Fred Collopy

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Education

The Wharton School of the University of Pennsylvania; Ph.D. in Decision Sciences; 1990.

Thomas More College; Ft. Mitchell, Ky.; Bachelor of Arts *cum laude* in Philosophy; 1971.

Professional Experience

Weatherhead School of Management, Case Western Reserve University
      Professor Emeritus of Design & Innovation, 2019-present
      Professor of Design & Innovation, 2001-2019.
      Professor of Cognitive Science, 2004-2019.
      Vice Dean and Professor of Design & Innovation, 2012-2017.
      Senior Associate Dean and Professor of Information Systems, 2010-2012.
      Professor and Department Chair of Information Systems, 2001-2010.
      Visiting Professor, Communications, Cornell University, Ithaca, NY, 2006.
      Associate Professor, 1996-2001.
      Visiting Scientist, IBM Thomas J. Watson Research Center, 1998-1999.
      Assistant Professor, 1989-1996.

Adjunct Faculty, The Wharton School, University of Pennsylvania, Philadelphia; 1981-1989. Developed courses in the management of computing and in software design.

Research Consultant, IBM Corporation, Armonk NY; 1986-1988. Managed research on internal office systems.

Founder & President, Conceptual Instruments Company, Philadelphia; 1982-1985. Created a new software category and developed *The Desk Organizer*.

Analyst-Planner, Intelligent Devices, Inc., Cincinnati; 1977-1980. Developed and implemented strategies for marketing consumer computer products.

Co-founder, Thiel Audio Products Company, Lexington; 1975-1977. Participated in creation of a manufacturing company that produced and marketed high-end, high-fidelity loudspeakers.

Associate, Whitewood Stamps Consulting, Boston; 1972-1974. Provided econometric support to governments, universities, and corporations involved in the planning of cable communications systems.

Research Assistant, Metropolitan Area Religious Coalition of Cincinnati; 1971-1972. Assisted in planning the media strategies of the city's major Protestant, Jewish, and Catholic congregations.

Research

Visual instrument design

For three centuries inventors, artists and musicians have worked to create an art form and instruments that bring to the sense of sight the same abstractions and pleasures that music brings to the sense of hearing. My work addresses two major issues in the area. In the first, I address the question, what are the dimensions of an art of light? In the second, I have explored the nature of models and interfaces that allow a player to control these in live performance. Visual musical instruments have served as a kind of sandbox for my explorations of computer programming and of interaction design.

Visual instrument design findings

Dozens of attempts at relating musical notes to color hues have proven arbitrary and unsatisfying.

Visual instruments must address an order of magnitude more dimensionality than musical ones.

Color-form-motion defines a model of graphic interaction that captures most of the dimensionality required for painterly abstraction in real time.

The cognitively based hue-saturation-brightness color model is more useful in performance instruments than the more commonly used technology-based RGB model.

Computer-based color models require empirically based adjustment to the brightness component for certain hues to achieve visually similar impact.

Computer-based implementations of hue space require adjustments to build color wheels with the relationships assumed by color theories.

The concept of a functor (an object integrating data and code to provide support for a variety of parameterized mathematical functions) that can be used across all visual dimensions, facilitates designing around human players' capabilities and instincts.

Visual instrument design research

F. Collopy, "Visual Synthesizer Design: Where Modern Art Was Headed," August 2020, working paper.

F. Collopy, "A Hypothesis Driven Approach to Designing a Visual Music Instrument," January 2018, working paper.

F. Collopy, "Playing (With) Color," *Glimpse | the art + science of seeing*, vol 2.3 (Autumn 2009), 62-67.

F. Collopy and R. M. Fuhrer, "A Visual Programming Language for Expressing Visual Rhythms," *Journal of Visual Programming Language*s, 12 (2001), 283-297.

F. Collopy, "Color Form and Motion: Dimensions of a Musical Art of Light," *Leonardo*, 33 (2000), 355-360.

F. Collopy, R. M. Fuhrer and D. Jameson, "Visual Music in a Visual Programming Language," *IEEE Symposium on Visual Languages*, (1999), 111-118.

Visual instrument design notes, commentaries, reviews

F. Collopy, "Visual Music as a Performing Art", *Offscreen*, Volume 11, Issue 8-9 (August-September 2007), article 10.

F. Collopy, "New Sounds, New Society—A Review of Trevor Pinch and Frank Trocco's *Analog Days: The Invention and Impact of the Moog Synthesizer*," *Metascience*, 13 (2004), 187-191.

F. Collopy, "Three Centuries of Color Scales," in K. Brougher, J. Strick, A. Weisman, and J. Zilczer, *Visual Music: Synaesthesia in Art and Music Since 1900*, Thames & Hudson, 2005.

Visual instrument design performances, mentions and artworks

Michael Betancourt, The History of Motion Graphics: From Avant-Garde to Industry in the United States, Wildside Press, 2013, 267-271.

The Rhythmic Light Ensemble Presents Sonic & Visual Music, Live at Cleveland's Ingenuity Festival, July 2007.

