

# Robert F. Bordley

## Work address

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12 Mile and Mound Road  
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## Home address

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Troy, Michigan 48085  
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www.bordley.org

**CAREER SUMMARY** Extensive experience in developing, applying and managing statistical, decision analysis and operations management models. Innovations have had a documented impact of billions of dollars.

## WORK EXPERIENCE

- 2009-Pres **Technical Fellow, Corporate Planning & Alliances, General Motors (GM)**  
Patent Application Award, Algorithmic Creation of Visual Images  
Improving Pricing and Production Model, studying powertrain complexity
- 2008-2009 **Operations Research Group, GM Research and Strategic Planning**  
Elected to Omega Rho: Informs Honor Society  
Technical Lead in creating advertising effectiveness tool  
Co-editor, Special Issue of Decision Analysis on Auctions in honor of Mike Rothkopf  
Patent Application Award: Algorithmic Creation of Personalized Advertising  
**2008 named Fellow of INFORMS (Inst. for Operations Research and Mgt Science)**  
Testified before Subcommittee on Research and Science Education of the Congressional Committee on  
Science and Technology on behalf of funding the social and decision sciences, September, 2007  
Led team which developed influence diagram of aggregate contribution margin drivers  
GM-representative on MIT project on morphing GM advertising to fit cognitive styles
- 2006-2008 **GM Vehicle Development Research Laboratory**  
**Received Award for Best Decision Analysis Publication**  
Determined how GM's supply chain should react if GM had a sudden need to add production of a foreign  
vehicle at an existing plant (Part of Global Flex initiative).  
Completed follow-up work on reducing drug costs by making better use of public drug efficacy data  
Quantified Impacts of late engine changes using design structure matrix and workload model  
Reanalyzed models relating vehicle attributes and customer attributes  
Developed an alternative approach to robust design optimization based on decision analysis
- 2003-2006 **GM Technical Fellow**  
**GM NA Product Development Center,**  
Worked with corporate strategy to model the drivers of GM's health care costs. Results led to reductions in brand drug coverage, initiatives on coordination of benefits and other efforts. Modeled GM's new product development process to identify sources of cost and waste. Particularly targeted opportunities for reducing rework. Led to initiatives focused on reducing product content change.  
**GM Proving Grounds**  
**GMNA Award for Creative & Incredible Performance in Engineering Design**  
Updating GM problem remediation tools (e.g., control charts) and testing by applying to root causes various product problems(fuel caps, fuel pumps, rattling, ignition switches, blower motors,motors)  
Using Statistical Analysis to Properly Target Welcome Call Initiative. Helped specify when calls would be made and the vehicles to be emphasized.  
**2004 Chairman's Honors Award (savings > \$360M/yr)**

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## **GM Global Engineering Center**

Used influence diagrams to identify the key drivers of GM warranty costs.

- Modeled the drivers of GM's JD Power Score. Results led to more headcount focused on root cause analysis.
- Developed overall warranty cost driver model.
- **2002 GM's People Make Quality Happen Award. (Realized savings exceeding \$250M/yr)**
- Developed battery warranty cost driver model. Potential Cost savings of \$30M/yr identified. Company switched to more heat-resistant battery design, consistent with model findings
- Developed models for ground warranty, brake warranty, powertrain control modules

## **GM Enterprise Customer Network**

- Developed model of drivers of customer loyalty to assist in formation of GM's CRM strategy

## 1998-2002 **Technical Director**

### **GM Corporate Strategy & Knowledge Development**

Provide technical support in decision analysis and marketing to strategy formulation and operations improvement projects.

- Validated and implemented algorithm creating current product segmentation.
- Used statistical analysis to identify key drivers of dealer dissatisfaction, leading to development of best practices for improving VSSM dealer relations. Subsequent corporate focus on these drivers improved GM's dealer satisfaction from worst in the industry to average
- Developed marketing modules of enterprise model commissioned by Strategy Board, including modules to value the impact of changing the number of GM product entries and to project GM's long-run share given current policies.
- Conducted statistical analyses supporting the design of GM web tool, AUTOCHOICE.
- As part of a 3-person team, guided the use of CART software for revising GM's needs segmentation.
- Developed a panel on social cycles as part of creation of New Product Concepts war room. **Team received 1998 President's Council Award.**
- Led successful Dialogue Decision Process projects in technology partnering, information technology and procurement.
- Used Enterprise Miner to prove that the current needs segmentation is more accurate than Claritas or demographic segmentations.
- Developed a 120-page overview of the approaches used by 60 major corporate strategists.

