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EDUCATION

University of Massachusetts, Amherst, Massachusetts – Ph.D., 1978.

- Major Field: Accounting
- Minor Field: Computer Science
- Qualifying Fields: Behavioral Science, Economics, and Statistics and Research Methods.
- Dissertation Title: *A Relational Model for Events-Based Accounting Systems*.

Southern Illinois University, Edwardsville, Illinois – M.B.A., 1973
(United States Air Force MAC-MBA Program).

Boston College, Chestnut Hills, Massachusetts – A.B. (Economics) 1968.

EXPERIENCE

- Professor of Accounting, Michigan State University, July 1986 to Present – Also appointed as an *MSU Ameritech Scholar* for 1988-1989, as *Arthur Andersen Professor* for 1987-2002, and as *KPMG Faculty Fellow* for 2006-2012. Duties included teaching classes in accounting information systems and enterprise information management at the undergraduate, MBA, accounting masters, and doctoral level. Primarily responsible for development of information systems curriculum within accounting masters and MBA program.
- Member of e-commerce standards and implementation groups, March 2000 to present. Groups have included:
 - ebXML (electronic business extensible markup language) sponsored by UN/CEFACT and OASIS. Metamodel and Business Process Analysis teams. Duties have included participation in team development of detailed specification of information metamodel for ebXML and UN/CEFACT TMWG, development of ebXML specification schema, development of business process catalog specification, and business analysis overview and requirements worksheets
 - United Nations Trade Facilitation Group. Member of Business Process Group, Business Process Catalog Group, and Uniform Business Agreements and Contracts

- (UBAC) Group. Duties have included work on business entity types, collaboration state machine architecture, and business process classification scheme.
 - ISO (International Organization for Standards). Member of the Open-edi Standards Team (WG1, SC32). Duties have included preparation of the Open-edi Ontology Standard (15944-4) for economic and accounting, and related work on other Open-edi standards.
 - XBRL (extensible business reporting language) sponsored by the AICPA. Specification and Object Modeling teams (12 months only). Duties included development of object model specification for XBRL (not implemented).
 - AIAG (Automobile Industry Action Group) sponsored by OEM and supply chain firms in the automotive industry. Modeling Methodologies Team Co-Chair. Duties include preparation and conduct of modeling presentations and workshops for other e-commerce and materials management groups of AIAG plus coordination of supply chain modeling initiatives within AIAG.
 - Smaller amounts of standards work with OAG (Open Applications Group), OMG (Object Management Group), and the Ontolog Forum.
- Member, Artificial Intelligence Group, Technical Services Organization, Arthur Andersen & Co., Chicago, Illinois, September 1986 to June 1987 – Duties with 16 member AI (artificial intelligence) group charged with research and support for international practice. Specific projects included development of an expert systems methodology, exploration and development of capabilities in the areas of automated knowledge acquisition and machine learning, work with SEC financial reporting systems FSA and Eloise (the initial prototypes for **EDGAR**), and participation on a variety of client engagements.
- Associate Professor of Accounting, Michigan State University, 1982 to 1986 – Taught undergraduate and graduate courses in accounting information systems and developed an information systems specialty track within the Program for Professional Accountancy (accounting masters program).
- Assistant Professor of Accounting, Michigan State University, 1978 to 1982 – Courses taught at graduate and undergraduate level concerned accounting information systems and involved actual experience with database management systems, automated system specification tools, and internal control reviews of local companies.
- Teaching Assistant, University of Massachusetts, 1973 to 1977 – Courses taught included business information systems, computer programming in BASIC and FORTRAN, financial accounting, and managerial accounting.
- Administrative Management Officer, and Radar Site Executive Officer and Commander, United States Air Force, Texas, Mississippi, Delaware, and the Republic of Korea, 1968-1972.

HONORS, AWARDS, AND LEADERSHIP POSITIONS

Recipient of *Roland F. Salmonson Teaching Excellence Award* for 1984-85 from the Department of Accounting at Michigan State University.

Winner of Distinguished Alumni Award from the Department of Accounting and Information Systems, University of Massachusetts, 1985.

Elected National Chairman of the Information Systems Section of the American Accounting Association in 1985-86.

Appointed Editor in Chief, *The Journal of Information Systems*, 1989-1992

Recipient of *Roland F. Salmonson Teaching Excellence Award* for 1992-93 from the Department of Accounting at Michigan State University.

Listed as an Outstanding MBA Faculty in *Business Week Guide to MBA Programs* for 1995, 1998, and 2001 editions (also on BW web site).

Winner of the first *Seminal Contributions to the Accounting Information Systems Literature Award* from the Information Systems Section of the American Accounting Association in 1996.

Elected National Chairman of the Artificial Intelligence and Advanced Technologies Section of the American Accounting Association in 1998-99.

Winner of the "Best Professor Award" from *The Spartan Business Journal* (MBA students), 1999.

Winner of the *Withrow Teacher-Scholar Award* (College-Wide Lifetime Teaching Award) from the Broad College of Business, Michigan State University, September 1999.

Winner of *The MSU Distinguished Faculty Award*, 15 February 2000.

Elected Vice-President of the American Accounting Association for 2001 – 2003.

Recipient of *Roland F. Salmonson Teaching Excellence Award* for 2002-2003 from the Department of Accounting and Information Systems at Michigan State University.

Winner of the American Accounting Association's *Innovation in Accounting Education Award* in 2003.

Appointed Editor for *The Accounting Review* (top research journal in accounting), 2005 to present.

Winner of the American Accounting Association's *Outstanding Service Award* in 2007

Winner of 2008 *Outstanding Educator Award* from the Strategic and Emerging Technologies Section of the American Accounting Association.

Winner of the American Accounting Association's *Outstanding Accounting Educator Award* in 2008 (highest lifetime achievement award given to accounting professors internationally).

Winner of the "Outstanding Teacher Award" from the MS in Accounting students, Michigan State University, April 2009.

Recipient of *Roland F. Salmonson Teaching Excellence Award* for 2010-2011 from the Department of Accounting and Information Systems at Michigan State University.

American Accounting Association Prize for "Best Publication in Accounting Horizons – 2013" (with Guido L. Geerts, Lynford E. Graham, Elaine G. Mauldin, and Vernon J. Richardson).