Bruce Wands, *Art in the Digital Age*, Thames & Hudson, 2004.

SonicLight, Paradiso, Amsterdam, February 2003, performed Imager live with music by Dino Felipe.

Performance Cinema Symposium, Dimension 7, San Francisco, September 2003, performed Imager live with music by Henry Warwick.

New Center for Art & Technology, Cleveland, September 2002, performed Imager live with music by Kassaba.

"Improvisational Lumia: Painting Along with Musicians," Artist's Statement, *Leonardo*, 34 (2001), 353.

Matt Woolman, *Sonic Graphics/Seeing Sound*, New York: Rizzoli, 2000, 40-43.

"A Very Brief History of Lumia," SIGGRAPH 2000 Conference Abstracts and Applications CD.

"A Very Brief History of Lumia," One Iota/Two Iota Video Compilation, 2000.

Visual instrument software, CD, and web site

Imager visual synthesizer, iPad app, 2019.

Imager for Macintosh computers, 1986.

Unauthorized Duets: The Authorized Edition, CD for computers, 2000.

RhythmicLight.com: a site that explores design issues in visual music, 1998-present.

Imager for IBM PC computers, 1981.

Imager for Apple II computers, 1979.

Visual instrument design lectures and residencies

"The Imager Project: Designing the Future of Painting," *Seeing Sound*, December 12, 2020.

"Visual Synthesizer Design: Where Modern Art Was Headed," *Expanded Animation, Synaesthetic Syntax: Sounding Animation/Visualising Audio at Ars Electronica*, September 13, 2020.

"Where Modern Art Was Headed," *Visual Music Symposium*, Sonoma State University, California, August 13, 2018.

2017 Toolmaker in Residence, *Signal Culture*, Owego, New York, June 1-8, 2017.

"The Modernists' Impulse Toward a Musical Art of Light," *Seeing Sound*, Bath, England, April 9, 2016.

"Performing Abstract Visuals in Real-Time—Some Issues and Ideas," *The San Francisco Performance Cinema Symposium*, September 17, 2003.

 "An Instrument for Performing Real-Time Abstract Animations," *SonicLight 2003*, Amsterdam, Feb 23, 2003.

"The Contributions of Painters to the Development of Visual Music," *SonicLight 2003*, Amsterdam, Feb 21, 2003.

"Color, Form and Motion: The Application of Some Ideas from Constructivism to Visual Music and to Management", MIT Media Lab, Dublin, Ireland, June 26, 2002.

"Lumia for a New Time," Academy of Management, Toronto, August 2000 (with Dick Boland).

"A Constructive Approach to Playing Dynamic Graphics," *SIGGRAPH 2000*, New Orleans, July 2000.

"Visual Music in a Visual Programming Language," *IEEE Symposium on Visual Languages*, Tokyo Japan, September 1999.

"Some Notes on the Design of an Instrument for Visual Improvisation and Composition," San Francisco State University, MIT Media Lab, IBM's Watson Research Center, University of Illinois' Beckman Institute, 1997-98.

"Graphic Improvisation," *Columbia University Interactive Media Festival*, New York, April 1999.

"Designing Instruments for Visual Improvisation and Composition," *International Symposium on Electronic Arts*, Manchester England, September 1998.

Managing as designing

Everything about a business is designed. Among other things, managers design the conditions in which other people work. These facts are as central to their effectiveness as analysis and decision-making are. If managers are to address the unique situation faced by their particular organization, are to be innovative and creative, and are to take on the challenges facing business and the world, we must get good at designing.

Managing as designing findings

Reframing can lead to substantially different problem statements and solution strategies.

A design attitude can lead to the generation of alternatives that improve on all of the options considered when constrained by a decision attitude.

Given the idiosyncratic nature of many organizations, design often represents a better alternative than best practices or other approaches to issues that are based on benchmarking.

Creativity and innovation flow from design practices, design attitudes and design spaces.

Managing as designing publications

F. Collopy, "Why the Failure of Systems Thinking Should Inform the Future of Design Thinking*," Design Issues*, 35, 2019, 97-100.

F. Collopy, "Management Meets Design," reprinted in *BizEd* special collection on creativity, August, 2018.

F. Collopy & R. Boland, "A call for strong design language," in *Millennial Spring: Designing the Future of Organizations*, Miriam Grace & George Graen, eds., Information Age Publishing, 2014, 243-250.

F. Collopy, "Management Meets Design," *BizEd*, (Sept/Oct, 2010), pp. 36-45.

F. Collopy "Blogs on Management and Design," *Revue fur postheroiches Management*, Heft 8, 2011, 42-43, 76-77, 122-123, 145, 158-159.

F. Collopy & R. Beuker, "A conversation between specialists: Designing strategies and strategic design," in Erik Rosscam Abbing, *Brand-Driven Innovation*, AVA Publishing SA, 2010, 48-49.

F. Collopy, "Foreword," in M. Avital, R.J. Boland, and D.L. Cooperrider (Eds), *Designing Information and Organizations with a Positive Lens, Advances in Appreciative Inquiry Series*, Volume 2, Elsevier Science, 2008, Oxford, pp. xxi-xxii.