### **GM Vehicle Development & Technical Operations**

## 1993-1997 **Manager, GM R&D Portfolio Planning Department**

Coordinated the review & documentation of GM's R&D projects.

- Led decision analysis on more than 50 R&D projects. Work stimulated dramatic changes in some projects. **Team received GM Award of Excellence in 1994.**
- Managed creation of a database to enable customers to access GM R&D projects more easily.
- Managed the implementation of new project budgeting system.

## 1991-1993 **Manager, GM R&D Management & Marketing Sciences**

Managed a team of 12 R&D professionals.

- Managed development of a model prioritizing product problems based on their impact on product repurchases.
- Developed the mathematical model that was the basis of Pricewar, a widely used GM product pricing software package. A team applying Pricewar won GM's Chairman's Honor. More recently, an optimization tool using Pricewar (called Argus) was credited with over a billion dollars in pricing improvement based on a letter from the executive director of US Sales Operation Finance. This optimization tool also won the McCuen Award in 2008.

### **National Science Foundation, US Government**

## 1990-1991 **Director, Decision, Risk & Management Science Program**

Administered review and recommended awards of grants from a \$3 million budget.

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- With other grant officers, successfully lobbied for creation of a social sciences directorate at NSF.
- Awarded first grants to industry as part of NSF's private sector initiative.
- Successfully championed the funding of educational grants to teach students decision-making.
- Successfully lobbied for doubling the research budget on biotechnology social impact research.

### **GM Research: Operating Sciences Department**

1987-1990 **Manager, Decision Support Systems**

Managed a diverse team of 9 professionals in marketing, intelligence vehicles and risk analysis.

- Managed development of first needs-based segmentation.
- Managed development of in-vehicle navigation system.

### **GM Trilby Vehicle Design Project**

1985-1987 **Supervisor, Mission Analysis Group**

Managed a four-person team developing a mission statement for the Trilby prototype vehicle.

- Led business case analysis for proposed new vehicle.
- Developed a template specifying how the "voice of the customer" could feed into vehicle engineering.

### **GM Research: Societal Analysis Department**

1982-1985 **Staff Research Engineer**

1978-1981 **Associate Senior Research Engineer**

Conducted research & consulting work in economics, finance and environment.

- Discovered the importance of second choice data in potentially segmenting products. This idea was central to the development of GM's initial product segmentation.
- Developed a model of air pollution for Environmental Activities Staff.

## TEACHING EXPERIENCE

2002-present **University of Michigan, Ann Arbor, MI**  
**Adjunct Professor, Industrial & Operations Engineering Department**  
Taught Course in Decision Analysis

2000- 2002 **University of Michigan, Dearborn, MI**  
**Adjunct, Lecturer, School of Management**  
Taught Courses in Operations Management

1995- 2000 **Oakland University, Rochester, MI**  
**Adjunct Full Professor, Systems Engineering Department**  
Taught courses in engineering risk analysis at Oakland University campus  
Taught courses at Vienna on behalf of Oakland University and Vienna Technical

University

1996-1998 **Wharton, University of Pennsylvania; Philadelphia, PA**  
**Guest Lecturer, Marketing**

## EDUCATION

1979 **University of California; Berkeley, CA**  
PhD Industrial Engineering & Operations Research. Thesis: "Studies in Mathematical Group Decision Theory" (Dr. T. Marschak). Awarded 3-Year National Science Foundation Fellowship.

1979 MBA Finance.

1977 MS Industrial Engineering & Operations Research.

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### Michigan State University; Lansing, MI

- 1976 MS Systems Science with specialty in Economic Systems.
- 1976 BA in Public Policy. Graduated Magna cum Laude.
- 1975 BS Physics. Awarded 4-Year Full Scholarship, National Merit Scholarship.