PAPERS PUBLISHED

"An Entity-Relationship View of Accounting Models," *The Accounting Review* (October 1979), pp. 667-86 (also reprinted in *Information Systems for Accountants & Management*, J. W. Wilkinson and D. C. Kneer (eds.), Prentice-Hall, 1987).

"Construction and Use of Integrated Accounting Systems with Entity-Relationship Modeling," in P. Chen ed., *Entity-Relationship Approach to Systems Analysis and Design* (North-Holland, 1980), pp. 626-37.

"Multidimensional and Disaggregate Accounting Systems: A Review of the 'Events' Accounting Literature," *MAS Communication*, Vol. 5 (July 1981), pp. 7-13.

"The REA Accounting Model: A Generalized Framework for Accounting Systems in a Shared Data Environment," *The Accounting Review* (July 1982), pp. 554-78 (This paper was given the first *Seminal Contribution to the Accounting Information Systems Literature Award* by the American Accounting Association in 1996).

"Declarative and Procedural Features of a CODASYL Accounting System," in P. Chen, ed., *Entity-Relationship Approach to Information Modeling and Analysis* (North-Holland, 1983), pp. 197-213 (with Graham Gal).

"Specification of Internal Controls in a Database Environment," *Computers and Security* (March 1985), pp. 23-32 (with Graham Gal).

"Auditing and Information Systems: Some Problems and Opportunities," in D. Jensen, ed., *Information Systems in Accounting Education* (The Ohio State University, 1985), pp. 163-81 (with Alvin Arens and Graham Gal).

"Operation of a Relational Accounting System," *Advances in Accounting* (Volume 3, 1986), pp. 83-112 (with Graham Gal).

“An Events Accounting Foundation for DSS,” in C. W. Holsapple and A. B. Whinston (eds.) *Decision Support Systems: Theory and Applications* (Proceedings of the NATO Advanced Study Institute on Decision Support Systems, Maratea, Italy), Springer-Verlag Publishing Company, 1987, pp. 239-63 (with Eric Denna).

“On the Future of Knowledge-Based Accounting Systems,” in the *D. R. Scott Memorial Lecture Series*, (The University of Missouri, 1987) pp. 19-42, (also published in *Artificial Intelligence in Accounting and Auditing: The Use of Expert Systems*, M. Vasarhelyi (ed.), Markus Wiener Publishing, October 1987).

“FSA: Applying AI Techniques to the Familiarization Phase of Financial Decision Making,” *IEEE Expert* (Fall 1987), pp. 33-41 (with Chunka Mui).

“Accounting Information Systems: Research Directions and Perspective,” in *The Journal of Information Systems* (Fall 1987), pp. 29-32.

“Decision Support Using Entity-Relationship Modeling” in *Journal of Accounting and EDP* (Fall 1987) pp. 12-19 (with Howard Armitage).

“A Structured Methodology for the Design of Accounting Transaction Systems in a Shared Data Environment,” *Proceedings of the Structured Techniques Association*, May 1989, (with Stephen Rockwell and Howard Armitage).

“The Integrated Use Of First-Order Theories, Reconstructive Expertise, And Implementation Heuristics In An Accounting Information System Design Tool.” *Proceedings of the Ninth International Avignon Workshop on Expert Systems and Their Applications*, May 1989 (with Steve Rockwell), pp. 537-48.

“An Analysis of the Applicability of Artificial Intelligence Techniques to Problem Solving in Taxation Domains,” in *Accounting Horizons* (June 1989) pp. 14-27 (with Edmund Outslay).

“Database Accounting Systems” in *IT and Accounting: The Impact of Information Technology*. B.C. Williams and B.J. Spaul (eds.). London: Chapman & Hall, 1991, pp. 159-183 (with Guido Geerts).

“The Extended Use Of Intensional Reasoning And Epistemologically Adequate Representations In Knowledge-Based Accounting Systems” in *Proceedings of the Twelfth International Avignon Workshop on Expert Systems and Their Applications*, June 1992, (with Guido Geerts), pp. 321-32 .

“Conceptual Models Of Economic Exchange Phenomena: History's Third Wave of Accounting Systems” in *Collected Papers of the Sixth World Congress of Accounting Historians*, 1992, Kyoto, Japan. Volume I, pp. 133-164 (with Cheryl Dunn).

“Expert Systems and AI-Based Decision Support in Auditing. *The International Journal of Intelligent Systems in Accounting, Finance & Management* (January 1992), pp. 53-63 (with G. Gal, E.L. Denna, and S. Rockwell).

"Design, Development, and Deployment of Expert Systems within an Operational Accounting Framework," in *Artificial Intelligence in Accounting and Auditing: Knowledge Representation, Accounting Applications and the Future.*, VOL. 3, Markus Weiner Publishers, January 1995 (with Stephen Rockwell and Eugene Wallingford), pp. 155-76.

"Automated Integration of Enterprise Accounting Models throughout the Systems Development Life Cycle" (with Guido Geerts and Stephen Rockwell) *International Journal of Intelligent Systems in Accounting, Management and Finance* (September 1996), pp. 113-128.

"The REA Accounting Model: Intellectual Heritage and Prospects for Progress" *The Journal of Information Systems* (Spring 1997), pp. 31-51 (with Cheryl Dunn).

"Modeling Business Enterprises as Value-Added Process Hierarchies with Resource-Event-Agent Object Templates," in *Business Object Design and Implementation* J. Sutherland and D. Patel (eds.), 1997, Springer-Verlag, pp. 94-113 (with Guido Geerts).

"Semantic Modeling in Accounting Education, Practice, and Research: Some Progress and Impediments," in: *Conceptual Modeling: Current Issues and Future*, Editors: P. P. Chen, J. Akoka, H Kangassalo, B. Thalheim, L. Y. Wong. Springer Verlag, Berlin and Heidelberg, April 1999, pp.144-53..

"The Research Pyramid: A Framework for Accounting Information Systems Research," (with Julie Smith David, Cheryl L. Dunn, and Robin S. Poston) in *The Journal of Information Systems* (Spring 1999), pp. 1-23.

"An Accounting Object Infrastructure for Knowledge-Based Enterprise Models," *IEEE Intelligent Systems & Their Applications* (July/August 1999), pp. 89-94 (with Guido Geerts). Earlier version published in *Ontological Engineering: Papers from the 1997 AAAI Spring Symposium*, pp. 41-49, Adam Farquhar and Michael Gruninger (eds.) AAAI Press (ISBN 1-577357-042-1)

"REACH: Automated Database Design Integrating First-Order Theories, Reconstructive Expertise, and Implementation Heuristics for Accounting Information Systems" in *International Journal of Intelligent Systems in Accounting, Management, and Finance*, September 1999 (with Stephen Rockwell).