R. J. Boland, Jr., F. Collopy, K. Lyytinen, and Y. Yoo, "Managing as Designing: Lessons for Organization Leaders from the Design Practice of Frank O. Gehry," *Design Issues,* 24, 2008, 10-25.

Fred Collopy, "Manage by Designing," Weatherhead Collection, (Fall 2008), 8-13.

F. Collopy, "Art and Management: Do We Share a Common Language?," in J. Faust and F. Collopy [eds.], *Managing as Designing: Dialogues in Art and Management*, 2005.
R. J. Boland, Jr. and F. Collopy [eds.] *Managing as Designing*, Stanford University Press, 2004.

R. J. Boland, Jr. and F. Collopy, "Design Matters for Management," in R .J. Boland, Jr. and F. Collopy [eds.], *Managing as Designing*, Stanford University Press, 2004, 3-18.

F. Collopy, "I Think With My Hands: On Balancing the Intuitive and Analytic in Designing," in R. J. Boland, Jr. and F. Collopy [eds.], *Managing as Designing*, Stanford University Press, 2004, 164-168.

R. J. Boland, Jr. and F. Collopy, "Toward a Design Vocabulary for Management," in R. J. Boland, Jr. and F. Collopy [eds.], *Managing as Designing*, Stanford University Press, 2004, 265-276.

Managing as designing video and blogging

Managing as Designing: Bringing the Art of Design to the Practice of Management, half hour video, 2003.

Expert blogger for *Fast Company* and for *Bloomburg Business Week* on *Managing by Designing*, 2008-09.

Managing as designing lectures and workshops

EMBAC Midwest Regional Conference, "Managing by Designing: Education for Innovation," Cleveland, July 19, 2017.

AACSB workshop on "Teaching Design for Creativity and Innovation" (with Youngjin Yoo), Cleveland, OH, April 3-4, 2017.

"Teaching Design," University of Kutztown, Pennsylvania, October 14, 2016.

"Teaching Design," University of Wisconsin—Whitewater, June 30, 2016.

"Teaching Design to Managers: A Path to Innovative and Critical Thinking," AACSB Redesigning the MBA Curriculum Conference, Indianapolis, May 9, 2016.

"The tools of Leadership: Perspectives for Varied Applications" American Institute of Architects, 2015 leadership Institute, Cleveland, October 23, 2015.

"Design and Analytics: Leadership and Management Challenges," Strategic Management Society, Sydney, Australia, December 2, 2014.

"Design Thinking for Creativity, Innovation and Transformation," (with Youngjin Yoo) AACSB Workshop, Tampa, Florida, October 28, 2011, October 25-26, 2012, October 28-29, 2013, October 27-28, 2014, November 9-10, 2015.

"Designing Large Systems: Towards Some Second Order Lessons, " Keynote address at the Conference on Relating Systems Thinking and Design, Oslo, Norway, October 10, 2013.

 "Design for Global Leadership, McGill University, August, 2013.

"The Ultimate Eco-System…for Designing," Industrial Designers Society of America, Cleveland, January, 2013.

"The Peter B Lewis' Building Impact on How to Manage By Designing," American Institute of Architects, Cleveland, September 14, 2012.

"Innovation and Design Thinking," Keynote at the AMBA Latin America Conference of Deans and Directors, Cartagena de Indias, Colombia, August 30 2012.

"Using Design to Manage," Apple Supplier Responsibility Summit, Cupertino, California, July 25, 2012.

"Design and Studio Based Learning for Creativity and Innovation, AACSB International Conference (ICAM), April 30, 2012.

"Design & Studio Education in an MBA Program," *AACSB's Symposium on Redesigning the MBA*, Tampa, Florida, March 26, 2012.

"Innovation and Design: Studio Education for Managerial Balance," eNEWSLINE Live interview by AACSB President & CEO John Fernandes, March 6, 2012.

"Manage by Designing: An Approach to Everyday Innovation," International Association of Business Analysts, Cleveland, January 30, 2012.

"Design Thinking for Strategy, Structure and Innovation," keynote at *II Simposio Iberoamericano de Estudios Gerenciales*, Universidad Icesi, Calle, Colombia, October 13, 2011.

"Design & Studio Education in an MBA Program," *AACSB's Symposium on Redesigning the MBA*, Tampa, Florida, March 21, 2011.

"Redefining Management and Innovation," *inciteXchage*, Philadelphia, Pennsylvania, March 18, 2011.

"Design for Systems Thinkers; Systems for Design Thinkers," *x-treat*, Berlin, Germany, March 1, 2011.

"Leadership Through Design," *Education Innovation Summit*, Hathaway Brown, Cleveland, November 5, 2010.

"Why Design is Changing Management", Design Management Institute webinar, October 6, 2010.

"Managing by Designing" The Future of Packaging Conference, Cleveland, April 28, 2010.

"Designing in Management," *AIGA*, Memphis, October 9, 2009.