### REFEREED PUBLICATIONS

- (79) "An Anti-Ideal Point Approximation of Economic Discrete Choice Models." *Economic Letters*, 2011,110,60-63.
- (78) "A Comment on a Psychologically Plausible Goal-Based Utility Function." *Informing Science Journal*.Vol.12,217-221,2010.
- (77) "Normative Non-Expected Utility Theories." *Encyclopedia of Operations Research and Mgt Sciences*. 2010
- (76) "Decision Trees." *Encyclopedia of Operations Research and Mgt Sciences*. 2010.
- (75) "The Hippocratic Oath, Effect Size and Utility Theory." *Journal of Medical Decision Making*. 293,377-379, 2009.
- (74) "Combining the Opinions of Experts who partition events differently." *Decision Analysis*. 6(1), 38-46, 2009.
- (73) (with S. Pollock). "A Decision Analytic Approach to Reliability-Based Design Optimization." *Operations Research*. 57,5, 1262-1270, 2009.
- (72) (with V. Bier). "Updating Beliefs about Variables given new information on how those Variables Relate." *European Journal Of Operational Research*. 193, 1, 184-194, 2009.
- (71) (with A. Abbas and J. Matheson). "Effective Utility Functions Induced by Organizational Target-Based Incentives." *Managerial and Decision Economics*. John Wiley & Sons, 30(40),235-251, 2009
- (70) "How to Make Risky Decisions Visually." *Visual Communication*. Society for Visual Communication, 2007
- (69) "Statistical Decision Making without Math." *Chance*. American Statistician Association, 2007.
- (68) "Econophysics and Individual Choice." *Physica A: Statistical Mechanics and its Applications*. Vol.354.pg.479, Elsevier, 2005.
- (67) (with C. Kirkwood.) "Multiattribute Preference Analysis with Performance Targets." *Operations Research*. 52(6), 823-835,2004.
- (66) "Reformulating Decision Theory using Fuzzy Set Theory and Shafer's Theory of Evidence." *Fuzzy Sets and Systems*. 139, 2(October,2003), 243-266.
- (65) "Determining the Appropriate Depth and Breadth of a Product Portfolio." *Journal of Marketing Research*, Spring, 2003.
- (64) "Decision Rings: Making Decision Trees Visual & non-Mathematical" *INFORMS Transactions on Education*, 2002, Vol. 2, No. 3, <http://ite.informs.org/Vol2No3/Bordley/>
- (63) "Representing Trees using Microsoft Doughnut Charts." *American Statistician*, 56,2,1,2002
- (62) "Relating Value-Focused Thinking and Interactive Planning." *Journal of the Operational Research Society*, December, 2001..
- (61) "Foundations of Target-Based Decision Analysis." 2002, in *Encyclopedia of Life Support Systems, EOLSS Publishers, Oxford, UK. www.eolss.net*.
- (60) "Teaching Decision Theory in Applied Statistics Course." *Journal of Statistical Education*.Vol.9,#2,2001.
- (59) "Integrating Gap Analysis and Utility Theory in Service Research." *Journal of Service Research*. March,2001.
- (58) "Naturalistic Decisionmaking and Prescriptive Decision Theory." *Journal of Behavioral Decisionmaking*. 2001
- (57) (with L.Calzi) "Decision Analysis using Targets instead of Utility Functions." *Decisions in Economics and Finance*. 23,53-74,2000.
- (56) (with J.Kadane). "Experiment-Dependent Priors in Psychology and Physics." *Theory & Decision*. December,1999.
- (55) (with Dennis Blumenfeld and Mark Beltramo.) "Consolidating Distribution Centers can Reduce Lost Sales." *International Journal of Production Economics* ,1998
- (54) "R&D Project Generation versus R&D Project Selection." *IEEE Transactions in Engineering Mgt*. December,1998.
- (53) "Keeping it Sophisticatedly Simple in R&D Management." *Engineering Economist*.1998
- (52) "Stochastic Mechanics & Classical Mechanics with Finite Differences." *Journal of the Physical Society of Japan*. 66,10,1997.
- (51) "Teaching Precalculus Classical Mechanics instead of a Calculus-Based Classical Mechanics." *European Journal of Physics*. #5,9,1997,pg.327-333.
- (50) "Quantum Mechanical and Human Violations of Compound Probability Principles:Toward a Generalized Heisenberg Uncertainty Principle." *Operations Research*.November,1998.
- (49) "Filling in Incomplete Survey Responses." *Communications in Statistics:Simulation & Computation* ,26,4,1997.

