: jpbrooks@vcu.edu

Techniques and skills for leveraging real-world data to support decision-making using computational software. Topics include the analytics workflow, data preparation, visualization, cluster analysis, predictive modeling, and learning-enabled optimization.

Texts:
- Camm, J.D., Cochran, J.J., Fry, M.J., Ohlmann, J.W., Anderson, D.R., Sweeney, D.J., Williams, T.A. Business Analytics, 3rd Edition. Cengage, 2019. Available via Cengage Unlimited. 4th Edition not available via Cengage Unlimited, but available as an eBook.
- James, G., Witten, D., Hastie, T., Tibshirani, R. An Introduction to Statistical Learning with Applications in R. Springer, 2017. Available online: http://faculty.marshall.usc.edu/gareth-james/ISL/ISLR\%20Seventh\%20Printing.pdf
- Tan, P.-N., Steinbach, M., Karpatne, A., Kumar, V. Introduction to Data Mining, 2nd Edition. Pearson, 2019. Chapters available online: https://www-users.cs.umn.edu/~kumar001/dmbook/index.php
- Grolemund, G. and Wickham, H. R for Data Science. O'Reilly, 2017. Available online: https://r4ds.had.co.nz/.
- Leemis, L.M. Learning Base R. Self-published, 2015.

Course Software: R

Skills Targeted for Improvement:
- Problem formation: Ability to translate a decision problem into an analytics task.
- Analytics implementation: Ability to choose appropriate methods to support an analytics task.
- Computer software skills: Ability to manipulate software to derive information from data.
- Technical communication: Ability to summarize and communicate results of an analytics investigation.

Course Topics: Introduction to Analytics, Descriptive Analytics (Data Preparation for Analytics, Data Exploration and Visualization, Cluster Analysis and Principal Component Analysis); Predictive Analytics (Introduction to Classification, Empirical Evaluation of Classification, Choosing the Best Classification, Beyond Linear Regression); and Prescriptive Analytics (Using Machine Learning Predictions as Inputs to Optimization Models)

**Projects Completed:** Business Data Analytics (Machine Learning, Classification Trees, Regression, Random Forests, Support Vector Machines, etc.)

⭐ Alchemy Broker Analysis Project:  Performed segmentation analysis and predictive modeling on insurance broker performance to conclude a random forest model (highest AUC of 73%) predicted whether 2020 Gross Written Premium will increase or decrease from 2019 with a misclassification rate of 35%. Four classification models (classification trees, logistic regression, random forests, and support vector machines) were built, evaluated, and then tuned for prescriptive measures to analyze broker performance. Explored, visualized, and described five groups of brokers using principal component analysis.

⭐ ⭐ Lending Club Data Analytics in R: Topics include the analytics work flow, data preparation, visualization, cluster analysis, predictive modeling, and learning-enabled optimization. The Lending Club data is a mix of numeric, character, factor, and date data.
   I.   Importing the data | To an acceptable format to use in r.
   II.  Data Prep | Slicing, summarizing, missing values, aggregating, descriptive statistics, histograms, log transformation due to skewedness, normalizing and box plot of interest rate for each loan status

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III. [Visualization](#) | Histograms, log transformation due to skewedness, normalizing, box and whisker plot, Mosaic Plot, scatter plot, 3D Scatter, time series

IV. [Cluster_pca](#) – Cluster Analysis and Principal Component Analysis (PCA) in R (Cluster Dendrogram, silhouette plot, evaluating 3D clusters etc.) | (★ [Lending Club Cluster and Principal Component Analysis](#) – Performed a Kmeans cluster analysis to identify 7 groups or clusters of the borrowers by income, loan amount, employment length, home ownership status, and debt-to-income ratio. Included Data Preprocessing and Removing Outliers.)

V. [Classification](#) | Logistic Regression and Classification Trees

VI. [Evaluating Classification Methods in R](#) – A/B testing or partitioning data, Logistic Regression, Classification Trees, ROC Curves, AUC, Categorical Variables with Many Levels | (★ [Lending Club Classification Analysis](#) – Built a logistic regression model and a classification tree model for predicting the final status of a loan based on various variables available. Confusion matrix and misclassification rate for each model for a test dataset. Variables that appear to be important for predicting outcome. Plotted and described the ROC curves and AUC for the four models.)

