Appendix A: Detailed Resumes

Experience: 35 years
MBA, Statistics, University of La Verne; BA, Chemistry, University of Illinois
30 Post-Graduate Semester Units, Computer Science, San Diego State University
Six Sigma Black Belt; ISACA Certified Information System Auditor (**CISA**); PMI Certified **PMP** (Project Management Professional); ISACA Certified in Risk and Information Systems Control (**CRISC**); PMI Certified **RMP** (Risk Management Professional); ICEAA Certified Cost Estimation Analyst (**CCEA**); Security Clearance: Active Top Secret

Level 4 Ventures, Inc.	(1994-Present) Founder and CEO
Booz·Allen & Hamilton, Inc.	(1990 - 1994) Business Unit Manager
The MITRE Corporation	(1985 - 1990) Senior Systems Analyst
Honeywell, Inc.	(1983 - 1985) Senior Project Manager
U.S. Navy	(1977 - 1983) Lt., Naval Flight Officer

Mr. Roetzheim is a leader in the areas of cost estimation benchmarking, productivity analysis and forecasting, acquisition support, fee analysis, performance reviews, feasibility studies, cost estimation, information technology governance and strategy, activity-based costing (ABC) and cost allocation, and oversight for large, complex organizations and projects. He has developed two of the industry's leading benchmarking tools (Cost Xpert and ExcelerPlan) and he maintains the industry's largest database of productivity related benchmark data. Mr. Roetzheim has provided this support to Federal agencies including GSA, USPS, DOI, DOE, NASA, DHS, ACF, USAF, CNCS; California state agencies including the Franchise Tax Board, Board of Equalization, Department of Child Support, Department of Social Services, Public Utility Commission, Department of Health Care Services, State Controller's Office, and Covered California; for other large State agencies in Texas, Colorado, Washington, and Florida; and for private companies including BB&T, Wells Fargo, IBM, Accenture, US Bank, Mass Mutual, Halliburton, CGI, and KPMG.
  He has written 27 published books, over 100 articles, and three columns dealing with a variety of management and technology issues.

Level 4 Ventures, Inc. (Founder and CEO)
- **California State Treasurer's Office:** Led the Level 4 team which conducted a risk and feasibility analysis regarding potentially establishing a California State bank to support the cannabis industry. The study considered costs, benefits, risks, and regulatory issues, including capitalization, deposit insurance, financing alternatives, and access to interbank funds transfer systems. As part of our work Level 4 conducted 36 interviews with stakeholders including Federal Reserve members; reviewed 330 documents; prepared both a detailed technical report and a high-level report summary for the general public; and participated in public hearings before a senate sub-committee.
- **California Public Utilities Commission (CPUC)** (Compensation Analysis): Mr. Roetzheim led a team of three during a review of five years of proceeding data, national benchmark data, salary surveys, and proposed rates from over one-hundred independent organizations doing work related to the CPUC to define fair and reasonable intervenor rates and an appropriate escalation methodology as part of a program review/audit. We conducted interviews, designed and conducted stakeholder surveys, and held public workshops as part of our work.
- **Dept. of Interior**, Bureau of Safety and Environmental Enforcement: Documented As-Is budgeting and governance processes; recommended To-be processes; used benchmark data to support process analysis; configured and validated productivity forecasting models; conducted quantitative risk analysis, defined fair and reasonable labor rates across all labor categories, provided training on new processes; prepared all forward estimates for the entire portfolio of projects; supported development of performance work statements for all IT acquisitions. Applications centered on core mission of safety and environmental enforcement.
- **California Public Utilities Commission (CPUC)** (CHANGES Program Evaluation): Under two separate contracts, Mr. Roetzheim conducted two evaluations using a combination of quantitative

and qualitative analysis approaches to evaluate the program, including directed interviews with utility, Community Based Organizations (Grant Recipients), CPUC, and contractor personnel across the State; hosting of a series of public workshops; designed and conducted internet based surveys; data mining and analysis; statistical analysis of data versus benchmark data; workflow analysis and cost allocation analysis for key program workflows; auditing of financial payment supporting materials; and analysis of data security and integrity risks.

- **Department of Energy, Southwestern Power Administration**: Conducted an alternative analysis reviewing multiple alternatives versus industry benchmark and historic data.
- The **Colorado Department of Revenue**: Performed Fee Analysis. Surveyed the 49 other states to determine benchmark fees; developed a survey and collected relevant financial data from Colorado businesses; performed an activity-based cost allocation analysis, looked at historic labor costs and trends, analyzed the data to determine appropriate fees; and prepared a report outlining Level 4's methodology, results, and recommendations.
- **Washington Department of Natural Resources (DNR):** Led an effort to prepare an alternative analysis with budget estimates for moving the DNR data center to a State Data Center, the cloud, or a combination.
- **California Department of Parks and Recreation:** Provided an alternative analysis including budgets and financial analysis to the project management team for the cloud based implementation of a statewide park management solution.
- **Dept. of Veterans Affairs:** Analyze historic data; collect and analyze time and motion (activity) data from offices nationwide; develop staffing forecasting models; develop productivity benchmark data.
- **California Franchise Tax Board:** Supported the EDR and EDR2 alternative analysis and subsequent acquisition through functional analysis, cost and benefit forecasting, acquisition strategy, and risk analysis.
- **California Department of Tax and Fee Administration:** Supported the CROS alternative analysis and subsequent acquisition in the areas of cost and benefit forecasting, acquisition strategy, compensation process development, and risk analysis.
- **California Department of Child Support Services:** Analyzed the cost to move data processing from distributed vendor sites to a state data center (Health and Welfare Data Center).
- **California Employment Development Department:** Led a team that defined the 10-year EDD information technology strategy and related implementation plan.
- Covered California/California HealthExchange (**California Department of Healthcare Services**): William supported the Senior Executive governance and budgeting function by developing and deploying benchmarking models, governance processes, and validating vendor performance against industry benchmarks.
- On behalf of the **Agency for Children and Family (ACF),** conducted a review of California acquisition, oversight, and management processes covering the over $1 Billion Federal Expenditures on the **California Child Welfare Services**/Case Management System (CWS/CMS).

Booz-Allen & Hamilton, Inc. (Business Unit Manager)
- Led the San Diego and Sacramento Booz-Allen & Hamilton, Inc. practices, focusing on SPAWAR and QA/Oversight work. Supported projects including MILSTAR ground control (over $1B); JTIDS Tactical Digital Network (over $1B); and the Navy Extremely High Frequency Satellite Program ($750M).

The MITRE Corporation (Senior Systems Analyst)
- Supported several military projects in a technical and management capacity.

Honeywell, Inc. (Tetra Tech Services Division) (Senior Project Manager)
- Mr. Roetzheim was the practice lead for military operations, directly managing over 30 projects (mostly for SPAWAR).
- **U.S. Forest Service:** Led the team that developed the first computerized wildfire tracking and management system for the US Forest Service.

Experience: Seven Years
BA, Economics University of California, San Diego
Certificate of Completion, Cisco Networking Academy
Certified Public Accountant (CPA)
Clearance: Secret

Level 4 Ventures, Inc.	(2020-Present) Senior Manager
1798 Consultants, LLC	(2016-2019) Management Consultant
CASK, LLC	(2015-16) Management Consultant
Cornwell Jackson, PLLC	(2014-2014) Tax Accountant
Miller and Co	(2014-2014) Tax Accountant
Level 4 Ventures, Inc	(2013-2013) Consultant 1

Areas of Expertise
- Financial analysis: Financial model development, Life-cycle cost estimations, and business intelligence reports
- Operations analysis: Business process improvements, standard operating procedure development, project/program management & support

Summary
Management consultant with seven years of progressive experience leading financial, business process, and strategic assessments for complex healthcare, life science, Department of Defense, and private business engagements.

Experience
Level 4 Ventures, Inc. (Senior Manager)
- Luis Medina is a senior manager with Level 4, focusing on proposal writing & management, engagement management, and technical contributions
- Luis is a technical contributor to operations research engagements such as cost estimation, feasibility studies, program management, process analysis & optimization

1798 Consultants (Management Consultant)
- Led multiple engagements centered around value proposition development, payer messaging, pricing & contracting strategy, competitive benchmarking and healthcare policy implications for oncology and neurology therapies
- Led financial model development for multiple chronic disease biologics entering multi-billion-dollar markets; developed financial models to quantitatively visualize market entry scenarios and produce desired actionable insights
- Led cost estimation for new technology advantaged reimbursement engagements; reconciled Medicare data and epidemiologic factors to produce cost burden calculations and secure higher provider payment (100% success rate)

- Reconciled and arbitrated stakeholder interests to negotiate engagement scope, resources, and timeline
- Reviewed, assessed, and consolidated legal, regulatory, and medical input on promotional materials for pull-through
- Monitored health regulation, clinical, and business news outlets for any impact to strategic recommendations; prepared client communication materials for any events that posed a material risk inclusive of proposed strategy changes
- Generated business process improvements through process review, gap assessment, redesign, and development of key performance indicators (KPI)s and standard operating procedures (SOPs) to promote continuous improvement
- Effectively managed project staff and project budget through negotiation with internal and external stakeholders
- Developed in-depth business intelligence reports including provider reimbursement rates by disease related group (DRG), DRG and ICD-10 code reconciliation, key opinion leaders (KOLs), sales projections, and pipeline reports
- Developed firm-wide quantitative capabilities through staff training and process documentation

CASK (Management Consultant)
- Led cost estimation for two defense programs managing scope, planning, milestones, and final delivery
- Managed the application of cost estimation methodologies to a $400M life-cycle program
- Forecasted and addressed budget, operational, and strategic risks to project objectives

Cornwell Jackson, PLLC (Tax Accountant)
- Individual, state and federal tax return preparation

Miller and Co (Tax Accountant)
- Individual, state and federal tax return preparation

Level 4 Ventures, Inc. (Consultant 1)
- Technical contributor to operations research engagements with the State of California
- Extrapolated data from 4,000 acquisitions reports and prepared data for parametric analysis
- Supported data collection and normalization of 40 state and federal information technology acquisitions valued between $10M and $1B

Max Henrion, PhD
Resume

Professional roles

Current   Chief Executive Officer, Lumina Decision Systems, Inc., Los Gatos, California.