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- (48) "Experiment-Dependent Probabilities in Quantum Mechanics & Psychology." *Physics Essays*. 10,#3,1997.
- (47) "Discrete-time General Relativity & Hyperspace." in *Il Nuovo Cimento*, 1997.
- (46) (with Ron Harstad.) "Lottery Qualification Auctions." in Bayes,M(ed.). *Advances in Applied Microeconomics:Auctions*, JAI Press,1996.
- (45) (with Jim McDonald, Anand Mantrala) "Something New, Something Old: Parametric Models for the Size of Distribution of Income." *Journal of Income Distribution*, 6,1,1996.
- (44) "Relating Probability Amplitude Mechanics to Standard Statistical Models." *Physics Letters A*. 204,26-32(1995).
- (43) "Modelling Unforeseen Events with Similarity Templates Changes Bayesian Probabilities into Pignistic Probabilities." *International Journal of Approximate Reasoning*. (1995).
- (42) "Possible Convexity of the Indirect Utility Due to Nonlinear Budget Constraints." *Economic Letters*.(1994).
- (41) "Making Social Tradeoffs Among Lives, Disabilities and Costs." *Journal of Risk and Uncertainty*. 9,2(1994),135-150.
- (40) "An Overlapping Choice Set Model of Automotive Elasticities." *Transportation Research*. 28B,6(1994),401-408..
- (39) "Estimating Automotive Elasticities from Segment Elasticities and First Choice/Second Choice Data." *Review of Economics and Statistics*. 3, August, 1993, 455-462..
- (38) (with Jim McDonald). "Estimating Aggregate Automotive Income-Elasticities from the Population Income-Share Elasticity." *Journal of Business and Economic Statistics*. 2(1993).
- (37) "An Intransitive Expectations-Dependent Variant of Prospect Theory." *Journal of Risk and Uncertainty*. 5(1992).
- (36) (with G.Hazen) "Nonlinear Utility Models Implied by Small World Intercorrelations." *Management Science*. (1992).
- (35) (with G.Hazen). "Intertemporal Risk-Aversion and Calibration Uncertainty May Explain Violations of the Independence Axiom." in J.Geweke. *Decision-Making under Risk and Uncertainty: New Models and Empirical Findings*. Kluwer Academic Publishers, London, 1992.
- (34) "The Dogit Model is Applicable even without Perfectly Captive Buyers." *Transportation Research*. (1990).
- (33) (with G.Hazen) "SSB & Weighted Linear Utility as Expected Utility with Suspicion." *Management Science*. 4, 1990.
- (32) "Discounted Longevity as a Risk-Reduction Measure." *Operations Research* 38,5,(1990),815-819.
- (31) "Relaxing the Loyalty Assumption in the Colombo/Morrison Model." *Marketing Science*. (1989).
- (30) "An Intertemporal Utility Function Concave in Gains and Convex in Losses." In *Annals of Operations Research*. (ed. By I.LaValle & P.Fishburn, 1989).
- (29) "Fuzzy Set Theory, Observer Bias and Probability Theory." *Fuzzy Sets and Systems*.(1989).
- (28) "Reflection as an Explanation of Bell's Inequality Violations" *Physics Letters*(1989)
- (27) "Generating Market Elasticity Estimates Using Cross-Sectional First and Second Choice Data." *Journal of Business and Economic Statistics*(1988).
- (26) "An Additive Group Utility for a Funds Manager." *Management Science*,34,7,(1988),835-842.
- (25) "The Energy Function in Optimal Control Theory." *Journal of Optimization Theory and Applications*.57,3,1988.
- (24) "The Cost of Delayed Lottery-Resolution." *Operations Research*,36,1(1988)
- (23) "The Sum of Two Bell-Shaped Curves Can Be Sinusoidal." *Physics Letters*(1987).
- (22) "An Intuitive Form of Non-localism for Quantum Mechanics." *Physics Letters*(1987)
- (21) "Satiation and Habit Persistence (or the Dieter's Dilemma)." *Journal of Economic Theory*(1986).
- (20) "Linear Combination of Forecasts with an Intercept: A Bayesian Approach." *Journal of Forecasting*(1986).
- (19) "One Person/One Vote is not Optimal given Information on Factions." *Theory and Decision*(1986).
- (18) "Higher Derivatives of Velocity and Quantum Mechanics." *Physics Letters* (1986).
- (17) "Comparing Different Decision Rules: A Simulation." *Behavioral Science*(10,1985).
- (16) "Using Factions to Estimate Preference Intensity: An Argument Against One Person/One Vote." *Public Choice*.3(1985).
- (15) "A Precise Method for Evaluating Election Schemes." *Public Choice*.2(1985).
- (14) "Relating Elasticities to Changes in Demand." *Journal of Business and Economic Statistics*(Summer,1985).
- (13) "A Model of Risky Shift." *Organizational Behavior and Human Performance*.(December,1983).
- (12) "Deriving the Schroedinger Equation and Hamilton's Principle from Generalized Consistency Conditions." *International Journal of Theoretical Physics*(9,1983).
- (11) "A Pragmatic Approach to Evaluating Election Schemes through Simulation." *American Political Science Review*. 3,(March, 1983),123-141.