VII. [Other Classification Methods in R](#) | Fitting Models, Random Forest, Support Vector Machine, Neural Networks and ROC Curves

VIII. [Choosing the Best Classifier](#)

IX. [Regression Models](#) | Linear Regression, Regression Tree

X. [Optimization](#) | Calculating Estimated Return, Build Predictive Models and Determining an Optimal Portfolio

[Business Data Analytics Overview](#): Terms, classification models, test and training dataset splits, logistic regression models, classification tree models, ROC curves, AUC, confusion matrix, support vector machines, variance, bias, leakage, MAE and RMSE, R squared, LASSO approach (penalty on the coefficients) etc.

Spring 2021

## SCMA 691 Special Topic: Decision and Risk Analytics

Professor: Dr. Jason R. W. Merrick, jrmerric@vcu.edu, Phone: (804) 828 7483

Although difficult decisions are a common fact of life and business, understanding how to rigorously analyze decisions is not so common. Decision analytics is a set of concepts and tools that produce clarity about the best choice in an uncertain and dynamic environment. Decision analytics is most effective in environments with high analytical and organizational complexity.

|  |  | Analytical Complexity | |
|---|---|---|---|
|  |  | Low | High |
| Organizational Complexity | Low | Decide Now | Facilitated Leadership |
|  | High | Business Analysis | Decision Analytics |

Focusing on each element of a rational decision and involving the right stakeholders make it possible to create significant value, mitigate risk, and avoid mistakes. Structure complex decisions using diagrams and models that decompose the alternatives, uncertainties, and objectives and reveal the best strategy. Discussed the probabilistic and statistical underpinnings of good decision-making and the psychology of bad decision-making.

Analytics Process:
Information Systems > Descriptive Analytics > Predictive Analytics > Decision/Prescriptive Analytics

Decision Analytics is the final step in the analytics process. You must collect your data (information systems), understand your data (descriptive analytics), make predictions about the outcomes of your decisions (predictive analytics), and then make a rigorous and high-quality decision (decision analytics). Dr. Merrick has used decision analytics throughout his research in oil spill risk management, counterterrorism, and supply chain management. He also served as president of the Decision Analysis Society.

Learning Objectives: Decision analysis and Bayesian statistics; Structuring decisions, uncertainties and values of a decision maker; Identify and formulate decision opportunities; Clearly and concisely present the insights obtained from the analysis.

Textbook: Making Hard Decisions with Decision Tools, 3rd Edition, 2014, Robert T. Clemen and Terence Reilly, ISBN: 9780538797573 (Hardcover), 9781408092880 (Ebook).

Software: Excel, Palisade Decision Tools (Integrated set of programs for risk analysis and decision making under uncertainty. Decision Tools Suite software integrates with Microsoft Excel.)

| Topics | Relevant Reading |
|---|---|
| Structuring Objectives, Alternatives, and Uncertainties | Chapter 3 |
| Making Rational, Optimal Decisions | Chapter 4 |
| Gaining Clarity through Sensitivity Analysis | Chapter 5 |
| Organizational Decision Making | Chapter 6 |
| Subjective Probability and Behavioral Biases | Chapters 7 & 8 |

| | |
|---|---|
| Value of Information | Chapter 12 |
| Monte Carlo Simulation | Chapters 9 and 11 |
| Modeling Risk Attitudes | Chapter 14 |
| Behavioral Decision Making | Chapter 15 |
| Multiple Objective Decision Making | Chapters 16 & 17 |

**Projects Completed:** Decision and Risk Analytics (Decision Tree and Influence Diagram)

Decision Tree and Influence Diagram Scenarios: Probabilities, Decision Trees and Influence Diagram scenarios
(View Repository)

⭐ Project Proposal Decision Tree – Career Moves: Objectives, uncertainties, influence diagram, assumptions, decision tree model, probability and cumulative comparison node chart (supporting documents – proposal, excel analysis and presentation)
(View Repository)

# SCMA 669 Developing and Implementing Forecasting Methods

Stephen W. Custer, swcuster@vcu.edu, Office: (804) 828-7170, Personal: (702) 526-8154

This course develops communication, presentation, and consulting skills which helps students explain, in non-technical terms, forecasts to management. The emphasis was on developing practical approaches to forecasting for business. We developed forecasting tools with Microsoft Excel and understood the basic principles underlying to forecasts.