                    Adjunct Professor, Carnegie Mellon University, Department of Engineering and Public Policy.

Past   Member of the Science Advisory Board of the US Environmental Protection Agency.

                    Fellow and Member of Board, Society for Decision Professionals

                    Vice President for Decision Technology, Ask Jeeves, Inc. (now Ask.com)

                    Consulting Professor, Stanford University, Section on Medical Informatics

                    Founder and Director, Institute for Decision Systems Research.

                    Founding President, Association for Uncertainty and Artificial Intelligence

                    Associate Professor, Carnegie Mellon University, Department of Engineering and Public Policy, and Department of Social and Decision Science.

Experience

Dr Henrion has experience as a decision consultant, researcher, professor, software designer, and entrepreneur working in risk, uncertainty, and decision analysis. He has designed and led development of many decision-support software and models and is the originator of Analytica. He has led consulting teams to create applications in energy, environment, transportation, consumer choice, finance, and healthcare for private and public sector clients, including the Electric Power Research Institute, California Energy Commission, NREL, US Department of Energy, and the World Bank.

Education

PhD   Carnegie Mellon University, The Heinz School, Pittsburgh, PA. Dissertation: *The Value of Knowing how little you know*.

M. Design   Royal College of Art, London, Department of Design Research.

BA   Emmanuel College, Cambridge University. Natural Sciences (Physics and Statistics).

Awards & Distinctions

- Exhibition to Emmanuel College, Cambridge University.

- *Decision Analysis Practice Award* for 2014 from the Decision Analysis Society and Society for Decision Professionals for the "Rigs to Reefs" project.

- The *Frank P. Ramsey Medal* in 2018 from the Decision Analysis Society for lifetime contributions for the theory and practice of decision analysis.

Selected Publications

Max Henrion has coauthored 5 books and over 70 articles, including:

Selected Books

- *Low-Carbon Development: Opportunities for Nigeria*, Raffaello Cervigni, John Allen Rogers, and Max Henrion, No 15812, World Bank Publications, January 2013. 186p.

- *Best practice approaches for characterizing, communicating, and incorporating scientific uncertainty in Climate Decision Making*, M. Granger Morgan, Hadi Dowlatabadi, Max Henrion, *et al.*, Report by the US Climate Change Science Program, Subcommittee on Global Change Research, Washington DC, Jan 2009.

- *Uncertainty in Artificial Intelligence 6,* M. Henrion & P. Bonissone (eds.), Machine Intelligence and Pattern Recognition, Volume 12, Elsevier, North Holland: Amsterdam, 1991.

- *Uncertainty: A Guide to Dealing with Uncertainty in Quantitative Risk and Policy Analysis*, M. Granger Morgan and Max Henrion, Cambridge University Press: New York, 1990. ISBN 0-521-42744-4

Selected Refereed articles

- "Estimation of the year-on-year volatility and the unpredictability of the United States energy system", Evan D. Sherwin, Max Henrion, Inês M.L. Azevedo, *Nature Energy*, Vol 3, April 2018, 341–346

- "Future Costs of Key Low-Carbon Energy Technologies: Harmonization and Aggregation of Energy Technology Expert Elicitation Data", Erin Baker, Valentina Bosetti, Laura Diaz Anadon, Max Henrion, Lara Aleluia Reis, *Energy Policy*, 2016

- "A Multi-attribute Decision Analysis for Decommissioning Offshore Oil and Gas Platforms." Henrion, M., Bernstein, B. and Swamy, S. *Integrated Environmental Assessment and Management*, 11: 594–609. 2015

- "Open-Source Policy Modeling", M. Henrion, *I/S, A Journal of Law and Policy for the Information Society*, Vol 3, Issue 2, Fall 2007

- "Assessing Uncertainty in Physical Constants", M. Henrion & B. Fischhoff, American Journal of Physics, 54, (9), 1986, pp. 791-798. Reprinted in *Heuristics and Biases: The Psychology of Intuitive Judgment*, Edited by Thomas Gilovich, Dale W Griffin, Daniel Kahneman, Cambridge UP, 2006.

- "Integrated Assessment of Acid-Deposition Effects on Lake Acidification", E.S. Rubin, M.J. Small, C.N. Bloyd, and M. Henrion*, J. Environmental Engineering*, Vol 118, No 1, 1992, p120-134.

- "Decision Analysis and Expert Systems", Max Henrion, Jack S. Breese, and Eric Horvitz, *Artificial Intelligence Magazine*, Vol 12, No 4, Winter 1991, pp64-91.

- "Decision theory in Expert Systems and Artificial Intelligence", E.J. Horvitz, J.S. Breese, & M. Henrion, *International Journal of Approximate Reasoning,* No 2, 1988, 247-3

Sam L. Savage
3507 Ross Rd.
Palo Alto, CA 94303
Emails: Sam@ProbabilityManagement.org / savage@.stanford.edu

EDUCATION

YALE UNIVERSITY. Ph.D., in Computational Complexity, (from the Department of Engineering & Applied Science), 1973. Dissertation Title: "The Solution of Discrete Linear Optimization Problems by Neighborhood Search Techniques"
YALE UNIVERSITY. Masters of Philosophy, Engineering & Applied Science, 1970.
BOSTON UNIVERSITY. B.A., Mathematics, 1967.

ACADEMIC EMPLOYMENT

ENERGY DELTA INSTITUTE – Groningen, Netherlands
Delivered short course on Petroleum Exploration Portfolio Management, April 7, 2008.

JUDGE BUSINESS SCHOOL, CAMBRIDGE UNIVERSITY
Fellow, October 2005 – Present
Visiting Faculty, co-developed and taught course on Strategic Thinking for Royal Dutch Shell exploration executives. Co-developed and taught numerous classes for executives of Lloyds TSB Bank (UK).

NAVAL POSTGRADUATE SCHOOL
Visiting Professor of Operations Research
May 2000.

NORTHWESTERN UNIVERSITY KELLOGG SCHOOL OF BUSINRESS
Visiting Professor of Managerial Economics & Decision Science
Jan. 1999-Feb 1999.

STANFORD UNIVERSITY
Adjunct Professor, Dept. of Civil & Environmental Engineering,
Sept. 2017 – present.
Adjunct Professor, Dept. of Management Science & Engineering,
Sept. 2001 – 2016.
Indutry Affiliate Liason for Wells Fargo 1997 – Present.
Director, Industrial Affiliates Program and Senior Research Associate,
Dept. of Management Science & Engineering, Jan. 2000 – Aug. 2001.
Director, Industrial Affiliates Program and Senior Research Associate,
Dept. of Engineering Economic Systems & Operations Research, Jan.1997 – Jan. 2000.
Consulting Professor, Dept. of Operations Research, Jan. 1990 - Dec. 1996.
Lecturer, Graduate School of Business Jan. 1991 - Aug. 1992.

- Served as course director and lecturer for course on Project Risk Management, Stanford Advanced Project Management Curriculum 2005
- Developed and deliver a one day executive education course in Investment Risk and Simulation
- Spearheaded a partnership between the Department of MS&E and Information Week to deliver a series of 5 day Executive Education programs for CIO's and CTO's.
- Developed and regularly deliver a popular 3 unit Masters level course "Interactive Management Science".

- Run Curricular Practical Training course, allowing students to get credit for work experience.
- Developed and led a two-day workshop on "Scientific Decision Making in Health Care" of Operations Research.
- Developed and delivered a short course on "Quantitative Management Tools for Spreadsheets" aired over the Stanford Instructional Television Network (SITN). This course pioneered the use of Chroma Key, the " TV weather man technique" to clearly display computer screens.

UNIVERSITY OF CHICAGO, GRADUATE SCHOOL OF BUSINESS
Independent Consultant. December 1990 - 1997,
Senior Lecturer in Management Science. August 1978 - December 1990,
Asst. Professor of Management Science. September 1974 - August 1978.

- Developed and regularly delivered seminars to industry in "Management Science in Spreadsheets" and "Risk Management & Financial Engineering", 1990-1997.
- Pioneered one of the first courses in the country on Management Science using Spreadsheets in 1989.
- Developed and taught courses in Mathematics for Business Decisions, Computer Science and Programming
- Research area: Probabilistic Analysis of Approximate Algorithms.

YALE UNIVERSITY. *Teaching Assistant with Lecturing Duties*, Engineering & Applied Science 1970-1972.

- Taught and graded introductory computer science course.

OTHER EDUCATIONAL ACTIVITIES

U.S. ARMY LOGISTICS MANAGEMENT COLLEGE, 1995 - Present
- Developed and regularly deliver a 3 ½ day course on "Interactive Operations Research in Spreadsheets".

INDUSTRIAL SEMINARS, 1988 - Present
- Develop and regularly deliver seminars to industry on analytical modeling with spreadsheets. Clients have included Dept. of Energy, National Security Agency, GATX, Arco Petroleum, Pacific Bell, Palo Alto Utilities, Wells Fargo Bank, Hewlett-Packard, Texaco, United Power Association, Missouri Public Service and Marsh & McClennan.

PROBABILITY MANAGEMENT

ProbabilityManagement.org, 2007 – Present,
- Co-Founder and Executive Director.
  A 501(c)(3) non-profit corporation devoted to improving the communication of uncertainty and risk. Founding board members include Harry Markowitz, Nobel Laureate in Economics. Corporate sponsors have included Chevron, General Electric, Kaiser Permanente, Lockheed Martin, and Wells Fargo Bank. See www.ProbabilityManagement.org.