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- (10) "A Central Principle of Science: Optimization." *Behavioral Science*. (January, 1983).
- (9) "A Standard (Non-Quantum) Probability Model of Quantum Behavior." *Journal of Mathematical Physics* (9, 1983).
- (8) "The Combination of Forecasts: A Bayesian Approach." *Journal of the Operational Research Society* (Feb., 1982).
- (7) "A Multiplicative Formula for Aggregating Probability Estimates." *Management Science*. (10, 1982).
- (6) "Deducing Warr's Power Function." *Social Forces*. (September, 1982).
- (5) (with Ron Wolff). "The Aggregation of Individual Probability Estimates." *Management Science* (August, 1982).

### INVITED PUBLICATIONS

- (4) "The Psychology of Individual Choice." *Proceedings of the American Statistical Association*. American Statistical Association, Alexandria, Virginia (1993).
- (3) "Murphy's Law and Non-Informative Priors." in C.R. Smith (ed.) *Maximum Entropy & Bayesian Methods*. Seattle, Washington, 1991.
- (2) "Bayesian Group Decision Theory." in B. Grofman & G. Owen. *Information Pooling and Group Decisionmaking*. Decision Research Series. Jai Publishers, London (1986).
- (1) "Quantifying Societal Concerns in R&D Project Selection" in M. Shahinpoor & J. Weinrhaeh. *Environmentally Conscious Design & Manufacturing*. ECM Press, New Mexico, 1996.

### PROFESSIONAL ACTIVITIES

#### AMERICAN STATISTICAL ASSOCIATION

Program Chair, Section on Marketing in Statistics, American Statistical Association, 2002-2004.  
General Chair, Section on Risk Analysis, American Statistical Association, 1997-9  
Program Chair, Risk Analysis Section, American Statistical Association, 1996-7  
Program Chair, Risk Analysis Section, American Statistical Association, 1995-6  
Member, Council of Representatives (for Risk Analysis), American Stat. Association, 1994  
Member, Council of Sciences, International Society for Bayesian Analysis, 1994-1995  
Session Chair, 1987, International Society of Forecasting  
Session Chair, 1989, Southern Economic Association Meeting  
Program Committee, International Symposium on Automotive Technology & Automation  
Advisor on NSF Contract