Time series forecasting, new product forecasting, judgmental forecasts, Bayes forecasting and overview several popular forecasting software systems. We will also discuss organizational concerns when implementing a forecasting system in a real organization.

Topics Covered: The Philosophy of Forecasting, Time Series/First Look, Naïve F/C & Moving Averages, Classical Decomposition, Seasonal Adjustments, Goodness of Fit, Simple Exponential Smoothing, Holt's Linear Method, Holt-Winters' Trend & Seasonality Method, Dampen Trend, Level Adjusted Exponential Smoothing, Random Walk, Top-Down or Bottom-Up, Intermittent Demand, New Product Forecasting, Regression and Forecasting, ARIMA models (Box-Jenkins), Forecasting Competitions, Averaging F/C, Telling a Story with Data, Judgmental Forecasts, Evaluation of Forecast, Bayes Forecast, Confidence of Forecast, Implementation Issues

## **Projects Completed:** Forecasting Methods

⭐ Richmond Bank Total Core Deposit Forecasts: Using MS Excel and R, accurately forecasted total core deposit data from a Richmond Bank. The Holt's Linear Exponential Smoothing had the overall lowest "Quick and Dirty" MAPE (1.2%), the lowest overall Maximum MAPE (3.49%), and consistently more accurate projections for each of the forecast horizons. Overall, the Unaided, Holts Linear Exponential Smoothing, and both regressions overestimated while the Naïve, 12 Month (M) Center Moving Average (CMA), 3M Moving Average (MA), 6M MA, Damped Trend Exponential Smoothing, and Simple Exponential Smoothing underestimated.
(View Repository)

Richmond Casino Proposal Analysis: Research analysis completed on the proposal of a Richmond, VA Casino presentation including history/background, economic/revenue impact, frustrations, process etc.
(View Repository)

New Product Forecasting: New product forecasting concepts (such as Delphi method, Assumptions Based, ATAR model, and Sensitivity Analysis) used to forecast and present an innovative smart sticky note printer.
(View Repository)

Forecasting with R.: Forecasting described from the perspective of using R and R studio software.
(View Repository)

KJ Manufacturing Company Case Scenario
4. Discussed the forecasting process at KJ Manufacturing, any relevant factors about the company and industry that are pertinent to the new forecast and Ken's forecast.
5. Forecasted monthly revenues for KJ Manufacturing for the coming year. Used a variety of methods and graphically displayed them. Explained and supported the new forecasting approach as well as the choice of models and the rational for parameters selected.
6. Prepared a report to owner explaining/supporting the forecast.
(View Repository)

Time Series Forecasting Final Exam: Comprehensive review with questions and answers on all topics learned including a variety of forecasting methods and examples.  Case scenarios to answer questions on topics such as confidence intervals, forecast adjustments, classical decomposition, exponential smoothing, Croston's method, holt's Exponential Smoothing, MSE, $\alpha$ and $\beta$, seasonal adjusted series, Damping Coefficient, difference Autocorrelation, MAPE, take-off points etc.
([View Repository](#))

Summer 2021

## MGMT 642 Business Policy and Strategy

Instructor: Robert S. Kelley, rskelley@vcu.edu (cell) (804) 347-0637

Strategic aspects of management. (MBA capstone course)

Strategic Theory: The concepts and tools that are used in *Strategic Thinking*
Strategic Management: *The process* whereby the firm chooses its business, establishes and sustains a strong competitive position in its industry, and enhances long-term performance.
Strategic Thinking: The use of creative problem-solving techniques to develop innovative solutions required for long-term performance
Strategy Execution: How managers convert strategic goals into plans and then *action*.