PATENTS

Storage of stochastic information in stochastic information systems
US 8463732 B2

Utilization and distribution of stochastic data
US 8255332 B1

Pending
Sparse and non congruent stochastic roll-up
WO2017185066A1

Aggregating sparse non-congruent simulation trials
US20190392021A1

BUSINESS ACTIVITIES

SIPmath Group February 2017 – Present
- In 2017 AnalyCorp launched the SIPmath Group to focus on the transformational discipline of probability management, of which Dr. Savage is a founder.

VECTOR ECONOMICS INC. August 2010 – May 2012
- Cofounder, Vector Economics, Inc. a firm owns Probability Management related intellectual property.

ANALYCORP INC. August 1997 – Present
- President and Founder of AnalyCorp Inc., a firm that consults and develops executive education programs in management science.

CONSULTING 1988 - Present
- Analytical Modeling for clients including ARCO Petroleum, Pacific Bell, U.S. Transportation Command, Anadarko Petroleum, Palo Alto Utilities, Hewlett-Packard, PG&E, Texaco, Shell Oil, Lindo Systems, & General Mills, Wells Fargo Bank, Bessemer Trust, ConocoPhillips Petroleum, National Security Agency, Dept. of Energy, EPOCH Innovations, Shell Exploration and Production Company, Lloyds TSB Bank (UK), Olin Chlor-Alkali Division, Merck & Co., Foster Pepper LLC, Verizon, PG&E, Davies Consulting, Lockheed Martin, Highmark Health.

- Expert Testimony for LeBoef, Lamb, Leiby & MacRae, Jenner & Block, Russo & Hale, Foster Pepper

GENERAL OPTIMIZATION, INC., *Co-founder*, *Chairman*, February 1985 - December 1990.
- Led design and documentation of What's*Best!*® software which brought linear programming to 1-2-3. This program won PC Magazine's Technical Excellence Award in 1986, and was extensively reported on in the press, including an article in the Wall Street Journal, and back to back articles in the New York Times. Assisted in the development of a Linear Programming based Nurse Scheduling system. Worked on the development and licensing of heuristic Staff Scheduling software.

SHMUZZLES, INC. *Inventor, President and Founder*, October 1976 - February 1985.
- Invented, developed and marketed the SHMUZZLE® PUZZLE, a jigsaw puzzle based on the artwork of M.C. Escher. Whereas normal puzzles are comprised of pieces of many shapes that fit only one way, the SHMUZZLE PUZZLE is comprised of pieces of only one shape that fit together many ways (roughly 2.5×10^{302}), one of which correctly assembles the picture. This project required proving a theorem in geometry, and developing tooling with digitized lasers. The puzzle received widely publicity in such publications as the Wall Street Journal and People Magazine in the U.S. and Der Speigle in Germany. Puzzle re-introduced in 2003, see www.SHMUZZLES.com.

GENERAL MOTORS RESEARCH LABORATORIES. *Senior Associate Research Mathematician.* December 1972 - June 1974.
- Developed Linear Programming model to optimize parts inventory in "build-out" phase of production cycle.

RECENT RESEARCH AREAS

- Sparse Monte Carlo.

- Probability Management.

- Enterprize wide risk and portfolio management systems.

- The failure of Generally Accepted Accounting Practices (GAAP) to properly account for uncertainty.

- The use of interactive histograms (Blitzograms) to provide intuition into stochastic processes.

- The comparison of piecewise linear penalty functions with traditional parabolic ones based on variance.

- The simulation of both serially and cross correlated random walks involving equity prices and cost of living indices.

- Optimal portfolios of industrial projects by means of stochastic linear programming.

- Air Force funded study to developed stochastic models of simple transportation systems for U.S. Transportation Command. USAF Contract F30602-96-C-0215, 1996 as a private consultant.

- Principal investigator for U.S. Air Force Office of Scientific Research SBIR grant to Primal Solutions Inc., for development of user friendly interfaces to mathematical optimization in 1994. This project resulted in system that allowed multi-dimensional mathematical models developed in Lotus Improv to be optimized by algebraic optimization systems such as Lingo, GAMS or AMPL.

INFORMS ACTIVITY

Co-chair of Risk Analysis Track, INFORMS Winter Simulation Conference, December 2019

Served on Committee to develop Certified Analytics Professional (CAP) exam, 2012, 2013

Served on Advisory Council for INFORMS Conference on OR/MS Practice, 2005, 2006

BOOKS/SOFTWARE

SIPmath™ Modeler Tools free software tools for creating interactive simulation in Excel, available from ProbabilityManagement.org, 2013-2019.

The Flaw of Averages – Why we Underestimate Risk in the Face of Uncertainty, John Wiley & Sons, Hoboken, NJ, 2009. Paperback with a Foreword by Harry Markowitz, Nobel Laureate in Economics, 2012

Decision Making with Insight (includes INSIGHT.xla II), - Text and Software, Duxbury Press, Belmont CA 2003.

XLSim® Simulation for Microsoft Excel. AnalyCorp Inc www.AnalyCorp.com., November, 2000.

INSIGHT.xla Business Analysis Software for Microsoft Excel , a book/software package – Duxbury Press 1998

Improv Analytics, A software package for performing optimization and other analytical techniques in Lotus Improv. Partially funded by the Air Force Office of Scientific Research under SBIR Phase I. July 1994.

FAST POM, Fundamental Analytic Spreadsheet Tools for Production and Operations Management - Text and Software published by McGraw Hill March 1994.

FAST QM, Fundamental Analytic Spreadsheet Tools for Quantitative Management - Text and Software published by McGraw Hill April 1993.

The ABC's of Optimization using What'sBest!, General Optimization Inc., 1985

REFEREED PUBLICATIONS

Military Readiness Modeling: Changing the Question from "Ready or Not?" to "How Ready for What?" with Connor McLemore, Shaun Doheney and Philip Fahringer. Military Operations Research Journal, Vol. 26, No. 1, March 2021

The Metalog Distributions and Extremely Accurate Sums of Lognormals in Closed Form with Tom Keelin and Lonnie Chrisman. Proceedings of the 2019 Winter Simulation Conference.

Probabilistic Design of Sustainable Reinforced Concrete Infrastructure Repairs Using SIPmath with Michael Lepech and Melissa Zirps. Proceedings of the 2019 Winter Simulation Conference.

Characterization of Historical Methane Occurrence Frequencies from U.S. Underground Natural Gas Storage Facilities with Implications for Risk Management, Operations, and Regulatory Policy. Risk analysis : an official publication of the Society for Risk Analysis Schultz, R. A., Hubbard, D. W., Evans, D. J., Savage, S. L. 2019

Towards a Simulation Network, or, The Medium is the Monte Carlo (With Apologies to Marshall McLuhan), with Marc Thibault.Proceedings of the 2015 Winter Simulation Conference.

Savage, S.L. and Van Allen, M., 2006, *The Flaw of Averages in Law and Accounting*, with Marc Van Allen, in the Litigation Services Handbook: The Role of the Financial Expert, 4th Edition, published by John Wiley & Sons (Spring 2006). Editors: Roman L. Weil, Michael J. Wagner, Peter B. Frank, Christian Hughes.

Accounting for Uncertainty, Journal of Portfolio Management, Fall 2002, with Marc Van Allen.

Blitzograms – Interactive Histograms Informs Transactions on Education. January 2001. http://ite.informs.org/vol1no2/Savage/Savage.html

Financial Consequences of Distribution Elections from Total Return Trusts, with Patrick Collins and Josh Stampfli, Real Property, Probate and Trust Journal of the American Bar Association. Summer, 2000.

Equivalence of Linear Deviation about the Mean and Mean Absolute Deviation about the Mean Objective Functions, with Chris Kenyon and Ben C. Ball, Operations Research Letters. June 1999. volume/issue: 24/4 pp: 181-185

Some Theoretical Implications of Local Optimization, Mathematical Programming, Vol. 10, 1976, pp. 354-366

Neighborhood Search Algorithms for Finding Optimal Travelling Salesmen Tours Must be Inefficient (co-authored by P. Weiner and A. Bagchi), Journal of Computer and System Sciences, Vol. 12, No. 1, 1976, pp. 25-35

Statistical Indicators of Optimality, presented to the 14th Annual Symposium on Switching and Automata Theory of the IEEE, October, 1973

Towards a Theory of Convergent Local Search (co-authors: P. Weiner and M.J. Krone), Proceedings of the 6th Annual Princeton Conference on Information & Systems, 1972

INVITED PUBLICATIONS

Calculating Carrier Air Wing Readiness: An Additive Approach with Shaun Doheney, and Connor McLemore. December 2019, Phalanx - The Magazine of National Security Analysis, Volume 52, No. 4.

Measuring Military Readiness with Shaun Doheney, Sam Gray and Connor McLemore. December 2019, ORMS Today, Volume 46, Number 6.

Operational Readiness Rollup with Shaun Doheney and LCDR Connor S. McLemore. September 2019, Phalanx - The Magazine of National Security Analysis, Volume 52, No. 3. Recipient of the 2020 John K. Walker, Jr. Award

Curing the Flaw of Averages in Climate Change, Sam Savage, Public Sector Digest, September 2019

Operational Readiness Rollup, by Shaun Doheney, LCDR Connor S. McLemore, and Sam L. Savage. September 2019, Phalanx - The Magazine of National Security Analysis, Volume 52, No. 3

How to profit from probability management, Bank Admission Institute, Matthew RaphaelsonDr. Sam L. SavageMay 9, 2018

Probability Management: Rolling up operational risk at PG&E, with Jordan Alen, Christine Cowsert Chapman, Melissa Kirmse, and Farshad Miraftab, OR/MS Today, Dec. 2016, Volume 43 Number 6

Monte Carlo for the masses, Analytics Magazine, Sep./Oct. 2016.

Speaking Uncertainty to Power, with Shayne Kavanagh, Government Finance Review, April 2016.

