Michael Natenzon
MichaelNatenzon.com ● natenzonm@gmail.com

Curriculum Vitae

JOHNS HOPKINS UNIVERSITY – CAREY BUSINESS SCHOOL
Master of Business Administration

Data Science

Business Analytics
Covered the analytical foundation required for modeling operations so that managerial decisions can optimize tradeoffs among competing objectives. Building on concepts from operations research, economics, and probability theory, this course entailed creating models to solve a variety of resource allocation and decision analysis problems. Topics of focus:

- Linear / Non-Linear Optimization, Network Models, Integer Optimization, Probability Models, Discrete Simulations, Decision Analysis, and the Monte Carlo Simulation

Big Data Machine Learning
Provided me a deep understanding of the mathematical and statistical theories that underlie the foundations of big data and machine learning. We focused on understanding the subtle differences between various ML algorithms, and then applied our knowledge to code Python scripts for both supervised and unsupervised machine learning problems – ranging from predicting credit card defaults to identifying sentiment in typed movie reviews. We also highlighted the core challenges and limitations associated with each type of machine learning algorithm. Topics of focus:

- Principle Components Analysis, Logistic Regression, Naïve Bayes, Perceptron, Support Vector Machines, Random Forest, Deep Neural Networks, Ensemble Learning, Model Evaluation ROC/AUC, and K-fold Cross-validation

Data Analytics
Covered the best practices for gathering, describing, and analyzing big data sets. Using R, we coded multiple scripts that helped to assess various operations, risk management, and marketing-related decisions. Topics of focus:

- Probability, Statistics, Hypothesis Testing, Regression, Clustering, and Decision Trees

Data Science and Business Intelligence
Delved into how the ubiquity and massiveness of digital data and the application of data science have changed competitive landscapes across almost every industry. We then coded ML algorithms in R to process data sets and extract business insights that companies could leverage to develop a competitive advantage. Topics of focus:

- Data Visualizations, Supervised Segmentation, Text Analysis, Overfitting, and Model Performance Evaluation

Quantitative Methods
Outlined the statistical techniques required to conduct deeper studies in business, economics, and finance. Topics of focus:

- Derivatives, Integrals, Discrete and Continuous Random Variables, Estimation, and Analysis of Variance

Management

Foundations of Management and Organizations
Introduced the fundamental topics related to managing, leading, and working in modern organizations, and presented a broad array of frameworks for understanding individual, team, and organizational dynamics. The coursework placed an emphasis on the design of work, interpersonal dynamics, organizational innovation and change, global work environments, and crafting meaningful careers. Topics of focus:

- Formal and Informal Organizational Structures, Accountability Systems, Networks Within Organizations, Teaming, and Culture

Effective Management
Presented behavioral research publications alongside HBS case studies to highlight the influence of subconscious human tendencies, such as group think and social pressure, on the effectiveness of an individual's performance in an organization. Topics of focus:

- Fostering Team Effectiveness, Lifecycle of Teams, Threats to Group Decision Making, and Inter- Organizational Culture

Managerial Decisions and Behavior
Built on the normative managerial economics and management science principles addressed in Business Analytics to introduce how principles of classical and Bayesian statistical analysis are used to account for the uncertainty and risks inherent in managers' decision environments. We also examined behavioral principles, showing how the normative tenets of decision making are often systematically influenced by managerial cognitive capabilities, motivational and emotional states, and socio-cultural factors. Topics of focus:

- Limitations of Individual Perception, Decision Making Biases and Misperceptions, Irrational Anomalies, and Heuristics

Management of Technology
Addressed how markets, market mechanisms and channels of product and service delivery have been impacted and transformed by information and communication technologies (ICT). The nearly instantaneous transmission of rich information across geographic and corporate boundaries has given rise to complex, electronic, settlement and fulfillment mechanisms that bring together multiple value chain and supply chain partners. Topics of focus:

- Network Effect, Disruptive Technologies, Cybersecurity, Digital Ubiquity, and Tradeoffs to Decision Models

Managing Complex Projects
Equipped me with techniques, methods, and best practices for defining, scoping, planning and managing projects to successful completion. Special areas of emphasis in the course included practical experiences with large and complex projects being late, over budget, or failing to meet specifications. We paid particular attention to understanding project complexity, risk, and uncertainty. Topics of focus:

- Project Branding, Causes of Complexity, Causes of Failure, Triple Constraint, Agile Manifesto, and Brooks' Law

Operations Management
Presented production as a series of individual, value-added activities along the path of sourcing, refining, assembling, and distributing products or services. With this process-view perspective, we could fit operations and production problems into equations that could be optimized using linear algebra. Topics of focus:

- Little's Law, Lean Manufacturing, Production Losses, and Cost vs. Service Inventory Models

Solving Organizational Problems
Provided an overview of the challenges faced by teams as compared to the challenges faced by larger corporations, grounding my perspective in an understanding of both parties' resources, priorities, and obligations. Topics of focus:

- The Iterative Process, Logic Trees, Managing Scope, and Evaluating Evidence Against Biases and Misperceptions

Strategic Communication
Covered a decision-making process that analyzes purpose, audience, cultural context, and communication channels when creating persuasive messages. We applied this model to business cases involving crisis and cross-cultural communication, and we explored the role of nonverbal and visual forms of communication in mediating the tonality of a message. Topics of focus:

- Addressing a Crisis, Consideration of Cultural Differences, Public Speaking, and Clear, Concise Communication

Entrepreneurship

Entrepreneurial Ventures

Created an opportunity to experience each step of the entrepreneurial process by supplementing lecture materials with a team project that assessed the feasibility and market opportunities for Community Development Financial Institutions (CDFI). Topics of focus:

- Competitive Forces Shaping Strategy, Market Analysis, Financial Modeling, and the Business Model Canvas

New Product Development

Focused heavily on identifying a customer problem, innovating around a solution for that problem, and effectively marketing that solution against competitor offerings. We applied these strategies as a group to a product we envisioned called "My Data Vault" – a phone application what locks your personal data away from other applications, while letting you selectively sell your information to corporate partners of your choice. Topics of focus:

- Ethnography, Sustainable Production, Stage-Gate Model, Product Characteristics, and the Double-sided Adoption Funnel

Discovery to Market

Presented frameworks to assess the feasibility of product commercialization, and the strategies available to bring the product to market. Course concepts were applied in teams to develop commercialization plans for inventors within the JHU ecosystem. Topics of focus:

- IP Law, Common Startup Mistakes, Market Segmentation, Pricing Strategies, and Licensing Agreements

Innovation for Humanity

Provided a team-based learning experience focused on understanding and applying social entrepreneurship practices and skills to offer solutions grounded in the United Nation's 17 Sustainable Development Goals for 2030. Our project addressed various aspects of the multifaceted challenges faced by the resource-constrained and economically challenged business in Rwanda. Just one year after beginning to implement our recommendations, the organization has increased sales, grown their employment capacity, and expanded to a new location in Kigali.

Marketing

People and Markets

Covered principles of market-driven managerial decision making that determine competitiveness in dynamic consumer and corporate markets. Topics of focus:

- Dynamics of Competition, Market Segmentation, Target Marketing, Distribution Channels, and Product / Pricing Decisions

Competitive Strategy

Provided case studies that put us into the role of a general manager, helping us to think in a cross-functional and holistic manner when creating and presenting ideas for new marketing opportunities to Luke Holden, CEO of Luke's Lobster. Topics of focus:

- PEST, SWOT, Core Competencies, Sustainable Competitive Advantage, Vertical Integration, and Value Chain Analysis

Finance

Financial Modeling and Valuation

Aimed at helping to develop a familiarity with financial spreadsheet modeling and strengthening one's understanding of financial analysis. The course also equipped me with practical skills and techniques necessary in modern financial decision making. Topics of focus:

- Calculating WACC, Valuation in LBO Settings, and Portfolio Models

Financial Resources I

Emphasized the vocabulary and processes by which for-profit business transactions are communicated. Topics of focus:

- Accounting Cycle, Financial Statements, Internal Controls, Financial Analysis, and Basic Managerial Accounting

Financial Resources II

Covered corporate finance and capital markets, emphasizing the financial aspects of managerial decisions. Topics of focus:

- Valuation, NPV, IRR, PI, β, CAPM, Tax Advantage of Debt, Optimal Debt Levels, and WACC

Corporate Governance

Ethical Leadership

Challenged us to think critically about ethics within organizational life. What is an organization's or leader's ethical obligation to the people they serve? How can ethics and pragmatism in business co-exist? And, why do individuals within organizations fall prey to unethical behavior? With cases and empirical research as a backdrop, this highly interactive seminar challenged me to examine these and other fundamental questions in order to cultivate the skills and dispositions that are required of an effective leader. Topics of focus:

- Euphemistic Language, Group Attractiveness, Rationalization, Incrementalism, and the Global Business Standards Codex