The objective of strategic management is to make strategic decisions that lead to above-average returns and long-term performance. Superior performance is about meeting stakeholder's needs. One important measure is profitability (i.e., maximizing shareholder value). The firm enhances long-term performance choosing a good business in which it has the resources and competencies to compete, and by establishing a competitive advantage relative to competitors that is sustainable over time. Competitive advantage is driven by executives' effective analysis of the firm's external environment and the development of internal resources and capabilities that lead to a sustainable competitive advantage. The objective of this course is help students to develop better insight into how effective strategy making leads to superior performance, to understand the basic concepts, tools, and models of strategic analysis, and to develop practice in formulating and implementing effective strategy.

Business Policy & Strategy differs from others in that it takes the broad perspective of the general manager rather than the narrower perspective of the functional manager. A general manager must integrate the functional activities of the business into a coherent whole. Thus, the course cuts across the entire spectrum of business and management activities. The course focuses on the total enterprise – the brand's industry and competitive environment, its long-term direction and strategy, its resources and competitive capabilities, and its prospects for long-term success. Throughout the course, the spotlight is trained on the issue of running the business enterprise: "What must managers do, and do well, to make a company a winner in the game of business?" The answer that emerges, as well as the theme of the course, is that good strategy making and good strategy execution are the key ingredients of a company's success and the most reliable signs of good management.

COURSE OBJECTIVES
General Working Knowledge Goals
1. To understand the role and importance of strategy in determining long-term firm success   and performance.
2. To understand the process of strategic management, beginning with strategic analysis and extending through strategy formulation and implementation.
3. To develop an awareness that strategy is fundamentally about "preparing the firm to compete in the future" and requires the firm to create, react to, and manage change.
4. To deeply understand the role of leadership in the strategy process.
5. To improve overall understanding of how firms respond to industry forces, create internal capabilities, formulate and implement strategy, establish a sustainable competitive advantage, and increase long-term performance,
6. To understand how the functional strategies of the firm (e.g., accounting, economics, finance, information systems, management, operations, and marketing) are integrated to create an effective firm-level strategy.

Management Specific Skills Goals

7. To improve analytical reasoning and problem solving skills.  To improve your ability to think critically and systematically about strategic issues, develop effective solutions while remaining sensitive to ethical implications, and present solutions effectively, both orally and in written form.
8. To develop creative problem solving skills
9. More specifically, to develop skills in analyzing complex business situations, evaluating historical trends and current operational conditions, and developing recommendations on how firms can (1) establish a unifying strategy, (2) develop integrated functional strategies, and (3) create a plan of action to achieve strategic objectives.
10. Improve communication, teamwork, and leadership skills.


REQUIRED READINGS
- De Brabandere,Luc and Iny, Alan, *Thinking In New Boxes,* Random House, 2013, ASIN BO0BVJG4WM
- Margetta, Joan, *Understanding Michael Porter: The Essential Guide to Competition and Strategy,* Harvard Business Review Press, Cambridge, Mass., 2011 (IBSN # 10: 1422160599; #13: 978-1422160596)
- O'Reilly, Charles A. & Tushman, Michael, *Lead & Disrupt – How To Solve the Innovator's Dilemma,* Stanford Business Books, (IBSN 9780804798655)
- Wallace, Amy & Catmull, Ed, Creativity Inc. Random House, (9780812993011)

Group Projects: Project Teams are central to the course design. In management situations, we start off with our own perspectives and understanding of the situation. We then confer with our associates – above, peer and subordinate – to understand their views and convey ours, learning from each other. The conclusions reached and/or decisions made may be a consensus, or our or someone else to make. Whatever the case, group involvement is a key part of the management process.