Probability Management 2.0, with Melissa Kirmse, OR/MS Today, October 2014, Volume 41 Number 5

Teaching Modern Portfolio Theory to 10-year-olds, OR/MS Today, October 2014, Volume 41 Number 5

Probability Management in Financial Planning, with Shayne Kavanagh, Government Finance Review, February 2014.

The 'Sequestetron', with Shayne Kavanagh, Analytics Magazine, Nov./Dec. 2013.

Distribution Processing and the arithmetic of uncertainty, Analytics Magazine, Nov./Dec. 2012.

Cost vs. Risk in Defense Portfolios, with Philip Fahringer, The Bulliten of Military Operations Research, March 2012.

The Flaw of Averages in Project Management, with Philip Fahringer, John Hinton, and Marc Thibault, Project Management Institute, 2011

Markowitz 2.0, with Paul D. Kaplan, Morningstar Advisor, April/May 2010.

Toward a Consolidated Risk Statement, with Aaron Brown, Risk Professional magazine, December 2009.

Until Proven Guilty: False Positives and the War on Terror with Howard Wainer, Chance magazine, volume 21, number 1, 2008.

Interactive simulation PROCEEDINGS OF THE 2006 WINTER SIMULATION CONFERENCE, VOLS 1-5

Probability Management, with Stefan Scholtes and Daniel Zweidler, OR/MS Today, February 2006, Volume 33 Number 1

Probability Management Part 2, with Stefan Scholtes and Daniel Zweidler, OR/MS Today, April 2006, Volume 33 Number 2

Prices, Predictions and Probabilities, OR/MS Today, June 2004, Volume 31 Number 3

Predictive Power, Perspectives, San Jose Mercury News, May 30, 2004

Confidence Intervals: A Case Study with Marc Van Allen, from the 2004 (and 2005) Cumulative Supplement of the third Edition of the Litigation Services Handbook: The Role of the Financial Expert. Editors: Roman L. Weil, Michael J. Wagner, Peter B. Frank

Some Gratuitous Inflammatory Remarks on the Accounting Industry, Journal of Forensic Accounting 1524-5586/Vol. IV (2003), pp. 351-354

Weapons of Mass Instruction, OR/MS Today, Aug. 2003, Vol 30, No. 4, pp. 36-40

If This is Harebrained, Bet on the Hare (with Michael Schrage) OUTLOOK, The Washington Post, August 3, 2003 p. B4

Rolling the Dice, Financial Planning Magazine, March 2003

Calculated Risk, with Marc Van Allen, The Daily Deal, January 29, 2003

The Risk in Models, Financial Planning Magazine, December 2002

The Flaw of Averages, Harvard Business Review, November 2002.

Beat The Odds: Understand Uncertainty, Optimize Magazine, December 2001.
See http://www.optimizemag.com/issue/002/financial.htm.

The Flaw of Averages, Soapbox column, San Jose Mercury News, October 8, 2000. Reprinted in The Stanford Report, November 8, 2000, and distributed over Stanford's news wire to 500 newspapers and magazines. See http://www.stanford.edu/~savage/flaw/Article.htm.

Hazards Ahead: Estimating, Taking, and Managing Risk, in Finance in Brief: Six Key Concepts for Healthcare Leaders, by Kenneth Kaufman, ed. Chicago: Health Administration Press, Summer 2000

Portfolio Thinking From the Top Down, with Ben C. Ball and Thomas R. Varner, Exploration Business Journal Vol. IV No. III. August 2000.

Decision Trees in the Oil Patch with Roots on Wall Street, with Ben C. Ball, Exploration Business Journal Vol. IV No. III. August 2000.

Holistic vs. Hole-istic Exploration and Production Strategies, with Ben C. Ball, the Journal of Petroleum Technology. Sept 1999.

Portfolio Thinking: Beyond Optimization, with Ben C. Ball, Petroleum Engineer International, p. 54 May 1999.

Statistical Analysis For The Masses, in Statistics in Public Policy, Bruce Spencer, ed.,Oxford University Press 1998.

Weighing the Pros and Cons of Decision Technology in Spreadsheets, OR/MS Today, Feb. 1997, Vol 24, No. 1, pp. 42-45

The DNA of Decision Science, in Education in a Research University, Richard Cottle, Ingram Olkin, eds.,Stanford University Press 1996.

Consumer Stochastics, OR/MS Today, Dec. 1994, Vol 21, No. 6, pp. 39-43

Optimization vs. Intuition, Lotus Magazine, April, 1992.

Math for the Rest of US, PC Computing, October 1988

Hey Dad I'm Getting a Disk Read Error, COMPUTE Magazine, Sept. 1982

INVITED PRESENTATIONS

Financial Planning in Uncertain Times, Governement Finance Officers Association Annual Meeting, May 2017, Denver

Probability Management, a Cure for the Flaw of Averages, Environmental Protection Agency, Washington DC, June 2015

Permission to be Uncertain: Applying Risk Model Analysis to Utility Business Decision Making, INFORMS Conference on OR/MS Practice, Huntington Beach, April 2015.

Probability Management: Unambiguous Uncertainty, with Michael Salama, Cambridge Centre for Risk Studies, Annual Meeting, June 2013.

Keynote Address, Disney Analytics & Optimization Summit, Orlando August 2012

Keynote Address, Netherlands Society for Statistics and Operations Research, March 2012

Decision Analytic Appliances, INFORMS Conference on OR/MS Practice, Chicago, April 2011.

Tutorial on Optimizing Portfolios w/Multiple Objectives under Uncertainty, INFORMS Conference on OR/MS Practice, Phoenix, April 26-28 2009.

Methodology Tutorial on Probability Management, INFORMS Conference on OR/MS Practice, Baltimore, April 13-15 2008.

The Flaw of Averages, Director's College, June 26, 2007, Stanford University Law School.

Methodology Tutorial on Probability Management, INFORMS Conference on OR/MS Practice, Vancouver, April 29-May 1 2007.

Interactive Simulation: A New Perception of Uncertainty, EURO XXI in Iceland, 21st European Conference on Operational Research, July 2-5, 2006.

The Flaw of Averages, Director's College, June 27, 2006, Stanford University Law School.

Methodology Tutorial on the Value of Information, INFORMS Conference on OR/MS Practice, Miami, April 30-May 2 2006

Enterprise-wide risk modeling through Coherent Simulation, INFORMS Conference on OR/MS Practice, Palm Springs, April 17-19 2005

Interactive Simulation for Retirement Trust Funds, with Andrew Parker, Bessemer Trust, INFORMS Conference on OR/MS Practice, Palm Springs, April 17-19 2005

Uncertainty and Risk: Connecting the Seat of the Intellect to the Seat of the Pants, Financial Planning Association's Retreat 2004, May 13-16, Cheyenne Mountain Resort, Colorado Springs, CO

Methodology Tutorials: Managing Uncertainty – It's Dumb to be Too Smart, INFORMS Conference on OR/MS Practice, Cambridge, April 25-26 2004

Disciplined intuition: Connecting the seat of the intellect to the seat of the pants, IQPC Portfolio Management Conference, Houston, Texas, February 2004

The Value of Information and Market Indicators of Uncertain Events, with Justin Wolfers, presented to Stanford's Center for International Security and Cooperation. December, 2nd 2003

CPMS Keynote and Dinner: Confessions of a Born Again Management Scientist INFORMS Conference on OR/MS Practice, Phoenix, May 4-6 2003

Methodology Tutorials: *The Flaw of Averages--or Why Everything is Behind Schedule and Over Budget* INFORMS Conference on OR/MS Practice, *Phoenix, May 4-6 2003*

Cellular Automata in Spreadsheets: The New Science?, Invited Session at INFORMS Fall Meeting, San Jose, November 2002.

Blitzograms - Interactive Histograms, Invited Session at INFORMS Fall Meeting, San Antonio, November 2000.

Hazards Ahead: Estimating, Taking, and Managing Risk, presentatation at conference on "Corporate Finance Skills for Healthcare Executives" sponsored by the Healthcare Financial Management Association. New Orleans, October 18th, 2000.

The Flaw of Averages and the Risk of Ranking: Two Pitfalls in Portfolio Management, presentation to the The Leasing Exchange Portfolio Management Conference. Phoenix, October 17th, 2000.

The Flaw of Averages, or Why Everything is Behind Schedule and Over Budget, presentatation to the American College of Healthcare Executives. Chicago, September 14th, 2000.

Some Mindles for Management Science, Invited Session at INFORMS Spring Meeting, Salt Lake City, May 2000.

Tactical Issues in Grading Spreadsheet-Based Courses, Invited Session at INFORMS Spring Meeting, Salt Lake City, May 2000.

Practical Risk Modeling in Spreadsheets, presented to the 41st Annual Meeting of the National Association for Business Economics. San Francisco, September 26,1999.

Instability, Markov Chains and Logistic Growth, presented to the U.S. Pacific Command's Instability Analysis Methodology Workshop hosted by the Center For Army Analysis (CAA) May, 1999, Fort Belvoir, Virginia.

The Decision Forest, Invited Session at INFORMS Spring Meeting, Cincinnati, May 1999.

Distribution Distribution, Invited Session at INFORMS Fall Meeting, Seattle, October 1998.

Using Spreadsheets in the Classroom, Plenary Session at conference on Teaching Management Science in Spreadsheets at Dartmouth College, June 1998.

What Do You Get When You Mate Excel With Mathematica?, Invited Session at INFORMS Spring Meeting, Montreal, April 1998.

Deiteration: from iterative to instantaneous, Invited Session at INFORMS Fall Meeting, Dallas, October 1997.

Facing Up to Uncertainty in Military Transportation Problems, Invited Session at INFORMS Spring Meeting, San Diego, May 1997.

Spreadsheet Model for Inspiring Analytical Thought, Invited Session at INFORMS Section on Health Applications, Atlanta, November 1996.