"How Not to Design Instruments for Abstract Visual Improvisation," *SIGGRAPH*, New Orleans, August 2, 2009.

"Manage by Designing: Building Theory and Pedagogy," *4th International DOM Conference and Workshop*, Linz, Austria, May 15, 2009.

"A Dynamic Representation of the Health of a Firm: Design Directions," IS Department Seminar, January 23, 2009.

"Managing Creativity or Managing Creatively," *APCI Design Innovation Conference*, Paris, January 13, 2009.

"A Dialogue on the Use of Design for Managing," (with Christopher Riker of Nottingham-Spirk), Beta Gamma Sigma, Cleveland Chapter, December 4, 2008.

"Manage by Designing: a Guide for Small Enterprises," COSE, Cleveland, October 22, 2008.

"Manage by Designing: a Challenge for Leaders," Weatherhead Alumni Association, Chicago, October 15, 2008.

"Why Am I Not Rationale in My Designing?" Penn State University Workshop on Rationale and Creativity in Software Design, June 15, 2008.

"Managing as Designing: Meeting a Challenge for Graduate Education," Weatherhead Webinar, September 26, 2007.

"Order and Spontaneity: Diana Cooper and Fred Collopy in Conversation," Meyers School of Art, University of Akron, September 13, 2007.

"Managing as Designing", Weatherhead Chicago-Based Alumni Seminar, Chicago, Illinois, July 19, 2002.

"Managing as Designing," Professional Fellows Program, Cleveland, Ohio, September 9, 2002.

Forecasting

My work in forecasting revolves around the problem that no forecasting method or approach dominates the set of available methods. To identify the conditions under which a particular method is preferable to others has required advances in eliciting expert knowledge, identifying and characterizing features of time series, calibrating and comparing rules and methods (through error measures), and fine tuning rules (through pattern identification).

Forecasting findings

On annual time series data, Rule-Based Forecasting (RBF), using weights determined by a hundred rules, can outperform equal or statistically based weights. The gains are greater when domain knowledge is incorporated.

A significant portion of domain expertise can be captured by the construct 'cause forces' which relates expectations of domain experts to historical trends.

Knowledge of the causal forces affecting a series can significantly improve the performance of RBF.

Relative error measures are useful for observing and calibrating changes across small numbers of series and are intuitively understandable comparators of performance.

Empirical prediction intervals for most forecasting methods and situations are asymmetric.

Neural networks can assist in the calibration of weights in a rule-based forecasting (RBF) system that is being applied to a new type of data.

Even a random walk model outperforms logistic and other diffusion models at predicting information systems spending forecasts.

Discontinuities substantially impact the performance of forecasting methods, yet are not widely by forecasting experts identified as an important feature.

Forecasting research

J. S. Armstrong, F. Collopy and J. T. Yokum, "Decomposition by Causal Forces: A Procedure for Forecasting Complex Time Series," *International Journal of Forecasting,* 21 (2005), pp. 25-36.

M. Adya, F. Collopy, M. Kennedy and J. S. Armstrong, "Identifying Features of Time Series for Rule-Based Forecasting," *International Journal of Forecasting*, 17 (2001), 143-157.

J. S. Armstrong and F. Collopy, "Identification of Asymmetric Prediction Intervals through Causal Forces," *Journal of Forecasting*, 20 (2001), 273-283.

F. Collopy, M. Adya and J. S. Armstrong, "Expert Systems for Forecasting," *Principles of Forecasting: A Handbook for Researchers and Practitioners*, J. S. Armstrong [ed.]: Norwell, MA: Kluwer Academic Publishers, (2001), 285-300.

J. S. Armstrong, M. Adya and F. Collopy, "Rule-Based Forecasting: Using Expert and Domain Knowledge in the Extrapolation of Time Series", *Principles of Forecasting: A Handbook for*

Researchers and Practitioners, J. S. Armstrong [ed.]: Norwell, MA: Kluwer Academic Publishers, (2001), 259-282.

M. Adya, J. S. Armstrong, F. Collopy and M. Kennedy, "An Application of Rule-based Forecasting to a Situation Lacking Domain Knowledge: The M3-IJF Competition" *International Journal of Forecasting*, 16 (2000), 477-484.

M. Adya and F. Collopy, "How Effective are Neural Networks at Forecasting and Prediction? A Review and Evaluation," *Journal of Forecasting*, 17 (1998), 481-495.

J. S. Armstrong and F. Collopy, "Integration of Statistical Methods and Judgment for Time Series Forecasting: Principles from Empirical Research," in G. Wright and P. Goodwin [eds.] *Forecasting with Judgment*, John Wiley & Sons, Ltd., (1998), 269-293.

M. Adya and F. Collopy, "Does AI Research Aid Prediction? A Review and Evaluation," *Proceedings of the International Conference on Information Systems*, (1995), 123-140.

F. Collopy, M. Adya and J. S. Armstrong, "Principles for Examining Predictive Validity: The Case of Information Systems Spending Forecasts," *Information Systems Research*, 5 (1994), 170-179.