"Enterprise Resource Planning Systems Research: The Necessity Of Explicating And Examining Patterns In Symbolic Form" in *Proceedings of the First Annual Workshop on Enterprise Management and Resource Planning Systems: Methods, Tools and Architecture*, November 1999, Venice, Italy (with Julie David and Cheryl Dunn).

"Augmented Intensional Reasoning in Knowledge-Based Accounting Systems," *The Journal of Information Systems* (Fall 2000) pp. 127-50. (with Guido Geerts).

"Using Object Templates from the REA Accounting Model to Engineer Business Processes and Tasks," *The Review of Business Information Systems*, vol. 5, no. 4, 2001, pp. 89-108 (with Guido Geerts).

"An Ontological Analysis of the Primitives of the Extended-REA Enterprise Information Architecture," *The International Journal of Accounting Information Systems* (March 2002) pp. 1-16. (with Guido Geerts).

"Design Science: An REA Perspective on the Future of AIS," in *Researching Accounting as an Information Systems Discipline* (eds., V. Arnold and S. Sutton) American Accounting Association, Sarasota, 2002, pp. 35-63. (with Julie Smith David and Gregory J. Gerard).

"Agility: The Key to Survival of the Fittest in the Software Market" *The Communications of the ACM* (May 2003) pp. 65-69 (with Julie David and Brian Sommer).

"The REA Modeling Approach to Teaching Accounting Information Systems," *Issues in Accounting Education* (November 2003), pp. 427-441.

"Policy-Level Specifications in REA Enterprise Information Systems," *The Journal of Information Systems* (Fall 2006), pp. 37-63 (with Guido Geerts).

"ISO 15944-4: Information Technology – Business Operational View – Part 4: Business Transaction Scenarios – Accounting and Economic Ontology," International Standard, The International Organization for Standards (ISO), Geneva, Switzerland, November 2007 (author of all parts except for French translation of standard definitions).

"Accounting Craftspeople vs. Accounting Seers: Exploring the Relevance and Innovation Gaps in Academic Accounting Research." *Accounting Horizons* (December 2012), pp. 833-43.

"Integrating Information Technology into Accounting Research and Practice" *Accounting Horizons* (December 2013), pp. 815-840. (with Guido L. Geerts, Lynford E. Graham, Elaine G. Mauldin, and Vernon J. Richardson).

"ISO 15944-4: Information Technology – Business Operational View – Part 4: Business Transaction Scenarios – Accounting and Economic Ontology," Second Version of International Standard, The International Organization for Standards (ISO), Geneva, Switzerland, April 2015.

PRESENTATIONS

"A CODASYL Implementation of an Events Accounting System," Midwest American Accounting Association Meeting, Chicago, March 1980 (with Graham Gal).

"Multidimensional and Disaggregate Accounting Systems: A Review of the 'Events' Accounting Literature," Northeast American Accounting Association Meeting, New York, April 1980.

“A Case Study Demonstrating The Applicability Of Data Modeling To Accounting Object Systems” in *Proceeding of the 1980 Southeast Regional Meeting of the American Accounting Association (April 1980)*, pp. 319-324.

“Data Modeling of Accounting Systems,” National ORSA-TIMS Meeting, Colorado Springs, November 1980.

“Operation of a Relational Accounting System,” Northeast American Accounting Association Meeting, Newport, R.I., April 1982 (with Graham Gal).

“Specification of Internal Controls with QBE Views and Dictionary Facilities,” Midwest Meeting of the American Institute for Decision Sciences, Milwaukee, April 1982 (with Graham Gal).

“Derivation of Cost Accounting Data in a Relational Accounting System,” National Meeting of the American Institute for Decision Sciences, San Antonio, November 1983 (with Jane Fedorowicz).

“Materialization of Account Balances in the REA Accounting Model,” Invited Presentation to the British Accounting Association, Norwich, England, April 1984.

“The Frontiers of Accounting Information Systems Research,” National American Accounting Association Meeting, Toronto, August 1984 (with John Chandler and Ron Weber).

“An Artificial Intelligence Framework for Conceptual Specification and Evaluation of Internal Control,” National TIMS-ORSA Meeting, Boston, April 1985 (with Graham Gal).

“Operation of a Relational Accounting System,” Presentation to workshops at the University of Wisconsin, Pennsylvania State University, and Indiana University.

“A Computerized Information Systems Curriculum for 5-Year Accounting Programs,” National American Accounting Association Meeting, Reno, August 1985.

“Accounting Information Systems Courses and Curriculum,” National Meeting of the AAA Administrators of Accounting Programs Group, Phoenix, February 1987.

“On the Embedding of Domain Knowledge in Automated Software Engineering Tools: The Case of Accounting,” CASE88, Cambridge, Mass., July 1988 (with Stephen Rockwell).

“REACH: An Active CASE Tool Linking Accounting Domain Knowledge with View Modeling and Integration,” ACM-SIGART, St. Louis, August 1988 (with Stephen Rockwell) (also presented to Ohio State Accounting Workshop).

“Bull or Bear: The Use of Artificial Intelligence in Stock Markets,” American Society for Information Science, Atlanta, October 1988.

“Database Instantiation of Transaction Templates in an Expert System,” Ameritech Laboratories, Schaumburg Illinois, December 1988, (with Stephen Rockwell and Jon Sticklen).

“The Use of Artificial Intelligence Techniques in Accounting Research,” 1989 AAA Doctoral Programs Conference, New Orleans, January 1989 (with Rayman Meservy).

“Knowledge-Based Representation and Decision Use of Purchasing Domain Data,” 1989 NAPM Purchasing/Materials Management Symposium (March 1989) (with Stephen Rockwell and Jon Sticklen).

“AIS at MSU,” Presented to Michigan Accounting Educators Conference in Grand Rapids, May 1989.

“An Analysis of the Content and Objectives of the Accounting Information Systems Course,” 1988 Canadian Academic Accounting Association Meeting, Windsor, Ontario, June 1988

“Design, Development, and Deployment of Expert Systems within an Operational Accounting Framework,” The Workshop on Innovative Applications of Computers in Accounting Education, Lethbridge, Alberta (May 1989) (with Stephen Rockwell and Eugene Wallingford).