Innovative Uses of Spreadsheets in Teaching, Presented at the IFORS meeting, Vancouver, B.C. August 1996.

OLAP (On Line Analytical Processing) - Logical Generalization of the Spreadsheet? Presented at the IFORS Special Conference (SP3), Santa Monica, January, 1995

Lotus Improv as a Mathematical Modeling Language, Presented at the 15th International Symposium on Mathematical Programming, Ann Arbor, August 1994

Introduction to Optimization: What If vs. What'sBest, Presented at the 15th International Symposium on Mathematical Programming, Ann Arbor, August 1994

Spreadsheet-based Optimization for Natural Gas Contract Portfolio Planning, (co-authored by C. Yu and J. Jacobs), Presented at the 15th International Symposium on Mathematical Programming, Ann Arbor, August 1994

Spreadsheets: The New Vernacular of MS/OR, Invited Session at the Joint National Meeting of TIMS/ORSA, Boston, April 1994.

Ready - Fire - Aim: New Tactics for New Technologies, Sponsored Session on Interactive Optimization at the Joint National Meeting of TIMS/ORSA, Boston, April 1994.

OR/MS for the Masses: How Far Can It Go?, Tutorial at the Joint National Meeting of TIMS/ORSA, Boston, April 1994.

Mathematical Optimization in Lotus Improv, presented at 36th Joint National Meeting of TIMS/ORSA, Phoenix, November 1994.

OR/MS Instruction Using Spreadsheets, a full day workshop delivered at 32nd and 34th Joint National Meeting of TIMS/ORSA, Aneheim, November 1991, San Francisco, 1992.

The Spreadsheet as an Interface Between Petroleum Management and OR Specialists, presented at 32nd Joint National Meeting of TIMS/ORSA, Aneheim, November 1991

OR in Spreadsheets - a Survey, presented at 31st Joint National Meeting of TIMS/ORSA, Nashville, May 1990

Mathematical Modeling in Databases, presented at 29th Joint National Meeting of TIMS/ORSA, Las Vegas, May 1990

Extending the Analytical Power of 1-2-3, presented at Third Annual Lotus Developers Conference, Lotus Development Corp., Cambridge MA, May 1988

Spreadsheet Based Optimization Systems, presented at 25th Joint National Meeting of TIMS/ORSA, Washington, DC, April 1988

The Electronic Spreadsheet as an Interface to Other Methodologies, presented at the Sixth International Conference on Mathematical Modeling, Washington University, August 1987

Toward a Theoretical Framework for Heuristic Generation (co-authored by David B. Weinberger) Presented to the ORSA/TIMS Miami Joint National Meeting, Nov. 1976

AWARDS & RECOGNITION

- Sam featured in NBC Bay Area Proud news show about his teaching partnership with Kennan Scott of West Oakland Middle School, March 2017
- Sam cited in article in Quartz Magazine, January 2017
- Sam and nonprofit cited in article in Wall St. Journal, August 2016
- Discipline of probability management recognized as transformational by Gartner Inc. July 2016
- ProbabilityManagement.org cited in MIT Sloan Management Review, Dec. 2014
- The Flaw of Averages book, featured in Money Magazine article, May 2012.
- The Flaw of Averages achieved number 1 ranking on Amazon's Microeconoimcs list, 2009.
- Dr. Savage featured on Mornings on 2, KTVU TV on Pediction Markets May 30th. 2004.
- Dr. Savage featured in Inc. Magazine entitled *How to Take Risks in a Time of Anxiety* May. 03
- Dr. Savage featured in Training Magazine entitled *In Search of Subject Matter Excellence* Jan. 03
- Dr. Savage featured in CIO Magazine article on Monte Carlo simulation entitled *When Good People Make Bad Decisions* Jan. 2003
- Dr. Savage featured in Los Angeles Times article entitled *Monte Carlo Tool Lays Out Odds of Reaching Your Financial Ends* Jan. 28, 2001
- Dr. Savage featured in BusinessWeek article entitled *A Better Way to Size up Your Nest Egg* Jan. 22, 2001
- OR/MS Today quote: "Without question, the leader of the management science in spreadsheets movement is Sam Savage", 1999
- Widespread praise for INSIGHT.xla, published in 1998.
- OR/MS Today Reviews teaching approach 1998
- Workshop Committee Chair, INFORMS, 1996-1997
- OR/MS Today Review of FASTQM, 1993
- PC Week Article on Stanford course 1992
- PC Magazine's Technical Excellence Award for What'sBest!, 1986
- Widespread Publicity on What's*Best!* 1985-1989, including

Wall St. Journal, New York Times, PC Week, PC Magazine, MAC Week, Computerworld and PC World.

- Widespread Publicity on The Shmuzzle Puzzle 1980-1984, including Wall St. Journal, People Magazine, Forbes, Good Housekeeping, Games Magazine, Glamour, Der Spiegel and Cosmopolitan.

Matthew Raphaelson

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Chief Financial Officer and Strategy Executive

Visionary leader with track record of success. Combines creativity, analytics, and financial discipline to create value by transforming ideas into actions and profitable growth. Conveys complex concepts clearly. Flexible and adaptive – managed through mega-mergers and economic crises. 25 years experience in finance, strategy, analytics, and M&A.

Experience

Managing Partner, EleveneX LLC Consultants – Burlingame, CA   **Current**
EleveneX provides strategic and analytical support for performance management and finance. Clients include a range of industries (e.g., medical devices, virtual reality, food science, fintech).

Director, Business Applications, ProbabilityManagement.org   **Current**
Training and analytic support to help companies develop chance-informed models and analytics processes for marketing, sales, operations, human resources, finance and risk management.

Treasurer, Executive Committee, San Francisco Conservatory of Music   **2004-2018**
Board leadership roles in transitioning organization to new President and move to new Civic Center home.

Board Member, BAI   **2012-2018**
Finance and audit committee member for industry organization serving financial services.

Wells Fargo & Company – San Francisco, CA
Chief Financial Officer and Head of Strategy | EVP Community Bank   **1993-2017**
Key financial leader in the expansion of retail banking business from small regional footprint to national scale through both M&A and organic growth strategies.   Managed team of more than 200 finance and data science professionals across full national footprint.

- **M&A.** Developed driver-based valuation model to acquire numerous small retail banks (assets <$1B). Co-lead, retail bank transition team for Wells Fargo-Norwest merger

- **CFO for Retail Banking.** Finance leader for over 50 diverse LOBs. Managed FP&A, accounting, pricing, investor relations, performance management, and capital planning. Member of Management Committee.

- **Strategy/Analytics**. Executive team leader responsible for data-driven growth and optimization strategies across retail banking business.
    o Developed growth framework for households, sales and revenues based on data science. Hired, trained and managed team of data scientists.

    o Modeled business case for industry-first micro-lending start-up (2016 revenues >$1B). Structured and negotiated first strategic alliance in merchant processing, generating more than $100MM in shareholder value.

    o Developed proprietary small business customer segmentation.

    o Led enterprise-wide rationalization of contact center service model.
    o Transformed performance measurement, customer profitability, customer and employee engagement programs for 20MM customers and 100k employees across physical and virtual channels.

Chicago Music Alliance – Chicago, IL   **1985-1989**
Non-profit arts management start-up: Membership organization to promote Chicago area non-profit music organizations. Hired by board of directors as first leader of organization.

Lecturer

- ERE National Conference "Run a Mean, Lean Recruiting Machine: Uncover the hidden value in recruiting with data and analytics", 2020
- ProbabilityManagement.org Annual Meeting "Beyond Risk Management: How the rest of the enterprise can embrace uncertainty", 2019
- UC Davis, "The Art and Science of Embracing Uncertainty in Business", 2019

Education

Stanford Graduate School of Business

M.B.A., Finance and Quantitative Analysis.

University of Michigan, Ann Arbor

B.A., Economics, B.A. Political Science, *Magna Cum Laude*.

Personal

- Chair, Financial Applications at ProbabilityManagement.org
- Commandeur and Board Member, Commanderie de Bordeaux

Publications

- *BAI Banking Strategies*. "How to Profit from Probability Management". See also "The Sum of the Sandbags Doesn't Equal the Sandbag of the Sum".
- *Towards Data Science*. "How to Run an Exceptional Data Science Team"
- *Towards Data Science*. "The Simple Reason Why COVID-19 Data is So Confusing"

Gary L. Schultz, Ph.D., ERP

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Gary@GaryLSchultz.com
(U.S. Citizen)

Gary is a quantitatively oriented energy professional with experience in energy commodity structuring, risk management, energy derivative modeling, commercial operation of merchant power plants, valuation, business process design and the technology to support it.

Professional Experience

GARY L. SCHULTZ, PHD, LLC, Potomac, MD   2003 – 2007 and 2011 – present
Consulting for various clients.

- Designed and implemented custom risk analytics simulation model for a client with significant generation and contracts to serve electric demand.
- Built and deployed simulation models for valuing physical energy assets as exotic options for valuation, calculation of Deltas and risk metrics.
- Advised utility on ways to change its hedging plan from a procurement perspective to a program for insulating P&L from changes in market conditions.
- Providing a subscription-based analytics service for clients with generation and load portfolios. On a regular basis, a proprietary model is used to compute and recommend hedge quantities suitable for current market conditions.
- Hedging support and structuring for various generating companies and private equity firms to support financing acquisitions and re-powerings. Responsibilities have included structuring spark-spread hedges (mostly heat rate options and revenue puts), negotiating commercial and credit terms with counterparties, obtaining gas supply and other commercial agreements to work with hedges.
- Designed and built revenue-at-risk models for a wind generation owner. Company is interested in how variable their monthly and quarterly cash flows are, and how they are affected by hedging with swaps. This system written in Matlab and Python.
- Determined level of credit support needed for a large heat rate option, so my client and their bankers could verify that the hedging counterparty was not asking for an unreasonable amount. Model built in Python.
- Designed and wrote risk policies customized for independent power producers.
- Multiple customized reports written for clients interested in entering the merchant energy space. Focus on how energy derivatives work, collateral and reporting requirements, how these considerations interact with capital structure and financing requirements, and availability of static hedging products in the current market.

