

## **Emory W. Zimmers, Jr.**

Lehigh University, B.S. Industrial Engineering, 1966  
 Lehigh University, B.S. Mechanical Engineering, 1967  
 Lehigh University, M.S. Industrial Engineering, 1968  
 Lehigh University, Ph.D. Industrial Engineering, 1973

### **Appointments**

Professor, Industrial and Manufacturing Systems Engineering, 1980 to present  
 Director, Enterprise Systems Center, 1995 to present  
 Site Director, NSF CELDi, 2005 to present  
 NSF Partner for "Greenfield Coalition for Manufacturing Education." 1995 to 2004  
 Fellow, Institute of Industrial Engineers, 2001  
 Fellow, Society of Manufacturing Engineers, 2000  
 Deputy Director, Iacocca Institute, Lehigh University, 1993-1999  
 Director, Computer Integrated Manufacturing (CIM) IM Lab, 1984 to 1994  
 Director, Computer-Aided Manufacturing (CAM) Lab, 1970s

### ***1. Professional Experience.***

Academic Current: Dr. Emory W. Zimmers, Jr. is Professor of Industrial and Systems Engineering (ISE) at Lehigh University and Director of the Enterprise Systems Center (ESC). In the role of Professor, he teaches courses in leadership, industrial and business systems, computer-integrated manufacturing, and computer graphics. All undergraduate ISE students take his industry-based senior project course. As Center Director he leads multi-disciplinary project teams which analyze factory operations and design improved systems in collaboration with the Center's industry partners. In recent years, project contracts have averaged \$2-3 million per year with 22 to 25 companies and governmental agencies involved at any given time. He is the Site Director of the National Science Foundation Center for Engineering Logistics and Distribution (CELDi).

Academic Experience: In 1970, Dr. Zimmers returned from industry to the University for Ph.D. study and initiated work on the development of the Computer-Aided Manufacturing (CAM) Laboratory which grew from Lehigh's Manufacturing Processes Laboratory. This served to introduce new computer-based technologies to students as well as to research sponsors. During the early 1980's the CAM Lab evolved to become the Computer-Integrated Manufacturing (CIM) Laboratory. This laboratory served as a platform to conduct manufacturing research sponsored by the National Science Foundation and leading U.S. corporations. The CIM Lab currently is a component within the Enterprise Systems Center, which was founded by Dr. Zimmers in 1995. Currently, Professor Zimmers is spearheading the Learning Collaboratory initiative at Lehigh University, which is supported by various corporate sponsors and the Lehigh class of

1974. The collaboratory approach builds on current manufacturing industry programs at the Enterprise Systems Center and strives to bring experienced-based learning and industrial value creation to new levels of accomplishment. In 2005 Dr. Zimmers was appointed as the site director of the National Science Foundation sponsored Center for Engineering Logistics and Distribution (CELDi). Lehigh is one of ten universities participating in this Industry/University Cooperative Research Centers program.

Full-time industry work: From 1967 to 1970 Professor Zimmers was employed as a Research Engineer in the Research and Development Center of Illinois Central Industries. His work involved laboratory experiments in advanced manufacturing applications, numerical control system implementations and development of optimization systems for discrete metal parts manufacturing. Dr. Zimmers was responsible for new technology introductions in several domestic plants as well as three manufacturing units in Canada and Europe.

## ***2. Industrial leadership and program planning.***

Professor Zimmers has been very active in the program planning and implementation of interactive, hands-on, industrial training, seminars and short courses throughout his career. Many of these programs have been developed in conjunction with manufacturing and consulting organizations as part of their introduction of advanced and emerging manufacturing and systems technologies to their work force. Companies include General Electric, CertainTeed, Lucent Technologies, Westinghouse, IBM, Kraft Foods and Ernst & Young.