J. S. Armstrong and F. Collopy, "Causal Forces: Structuring Knowledge for Time Series Extrapolation," *Journal of Forecasting*, 12 (1993), 103-115.

F. Collopy and J. S. Armstrong, "Rule-Based Forecasting: Development and Validation of an Expert Systems Approach to Combining Time Series Extrapolations," *Management Science*, 38 (1992), 1394-1414.

J. S. Armstrong and F. Collopy, "Error Measures for Generalizing about Forecasting Methods: Empirical Comparisons," *International Journal of Forecasting*, 8 (1992), 69-80.

F. Collopy and J. S. Armstrong, "Generalization and Communication Issues in the Use of Error Measures: A Reply," *International Journal of Forecasting*, 8 (1992), 107-109.

F. Collopy and J. S. Armstrong, "Expert Opinions about Extrapolation and the Mystery of the Overlooked Discontinuities," *International Journal of Forecasting*, 8 (1992), 575-582.

W. R. Foster, F. Collopy and L. H. Ungar, "Neural Network Forecasting of Short, Noisy Time Series," *Computers in Chemical Engineering*, 16 (1992), 293-297.

F. Collopy and J. S. Armstrong, "Toward Computer-Aided Forecasting Systems: Gathering, Coding and Validating the Knowledge," in G. R. Widmeyer (Ed.), *DSS 89 Transactions,* TIMS College on Information Systems, Providence, RI, (1989), 103-119.

Forecasting notes, commentaries, reviews

F. Collopy, "Interview of J. Scott Armstrong," *International Journal of Forecasting*, 28 (July-September 2012), 754-761.

F. Collopy, "Difficulty and complexity as factors in software effort estimation," *International Journal of Forecasting*, 23 (2007), 469-471.

F. Collopy, "How Much Stock Should You Put in Expert Forecasts?" review of Dilek Onkal, J. Frank Yates, Can Simga-Mugan and Sule Oztin's OBHDP paper "Professional vs. Amateur

Judgment Accuracy: The Case of Foreign Exchange Rates," *International Journal of Forecasting*, 20 (2004), 731-732.

F. Collopy, "A Pattern Language for Forecasters," *Interfaces*, (November-December, 2003).

F. Collopy, "Where Do the Forecasting Auditor's Questions Come From?," *International Journal of Forecasting*, 19 (2003), 30-31.

F. Collopy, "From Exploration to Confirmation: Movement Through the M-Competitions," *International Journal of Forecasting*, 17 (2001), 554-555.

F. Collopy, review of Paul Goodwin and Robert Fildes "Judgmental forecasts of time series affected by special events: Does providing a statistical forecast improve accuracy?," *International Journal of Forecasting*, 16 (2000).

G. M. Wright, M. J. Lawrence and F. Collopy, "The Role and Validity of Judgment in Forecasting," *International Journal of Forecasting*, 12 (1996), 1-8.

F. Collopy, review of F. D. Davis, G. L. Loshe and J. E. Kottermann, "Harmful Effects of Seemingly Helpful Information on Forecasts of Stock Earnings," *International Journal of Forecasting*, 11 (1995), 354-355.

F. Collopy, "A World-Wide Information System for Forecasters," *International Journal of Forecasting*, 10 (1994), 491-494.

F. Collopy, review of P. Teicholz, "Forecasting Final Cost and Budget of Construction Projects," *International Journal of Forecasting*, 10 (1994), 474-475.

J. S. Armstrong and F. Collopy, review of N. R. Sanders and L. P. Ritzman, "The Need for Contextual and Technical Knowledge in Judgmental Forecasting," *International Journal of Forecasting*, 8 (1992), 651-652.

F. Collopy and J. S. Armstrong, review of D. Bunn and G. Wright, "Interaction of Judgmental and Statistical Forecasting Methods: Issues and Analysis," *International Journal of Forecasting*, 8 (1992), 277-279.

F. Collopy, review of P. N. Pant, and W. H. Starbuck, "Innocents in the Forest: Forecasting and Research Methods," *International Journal of Forecasting*, 7 (1991), 400-401.

Forecasting software and web sites

TimeScope (for Macintosh computers) Rule-Based Forecasting software, 1991.

At Forecasters.org, I established the initial web site for the International Institute of Forecasters to support business forecasting research and practice.

Forecasting PhD thesis supervised

Monica Adya, Critical Issues in the Extension of Rule-Based Forecasting: Refinement, Evaluation, and Validation, 1997.

Forecasting lectures

"Replacing Decision with Design in Software Effort Estimation," *International Symposium on Forecasting*, Santander, Spain, June 13, 2006.

"On The Use of Statistical Tests in Forecasting," (session chair), *International Symposium on Forecasting*, Santander, Spain, June 14, 2006.

"Rule-Based Forecasting @ Adolescence," *The International Symposium on Forecasting*, San Antonio, June 14, 2005.

Rules for Forecasters: Using Historical Data and Judgments Effectively, *Forecasting Summit*, Orlando, February 15, 2005.