- Advised a large California utility on appropriate methods for incorporating flexibility metrics into planning methods where large penetration of intermittent (renewable) generation is causing reserve-margin-based methods to fail. Reviewed methods proposed by others and proposed a way of modeling flexibility in unit commitment models. Presented overview to conference at FERC.
- Supported independent power producer's risk analysis tools by modifying implementation when changes became necessary. Matlab and Excel used.
- Designed, built and implemented process and tools for evaluating requests for offers ("RFO") for generating capacity for a large California utility. Included a chronological option model for doing valuation, models for portfolio fit, and a model for determining the best offers given multiple evaluation criteria. Worked with utility personnel and interfaced with the regulator's "Independent Evaluator" to ensure that the process was transparent and fair. Modeling in Excel VBA.
- Acquisitions analytics for a large industrial company interested in acquiring coal gasification technology business from a large oil company. Did market analysis showing the resulting revenue potential and risks associated with owning the technology.
- Acquisition support for a merchant generator with private equity funding. Analyzed portfolio cash flow and associated risks, supported valuations, and worked with financing team and investment banks to design commodity hedges.
- Model validation for the Risk Manager of a California investor-owned utility. I designed the test suite in accordance with their policies, implemented tests and wrote reports. The models considered included very complicated hybrid price and operational models of hydro and thermal generators.
- Hedging support for a merchant generator. Included finding and negotiating good commodity hedge structures, and implementing an outage insurance policy that supported the hedges at an appropriate cost.
- Designed and implemented portfolio analysis tools using Excel and VBA for an internal quant group at a large electric and gas utility.
- Customer support for a software vendor with a trading and risk management solution for NYISO participants. I attended NYISO working group meetings and provided written summaries to customers, conducted an annual customer meeting, interfaced with customers so they would get the most out of the product, and wrote user documentation for the software. The vendor's software made changes to accommodate the NYISO's SMD2 implementation during this time, and I was the primary interface with the NYISO from specification through going live.
- Risk business process mapping for a generation owner with a hedging program.

JOHNS HOPKINS UNIVERSITY, Baltimore, MD   **2013 – 2019**

Lecturer, Department of Applied Mathematics and Statistics, Whiting School of Engineering

- Taught course entitled "Commodities and Commodity Markets". JHU has a Masters degree program in Financial Mathematics, for which this course is required. The first half of the course covers energy commodities, and that is the half that I taught. Wrote my own lecture notes so I could focus on my preferred topics.
- Taught intersession course entitled "Energy Finance, Trading and Risk Management" aimed at introducing students of all levels to the financial and hedging aspects of the energy business. Use in-class games to illustrate how the concepts of seasonality, weather variation, cash flow variation, hedging, ISDA-type master agreements for credit support, capital structure, and bankruptcy protection work together.

US POWER GENERATING, New York, NY and Stamford, CT   **2007 – 2011**

Merchant energy company acquired 5,000 MW of generating assets before 2010 bankruptcy of Boston Generating operating company.

VP and Corporate Risk Manager

- Renegotiated a twenty year fuel contract with annual volumes of approximately 65 bcf – approximately $6.5 billion of gas at $5/mmBtu. This contract was obtained through a merger and at the time was in a contentious litigation. I was the main negotiator and worked with our supplier to build a new relationship. Together, we renegotiated new terms to replace the problematic parts of the contract. I did the economic analysis to support the new contract volumes and pricing terms and worked with legal staff to get the commercial and operational terms of the contract correctly documented.
- Designed and executed a number of large structured commodity price hedges.
  - A virtual toll that mirrored operating constraints of combined cycle plants better than strips of options. This mitigated hedge ineffectiveness typically incurred by fossil plants running overnight.
  - Restructured hedges obtained through merger to extract more value.
  - A strip of spark spread swaps for which we were able to pull the accounting value forward in time by papering a repurchase as a modification to the original deal, rather than as an offsetting trade.
  - Was responsible for the outage insurance portfolio. Determined needs vs. price based on an outage and market price risk analysis. Negotiated outage insurance policies to meet these needs at the appropriate price.
  - Helped to negotiate terms for sublease of oil storage rights owned by the company, combined with an obligation to supply us first with whatever commodity was on site.

- Working with corporate Treasurer, implemented and oversaw the corporate interest rate hedging program. We used both swaps and liquid caps to accomplish this.
- Negotiated several ISDA master agreements for commodity and interest rate hedging. The credit we provided was mostly based on first liens on the generating assets, which was cost effective, but required extra steps to be taken.
- Implemented formal risk policy, approved by the Board of Directors, and a credit policy, approved by management. I was the officer who oversaw compliance with these policies.
- Participated in cross-functional groups within the company to design Disaster Recovery and Business Continuity processes.
- Lead the corporate Risk Committee, consisting of the highest level executive management and various other participants from across functional areas of the company.
- Designed business process and implemented system for trade life-cycle management, from trade capture, to daily reporting on marks-to-market, and subsequent use in settlement. Reports were produced daily on swap positions, including not only valuations, but also metrics indicating net hedged heat rate and notional size by sub-period. Trading volume at USPG was small enough to make this a very effective solution at very low cost relative to familiar ETRM systems.
- Built and maintained modeling code in Matlab, VBA (Excel macros), Perl, and bash. Constructed models in Matlab, and also built all interface code, including VBA macros and Matlab objects that utilize the ZEMA web services interface.
- Wrote specifications for our market data warehouse project, for which we chose ZEMA. Worked closely with ZE staff during implementation to deliver specific functionality.
- Implemented and ran all complex models used for marking derivative contracts to market. Interface with internal accounting group and external auditors to ensure that the models used for financial reporting are stable and provide investors with clear information. Worked with accountants to correctly classify derivative contracts as Level 1, 2 or 3 in terms of FAS 157 reporting. Was a member of the disclosure committee, which was responsible to ensure accuracy of financial reporting.
- I participated in writing a detailed S-1 which was completed and filed with the SEC in preparation for the company to sell shares to the public.
- Worked closely with bankruptcy counsel during the Boston Generating bankruptcy. I was especially involved with the derivative contracts and managing our way through the safe harbor provisions of the bankruptcy code. In some cases, I negotiated side agreements with counter-parties that got them the value they were entitled to without exercising the safe harbor provisions. Exercise of some of these safe harbor provisions could have complicated and extended the court process or made a material adverse change event for the "stalking horse" bidder.

PG&E NATIONAL ENERGY GROUP, Bethesda, MD   2002 – 2003

Merchant energy subsidiary of a large energy holding company. Exited merchant sector in 2003.

Portfolio Analytics Manager

- Implemented prototype methodology to determine net sensitivity of generation portfolio to long-term drivers (e.g., Henry Hub gas price). Fundamentals models were used to model power price changes as a function of fuel prices, giving the total sensitivity, not just the partial derivative.
- Conducted empirical study of modeling generator constraints as an adjustment to the strike in a spread option model. Strike adjustment depended primarily on money-ness and the Vega of the fuel price.
- Coordinated a study of New England nodal spot price differences (for FTRs) prior to implementation of nodal spot market. Used transmission model (GE MAPS) with historical generator offer behavior.
- Re-designed toolset for pricing generation assets, modeled as spread options.

ORION POWER HOLDINGS, Baltimore, MD   1999 – 2002

Successful merchant energy start-up acquired by **RELIANT RESOURCES** in 2002.

Pricing and Operations Manager

- Coordinated set up of Henwood trade capture and dispatch systems for managing generation and load portfolio. Designed business processes in conjunction with the implementation so that systems and processes worked together. Invited speaker at Henwood's user conference to showcase this innovative piece of work.
- Negotiated and consummated a large toll for all output of a portfolio of hydro generators.
- Negotiated and consummated two full service supply deals for customers with load obligations.
- Negotiated, priced and consummated unit-contingent call options for two large coal units.
- Turned around a problem IT system that was selected prior to my employment. Got the project stabilized and hired employee to compensate for lack of functionality in the system we had purchased.
- Negotiated and priced multi-trigger portfolio insurance product. Triggers included the amount of coal capacity forced out, the temperature, and a power price index.
- Negotiated and priced large tolling deal at a coal plant where some of the payment was in coal.
- Transferred Orion business processes into Reliant systems and business processes. Did it immediately, so that parallel running of Orion systems was minimized, and Reliant front office staff did not need to learn Orion systems.

PG&E ENERGY TRADING, Bethesda, MD   **1998 – 1999**

Merchant energy trading subsidiary of a large energy holding company.

Generation Trader

- Designed and implemented systems and processes for large portfolio of generation and contracts to operate in New England ISO markets. Portfolio included coal, oil, gas, hydro, pumped storage, and load.
- Decided daily how to hedge portfolio of coal, oil, gas and hydro units with a Standard Offer load—how much fuel to buy forward, when to run plants, how to price output in spot markets, how to manage fuel inventories, and all other economic choices.

Pricing and Operations Analyst, Northeast Portfolio

- Set up models and processes for tracking the forward-looking position of the asset portfolio. This included dispatching the plants against forward or expected spot prices, a system for running multiple scenarios, and modeling many complex operational constraints.
- Provided modeling services to traders and marketers, particularly for mid-term hedging and deal valuation.
- Instructed colleagues in valuation of large portfolio of hydro generation assets in California.

PACIFIC GAS AND ELECTRIC COMPANY, San Francisco, CA   **1992 – 1998**

A large gas and electric utility with operations in California.

Bidding Consultant, Generation Portfolio Management (1997 – 1998)

- Decided upon economic use of generating assets controlled by the utility (unit commitment, fuel planning, and water use). Included the largest privately owned hydro system in North America and 6,000 MW of thermal plants and dispatchable power purchase agreements.
- Raised water management alternative that was very valuable to the company, but was strongly opposed by another department. This alternative was adopted and saved the ratepayers approximately $700,000 at a cost of $10,000.
- Designed business processes and model specification for spot market operation of a portfolio of generation units in the newly restructured California power markets.