## Projects Completed: Business Policy and Strategy

DoorDash Strategic Analysis (Presentations)
- Industry Analysis
- Environmental Assessment
- Strategic Review
- Growth through Acquisition


Uber's Failing Brand: Uber Technologies Inc. brand analysis research report describing brand culture and change strategy. Historical strategic context of the brand, the role culture played in the performance decline of the brand, how the culture impacted financial performance, and how they are attempting to transform and renew the culture. (View Repository)


Lowe's Case Assessment: Lowe's industry analysis for the market space, brand positioning, environmental assessment, and strategic opportunities/dilemmas. (View Repository)

## SCMA 677, Quality Mgmt & 6 Sigma

Stephen W. Custer                                        swcuster@vcu.edu
Monroe Park Campus
Snead Hall, Room B2152                                   Office: (804) 828-7170

Course Objectives: The consumer of a product or service experiences quality as a characteristic of the product or service; however, quality is not an attribute of the product or service itself, but a result of the system that produces it. An organization with a sustained quality cultural will produce quality products and services, delighted customers, fulfilled employees, pleased investors, and be positioned to respond to changing conditions. An organization without such a culture may do well enough during good times but be marginal during tough times, and likely to fail completely during extended bad times. We've seen too many examples of this; Kodak, Lehman Brothers, Bear Stearns, Bethlehem and US Steel, Enron, Borders Books, Sears and too many more.

We've seen other organizations faced with equally difficult environments survive and prosper; Ford Motors, Harley Davison, Xerox, Boeing, Caterpillar, Motorola, IBM to name a few. What's the difference?

The companies that prevailed made difficult wrenching changes in their organizational cultural. It wasn't quick; it wasn't easy. It started at the very top and flowed throughout the organization. No employee or supplier was untouched. Using Crosby's analogy, the existing fabric of the culture was rent and a new fabric created.

Many of the companies in the list of failed organization also invested heavily in quality and continuous improvement programs. However, much of the resulting changes were superficial, layered on top of the old culture.  When push came to shove management retrenched into comfortable behaviors that had served them well in the past but were ill-suited for their current situation. They failed to adopt the new philosophy. (Deming's second principle: Adopt the new philosophy.)

We will elucidate both the new philosophy of quality management and the tools that support it. Quality programs are sometimes thought of as a bag of statistical tools. However tools without the philosophy is like building a house with the saws, hammers, and other tools but no blueprint or plan. There is likely to be a lot of activity, but unlikely to produce anything of use. Similarly a philosophy without supporting tools is just that - a philosophy. Philosophy alone is unlikely to produce either activity or results.

Texts: The Six Sigma Memory Jogger II by Brassard, Finn, Ginn & Ritter
Second Edition of The Deming Route to Quality and Productivity by William Scherkenbach and W Edwards Deming (July 1, 2011)

**Projects Completed:** Quality Management and Six Sigma

Time Series Apple Watch Workout Analysis: Time series health workout data was extracted from my Apple watch to analyze workout variables. A Scope, descriptive statistics, pivot tables, C-Chart and scatter plots were created to check workouts outside of control. Tableau work was used to display correlations.
(View Repository)

# INFO 609 Data Centric Reengineering

Instructor          Peter Aiken. PhD peter.aiken@vcu.edu • 804.382.5957

Teaches methods of monetizing or otherwise valuing intangible data practice improvement opportunities in the context of organizational strategy as part of a semester long participation with regional organizations. (Department of Social Services DSS) Students use data-centric business case development to gain practical experience (all the fun of work experience without the pay). Student teams will work closely with organizational leadership to articulate a specific business case. Teams will evaluate data-centric means of improving operational effectiveness and/or innovation opportunities and recommend specific approaches and estimated benefits.

Outcomes: To provide advanced knowledge, understanding, and practice of various systems and business (re)engineering techniques as they should be encountered in business contexts. Approximately one half of class is devoted to lecture material and one-half to the semester project(s). This course typically involves the development of working information solutions to real-life organizational problems. These problems are addressed using group and individual assignments. The solutions to these challenges are not typically known at the beginning of the semester.

Objectives       To provide the opportunity to gain:
1) Demonstrate they have a grasp of data reengineering concepts and techniques by specifically articulating the precise challenge;
2) Experience the thrill of an evolving project; and
3) Illustrate how to select and apply appropriate tools and techniques.