"An Attempt to Reproduce the Hill, O'Connor and Remus Neural Network Study," (with Lin Zhao) *International Symposium on Forecasting*, Merida, Mexico, June 2003.

"Expert Systems for Forecasting: Empirical Evidence," International Symposium on Forecasting, Lisbon Portugal, June 2000.

"We Won! We Lost! We Tried! We Tied!: On the Performance of Rule-Based Forecasting in the M-3 Competition," *International Symposium on Forecasting*, Washington D.C., June 1999.

"Expert Systems for Forecasting and Prediction," *International Symposium on Forecasting*, Edinburg Scotland, June 1998.

"Application of Artificial Intelligence Techniques to Problems in Business Forecasting: A Review of Empirical Results," Ford Research Lab, March 1997.

"Automatic Identification of Features for Use in Rule-Based Forecasting," *International Symposium on Forecasting*, Istanbul Turkey, June 1996.

"Does AI Research Aid Prediction? A Review and Evaluation," *International Conference on Information Systems*, December 1995.

"Forecasting on the Internet," *International Symposium on Forecasting*, Toronto, June 1995.

"Error Measures for Comparing Forecasting Methods," *ORSA/TIMS Conference*, Detroit, October 1994.

"Theoretical Foundations for Developing Rules for Extrapolation," *The International Symposium on Forecasting*, Stockholm, Sweden, June 1994.

"The Use of Machine Learning to Refine Rule-Based Forecasting: An Analysis and Empirical Study," *International Symposium on Forecasting*, Pittsburgh, PA, June 1993.

"Mixing Business Research and Arts Knowledge to Forecast Where the Money Will Come From," Washington, D.C., April 1993.

"Forecasting Revenues in Public Radio: An Application of Expert Systems," Mandel Center for Nonprofit Organizations, Cleveland, March 1993.

"Rule-Based Forecasting," featured speech at the *1991 International Symposium on Forecasting*, New York and presented at U. of Aukland, U. of Canterbury, U. of Otago, Pennsylvania State U.,

Carnegie-Mellon U., University of Pittsburgh, Navy Personnel R & D Center, San Diego, 1991-1993.

"An Evaluation of Exponential Growth and Diffusion Models for Information Systems Spending Forecasts," *International Symposium on Forecasting*, Wellington, New Zealand, August 1992.

"Decomposition of Time Series by Causal Forces," *1992 Conference on Behavioral Decision Making*, San Francisco, May 1992.

 "A Multidisciplinary Look at Forecasting," *Financial Management Association*, October 1991.

"Applications of Rule-Based Forecasting," *ORSA/TIMS Conference*, Nashville, May 1991.

"The Value of Causal Forces in Extrapolation," *Decision Sciences Institute 21st Annual Meeting*, San Diego, November 1990.

"Modified Seasonal Factors in Exponential Smoothing," *ORSA/TIMS Conference*, Philadelphia, October 1990.

"Workshop: Rules for Forecasters," London School of Business, June 1990 and the *International Association of Business Forecasters*, Baltimore, October 1990.

"Mind-Machine Interaction," featured speech at the *International Symposium on Forecasting*, Athens, Greece, June 1990.

"Judgmental Forecasting by an Expert vs. Forecasting by the Expert's Rules," *Behavioral Decision Research in Management Conference*, Philadelphia, June 1990.

"Closing a Knowledge Gap with Rule-Based Forecasting," *Symposium on Integrating Technology into Business Education*, Carnegie-Mellon University, Pittsburgh, March 1990.

"Selecting and Applying the Proper Forecasting Method: A Rule-Based Approach," MIDS Partners Board, Case Western Reserve University, December 1989.

"Information Systems Support for Managers and Professionals: Descriptions and Prescriptions," Cleveland Data Center, City of Cleveland, October 1989.

"A Reanalysis of the M-Competition Using Relative Error Scores," *ORSA/TIMS Joint National Meeting*, New York, October 1989.

"Expert Systems in Forecasting," Session Organizer, *ORSA/TIMS Joint National Meeting*, New York, October 1989.

"Knowledge Acquisition Methods: A Computer-Aided Approach," *Twelfth Research Conference on Subjective Probability, Utility and Decision Making*, Moscow, USSR, August 1989.

"Selection Rules for Extrapolation Methods: Rule-Based Forecasting," *International Symposium on Forecasting*, Vancouver, B.C., June 1989.

"A Research Program for Improving Accuracy in Manpower Forecasts," U.S. Navy Personnel Research & Development Center, San Diego, June 1989.

"Toward Computer-Aided Forecasting Systems: Gathering, Coding and Validating the Knowledge," *TIMS Ninth International Conference on Decision Support Systems*, San Diego, June 1989.

"A Decision Support System to Aid in Forecasting," U.S. Coast Guard, Washington, D.C., March 1989.

"Selecting and Applying the Proper Forecasting Method: A Rule-Based Approach," INSEAD, Fontainebleau, France; January 1989 and Harvard University, Cambridge, April 1989.