Team Leader: Systems Engineer / Operations Research Analyst (1996 – 1997)

- Managed projects ranging from value of stored hydro, to power auction (game theory) research. Supervised a team of over a dozen operations research and computing professionals.
- Consulted to an unregulated subsidiary on acquisition of Hydro Generation assets on two separate instances in two regions of the world.

Systems Engineer / Operations Research Analyst (1992 – 1996)

- Hydro scheduling, performance metrics for hydro operations, generation planning, integrated resource planning, hydro planning, and other economic and risk related business or modeling issues.

Education and Certifications

Energy Risk Professional (ERP) – Certified by the Global Association of Risk Professionals, 2012

Ph.D., Computer Sciences, University of Wisconsin, Madison, WI, 1991

MS, Computer Sciences, University of Wisconsin, Madison, WI, 1988

BS, Majors in Mathematics and Computer Sciences, University of Wisconsin, Madison, WI, 1986

Volunteer Work

- Board of directors of a private school, many years as chairman of the board.
- Served in various leadership positions in local churches – in the DC Area, California and Wisconsin.

Skills

- *Risk Management:* Significant experience doing risk management, and consulting to others on risk topics.
- *Energy*: Power market experience in PJM, MISO, New England (ISO-NE), New York (NYISO), and California. Management of complex portfolios including physical assets including hydro and thermal generation and customer load contracts. Experience with MultiSym, ProSym, PROMOD and GE MAPS.
- *Finance*: Pricing of options, and complex deals with embedded options, deal structuring.
- *Mathematics*: Modeling and numerical methods for optimization, stochastic processes, Monte-Carlo simulations, and linear algebra.
- *Computing*: Currently use Python (preferred), Excel VBA, and Matlab. Significant past experience with Mathematica, C, Perl, scientific computing, and parallel processing. Have dabbled with Haskell, Go and Rust.
- *Speaking*: Invited speaker at numerous conferences (e.g., FERC, InfoCast, Henwood User Group, IEEE, InfORMS, and Stochastic Programming Symposium).
- *Writing*: Written work products that range from risk policy documents to model documentation targeting readers that range from senior management to professionals with specific domain knowledge.

Joseph Henry Scott

5115 Pintlar Mountain Ct, Missoula, MT 59803   ●   406-549-2340   ●   joe.scott@pyrologix.com

Education

UNIVERSITY OF **MONTANA**
Berkeley UNIVERSITY OF CALIFORNIA

1998   M.S. Forestry

1990   B.S. Forestry and Resource Management

Employment

Principal Wildfire Analyst, *Pyrologix LLC,* Missoula, Montana.
March 2004 to present

Research Forester*, Systems for Environmental Management*, Missoula, Montana.
September 1996 to December 2008

Consulting Forester*, Residential Forest Management,* Missoula, Montana.
May 1994 to September 1996

Forestry Technician, *Intermountain Fire Sciences Laboratory,* Missoula, Montana.
April 1991 to July 1994

Junior Forestry Specialist, *University of California, Berkeley*, Berkeley, California.
May 1990 to April 1991

Accomplishments

- Lead developer of NEXUS (public-domain software for assessing crown fire potential)
- Lead author of the Torching and Crowning Indices, now widely used to measure crown fire potential, and an associated method of integrating surface and crown fire models, used in all operational fire modeling systems in the United States.
- Lead author of a set of 40 standard fuel models; used throughout the United States and Europe
- Lead author of a geospatial, quantitative, integrated wildfire risk assessment process for application at a variety of spatial scales.
- Technical Lead on the SDG&E Utility Wildfire Risk Reduction Model (WRRM)
- Member of the CPUC FireMap2 Independent Review Team; Technical Lead on the Tier 3 mapping

Narrative

Mr. Scott made his first wildfire behavior calculations 30 years ago. He now has nearly three decades of experience using wildland fire science to address wildfire management problems. During that time, he led a variety of projects related to characterization of surface and canopy fuel, wildfire behavior modeling, crown fire hazard assessment, and quantitative risk assessment at the local through continental scales.

Joe is a Certified Forester™ with the Society of American Foresters, where he has been a member since 1990; and he is a Senior Fire Ecologist with the Association for Fire Ecology, where he has been a member since its inception in 2000. Joe has reviewed journal articles for Forest Science, the Forestry Chronicle, the International Journal of Wildland Fire, Fire Ecology, the Western Journal of Applied Forestry, the Canadian Journal of Forest Research, the European Journal of Forest Research, Natural Hazards, Ecology, and the International Association of Fire Safety Science.

Selected Oral Presentations

Housing-unit exposure to wildfire in Southern California
8th International Fire Ecology and Management Congress. November 2019, Tucson, AZ.

Effects of landscape-scape treatment extent and prioritization scheme on annual area burned and risk to homes and other assets
6th International Fire Behavior and Fuels Conference. May 2019. Albuquerque, NM.

Introduction to Wildfire and Wildfire Models
Insurance Institute for Business and Home Safety Disaster Dynamics Academy. March 2019. Richburg, SC.

Deterministic generation of flame-length probabilities for use in risk assessments
Fire Continuum Conference. May 2018. Missoula, Montana.

Assessing Wildfire Hazard and Risk: terminology, methods and applications
2018 National Wildland Fire Conference. April 2018. San Diego, CA.

Wildfire hazard and risk assessment concepts, terminology and analyses
National Cohesive Strategy Workshop. April 2017. Reno, NV.

Proactive mitigation of powerline-fire risk
Wildland Fire Litigation Conference. April 2016. Monterey, CA.

Wildfire threat to residential structures in the Island Park Sustainable Fire Community
6th Fire Behavior and Fuels Conference. April 2016. Portland, Oregon.

How to generate, interpret and apply landscape-scale hazard and risk assessment results
6th Fire Behavior and Fuels Conference. April 2016. Portland, Oregon.

Application of landscape-scale risk assessment results to incident management
6th Fire Ecology Congress. November 2015. San Antonio, Texas.

The relative contribution of USFS land to wildfire risk to adjacent homes—a pilot assessment on the Sierra National Forest, California
6th Fire Ecology Congress. November 2015. San Antonio, Texas.

Evaluación del riesgo por incendio forestal **(Wildfire risk assessment)**
Inventario y Modelizacion de combustibles: Nuevas Tecnologias. November 2015. Toledo, Spain.

A wildfire risk assessment framework for land and resource management
Missoula Risk Assessment Workshop. January 2015. Missoula, Montana.

Emerging concepts in wildfire risk assessment and management.
SAF/CIF Convention and IUFRO World Congress. October 2014. Salt Lake City, Utah.

The uses and limitations of Monte Carlo wildfire simulations for assessing wildfire damage.
Wildland Fire Litigation Conference. April 2014. Monterey, California.

Does 1% of the landscape account for 99% of the wildfire threat?
5th Fire Ecology Congress. November 2012. Portland, Oregon.

Use of geospatial fire modeling in landscape-scale fire management planning
Missoula Fire Sciences Laboratory Seminar Series. April 2012. Missoula, Montana.

Techniques for landscape-scale assessment of potential fire behavior
Interior West Fire Ecology Conference. November 2011. Alta, Utah.

Probability and risk assessment in fire management
NIMO-WFDSS workshop. February 2009. Missoula, Montana.

Publications

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Arno, Stephen F., Elizabeth D. Reinhardt and **Joe H. Scott**. 1993. Forest structure and landscape patterns in the subalpine lodgepole pine type: a procedure for quantifying past and present conditions. General Technical Report INT-294. Ogden, Utah: USDA Forest Service, Intermountain Research Station. 17 p.

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Martin, R. E. and **Joe H. Scott**. 1991. Observations on the glowing combustion of duff. In: Proceedings of the 1991 SAF National Convention, August 4-8 1991, San Francisco, CA.

Experience: 11 years
BS Accounting, San Diego State University
Certified Public Accountant (CPA)
Clearance: Top Secret (Current)

Level 4 Ventures, Inc.	(2014-Present) Consultant
The Campanile Foundation	(2013-2018) Chief Financial Officer
The San Diego Foundation	(2011-2013) Accounting Manager / Controller
SOLUTE Consulting, Inc.	(2010-2011) Accounting Supervisor
The Arc of San Diego	(2007-2010) Accounting Supervisor

Areas of Expertise
- Foundation/Non-Profit/Grant accounting and controls
- Budgeting and forecasting analysis, investigative accounting

Experience
Level 4 Ventures, Inc. (Consultant III)
- Mr. Clancy is a Consultant with Level 4, focusing on **financial analysis, special studies, and internal controls/risk.**
- Mr. Clancy supported the Level 4 work for the **Department of Veterans Affairs conducting a Time and Motion study.** Level 4 was tasked to examine historic data related to staffing, workload, and outcomes; develop a staffing model able to assist the VA in determining optimal staffing (FTE) required each fiscal year across the 56 Regional Offices (RO) and National Capital Region Benefits Office (NCRBO); collect time and motion data to quantify staff activities; and use this data to support improving internal processes and procedures. Workload modeling used statistical techniques to include correlation analysis, regression analysis, development of characteristic power functions, and ANOVA. Parametric Activity Based Costing (ABC) approaches were used to balance and reconcile workload activity to baseline data and to support forecasting based on anticipated future workloads.
- **Washington State Department of Natural Resources (DNR):** Level 4 was tasks to analyze alternatives for moving the DNR data center to a State Data Center, the Cloud, or a combination. Mr. Clancy provided support consolidating, reviewing, and analyzing data as part of preparing the alternative estimates.
- **State of California, Treasurer (California State Bank Feasibility Study):** Mr. Clancy supported Level 4's work analyzing the costs, benefits, risk and feasibility of establishing a California State Bank primarily to support financial transactions within the cannabis industry.
- **California Public Utilities Commission (CPUC) Intervenor Rate Review:** Mr. Clancy supported a Level 4 project to analyze the relationship between experience and compensation for advocates and expert witnesses that work in the administrative law and regulatory sector supporting the CPUC, with an objective of determining reasonable

advocate and expert witness fees. During this project we analyzed five years of CPUC proceedings; reviewed national databases of benchmark data; analyzed government data; conducted public hearings; and developed conclusions with supporting documentation.