## ***3. Educational leadership and curriculum development.***

Dr. Zimmers has pioneered numerous initiatives to advance the effectiveness of engineering education. He was the Lehigh team member responsible for curriculum development in the Lehigh University Manufacturing Systems Engineering Program recognized by the SME/CASA 1985 Lead University Award for Leadership and Excellence in the Application and Development of Computer Integrated Manufacturing Curricula. Professor Zimmers leads Lehigh's participation in the National Science Foundation funded Greenfield Coalition for New Manufacturing Education at Focus: HOPE in Detroit. This program, including SME as a strong partner, strives to establish a new paradigm in manufacturing engineering and engineering technology education that is learner-centered and experiential-based. It integrates actual industrial experiences into the academic programs. Professor Zimmers has worked to advance engineering education by leading Lehigh's participation in the founding of the Philadelphia Area Accelerated Manufacturing Education (PhAME) program. The Lehigh team is comprised of faculty from several disciplines who develop courseware which is ultimately delivered utilizing distance learning technologies. The ESC Learning Collaboratory was recently founded by Professor Zimmers as a nucleus or hub for the many types of activity that support the advancement of learning and improved interactions between the University and its educational, business and government partners. The Collaboratory contains leading-edge technologies for electronic communication and knowledge exchange among diverse

manufacturing groups. In 1995, Professor Zimmers was appointed Deputy Director of the Iacocca Institute where he has provided a thought leadership component to educational initiatives including the international Global Village for Future Leaders of Business and Industry and the advancement of the Discovery Center for Science and Technology. He has provided career guidance to 1225 undergraduate, 152 masters, and 15 doctoral students.

#### **4. Project management experience.**

Dr. Zimmers has served as principal investigator or project manager on more than 200 research and technology transfer projects with over 115 industry partners. Economic return of more than forty-one (\$41) million dollars was documented for the subset of these projects that were co-sponsored by the Ben Franklin Technology Partners, a Pennsylvania State economic development organization. Total program impact has been estimated in excess of \$66 million. Projects typically have been completed in the areas of operational improvements, enterprise resource integration, and product development and enhancement. For example, operational improvement projects with a food manufacturer resulted in increased line speed and throughput, implementation of optimum production scheduling techniques (including advanced linear programming) that minimize changeovers and production costs, and enhance the agility of the supply chain. The client verified over \$2 million in annual cost savings. These projects provided project experience for 31 undergraduate/masters degree students, and the technical problem basis for one Ph.D. thesis. A large customized precision sheet metal fabricator needed to re-engineer numerous business processes in order to implement a new ERP system. Results of the project included: revamping order administration; developing new algorithms for production planning and job order scheduling; implementing inventory management and quality procedures; and collecting real-time production data to aid in work scheduling and costing. The dollar impact was \$400,000 - \$500,000 per year. At a manufacturer of commercial ovens, design analysis resulted in improved product designs and lower manufacturing costs saving \$500,000 annually. The intensive involvement of students in these projects strengthens their technical skills, furthers their professional development, broadens their understanding of business environments, and provides opportunities to develop leadership skills. For example, leadership skills are developed through several student-run consulting companies that have been operating since 1994.

#### **5. Technical publishing.**

Professor Zimmers co-authored, with Dr. Mikell P. Groover, the widely adopted text and reference book entitled *CAD/CAM: Computer-Aided Design and Manufacturing* (1984), which has subsequently been translated into Japanese, Russian and Chinese. He has contributed to several books and professional handbooks such as chapters on “Computer-Aided Manufacturing” for the *Science and Engineering Students Handbook* (1998), “Computer-Aided Design” in the Second Edition of the *Mechanical Engineers’ Handbook* (1998), “CAD/CAM Applications in Machining” for the American Society of Metals International Metals Handbook, Volume 16, *Machining* (1989), and “Communication and the Manufacturing Organization” for the SME book *Organization*

*for Manufacturing* (1970). He has also served as the North American Editor of the journal *Agility and Global Competition*. Professor Zimmers has published over 76 articles and papers, as well as over 288 technical reports. Professor Zimmers researched and wrote about the application of microcomputers in manufacturing environments for process data acquisition and control, and the integration of graphical models into manufacturing through NC part programs derived from computer-aided designs (CASA/SME, 1982). Later, the focus expanded toward computer-integrated manufacturing and the modeling of manufacturing operations and processes from a unified systems or enterprise perspective. Dr. Zimmers continues to publish on technical topics, but a more recent and growing theme has been education and the effective application of technology to education including workforce education, curriculum development, distanced delivery methods, and computer- and web-based concepts for curriculum delivery.