“Automated Retrieval and Decision Use of Events Accounting Data in Future Capital Markets,” *World Conference on Information Processing*, Seoul, Korea, June 1989.

“Research Directions in Accounting Information Systems,” Workshop at the 1989 Midwest Meeting of the AAA (with R. Boland and D. Stone).

“Integrating Intelligence into Databases: Some Example Approaches,” Presentation at the *USC Symposium on Artificial Intelligence in Business, Management, and Accounting*, October, 1989 (with S. Rockwell and G. Gal).

“Knowledge Synthesis in REACH,” Presentation at the 1990 TIMS-ORSA Meeting, Las Vegas, May, 1990 (with S. Rockwell).

“Once Upon a Time at the Agleclap Store ... -- What Accountants and Managers of All Persuasions Need to Know About Economic Storytelling and Database Accounting,” Presented at the 1990 AAA Senior Faculty Consortium in Phoenix in June of 1990.

“Expert Systems and AI-Based Decision Support in Auditing: Progress and Perspectives,” 1990 University of Kansas Auditing Symposium (May, 1990) and (with Graham Gal and Eric Denna).

“An Overview of the REA-CH and REA-L Systems,” given at the campus-wide Symposium on Applications of Artificial Intelligence, July, 1990, Wells Hall, MSU.

“Publishing Opportunities in Information Systems,” Presentation at the August 1990 National Meeting of the American Accounting Association, Honolulu, Hawaii.

“Conceptualizing and Practical Implications of the Use of a Knowledge-Based Events Accounting System,” at the *IFORS Specialized Conference on Decision Support Systems*, Bruges, Belgium, March 1991 (with Guido Geerts and Stephen Rockwell).

“Semantic Specification and Automated Enforcement of Internal Control Procedures within Accounting Systems,” at the 1991 European Accounting Congress, Maastricht, The Netherlands, April 1991 (with Graham Gal) (paper also presented to workshops at the University of Georgia, Florida State University, the University of Western Australia, the University of Tasmania, and Melbourne University).

“Database Accounting Systems,” The Free University of Brussels, April 1991.

“Database Instantiation of Transaction Templates in an Expert System,” *The International Conference on Expert Systems in Management and Accounting*, Pasadena, CA, October 1991 (with Stephen Rockwell).

“The Cost Revolution from a Data Modeling Point of View,” The Fifteenth Annual Congress of the European Accounting Association, Madrid, Spain, April 1992 (with Guido Geerts).

“Database Accounting Support for Decision Problems in the New Manufacturing Environment,” *The International Conference on Economics/Management and Information Technology*, Tokyo, Japan, September 1992 (with Guido Geerts).

"On the Embedding of Domain-Specific Knowledge in CASE Tools," *Workshop on Information Technology*, Orlando, Florida, December 1993 (with Stephen Rockwell).

"Event-Driven Business Solutions: Implementation Experiences and Issues." *The Fourteenth International Conference on Information Systems*, Orlando, FL, December 1993 (with Owen Cherrington, D.P. Andros, R. Roth, and E.L. Denna).

"Events-Based Accounting Systems: A Research and Practice Summary" The Free University of Brussels, Belgium, April 1994.

"Augmented Intensional Reasoning in Knowledge-Based Accounting Systems" *The International Workshop on Knowledge-Based Systems and Strategic Management*, June 1994, ABO, Finland: EAA (with Guido Geerts).

"Origins of Events-Based Accounting Systems Concepts" Presentation to the 300th Anniversary Program, Martin Luther University, Halle-Wittenberg, Germany, September 1994 (with Cheryl Dunn).

"The Economic and Strategic Structure of REA Accounting Systems" Presentation to the 300th Anniversary Program, Martin Luther University, Halle-Wittenberg, Germany, September 1994 (with Guido Geerts).

"Origins of Events-Based Accounting Systems Concepts" TIMS-ORSA Conference, Detroit Michigan, October 1994 (with Cheryl Dunn).

"Augmented Intensional Reasoning in Knowledge-Based Accounting Systems" TIMS-ORSA Meeting, Detroit Michigan, October 1994 (with Guido Geerts).

“The Semantic Reorientation of Financial Information Systems for Strategic Use,” presentation to *The Second Financial Information Systems Conference*, Sheffield, England, June 1995” (with Guido Geerts) .

“The Evolution of Accounting Systems,” Presentation to Erasmus University of Rotterdam, The Netherlands, 1 September 1995.

“Use of an Accounting Object Infrastructure for Knowledge-Based Enterprise Models” (with Guido Geerts); Presentation to the *Workshop on Modeling the Enterprise with Objects* (15 October 95) and to the *Workshop on Business Object Design and Implementation* (16 October 95) at the ACM Conference on Object-Oriented Programming Systems, Languages, and Applications (OOPSLA 95), Austin, Texas.

“The Future of AIS -- Developing Our Own Frameworks for Research and Teaching,” Presentation to the AIS Research Symposium, Phoenix, 16 February 1996.

“The Evolution of Enterprise Information Systems” Presentation to the *Workshop on Business Object Design and Implementation- II* (October 1996) at the ACM Conference on Object-Oriented Programming Systems, Languages, and Applications (OOPSLA 96), San Jose, Calif. (with Julia Smith David and Brian S. Sommer).

“Using Object Templates from the REA Accounting Model to Engineer Business Processes and Tasks” paper presented to the *20th Congress of the European Accounting Association*, Graz, Austria, April 1997. Also presented to the OOPSLA Midyear Workshop on Object Models for Transaction Processing Systems, Port Jefferson, NY, June 1997 (with Guido Geerts).

“Accounting as Romance: Patterns of Unrequited Love and Incomplete Exchanges in Life and in Business Software.” Presentation to the *Workshop on Business Object Design and Implementation- II* (October 1997) at the ACM Conference on Object-Oriented Programming Systems, Languages, and Applications (OOPSLA 97), Atlanta, Georgia. Also presented to the REA roundtable at Arizona State University, February 1998 (with Guido Geerts). Also presented to SMAP-1998.

“Research Directions in Artificial Intelligence Systems, Accounting Ontologies and Advanced Technologies,” Presentation to annual AAA meeting in Dallas Texas, August 1997.

“Catch-22 Farm Technology teaching case,” presentation to SMAP-1997, Dallas.

“Fundamentals of the REA Accounting Domain Model,” Presentation made to the *Conference on Ontological Perspectives in Information Systems*, Balzano, Italy, September 1997.