- **California Public Utilities Commission (CPUC) (CHANGES Performance Review):** Mr. Clancy supported Level 4's work, during which we used a combination of quantitative and qualitative analysis approaches to evaluate the program, including directed interviews with utility, Community Based Organizations (Grant Recipients), CPUC, and contractor personnel across the State; hosting of a series of public workshops; data mining and analysis; comparison of performance with similar programs in other states; statistical analysis of data versus benchmark data; workflow analysis and cost allocation analysis for key program workflows; auditing of financial payment supporting materials; and analysis of data security and integrity risks.

- Mr. Clancy supported the **GSA $14B One Acquisition for System Integration Services (OASIS)** program, helping GSA senior management to establish information technology governance procedures for OASIS contract management. Level 4's work involved analyzing, documenting, and providing recommendations related to organization; workflows and requirements; architecture and interfaces; financial forecasting models; budgeting; data documentation; management controls; training; and future recommendations and strategic directions.

The Campanile Foundation (Chief Financial Officer)
- Support CEO with all areas of financial reporting, grant/audit compliance and investment management.

The San Diego Foundation (Accounting Manager / Controller)
- Support executive management, all internal departments and external customers with special projects, budgets, grant management, analyses and interpretations of financial reports and donor fund statements.

SOLUTE Consulting, Inc. (Accounting Supervisor)
- Managed accounting functions and processed billings to U.S. federal government and private contractors.

The Arc of San Diego (Accounting Supervisor)
- Managed staff of five accounting associates and an annual operating budget of $34 million dollars.
- Nonprofit organization, largest provider of services to children and adults with disabilities in San Diego County.
- Supervised billings to several state and private agencies.
- Managed the payroll process for nearly 2,000 employees.
- Assisted the Chief Financial Officer with the refinancing of a large bond with the County of San Diego.

Experience: 12 years
BS Biology, University of California San Diego
PMI certified Project Management Professional (**PMP**), TS/SCI Clearance
(Active)

Level 4 Ventures, Inc.	(2014-Present) Consultant
NATO E-3A Component	(2011-2017) Deputy Chief, Plans and Programs
US Navy	(2006-2015) Lt. Cmdr., Pilot

Areas of Expertise
- Process analysis, process management
- Organizational efficiency

Experience
Level 4 Ventures, Inc. (Consultant III)
- Ms. Buron is a Consultant with Level 4, focusing on **process analysis, process efficiency, and governance.**
- **State of California, Treasurer (California State Bank Feasibility Study):** Ms. Buron supported Level 4's work analyzing the costs, benefits, risk and feasibility of establishing a California State Bank primarily to support financial transactions within the cannabis industry.
- **California Public Utilities Commission (CPUC) Intervenor Rate Review:** Ms. Buron supported a Level 4 project to analyze the relationship between experience and compensation for advocates and expert witnesses that work in the administrative law and regulatory sector supporting the CPUC, with an objective of determining reasonable advocate and expert witness fees. During this project we analyzed five years of CPUC proceedings; reviewed national databases of benchmark data; analyzed government data; conducted public hearings; and developed conclusions with supporting documentation.
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- Ms. Buron supported the Level 4 work for the **Department of Veterans Affairs conducting a Time and Motion study.** Level 4 was tasked to examine historic data related to staffing, workload, and outcomes; develop a staffing model able to assist the VA in determining optimal staffing (FTE) required each fiscal year across the 56 Regional Offices (RO) and

National Capital Region Benefits Office (NCRBO); collect time and motion data to quantify staff activities; and use this data to support improving internal processes and procedures. Workload modeling used statistical techniques to include correlation analysis, regression analysis, development of characteristic power functions, and ANOVA. Parametric Activity Based Costing (ABC) approaches were used to balance and reconcile workload activity to baseline data and to support forecasting based on anticipated future workloads.

- Ms. Buron supported the **GSA $14B One Acquisition for System Integration Services (OASIS) program**, helping GSA senior management to establish information technology governance procedures for OASIS contract management. Ms. Buron's work involved analyzing, documenting, and providing recommendations related to organization; workflows and requirements; architecture and interfaces; financial forecasting models; budgeting; data documentation; management controls; training; and future recommendations and strategic directions.

NATO E-3A Component (Deputy Chief, Plans and Programs)
- Led international personnel in coordinating company policy and procedure mandates encompassing 1,305 personnel for the operational employment of $5.6B in NATO air assets.
- Project lead for two large scale training events testing currency, safety and policy execution throughout 15 departments and encompassing over 600 personnel.
- Moderated communication and issue resolution within an executive level, 15 person cross functional planning team ensuring leadership discussions were succinct, on track, focused and met 100% of pre-determined objectives.
- Authored point paper on a four year operation; codified four years of mission data, identified procedural inefficiencies and recommended modified best practices for future large scale operations.
- Chaired five-member project planning team, meeting weekly, responsible for negotiating timely and efficient solutions for movement and supply logistics including 800 international personnel and five aircraft as required by company headquarters.
- Developed and implemented a process that identified ineffective procedures across an multinational military base, centrally managed issue resolution, and disseminated new policy across all affected parties.
- Briefed 35 member executive leadership team weekly regarding training trends and shortfalls, allowing executives to justify participation in annual exercises while operating within a 25% fiscal budget constraint.

US Navy (Lt. Cmdr., Pilot)
- Lead interface officer between three separate agencies, enabled successful accomplishment of 15 anti-proliferation missions throughout Europe.

Experience: 14 years
BS Accounting, San Diego State University
Certified Public Accountant (CPA, Inactive)

Level 4 Ventures, Inc.   (2014-Present) Consultant
Moss Adams, LLP   (2013-2014) Assurance Associate
McGladrey, LLP   (2012-2013) Assurance Associate
Witt & Associates, CPA's   (2010-2012) Accountant
American International Theater, Inc.   (2004-2009) Executive Director

Areas of Expertise
- Internal Controls
- Risk Assessment
- Operations Management
- Financial Reporting

Summary
Experience in planning and performing financial statement audits, reviews and compilations with an emphasis on internal controls, risk assessment, and operations.

Experience
Level 4 Ventures, Inc. (Consultant III)
- Ms. Clancy is a Consultant with Level 4, **focusing on financial analysis, special studies, and internal controls/risk**.
- **09/2019-12/2019: Washington State Department of Natural Resources (DNR):** Level 4 was tasks to analyze alternatives for moving the DNR data center to a State Data Center, the Cloud, or a combination. Ms. Clancy provided support consolidating, reviewing, and analyzing data as part of preparing the alternative estimates.
- **9/2017-12/2018:** Ms. Clancy supported the Level 4 work for the **Department of Veterans Affairs conducting a Time and Motion study.** Level 4 was tasked to examine historic data related to staffing, workload, and outcomes; develop a staffing model able to assist the VA in determining optimal staffing (FTE) required each fiscal year across the 56 Regional Offices (RO) and National Capital Region Benefits Office (NCRBO); collect time and motion data to quantify staff activities; and use this data to support improving internal processes and procedures. Workload modeling used statistical techniques to include correlation analysis, regression analysis, development of characteristic power functions, and ANOVA. Parametric Activity Based Costing (ABC) approaches were used to balance and reconcile workload activity to baseline data and to support forecasting based on anticipated future workloads.
- **6/2018-09/2019: California Public Utilities Commission (CPUC) (Intervenor Rate Study):** Ms. Clancy supported Level 4's work, which

involved reviewing historic, benchmark and other state data to develop recommended labor rate models for more than one-hundred advocate organizations statewide; hosting public workshops; and managing public comment cycles to finalize rates.

- **05/2018-09/2019: California Public Utilities Commission (CPUC) (CHANGES Performance Review):** Ms. Clancy supported Level 4's work, during which we used a combination of quantitative and qualitative analysis approaches to evaluate the program, including directed interviews with utility, Community Based Organizations (Grant Recipients), CPUC, and contractor personnel across the State; hosting of a series of public workshops; data mining and analysis; comparison of performance with similar programs in other states; statistical analysis of data versus benchmark data; workflow analysis and cost allocation analysis for key program workflows; auditing of financial payment supporting materials; and analysis of data security and integrity risks.
- **08/2018-12/2018: State of California, Treasurer (California State Bank Feasibility Study):** Ms. Clancy supported Level 4's work analyzing the costs, benefits, risk and feasibility of establishing a California State Bank primarily to support financial transactions within the cannabis industry.
- **06/2014-09/2017:** Ms. Clancy supported the **GSA $14B One Acquisition for System Integration Services (OASIS) program**, helping GSA senior management to establish information technology governance procedures for OASIS contract management. Ms. Clancy's work involved analyzing, documenting, and providing recommendations related to organization; workflows and requirements; architecture and interfaces; financial forecasting models; budgeting; data documentation; management controls; training; and future recommendations and strategic directions.

Moss Adams, LLP(Assurance Associate)
- Performed substantive and analytical procedures for assurance over financial reporting.
- Analyzed and compliance tested internal controls.
- Identified and issued management letter comments related to material weaknesses and significant deficiencies.
- Assisted in the preparation of the tax provision for multiple clients.

McGladrey, LLP(Assurance Associate)
- Experience researching technical audit and accounting matters.
- Process documentation and flow charting of all accounting cycles.
- Recommended process improvements to clients.
- Assisted in the preparation of financial statements and related disclosures for a variety of industries.