## **6. Research and development interests.**

Professor Zimmers' research efforts have been primarily in the areas of enterprise systems, and operations management. His efforts in these areas have been rewarded with over \$28 million in grants and contracts from government and industrial organizations such as NSF, NIST, SME, General Motors, Honeywell, Hershey Foods, Mack Trucks, Kraft, Day-Timers, and Harris Corporation. His research program focuses on bridging the gap between academic theory and industrial practice. Research activities with the shipbuilding industry and the Department of Defense focused on double-hulled ship manufacturing techniques including robotic and teleoperated processes. This work was extended to include development of agile and virtual organizations under ARPA funding. A collaborative effort sponsored by the DOD ("Manufacturing 2005 Pathfinder", 1995) researched improved methods for weapon system development from initial concept stages through repair and service life extension. Project partners included two universities, three military bases, and six defense contractors. Dr. Zimmers has been one of the academics in systems who has applied his work to production and operating systems in the field.

## **7. Honors and awards.**

Professor Zimmers has received a number of honors and awards that recognize the excellence of his professional achievements throughout his career. These include the Outstanding Academic Partner Award presented in 1995 by the Commonwealth of Pennsylvania's Ben Franklin Technology Program, which is the state agency that co-sponsors research, development, and technology transfer within the manufacturing sector. The Outstanding Engineering Achievement Award from Michigan Society of Professional Engineers was presented to Dr. Zimmers in 1994 in recognition of Lehigh's contribution to the development of innovative engineering curricula. The Industrial Education Award, in recognition of "excellent support given to promote industrial/academic cooperation in advancing computer integrated manufacturing education and applications," was presented by the CASA/SME in 1984. On three separate occasions, in 1996, 1995, and 1991, Dr. Zimmers was recognized with the Outstanding

Teacher Award by the Senior Class in Industrial and Manufacturing Systems Engineering at Lehigh University. The Robinson Award, given annually to one University faculty member in recognition of outstanding service to the University community, was received in 1976.

## **8. Consulting interest areas.**

Professor Zimmers' expertise in the area of industrial systems has made him a highly sought out consultant by many manufacturing, government, and educational organizations. Industrial organizations to which he has served as a consultant include: Cook Technologies, Tobyhanna Army Depot, FLSmidth, Kraft Foods, Abex Corp, Bell Telephone Laboratories, Hershey Foods, Mack Trucks, Steel Tube Institute of North America, Raytheon, Hughes Shipbuilding, and General Electric Company. This consulting involved manufacturing, strategic planning, enterprise systems and operations management, design of process control systems, optimization, corporate business system plans, and development of in-house educational programs. Consulting engagements with government organizations include the Department of Defense, Mantech, U.S. Navy, Department of Labor, and the Commonwealth of Pennsylvania's Department of Community and Economic Development.

## **Areas of Research Interest**

Computer-Integrated Manufacturing, Agile Business Practices, Telecommunication Technologies, System Modeling and Simulation, and Computer-Aided Design/Computer-Aided Manufacturing (CAD/CAM)

## **Awards**

- 2005, Second Place Winner of the IE Division Best Paper Award for "Introducing Freshmen to the Field of Industrial Engineering Through the Use of Collaborative Project Experiences" presented at the 2003 ASEE Annual Conference. Award letter received June 9, 2005. Co-authors included Gregory L. Tonkay and Edmund O. Goll.
- 2005, Inducted into the Abington High School Hall of Fame in the Science category. (Historical Note: Past honorees included Dr. Amar Bose for the development of electronic and stereophonic technology.)
- 2001, Fellow, Institute of Industrial Engineers
- 2000, Fellow, Society of Manufacturing Engineers
- 2000, 1996, 1995, 1991, Outstanding Teacher Award, Senior Class, Industrial and Manufacturing Systems Engineering Department
- 1995, Outstanding Academic Partner Award, Commonwealth of Pennsylvania's Ben Franklin Technology Program
- 1994, Outstanding Engineering Achievement Award, Michigan Society of Professional Engineers
- 1985, CASA/SME Lead University Award for Leadership and Excellence in the Application and Development of Computer Integrated Manufacturing Curricula
- 1984, Industrial Education Award, CASA/SME Eastern Pennsylvania Chapter
- 1976, Robinson Award, Lehigh University, for outstanding service to the University