“Semantic Modeling in Accounting Research, Practice, and Education: Some Progress and Impediments,” presentation to the *1997 Conference on Conceptual Modeling*, UCLA, November 1997.

"Augmented Intensional Reasoning in Knowledge-Based Accounting Systems" Presentation made to The University of Oklahoma Accounting Workshop, February 1998.

“The AIS Research Pyramid,” presentation to SMAP-1998

“Overview of Accounting Systems Research and Accounting Systems Evolution,” Panel presentation to *the First European Conference on Accounting Information Systems*, Antwerp, Belgium, April 1998.

“The NICOSYS teaching case,” Presentation to SMAP-1999.

“An Ontological Analysis of the Primitives of the Extended-REA Enterprise Information Architecture,” Presentation to the 7th AIS Conference, Phoenix, February 2000.

“Jane’s JELL-O teaching case,” Presentation to SMAP-2000

“Applying Semantic Wrappers to Legacy Information Systems with REA-Verse Engineering,” Presentation to SMAP-2000 (with Guido Geerts and Steve Rockwell).

“The Use of REA Modeling in AIS Research,” Workshop presented to *European Conference on Accounting Information Systems*, Munich Germany, March 2000

“REA Accounting Models – The Need for Both Internal & External Views in a World of Interconnected Enterprises,” Invited Keynote Presentation to *European Conference on Accounting Information Systems*, Munich Germany, March 2000.

“The Use of REA Modeling in AIS Instruction,” Presentation to Midwest AAA Meeting, Indianapolis, April 2000 (with Anita Hollander).

“*The REA (Resources, Events, Agents) Model – Implications for Accounting Educators*,” Invited Presentation to National Meeting of the Canadian Accounting Association, Halifax, Nova Scotia, June 2000.

“REA Economic Agents as Homines Economici in an Agent-Oriented Information Systems Environment,” Invited Keynote Presentation to *The Second International Bi-Conference Workshop on AGENT-ORIENTED INFORMATION SYSTEMS* (AOIS-2000) 30 July 2000, Austin, Texas, USA, at AAAI-2000.

“The Ontological Foundation of REA Enterprise Information Systems,” Presentation to the Annual Meeting of the American Accounting Association, Philadelphia, August, 2000 (with Guido Geerts) (paper also presented to workshops at the University of Kansas, Virginia Tech, the University of South Florida, the University of Alabama, the University of Wisconsin, and the University of Minnesota).

“Teaching Business Processes in Introductory Accounting” Presentation to the Annual Meeting of the American Accounting Association, Philadelphia, August, 2000 (with Anita Hollander and Julie Smith David).

“Information Systems, Databases, and Event Messaging in the Age of XML,” Presentation to the Annual Meeting of the American Accounting Association, Philadelphia, August, 2000.

“The REA Accounting Ontology,” Presentation to the Accounting Faculty at the Autonomous University of Madrid, 31 October 2000.

“REA Economic Agents as *Homines Economici* in an Agent-Oriented Information Systems Environment,” Invited Keynote Presentation to *The Fifth International Conference On Artificial Intelligence And Emerging Technologies In Accounting, Finance And Tax*, Huelva, Spain. 2 November 2000.

“The Fundamental Components of the BRV Level of the ebXML Metamodel and Their Relationship to XBRL Components,” Presentations to the Tools Group and the main sessions of the US Jurisdictional Meeting of XBRL, Scottsdale, AZ., 25 January 2001.

“The REA Ontology as the Microeconomic Foundation of the ebXML Business Requirements View,” Presentation to the Business Process, Metamodel Specification, and Core Components Teams, *ebXML Plenary Meeting*, Vancouver, Canada, 13 February 2001.

“The Supply Chain Modeling Methodology,” Presentation to The Automobile Industry Action Group Modeling Workshop, Southfield, MI., 20 February 2001.

“REA Ontology Use in ebXML and the UN/CEFACT Modeling Methodology (N90)” Published Position Paper at the *First Semantic Web Conference*, Stanford University, July 2001 (with Guido Geerts).

“Materialization of Account Balances in the REA Accounting Model” paper presented to *SMAP-2001*, Atlanta, Georgia in August 2001 (with Julie David and Guido Geerts).

“Using Object Templates from the REA Accounting Model to Engineer Business Processes and Tasks,” presentation to the *AIS Educator Conference*, August 2001, Colorado (with Guido Geerts).

“Materialization of Account Balances in the REA Accounting Model” paper presented to *The University of Kansas XBRL Research Conference* in Lawrence, Kansas in October 2001.

“REA: A Semantic Model for Internet Supply Chain Collaboration,” Presentation to *The Business Object Component Workshop VI: Enterprise Application Integration*, ACM OOPSLA Conference, Minneapolis, MN. 16 October 2001.

“REA, ebXML, and ALOE: Accounting Recognition within the BRV Level of the UMM and ebXML,” presentation to *SMAP-2002*, Phoenix, FEB 2002.

“The REA Enterprise Economic Ontology and Its Use in E-Commerce Standards” Invited Keynote Presentation to the AIS Educators Association. Pingree Park, Colorado, July 2002.

“The Ontological Foundations of REA Enterprise Information Systems,” Presentation given to Microsoft Business Solutions Division in Copenhagen, October 2002.

“The Ontological Foundations of REA Enterprise Information Systems,” Presentation given to Royal Institute of Technology (KISTA) in Stockholm, November 2002.

“The REA Enterprise Economic Ontology and Its Use in E-Commerce Standards”
Presentation to the ISO Ontology and Metadata Forum, Santa Fe, New Mexico, January 2003.

“Design Science,” Presentation to the AAA-IS Doctoral Consortium, January 2003.

“Type-Level Specifications in REA Enterprise Information Systems,” Presentation to SMAP-2003, Honolulu (with Guido Geerts).

“The REA Modeling Approach to Teaching Accounting Information Systems,” Presentation to the Annual Meeting of the American Accounting Association, Honolulu, August, 2003.

“The REA Enterprise Economic Ontology and Its Use in E-Commerce Standards”
Presentation to the Open Applications Group (OAG) – Semantic Interoperability Group, Detroit, 14 August 2003.

“The REA Enterprise Economic Ontology and Its Use in E-Commerce Standards”
Presentation to the Object Management Group (OMG) – Business Enterprise Integration Task Force, Boston, 8 September 2003.