#### INFORMS Society

Councilmember, Decision Analysis Society, 2002-2005.  
Chair, INFORMS Award Committee for the Teaching of Practice  
Councilmember, Institute for Operations Research & Management Science (INFORMS), 1995.  
Councilmember, Operations Research Society of America (ORSA), 1994.  
Member, Management Sciences Roundtable (Member, Membership Subcommittee)  
Chair, Marketing Strategy Committee, Institute of Management Sciences (TIMS), 1993-4.  
Co-Chair, Fall 1994 TIMS/ORSA Program Committee (Responsible for invited papers)  
Member, Meetings Committee, INFORMS, 1995.  
Councilmember, ORSA/TIMS Decision Analysis Section (1987-1990).  
Chair, ORSA/TIMS Marketing Strategy Committee (1993-1994)  
Decision Analysis Cluster Chair, 1987, 1994 TIMS/ORSA Meetings  
Session Chair: 1985, 1986, 1988, 1992 TIMS/ORSA Meetings  
Vice-President, Southeast Michigan Chapter of ORSA/TIMS, 1992-1995  
Secretary, Southeast Michigan Chapter of ORSA/TIMS, 1987  
Co-Founder, Southeast Michigan Chapter

#### American Marketing Association

Review Board, Journal of Marketing  
Ad Hoc Reviewer, Management Science, Jr. of Academy of Mgt., Production & Operat. Mgt Soc, etc.

#### PRODUCTION & OPERATIONS MGT SOCIETY

Vice-President for Publications, Production & Operations Mgt Society (1999-)  
Vice-President for Finance, Production & Operations Mgt Society (1995-1996)  
Member, Board of Governors, Production & Operations Mgt Society (1992-1994)  
Area Editor, Production & Operations Mgt Journal (1993-1995)  
Member, Joseph Orlicky Operations Mgt Award Committee (1993)

#### GOVT. COMMITTEES

National Advisory Council on Environmental Policy--Envir. Protection Agency

## Robert F. Bordley

Member, Pollution Measurement Subcommittee  
Chairperson, Materials Accounting Data Working Party

Member, Toxic Data Reporting Subcommittee

### ALUMNI ASSOCIATIONS

James Madison College, Michigan State University  
Alumni Association President, 1985-8, Boardmember, 1981-3, Vice-President, 1984-5  
Vice-Chair, James Madison College Board of Visitors, 1995-1997  
Chair, Program Committee, James Madison College Board of Visitors, 1997-1998

Delivered many papers at  
TIMS/ORSA, International Federation of Operations Research, International Society of  
Forecasting, Public Choice, Bayesian Research Conference, American Physical Society,  
Economic Sciences & Public Choice Conference, Foundations of Utility & Risk Conference, Judgement/Decision making  
Conference, NBER-NSF Seminar on Bayesian  
Inference in Econometrics & Statistics, University of Chicago, Northwestern University,  
University of Michigan, University of Arizona, University of California at Irvine.  
Ad Hoc Reviewer for  
Physics Letters, IEEE Transactions, JASA, Mgt Science, International Economic Review,  
American Political Science Review, Journal of Risk and Uncertainty, National Science  
Foundation grant applications, Kentucky Planning Office grant applications.

#### Society Memberships:

Institute for Operations Research & Mgt Science	Society for Risk Assessment
International Society for Bayesian Analysis	American Physical Society
International Platform Association	Royal Economic Society
American Economic Association	Public Choice Society
American Statistical Association	Phi Beta Kappa
Judgment/Decision Making Society	Phi Kappa Phi

### FELLOWSHIPS/HONORS

National Merit Scholarship  
National Science Foundation 3-Year Fellowship  
Alumni Distinguished Scholarship, Michigan State University  
Lilly Fellowship

Award of Excellence, General Motors R&D, for R&D Project Selection Process.  
1998 President's Council Award, General Motors Corporation, for work on Portfolio Concepts Process  
2002 UAW-GM People Make Quality Happen Award  
2004 GM Chairman's Honors  
2006 Decision Analysis Publication Award  
2008 INFORMS Fellow  
Omega Rho Honor Society