Readings: A series of texts/articles-texts are provided in downloadable .pdf format.
Aiken & Harbour, *Data Strategy and the Enterprise Data Executive*, Technics Publications, LLC. ISBN: 1634622170
Aiken & Gorman, *The Case for the Chief Data Officer*, Elsevier Publishing, ISBN: 978-0-12-411463-0
Aiken & Billings, *Monetizing Data Management* Technics Publications, LLC, ISBN: 978-1-935504-66-5

**Projects Completed:** Data Centric Reengineering

Opioid Prescribing Rates Analysis: Semester long project working with Virginia Department of Social Services to assist in data centric reengineer useful data into VA's major FAACT database. Tableau dashboard analysis and presentation created using data from 2016 to 2019 on Medicare Prescribing rates.
(View Repository)

Children's Bureau Race and Ethnicity Analysis: General statistics on the race and ethnicity of children in foster care analyzing statistics on variables such as Child Maltreatment, Children Waiting for Adoption, children adopted etc.
(View Repository)

# Statement of Intent

October 30, 2018

Office of Graduate Admissions
VCU College of Business
 Snead Hall
 301 West Main Street
Richmond, VA 23284-4000

To whom it may concern:

In my opinion, the most critical practice an individual can do to be successful in life, is to invest in themselves. I am a strong believer that, whatever you do, you should never stop learning. This past summer, I conveyed my desire to continue my education to the Virginia State Corporation Commission (SCC) and was granted the opportunity and financial support to earn a master's degree. I have decided to pursue VCU's Master of Decision Analytics (M.D.A.) program to obtain a more specific skill that will improve the SCC, accelerate my career, improve myself and expand my network of peers. The variety of experiences I have in government administration, information technology, small business consulting, and retail management will enable me to contribute to my fellow classmates and ensure my success in the program.

Growing up, I have always had a passion for solving problems and making processes more efficient, whether it meant unloading the dishwasher or changing the oil in my car. I continued to enjoy teamwork, in classes at East Carolina University (ECU), such as organizational development and strategic management, that included problem solving, creativity, the chance to assess weakness, and identify success factors in real world business scenarios. From that point on, I have tailored my experience to specifically give me problem solving skills in different industries that will allow me to achieve my goal of becoming a data scientist or business consultant.

My experiences have vested me to love problem solving and each has emphasized the importance of data analysis. During my senior year at ECU, I was selected to join the top 30 students in the Business School to become a Strategic Business Consultant for a senior level Strategic Management Co-Op. During this opportunity, I was on a team of individuals with different business majors (accounting, marketing, finance, etc.) and backgrounds to increase the organizational effectiveness of a high-end retail company in New Bern, North Carolina. We gathered data, conducted value chain analysis, and identified opportunities for improvement. Our predictive analysis showed a $10,000 increase in value by implementing our suggested e-commerce and marketing plans. This Co-Op challenge made me realize how much I enjoyed using data to analyze areas of improvement.

In 2016 CVS Health's Retail Management internship helped provide me with additional data analytics, financial, consulting, and management skills. This opportunity allowed me to collect and analyze data on inventory, employee behavior, and the customer experience to develop performance scorecards. Based on these scorecards I provided additional training to the staff and developed internal controls and processes that improved the store's performance by 3% YTD within a month of implementing my plan.

One of the main reasons I have decided to apply for VCU's M.D.A. program is to better position myself and my organization in the rapidly evolving marketplace as well as to keep pace with consumer behavior, best practices, and technological advances. After graduating with a Bachelor of Science in Business Administration and Management from ECU, I accepted a job offer from the SCC to be a business analyst liaison between the Virginia Bureau of Insurance (BOI) and Information Technology Division. Since graduation, I have had the opportunity to travel, obtain certifications, attend work conferences and work on executive projects, legislative changes, and technology updates as well as join top administrators to make a difference in the SCC. My main responsibility has been to create system solutions for employees and clients to enhance and streamline process workflows. The knowledge this program provides me will allow me to use data to create opportunities, produce specialized reports, make critical decisions, identify technology improvements, and expand data resources to empower SCC employees.