“The UN/CEFACT Catalog of Common Business Processes,” Presentation given to the UN/CEFACT Forum, Palais des Nations, Geneva, Switzerland, September 2003 (with Colin Clark and Nita Sharma).

“The AAA Intensive Workshop on Teaching Accounting Systems.” Presentation to the Annual Meeting of the Federated Schools of Accounting, Denver, October 2003 (with Tracey Sutherland).

“On the Partial Mapping of Mediated REA Scenarios in E-Commerce Collaboration Space,”
Presentation to the University of Kansas XBRL Symposium II, Lawrence, Kansas, 24 October 2003.

“The REA Enterprise Economic Ontology and Its Use in E-Commerce Standards”
Presentation to the UBL-ONTOLOG Forum, San Francisco, 5 November 2003.

“The REA Accounting and Economic Ontology: Proposed State Machine,” Presentation to the First UBAC Workshop, Stockholm, Sweden, 6 December 2003 (also presented to SMAP-2004, Clearwater Beach, FL, 8 January 2004).

“AIS Teaching and Scholarship,” Presentation to the IS Section of the AAA Mid-Year Meeting, Clearwater Beach, Florida, January 2004.

“The UN/CEFACT Classification System for Common Business Processes,” Presentation given to the UN/CEFACT Forum, Bonn, Germany, March 2004.

“AIS Research and Teaching,” Presentation to the Midwest Section of the AAA, Kansas City, March 2004.

“The REA Accounting and Economic Ontology: Proposed State Machine,” Presentation to the First REA Research Conference, Copenhagen, Denmark, 23 April 2004.

“Type-Level Specifications in REA Enterprise Information Systems,” Presentation to the First REA Research Conference, Copenhagen, 23 April 2004 (with Guido Geerts).

“The REA Enterprise Economic Ontology and Its Use in E-Commerce Standards” Presentation to the 7th *Protégé Users’ Conference*, NIH Headquarters, Bethesda, Maryland, 7th July 2004.

“Type-Level Specifications in REA Enterprise Information Systems,” Presentation to the American Accounting Association Annual Meeting – Research Workshop for the Artificial Intelligence & Emerging Technologies Section, Orlando, August 2004

“The Future Directions of XBRL,” Presentation given as part of panel, American Accounting Association Annual Meeting, Orlando, 10 August 2004.

Keynote Speech to the The First International Conference on Enterprise Systems and Accounting on 3 September 2004 in Thessaloniki, Greece entitled “The Evolution toward REA Accountability Infrastructures for Enterprise Systems ”

“Western Michigan Office Furniture teaching case,” Presentation to the Semantic Modeling of Accounting Phenomena (SMAP) Workshop in New Orleans in January 2005.

“The Ontological Foundations of REA Enterprise Information Systems,” Presentation to the College of Business Research Workshop at Tulane University, 18 February 2005

Worldwide networked speech given on 17 March 2005 to the Ontolog Forum entitled “*The Integration of an Accounting Domain Ontology (REA) with an Upper Ontology (SUMO)*.” The slides and the recorded presentation of this speech are available from the link on my web site at <http://www.msu.edu/user/mccarth4/index.html> .

Keynote Speech to the Ohio Regional Meeting of the American Accounting Association, Columbus, 29 April 2005 entitled “*The Natural Expansion of Accounting Systems*”

“Type-Level Specifications in REA Enterprise Information Systems,” Presentation to the Annual Meeting of the American Accounting Association, San Francisco, August, 2005 (with Guido Geerts).

“The Ontological Foundations of REA Enterprise Information Systems,” Presentation to the Annual Meeting of the American Accounting Association, San Francisco, August, 2005 (with Guido Geerts).

"Semantic Specification and Automated Enforcement of Internal Control Assertions for Accounting Systems," Presentation to the Rutgers Continuous Auditing Symposium, November 2005.

"The Nantasket Manufacturing Case" Teaching Case presented to SMAP-2006, Phoenix, January 2006.

"Accounting Information Systems -- Research Topics in Semantic Enterprise Systems"
Luncheon presentation to the Information Systems Section Annual Meeting, Phoenix, January 2006.

"Policy-Level Specifications in REA Enterprise Information Systems," Presentation to the Annual Meeting of the Information Systems Section of the American Accounting Association, Phoenix, January 2006 (with Guido Geerts). This paper was given the **"Best Research Paper Award"** for the Conference.

"The Ontological Foundations of REA Enterprise Information Systems," Workshop presentations to the Philadelphia Area Accounting Research Symposium (University of Delaware), Rutgers University, and the University of California-Davis, Spring 2006.

Keynote Speech to The Third International Conference on Enterprise Systems and Accounting on 25 June 2006 in Santorini Island, Greece entitled "The Need for Design Science Research in Accounting."

"The REA Elevator Speech – the What, When, Who, Why, and How of Events-Based Accounting and Enterprise Systems," Presentation to the Semantic Modeling of Accounting Phenomena (SMAP) Workshop in Savannah, Georgia, January 2007.

"The Process Decomposition Stopping Point – Accommodating Different Levels of Managerial Control," Presentation to the Semantic Modeling of Accounting Phenomena (SMAP) Workshop in Savannah, Georgia, January 2007.

"What's Wrong with XBRL" Presentation to the University of Kansas XBRL Symposium, 11 May 2007.

"The REA Elevator Speech – the What, When, Who, Why, and How of Events-Based Accounting and Enterprise Systems," Presentation to REA-25 – Conference Celebrating the 25th Anniversary of the REA Model, Newark, Delaware, 13 June 2007.

"The Necessity of Embedded Accounting Semantics, Invited Keynote Speech to REA-25, Conference Celebrating the 25th Anniversary of the REA Model, Newark, Delaware, 13 June 2007.

"Design Science Research in Accounting," Presentation as part of a research panel at the Annual Meeting of the American Accounting Association, August 2007, Chicago, IL.

"The REA Enterprise Ontology – An Events-Based Foundation for the New Generation of Business Information Systems Within and Between Enterprises," Invited Keynote Speech to CONFENIS 2007 -- The IFIP International Conference on Research and Practical Issues of Enterprise Information Systems, Beijing, China, 10 October 2007.

"Ontological Extensions to the REA Model to Support Continuous Monitoring," Presentation to the 14th World Continuous Auditing and Reporting Conference, Newark, New Jersey, 3 November 2007.