 "Computer-Aided Forecasting," *Conference on Technology in Business Education*, Stanford Graduate School of Business, December 1988.

"Problems and Opportunities for Government Forecasters," keynote address *First Federal Forecasters Conference*, Washington, D.C., April 1988.

"Under What Conditions is Forecasting Accuracy Achieved? Expert Opinion and Empirical Evidence," *International Symposium on Forecasting*, Amsterdam, June 1988.

Information and technology in management

I have long-standing and widely varied interests in how information affects the judgment of mangers and in how technology changes management. My work in this area has been somewhat eclectic; touching on the subjective experience of time, how people misuse information, and how organizations adjust to new technologies.

Information and technology in management findings

Decision-makers who take a competitive-orientation (market share focused) are much more likely to suffer profit losses than those who focus on profit maximization.

Under some conditions providing additional information (e.g. on a competitor's performance) can result in less effective choices than are made in the absence of that information.

Self-reports of computer use regress to the mean with heavy users reporting less time spent using them than actual and light users reporting more.

Both new and experienced users of accounting information make more accurate assessments of the health of companies when using a dynamic graphic representation (the cycle model) than when using either spreadsheets or conventional business graphics.

Information and technology in management publications

R. J. Boland, Jr., F. Collopy, J. Grant, and Lin Zhao, "Virtual Prototyping of Financial Flows as a Form of Management Control," in Brandon and Kocaturk [eds.], *Virtual Futures for Design, Construction and Procurement*, Wiley Blackwell Publishing, 2008.

M Germonprez, D. Hovorka, F. Collopy, "A Theory of Tailorable Technology Design*,*" *Journal of the Association for Information Systems*, Volume 8 Issue 6 (June, 2007), Article 21.

F. Collopy, "Bias in Retrospective Self-Reports of Time Use: An Empirical Study of Computer Users," *Management Science*, 42 (1996), 758-767.

J. S. Armstrong and F. Collopy, "Competitor Orientation: Effects of Objectives and Information on Managerial Decisions and Profitability," *Journal of Marketing Research,* 33 (1996), 188-199.

J. S. Armstrong and F. Collopy, "The Profitability of Winning," *Chief Executive*, (June 1994), 61-63.

T. Hancock, J. Lane, R. Ray, D. Glennon, J. S. Armstrong, M. J. Mahoney, R. Hubbard and F. Collopy, "Factors Influencing Academic Research Productivity: A Survey of Management Scientists, *Interfaces*, 22 (1992), 26-38.

F. Collopy, "White Collar Computing: A Field Study Using Automated Logging," *Proceedings of the Twenty-First Annual Hawaii International Conference on System Sciences*, (1988), vol. IV, 236-244.

Information and technology in management software

Business Animator: the Cycle Model, abstract visualization of financial information, 2006.

The Desk Organizer (for Apple II, IBM PC and Macintosh computers) Warner Software; New York, 1983.

Information and technology in management PhD theses supervised

Lin Zhao, A Dynamic Representation of Financial Ratios: A Design and Empirical Test, 2007.

Kritsachai Somsaman, The Perception of Emotions in Multimedia: An Empirical Test of Three Models of Conformance and Context, 2003.

Dowan Kwan, The Effect of Valuation Logics of Information Technology on Company Performance: A Pluralistic Assessment of Paradox, 2001.

Information and technology in management lectures

"Producing Human-Centered, Usability-Sensitive and HCI-Competent Managers, CIOs and CEO," (invited panel with Ping Zhang, et al.), *CHI 06*, Montreal, April 24, 2006.

"The Design of an Interactive and Dynamic Representation of the Firm," (poster with Lin Zhao and Julia Grant), *CHI 06*, Montreal, April 24, 2006.

"Designing Abstract Visualizations," Syracuse University (April 28, 2008), University of Pittsburgh (June 2, 2006).

"Designing Abstract Visualizations: From Musical to Managerial," *New Media Consortium*, Cleveland, June 8, 2006.

"Designing Abstract Visualization: From Musical to Managerial," Cornell Information Science Seminar Series, November 17, 2004

"Navigating Music, Art and Business," The Art of Navigation: The World as an Interface Symposium, Cleveland Institute of Art, February 20-21, 2004.

"Managing in a World of Emerging Technologies," Weatherhead Affiliate Program, December 1997.

"Attitude as an Antecedent to Information Systems Use: A Meta-Analysis of Twenty-Five Years of Empirical Research," *Academy of Management,* 1997 (with H. Yang and B. Vandenbosch).

"On Worrying about the Impacts of Technology on Democracy," Discussant at the *Conference on Democracy and the Culture of Communications*, Cleveland, April 1995.

"Valuing Information Technology," Discussant at the *International Conference on Information Systems*, Vancouver, B.C., December 1994.

"Trends in Information Technology," Federal Reserve Bank of Cleveland, December 1994.

"Use of Technology by Non-Profit Organizations," *Achieving the Transforming Organization Conference*, Cleveland, November 1994.