As part of the Agent Licensing application process in Virginia, the BOI is introducing legislation in 2022, requiring individuals to get their fingerprints scanned and undergo criminal history background checks. This is the largest agent licensing project the BOI has undertaken in over 30 years. Being the primary lead for the fingerprinting part of this project, I have worked with BOI management, the Virginia State Police and FBI to examine fingerprinting vendor options. I also creatively identify key decision factors such as how far applicants will have to travel to get their fingerprints taken. To explain, I collected data to develop demographic maps, using MS Power BI, and analyzed the placement of vendor fingerprint locations relative to the quantity of the individuals' home address locations and applicant test centers. Expanding my knowledge of analytics software, problem solving, and Big Data will be very beneficial for implementing and supporting this new legislation.

Being identified as a top performer and high potential employee at the SCC, I was given the opportunity to become the subject matter expert for a financial audit software called TeamMate. As a result, I recently attended a TeamMate conference in Miami, Florida that focused on advanced auditing practices, training, software updates and business intelligence innovations. Much of this conference focused on the use and protection of Big Data and the most valuable insight I brought back from the conference is how impo1tant the process of data collection, protection, management, and analysis impacts business decisions and costs. I believe I will be able to develop effective programs, manage costs and mitigate risks for the SCC by applying the skills I will learn in this program.

I have been preselected to become a member and possibly a leader on the BOI's Business Intelligence Committee. This committee ensures that the BOI's technology programs support the business objectives and strategies to increase efficiency in monitoring and implementing technological advances. My role has actively increased in this committee as I have volunteered myself to present multiple scheduled training demos to teach employees best MS Power BI practices in data collection and analysis. My goal is to not only get myself up to date with advanced statistical analysis, business intelligence, and state-of-the-art technology but to teach SCC employees what I bring back from this program.

As you can see from the above, much of my education and work experience has directly involved decision analytics and I cannot see another program benefiting me better than the M.D.A. I am confident I will gain the needed decision-making skills and experience from this program to achieve my goals. Thank you for your consideration, and I welcome the opportunity to discuss with you personally how my skills and abilities can best serve VCU and the SCC.

Sincerely,

**Bryce Bowles**
Insurance Market Examiner
State Corporation Commission
(804) 371-9078
Bryce.Bowles@scc.virginia.gov

# VCU Recommendation Letters:

**Mike Beavers**
October 12, 2018

To whom it may concern:

It is my honor to recommend Mr. Bryce Bowles as a candidate for the Master of Decision Analytics (M.D.A.) program at VCU. I have had the pleasure of working with Bryce for the past 18 months in his role as an Insurance Market Examiner in the Information Technology Section of the Virginia State Corporation Commission's Bureau of Insurance. Bryce has quickly proven himself to be an asset to the Bureau with his technical skills, his above average professional maturity, and his ability to multi-task in many different directions. Bryce has assisted my division on many technical projects during his tenure and exhibits a knack for explaining complex processes in a user-friendly method. Bryce has been selected to participate in the Business Intelligence and Communication Committees as part of the Bureau's Strategic Plan and Information Technology project.

Bryce's attention to detail, analytical thought process, and his collaboration skills led me to seek his direct involvement in what can only be described as the largest agent licensing project that the Bureau of Insurance has undertaken in over 30 years. Bryce participates as part of the core team of professionals who are guiding this project and has been tasked as the primary lead for the fingerprinting implementation process. This requires a great deal of technical skill in analyzing the various methods by which we can accomplish this process and ensuring that the Bureau of Insurance has all of the physical, technical, and administrative safeguards in place to meet the security requirements of the Virginia State Police and the Federal Bureau of Investigation. Bryce is also the lead contact in dealing with the system developer/vendor and has exhibited excellent people skills in his contacts. Bryce participates in all of the project meetings and his suggestions show a great understanding of not only the parts of the project he is involved in, but in the entire project as a whole. Bryce provides well thought out ideas and suggestions and quickly absorbs information from other participants.

I believe Bryce would be an outstanding fit for the M.D.A. program since much of the coursework directly relates to the type of work he performs at the Bureau of Insurance. Bryce has discussed with me on several occasions his desire to continue his education in this selected field and I can only see his admission to this program as benefitting the Bureau of Insurance with his future work, benefitting Bryce with new and expanded capabilities, and benefitting VCU by having such a professional carry one of your advanced degrees.