## **Publications**

### **Articles and Papers:**

#### **Publications**

“Computer-Aided Design” in the Second Edition of the *Mechanical Engineers’ Handbook* (1998),

1. “The Comprehensive Framework for Supplier’s Agile Performance Evaluation”, ICAM 2006 – International Conference on Agile Manufacturing, July 20, 2006, Old Dominion University, Norfolk, Virginia (with M. Baramichai).
2. “Intelligent Systems in Design & Manufacturing: A Collaborative, Technology-Driven Approach to New Product Development”, ICAM 2006 – International Conference on Agile Manufacturing, July 20, 2006, Old Dominion University, Norfolk, Virginia (with C. Marangos).
3. “Agile Supply Network Transformation Matrix: A New QFD-Based Tool for Creating an Agile Enterprise”, International Conference on Information Systems, Logistics, and Supply Chain, May 15-17, 2006, Lyon, France (with M. Baramichai).
4. “Agile Supply Network Transformation Matrix: A New QFD-Based Tool for Creating an Agile Enterprise”, *Proceedings of the 2005 QFD Institute, Seventeenth Symposium on Quality Function Deployment*, September 17, 2005, Portland, Oregon (with M. Baramichai).
5. “Operations Management Education Utilizing eLearning Techniques with Industry-University Collaboration”, *Proceedings of the Second World Conference on POM and Fifteenth Annual POM Conference*, April 30 through May 30, 2004, Cancun, Mexico.
6. “Information and Systems Engineering Leadership Program (ISELP): A New Honors Program Concept at Lehigh University”, *Proceedings of the 2004 ASEE Annual Conference*, June 20-23, 2004, Salt Lake City, Utah.
7. “The Comprehensive Framework for Supplier’s Agile Performance Evaluation”, ICAM 2006 – International Conference on Agile Manufacturing, July 20, 2006, Old Dominion University, Norfolk, Virginia (with M. Baramichai).
8. “Intelligent Systems in Design & Manufacturing: A Collaborative, Technology-Driven Approach to New Product Development”, ICAM 2006 – International Conference on Agile Manufacturing, July 20, 2006, Old Dominion University, Norfolk, Virginia (with C. Marangos).
9. “Agile Supply Network Transformation Matrix: A New QFD-Based Tool for Creating an Agile Enterprise”, International Conference on Information Systems, Logistics, and Supply Chain, May 15-17, 2006, Lyon, France (with M. Baramichai).
10. “Agile Supply Network Transformation Matrix: A New QFD-Based Tool for Creating an Agile Enterprise”, *Proceedings of the 2005 QFD Institute, Seventeenth Symposium on Quality Function Deployment*, September 17, 2005, Portland, Oregon (with M. Baramichai).
11. “Information and Systems Engineering Leadership Program (ISELP): A New Honors Program Concept at Lehigh University”, *Proceedings of the 2004 ASEE Annual Conference*, June 20-23, 2004, Salt Lake City, Utah.
12. “Greenfield Coalition Course Modules in Measurements and Instrumentation”, *Proceedings of the 2004 ASEE Annual Conference*, June 20-23, 2004, Salt Lake City, Utah.
13. “Analysis of Current Food Processing Operations and Design of a New Facility Using Simulation Techniques”, *International Conference on Production Research Americas’ 2004*, August 2004, Santiago, Chile (with M. Ramirez, J. Bustos, P. Christian, V. Govande).