"Information Systems Support for Managers and Professionals: Descriptions and Prescriptions," Wharton Executive Education Program on Management Information Systems for Strategic Advantage in 1987 and 1988; Weatherhead School MIDS Partners Board, 1989; Japanese Institute of Office Automation, 1992.

"Intelligence for Software Systems: Where Do We Find It?," Manchester School of Business, Manchester, UK, January 1989.

 "White Collar Computing: A Field Study Using Automated Logging," *Hawaii International Conference on System Sciences*, December 1988.

"Measuring Computer Use," IBM Thomas J. Watson Research Center, November 1987.

"Managerial Computing: Individual and Corporate Impacts," IBM Corporate Headquarters, October 1987.

Professional Appointments, Service and Awards

Design Issues, Editorial board, 2011-2018.

International Conference on Information Systems, HCI, Design Issues and Design Science, Track Co-chair, 2017.

Information and Organizations, Editorial board, 1995-2014.

US Environmental Protection Agency FIFRA Scientific Advisory Panel, Ad hoc reviewer, 2002 2011.

International Journal of Forecasting, Guest Editor of special section on Forecasting with Artificial Neural Networks and Computational Intelligence, 2011.

Professor of the Week*, Financial Times*, February 2011.

International Journal of Forecasting, Editor, January 2005-2010.

Teaching Excellence Award, Weatherhead School of Management, 2007-08.

International Journal of Forecasting, Associate Editor, 1993-2004.

International Institute of Forecasters, Director, 1993-2002.

Co-host, *Managing as Designing Workshop*, June 2002.

Co-editor, Special Issue on Judgmental Forecasting of the *International Journal of Forecasting*, March 1996.

Publicity Chair, International Conference on Information Systems (ICIS), 1996.

Academic Liaison, International Symposium on Forecasting (ISF), 1995.

AACSB, Web Project Coordinator, 1995.

Reviewer for: *Management Science*, *Management Information Systems Quarterly*, *Information Systems Research, Information and Organization (Accounting, Management and Information Technologies)*, *International Journal of Forecasting*, *Journal of Forecasting*, *Information and Management*, *Interfaces*, *Journal of Strategic Information Systems*, *Omega*, *International Journal of Human-Computer Systems*, *International Transactions in Operation Research*, *European Journal of Operational Research*, *International Conference on Information Systems (ICIS)*, *Nonprofit Management and Leadership*, *Technovation*, *Journal of Management Education*

Research Grants: National Science Foundation (2001), Mandel Scholars Grant (1995), Office of Naval Research (1992), Cleveland Foundation Grant for Arts Management (1992), WSOM Research Initiation Grant (1991).

Institutional Service

Case Western Reserve University
 Academic Affairs Council (was Dean's Council), 2006 -2012.
 Culture, Creativity and Design Provost's Committee, 2009-2012.
 Provost's Promotion and Tenure Committee, 2002, 2007.
 Faculty Advisory Committee, Presidential Search 2006.
 Climate Change Committee, 2006-present.
 Information Technology Advisory Committee, 2000-2004.
 University ERP Steering Committee, 2002.
 Provost's Committee on eLearning, 1998-2000.
 University Library Committee, 1990-1994.

Weatherhead School of Management
 Vice Dean, 2012-2017.
 Senior Associate Dean, 2010-2012.
 Curriculum Committee, 2006-2010.
 Department Chair, 2001-2010.
 Chair of Appointments Committee, 2004-2005, 2007-2009.
 Appointments Committee, 1999-2005, 2007- 2009.
 Elected member of Council, 1999-2001.
 Chair of Weatherhead Connection Steering Committee, 2000-2004.
 Undergraduate Committee, 2002-2003.
 PDPC, 2001-2002.
 Chair of Information Resources and Technology Committee, 1994-2000.
 Personnel Policy Committee 1996-1998.
 Research Committee, 1993-1997.
 Library Committee, 1991-1993.

Information Systems Department
 Chair, 2001-2010.
 Director of MSM-IS Program, 1999-2001.
 PhD Program Director, 1993-1997.

Related Academic Units
 Department of Cognitive Science, 2004-2019.
 Mandel Center Program Faculty Member, 1994-2009.
 Regional Economic Institute (REI) Academic Advisory Board, 1994-1998.

Consulting

I have consulted in the areas of information and systems (Apple, Sherwin Williams, Progressive, Lubrizol, Goodrich Landing Gear, Nordson Corporation, Cleveland Foundation, Federal Reserve Bank of Cleveland, Hillmed Medical, IBM, KeyCorp, Ford Motor Company, Sealy, Biological & Popular Culture, Inc., Cleveland Public Schools), business forecasting (Prodigy—IBM/Sears, Prince Manufacturing, Fingerhut Corporation, the U.S. Coast Guard, the U.S. Naval Office of Personnel Research and Development, U.S. Environmental Protection Agency, WCPN—Cleveland Public Radio, Cleveland Public Schools), and telecommunications modeling (City of Cincinnati, State of Massachusetts, Mid-States Theaters, National Urban League).

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