Governance and Accountability

Brought a focus onto corporate governance in the context of scandals involving Enron, WorldCom, Lehman Brothers, and AIG. What gives rise to the kinds of risky behavior that these scandals reveal? What mechanisms do – or should – corporations have in place to prevent such disasters? To whom are they ultimately responsible: shareholders and owners or a wider spectrum of stakeholders? What are the roles and responsibilities of boards of directors normally and in times of crisis? How do boards monitor performance and compliance among corporate officers, and what kinds of reporting structures exist? How do the approaches to self- and external regulation of companies differ in other countries and in a global context? These were some of the questions addressed in this seminar. Topics of focus:

- Triple Bottom Line, Sarbanes-Oxley Act, and Dodd-Frank Wall Street Reform and Consumer Protection Act

Negotiation

Designed around a series of research-based negotiation exercises, this course exposed me to a variety of situations that helped to develop an understanding of the critical aspects of negotiations. Topics of focus:

- Soft on People Hard on Elements, Expanding the Pie, BATNA, MESO, and Post-Settlement Settlements

Power and Politics

Shined a light on the forms and faces of power and authority, as well as on the methods by which entities leverage that power to mobilize their own resources and the resources of others. Topics of focus:

- Power Paradox, Relational Power, Paradoxes of Belonging, and Organizational Dissent

JOHNS HOPKINS UNIVERSITY – WHITING SCHOOL OF ENGINEERING
Bachelor of Materials Science and Engineering

Materials Engineering

BioMaterials
Covered materials surface properties and modifications, polymer degradation and engineering of biodegradable polymeric materials, synthesis and properties of hydrogels in the context of biomedical applications, and materials surface engineering strategies. Topics of focus:

- Polymer Characterization, Polymer Synthesis, Structure-Property Relationships, and Surface Property Modification

Electrical Properties of Materials
Provided an overview of the electric, optical, and magnetic properties of materials based on the interactions of electrons and photons with solids. Topics of focus:

- Semiconductors, Superconductors, Capacitors, Batteries, Optical Fibers, and Transistors

Electrical Properties Lab
Concentrated on the experimental investigation of electronic properties of materials using industry-standard processing and measurement techniques. Topics of focus:

- Thermal and Electrical Conductivity of Metal Alloys, Carrier Mobility, and the Hall Effect

Kinetics and Phase Transformations
Covered diffusion and phase transformations within multi-component material systems. Topics of focus:

- Fick's Laws of Diffusion, Atomic Theory of Diffusion, Solidification, and Interfacial Phenomena

How Advances in Materials Science Shape the World
Used articles and research publications to demonstrate the critical role that materials engineering plays in solving the world's most difficult challenges, ranging from energy storage to the mounting global waste crisis. Topics of focus:

- Sustainability, Energy Generation, Air and Water Filtration

Mechanical Properties of Materials
Discussed the mechanical behavior of metals, ceramics, and polymers, with an emphasis on the microstructural mechanisms that give rise to a materials' mechanical properties. Topics of focus:

- Mechanical Testing, Stress, Strain, Elasticity, Plasticity, Anelasticity, Fracture, and Fatigue

Mechanical Properties Lab
Offered training on equipment for characterizing the microstructure and mechanical properties of materials commonly used in modern technology: Al alloys, Ti alloys, carbon and alloy steels, and composite materials. Topics of focus:

- Optical Metallography, X-ray Diffraction, Scanning and Transmission Electron Microscopy

Structure of Materials
Developed an understanding of the structure of materials starting at the atomic scale and building up to macroscopic structures. Topics of focus:

- Bonding, Crystal Structures, Defects, Crystallography, Diffraction, Molecular Solids, and Colloids

Thermodynamics of Materials
Covered phase transitions and statistical mechanics surrounding energy and entropy. Topics of focus:

- Laws of Thermodynamics, Phase Transitions, Gibbs Energy, and Electrochemistry

NanoTechnology

Characterization of Materials
Offered training on equipment for characterizing materials' visual, structural, chemical, optical, and thermal properties. Topics of focus:

- X-Ray Photoelectron Spectroscopy, Scanning Probe Microscopy, and Spectrometry

Chemistry of NanoMaterials
Focused on principles underlying the behavior of materials at length scales larger than atoms or molecules – with applications in chemistry and materials science. Topics of focus:

- Nanoparticle Synthesis, Self-Assembly, Ordered Porous Materials, Catalysis, and Nanostructured Thin Films

Micro/Nano Structured Materials and Devices
Examined ways to make micro- and nano-structured materials and devices, while also discussing their mechanical, electrical, and chemical properties. Topics of focus:

- Vapor Deposition, Thin Film Patterning, Computer Chips, Diffusion Barriers, and Microelectromechanical Devices

NanoMaterials Lab
Completed experiments designed to cover both bottom-up and top-down methods of fabrication and characterization, leading up to an individual, open-ended module involving the design and scalable manufacturing of RFID antennas. Topics of focus:

- Photolithography, Solar Cells, Gold Nanoparticles, Oxidation, and Nanocomposites

Nanowire Undergraduate Research
Led a team of four students to leverage optimization tools in MS Excel to improve the yield and the electrical properties of piezoelectric nanowire arrays – used for applications in nerve implants and micro- power generators. Topic of focus:

- Lithium-doped Zinc Oxide Nanowire Arrays Exhibiting Emergent Piezoelectric Properties

Mathematics

Calculus I, II, and III
Standard undergraduate calculus courses with applications in physics and engineering. Topics of focus:

- Derivatives, Integrals, 3D Planes, and Geometric Relationships

Linear Algebra and Differential Equations
Applied linear algebra and differential equations to optimization problems using MATLAB. Topics of focus:

- Vector Spaces, Dot Products, Cross Products, Linear Combinations and Independence

Probability and Statistics for Engineers
Outlined standard statistical practices required for hypothesis testing in engineering environments. Topics of focus:

- Test Statistics, Rejection Regions, Confidence Intervals, and Probability Distributions

Computational Engineering

Computation and Programming for Engineers
Applied algorithmic thinking and computer programming in MATLAB to solve various physics and engineering problems. Topics of focus:

- Modeling Phenomena in Physics using MATLAB Programming

Gigantic Calculators for Materials Engineering
Leveraged cloud computing to simulate atomic scale interactions within a predefined system. Topics of focus:

- Cloud Computing and VESTA Molecular Modeling

Neurological Data Design
Organized and led a team building data cleaning algorithms for a Python-based, EEG signal processing pipeline – created to simplify data analysis for non-technical researchers exploring brain-to-computer interfaces. Topics of focus:

- Anaconda, Python, Jupyter Libraries, Signal Smoothing, and Independent Component Analysis

Neural Network Modeling for Learning, Language, and Cognition
Focused on a connectionist approach to artificial intelligence that uses a collection of simple processing units (perceptrons), massively interconnected with each other, to represent knowledge through the pattern of connections. Topics of focus:

- Deep Neural Networks, Language Processing, Backpropagation, and the Boltzmann Machine

Chemistry and Physics

Chemistry Lab I & II
Standard undergraduate chemistry labs involving acids, basis, and inorganic solvents. Topics of focus:

- Filtration, Enthalpy of Vaporization, Titration, Electrolytic Cells, and Beer's Law

Materials Chemistry
Outlined the fundamentals building blocks and physical states of materials. Topics of focus:

- Atoms, Chemical Bonds, Molecular Shape and Structure, Gases, Liquids, and Solids

Organic Chemistry I & II
Offered a comprehensive introduction to modern organic chemistry, including details on alkanes, alkenes, alkynes, alcohols, carbonyl compounds and stereochemistry. The course also discussed characterization techniques including infrared, nuclear magnetic resonance, and mass spectroscopy. Topics of focus:

- Synthesis of Alcohols, Aromatic Compounds, Aldehydes, Ketones, Carboxylic Acids, and Radical Reactions

Organic Chemistry Lab I & II
Theorized and then synthesized various organic compounds. Topics of focus:

- Aldol Condensation Reaction, Oxidation, Reduction, Fischer Esterification, and Friedel-Crafts Alkylation

Physics I & II
Standard undergraduate physics applied to real-world problems. Topics of focus:

- Mechanics, Heat, Sound, Electricity, Magnetism, Optics, and Atomic Physics

Physics Lab I & II
Engaged in experiments that validated outcomes theorized through mathematical calculations. Topics of focus:

- Electric Fields, AC/DC Circuits, Geometric Optics, and Diffraction of Biological Specimens

Professional Development

Culture of the Engineering Profession

Developed one's ability to communicate effectively with the various audiences an engineer may interact with. Topics of focus:

- Communicating Technical Ideas to Non-Technical Audiences

Engineering for Sustainable Development

Discussed how contextually attuned engineering projects can help alleviate some of the challenges resulting from the complex problems of poverty, inequality, and social and environmental dislocation. Topics of focus:

- History of Development Policy, Large-scale Interventions, and Relationships Between States and Markets

Leadership and Management in Engineering

Covered leadership, social responsibility, corporate strategy, finance, project management and people management – within the context of industrial engineering. Topics of focus:

- SMART Goals, Active Listening, Wisdom of the Team, Coaching, and Cognitive Framing Biases

Professional Communication for Science, Business, and Industry

Focused on the importance of clarity, brevity, and stylistic elements within presentations. Topics of focus:

- Crafting an Engaging Document, Structuring the Presentation of Information, and PowerPoint Best Practices