"Teaching REA Modeling with UML and Time-Phased Coloring," Redondo Beach, California, 3 January 2008, Semantic Modeling of Accounting Phenomena (SMAP) Workshop.

"The REA Elevator Speech – the What, When, Who, Why, and How of Events-Based Accounting and Enterprise Systems," Vienna, Austria, 4 February 2008, Research Seminar, Technical University of Vienna, Austria.

"ISO-IEC 15944-4 – The Open-edi Accounting & Economic Ontology," Arlington, Virginia, 12 May 2008, The NSF Arlington Accounting Interoperability Workshop.

"Ontologically-Driven Standards Development for Business Process Systems," On-line worldwide presentation on the ONTOLOG Forum, 5 June 2008, Worldwide ONTOLOG audience.

"An OCL Framework for Representing Internal Controls in an REA Framework," Montpellier, France, 15 June 2008, The 2008 REA Workshop (with Graham Gal and Guido Geerts).

"The REA UML Profile," Berlin, Germany, 24 June 2008, UN-CEFACT TMG Meeting.

"Report on the NSF Arlington Interoperability Summit," Anaheim CA, 4 August 2008, American Accounting Association Annual Meeting.

Research presentation the roles of "seers" and "craftsmen", Presentation as part of a research panel, Anaheim CA, 6 August 2008, American Accounting Association Annual Meeting,

"The REA UML Profile", Tokyo, Japan, 10 September 2008, UN-CEFACT TMG Meeting.

"A Different Way of Thinking about Accounting," Copenhagen Business School, Denmark, 18 November 2008, The 3rd Generation ERP Workshop -- Invited Presentation.

"ISO-IEC 15944-4 – The Open-edi Accounting & Economic Ontology," Ghent University, Belgium, 20 November 2008, seminar for the MIS Group.

"Improving the Interoperability Possibilities by Enhancing the Semantic Expressiveness of Conceptual Categories," The Technical University of Vienna, Austria, 24 November 2008, University e-Commerce Forum -- invited presentation.

"The SEC's Interactive Data Initiative & XBRL," Charleston, South Carolina, 10 January 2009, Midyear Meeting of the Information Systems Section of the AAA (with Graham Gal).

"Modeling Multi-party Collaborations in e3-Value and REA: An Example and Some Preliminary Observations," Stockholm, Sweden, 9 February 2009, The International Workshop on Value Modeling and Business Ontologies (VMBO) (with Rainer Schuster & Thomas Motal).

“Semantic Specification & Automated Enforcement of Internal Controls,” Stockholm, Sweden, 10 February 2009, The International Workshop on Value Modeling and Business Ontologies (with Graham Gal).

“Ontologically-Driven Standards -- the Natural Tensions,” On-line worldwide ONTOLOG community, 19 March 2009, worldwide group of standard setters.

“REA Modeling – the hard stuff,” Presentation to the Semantic Modeling of Accounting Phenomena Workshop (SMAP -2009), 2 August 2009, New York City.

“Modeling Multi-party Collaborations in e3-Value and REA: An Example and Some Preliminary Observations,” Presentation to the Semantic Modeling of Accounting Phenomena Workshop (SMAP -2009), 2 August 2009, New York City.

“An Ontology-Based Business Process State Machine,” Amsterdam, Holland, 21 December 2009, The International Workshop on Value Modeling and Business Ontologies – VMBO-2009 (with Satoshi Horiuchi, Graham Gal, and Guido Geerts).

“Accounting Interoperability and XBRL,” Clearwater Beach, Florida, 8 January 2010, Mid-year meeting of the IS Section of the AAA.

“The New ERP: SaaS and REA,” Introductory comments presented to The Transformative Technologies in Accounting Workshop, San Francisco, CA. 6 August 2010.

“Types and Tasks,” presentation to SMAP 2010, San Francisco, CA. 8 August 2010. ,
“A Study for Modeling Service with REA in Regard to the Logistics Services in the Bill’s Bike Case” presentation with Satoshi Horiuchi to SMAP 2010, San Francisco, CA., 8 August 2010.

“The Ontological Foundations of REA Enterprise Information Systems” Invited Keynote Presentation (with Graham Gal and Guido Geerts) to The Workshop on Value Management and Business Ontologies (VMBO), Ghent, Belgium, 7 February 2011

“An Ontology-based State Machine for Catalog Orders, presentation with Satoshi Horiuchi to The Workshop on Value Management and Business Ontologies (VMBO), Ghent, Belgium, 7 February 2011.

“Perspectives on Design Science Research in Accounting and Accounting Craftspeople vs. Accounting Seers,” presentation to the Executive Committee of the AAA, Tampa, Florida 5 May 2011.

“Teaching REA – the Hard Stuff,” Presentation to the SMAP Workshop, Denver Colorado, 6 August 2011.

“How I changed practice or how Practice has changed me,” presentation to the AAA Annual Meeting, Denver Colorado, 8 August 2011.

"How should we teach accounting information systems," Presentation to the AAA Annual Meeting, Denver Colorado, 8 August 2011.

“Alignment of the REA and the EDMC Financial Ontologies,” Presentation to The Workshop on Value Management and Business Ontologies (VMBO), Vienna, Austria 20 February 2012.

“Educational Innovation for AIS,” Presentation to Teachers of Accounting at Two Year Colleges (TACTYC) Annual Meeting (with Julie Smith David, Tracey Sutherland, and Susan Crosson), Savannah, Georgia, 5 May 2012.

"Master Teachers – Mentoring," Presentation to the AAA Annual Meeting, Washington, DC, 6 August 2012.

“The Pathways Commission -- REA Research Exemplar,” Presentation to the AAA Annual Meeting, Washington, DC, 6 August 2012.

"REA: Celebrating 30 Years of Significant Contribution to Accounting," Presentation to the AAA Annual Meeting, Washington, DC, 7 August 2012.

“The REA Enterprise Ontology,” Keynote Presentation for *The 6th International Conference on Research and Practical Issues of Enterprise Information Systems*, Ghent, Belgium, 20 September 2012.

"The REA-invention of accounting: Developing the accounting systems of the future with REA semantics" – Presentation to the Microsoft Enterprise Systems Group, Bellevue, Washington, 2 February 2013.

“The REA Accounting and Economic Ontology –Its Use in ISO 15944-4 and Its Development as a Literary Warrant”, November 7th 2013, Worldwide Presentation made to the Ontolog Forum.