I hope to continue working with Bryce on numerous projects in the future especially with the increased skills and abilities he would garner from your program. In my opinion, Bryce would make an excellent and highly successful candidate and seems tailor made for a program such as this one.


Sincerely,
Michael T. Beavers, CFE, CPCU, CIC, CIE
(B.S. Administration of Justice, V.C.U. 1987)
Deputy Commissioner
Agent Regulation Division

**Vicki Ayers**

October 24, 2018

To whom it may concern:

It is my honor to write a letter of recommendation for Bryce Bowles as a candidate for the Master of Decision Analytics (M.D.A.) program at VCU. In just one year, Bryce has risen from an Insurance Trainee to Insurance Market Examiner. Evidence of his ability to advance quickly is shown by his exceptional work here at the Bureau of Insurance (B01). He strives to help BOI employees work efficiently and effectively. Bryce approaches his work with energy, enthusiasm, and commitment. He would be an outstanding candidate for the M.D.A. program.

I am the Chief Insurance Market Examiner of the Automated System section of the Bureau of Insurance. In addition to overseeing the section, I am responsible for managing IT projects for the Bureau; I am also the contract administrator on vendor contracts. Bryce has learned the business of the Bureau in just over a year. His knowledge was gained by analyzing information to help the Bureau with system enhancements and determining the best software available for the Bureau's utilize. For example, the Bureau is currently using Microsoft BI. Bryce has learned the software and has offered ways the software can benefit the Bureau.

Bryce has been instrumental with numerous Bureau projects. For example, he is analyzing certain aspects of a project with the Agent's Regulation Division. His involvement requires him to work with developers and vendors. He leads meetings and acts as a liaison between the Agent Regulation Team and the developers. His involvement in projects often require him to test and write-up his findings for the vendor.

Bryce participates in system related committees and working groups. He participates in monthly calls with vendors to learn about system enhancements and communicates them back to Bureau. He recently became involved in three new Bureau working groups for Microsoft B1, Technology Education and Communication.

Please consider Bryce for the M.D.A. program. This program aligns with Bryce's duties here at the Bureau and his commitment for education. I am certain that he will be successful.

Vicki M. Ayers
Chief Insurance Market Examiner - Automated Systems
Virginia Bureau of Insurance
(804) 371-91115
Vicki.ayers@scc.virginia.gov

**Trish Todd**
October 24, 2018
To whom it may concern:

It is my pleasure to write a letter of recommendation for Bryce Bowles as a candidate for the Master of Decision Analytics (M.D.A.) program at VCU. Bryce joined the Bureau of Insurance's Automated Systems team in June 2017. I am Bryce's direct manager and I can say with certainty, that Bryce has many qualities that make him the ideal candidate for this M.D.A. program.

Some primary responsibilities of the Automated Systems section are to provide business systems support to the nearly 200 team members of the Bureau of Insurance (Bureau), which includes processing systems security requests, and participating in Bureau systems projects. Bryce's participation in system projects has revealed his strong analytical skills. Examples of these skills include, but are not limited to, testing and reporting findings on new and enhanced systems, analyzing data via various reports and research.

Bryce is committed to learning and developing his skills and those of his co-workers. He voluntarily committed to a SharePoint certification program offered within the State Corporation Commission. He recently attended a conference on Teammate software that is currently used in the Bureau's Financial Regulation Division. The knowledge he gained at this conference has already shown to be invaluable. He shares information well and enjoys empowering other employees with the many skills he has learned. In addition, he has outstanding customer service skills, which is essential considering the interaction necessary for assisting the Bureau's entire team. I am certain that the knowledge Bryce will gain by the M.D.A. program will benefit him in his current position and the Bureau as a whole, as we are evolving with the many technological advances of today and tomorrow.

Since joining the team, Bryce's professionalism, work ethic, his ability to analyze and to grasp new systems and procedures is very impressive. I am confident that he will demonstrate the same commitment and competence in his pursuit of a Master of Decision Analytics degree that he has shown during his career with the Bureau.

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