“E-R or ERP: Which Came First?” Presentation to the *Conference on Conceptual Modeling*, Atlanta, Georgia, 27 October 2014.

“The REA Ontology Research Monograph” Presentation to *The Value Management and Business Ontology Workshop* (VMBO 2015), Tilburg University, Netherlands, 23 February 2015

“Combining Accounting Systems with Business Analytics at Michigan State University,” Presentation to the 2015 EYARC Analytics Colloquium, June 2015.

“REA Progress & Prospects.” Presentation to the Annual Meeting of the American Accounting Association, August 2015, Chicago, IL.

“Congruent and Meronymic Constellations in the REA Ontology” Presentation to *The Value Management and Business Ontology Workshop* (VMBO 2016), Trento University, Italy, 11 March 2016 (with Graham Gal and Guido Geerts)

http://www.loa.istc.cnr.it/vmbo2016/wp-content/uploads/2016/02/VMBO2016_paper_15.pdf

“The Economic Structures of Exchanges vs. Conversions in the REA Enterprise Ontology”
Presentation to *The Workshop on Understanding the Notion of Value in the Service Economy*,
Trento University, Italy, 14 March 2016

<http://www.foa.istc.cnr.it/vmbo2016/wp-content/uploads/2016/02/conversion-paper-trento-22-FEB.-embedded-figures.pdf>

RESEARCH AND TEACHING WORKSHOPS

"The REA Boot Camp -- A Week-Long Workshop on Teaching the Accounting Information Systems Course" -- AIS Teaching Workshop sponsored by the American Accounting Association for the years 2002 through 2006 at the Kellogg Center at Michigan State University. This was an experimental program where we accepted college professors from around the world (35-38 each year) to participate in six days of extensive tutorials and computer work on teaching the REA approach to teaching AIS. Class instruction time was 44 hours with multiple assignments due during afternoon and night breaks. The class was oversubscribed each of the five years. I was assisted by Tracey Sutherland, Guido Geerts, Julie David, Cheryl Dunn, and three MS-Accounting students from MSU (Adrian Tirtarahardja, Samantha Lew, Tim Dixon). More information available at <http://www.msu.edu/user/mccarth4>.

"Design Science and REA Modeling" 2-day Research Seminar presented for academics from Australia and New Zealand, 22-23 January 2004, University of Technology, Sydney. Information available at <http://www.msu.edu/user/mccarth4>.

FUNDED RESEARCH PROPOSALS

"Internal Control Specification and Evidence Gathering in the REA Accounting Model," Funded by the Peat, Marwick, Mitchell Foundation. This research deals with implementation and use of a non-traditional (no accounts or double-entry structures) accounting system. Specific audit features to be incorporated in this system include integrity assertions (for internal control specification) and non-procedural retrieval capabilities (for audit queries), 1980.

"The Use of Structured and Conceptual Design Techniques in the Development of an Advanced Accounting Information Systems Curriculum," Funded by the Touche Ross Foundation. This research deals with the development and use of structured specification tools (such as PSL/PSA) and with the use of microcomputer database systems in a five-year accounting systems curriculum, 1981. The courses started here formed the backbone for the MSU Masters of Accounting – Systems Track which came on line in the Fall of 1987.

"Knowledge-Based Representation and Decision Use of Accounting Data," The Ameritech Foundation. Research dealt with embedded REA model use in intelligent systems for purchasing and for automated database design, 1989.

"Ontological Specification of Interoperability Semantics for Financial Information and Business Reporting Systems" A National Science Foundation Research Grant, 2008-09. This grant centered around a workshop that I organized and ran in Arlington, Virginia for the National Science Foundation on the topic of accounting interoperability standards. Presenters and participants from all affected standards (XBRL, UN-CEFACT, SDMX) plus major IT companies participated.

DISSERTATIONS CHAIRED:

Howard M. Armitage, "Toward an Improved Distribution Accounting Information System through an Entity-Relationship Data Modeling Approach," 1983. Retired Chaired Professor at The University of Waterloo.

Paul J. Steinbart, "The Construction of an Expert System to Make Materiality Judgments," 1984 (Results published as the first and only expert systems research in *The Accounting Review*; paper also given IS Section Award for Notable Contribution to the AIS Literature). Currently Chaired Full Professor at Arizona State University.

Graham F. Gal, "Using Auditor Knowledge to Formulate Data Model Constraints: An Expert System for Internal Control Evaluation," 1985. Currently Associate Professor at The University of Massachusetts at Amherst.

Eric Denna, "Toward a Representation of Auditor Knowledge: Evidence Aggregation and Evaluation" 1989 (One of the resulting papers was given IS Section Award for Notable Contribution to the AIS Literature). Currently Chief Information Officer for the University of Maryland, College Park.

Stephen Rockwell, "The Conceptual Modeling and Automated Use of Reconstructive Accounting Domain Knowledge" 1993 (Winner of the 3rd AAA-IS Outstanding Dissertation Award). Currently Associate Professor at The University of Tulsa.

Guido L. Geerts, "Toward a New Paradigm in Structuring and Processing Accounting Data" 1993 (This thesis was given highest distinction award from The Free University of Brussels), Co-Supervisor with Marc Despontin. Currently Professor at the University of Delaware.

Cheryl Dunn, "An Investigation of Abstraction in Events-Based Accounting Systems" 1994 (Winner of the 4th AAA-IS Outstanding Dissertation Award). Currently Associate Professor at Grand Valley State University.

Julie Smith David, "An Empirical Analysis of REA Accounting Systems, Productivity, and Perceptions of Competitive Advantage" 1995 (Winner of the 5th AAA-IS Outstanding Dissertation Award). Currently Chief Technology Officer for the American Accounting Association.

Gregory Gerard, "REA Knowledge Acquisition and Related Conceptual Database Design Performance" 1998 (Winner of the 8th AAA-IS Outstanding Dissertation Award). Currently Associate Professor at Florida State University.

Other dissertations served as reading member: Anderson (MSU-Accounting), Trewin (MSU-Accounting), Essex (MSU-Accounting), March (MSU-Management), Miller (MSU-CPS), Wallingford (MSU-CPS), Mitri (MSU-CPS), Hawkins (MSU-CPS), Martinez (MSU-CPS), Back (Finland), Adamson (Canada), Debreceny (Australia), Laurier (Belgium), Mayrhofer (Austria) Karimi (Canada).