14. "Information and Systems Engineering Leadership Program (ISELP): A New Honors Program Concept at Lehigh University", *Proceedings of the 2004 American Society for Engineering Education Annual Conference and Exposition*, Session 1793, June 2004, Salt Lake City, UT (with G. L. Tonkay and A. N. Williams).
15. "Greenfield Coalition Course Modules in Measurements and Instruments", *Proceedings of the 2004 American Society for Engineering Education Annual Conference and Exposition*, Session 1359, June 2004, Salt Lake City, UT (with G. L. Tonkay, L. R. Butler, J. Wang-Chavez).
16. "Innovative Application - How TOC Can Manage Human Resources and Eliminate Workforce Burdens", *APICS, March 2004 Issue*, (with J. Pastore and S. Sundararajan).
17. "New Course Development in a Distanced Collaborative Environment", *33<sup>rd</sup> ASEE/IEEE Frontiers in Education Conference, Session 1439, November 2003, Boulder, Colorado*, (with D. Servas, L. R. Butler and G. L. Tonkay).
18. "Productivity and Scheduling Improvements of Packaging Operations through Short Interval Scheduling", *SME East Coast Region 3<sup>rd</sup> Annual Members Conference, October 2003, Bethlehem, PA*, (with P. Christian).
19. "Development of a Software Tool to Improve Performance of Packaging Operations through Short Interval Scheduling", *Packaging Technology and Science, Published Online October 2003, John Wiley & Sons, Inc.*, (with P. Christian, M. Ramirez-Valdivia, P. Frederick and B. Aksoy).
20. "Careful With That Warehouse", *Industrial Engineer, September 2003 Issue*, (with J. Klemperer and S. Sundararajan).
21. "eLearning Activities for Teaching Manufacturing System", *International Conference on Engineering Education, July 2003, Valencia, Spain*, (with M. S. Ahmed, N. L. Baskin and G. L. Tonkay).
22. "The Comprehensive Framework for Supplier's Agile Performance Evaluation", ICAM 2006 – International Conference on Agile Manufacturing, July 20, 2006, Old Dominion University, Norfolk, Virginia (with M. Baramichai).
22. "Intelligent Systems in Design & Manufacturing: A Collaborative, Technology-Driven Approach to New Product Development", ICAM 2006 – International Conference on Agile Manufacturing, July 20, 2006, Old Dominion University, Norfolk, Virginia (with C. Marangos).
23. "Agile Supply Network Transformation Matrix: A New QFD-Based Tool for Creating an Agile Enterprise", International Conference on Information Systems, Logistics, and Supply Chain, May 15-17, 2006, Lyon, France (with M. Baramichai).
24. "Agile Supply Network Transformation Matrix: A New QFD-Based Tool for Creating an Agile Enterprise", *Proceedings of the 2005 QFD Institute, Seventeenth Symposium on Quality Function Deployment*, September 17, 2005, Portland, Oregon (with M. Baramichai).
25. "Information and Systems Engineering Leadership Program (ISELP): A New Honors Program Concept at Lehigh University", *Proceedings of the 2004 ASEE Annual Conference*, June 20-23, 2004, Salt Lake City, Utah.
26. "Greenfield Coalition Course Modules in Measurements and Instrumentation", *Proceedings of the 2004 ASEE Annual Conference*, June 20-23, 2004, Salt Lake City, Utah.
27. "Analysis of Current Food Processing Operations and Design of a New Facility Using Simulation Techniques", *International Conference on Production Research Americas' 2004*, August 2004, Santiago, Chile (with M. Ramirez, J. Bustos, P. Christian, V. Govande).
28. "Information and Systems Engineering Leadership Program (ISELP): A New Honors Program Concept at Lehigh University", *Proceedings of the 2004 American Society for Engineering Education Annual Conference and Exposition*, Session 1793, June 2004, Salt Lake City, UT (with G. L. Tonkay and A. N. Williams).

29. "Greenfield Coalition Course Modules in Measurements and Instruments", *Proceedings of the 2004 American Society for Engineering Education Annual Conference and Exposition*, Session 1359, June 2004, Salt Lake City, UT (with G. L. Tonkay, L. R. Butler, J. Wang-Chavez).
30. "Operations Management Education Utilizing eLearning Techniques with Industry-University Collaboration", *Second World Conference on POM and 15<sup>th</sup> Annual POM Conference*, Cancun, Mexico, April-May, 2004 (with G. L. Tonkay, N. L. Baskin, L. R. Butler, M. S. Ahmed).
31. "Innovative Application - How TOC Can Manage Human Resources and Eliminate Workforce Burdens", *APICS, March 2004 Issue*, (with J. Pastore and S. Sundararajan).
32. "New Course Development in a Distanced Collaborative Environment", *33<sup>rd</sup> ASEE/IEEE Frontiers in Education Conference, Session 1439, November 2003, Boulder, Colorado*, (with D. Servas, L. R. Butler and G. L. Tonkay).
33. "Productivity and Scheduling Improvements of Packaging Operations through Short Interval Scheduling", *SME East Coast Region 3<sup>rd</sup> Annual Members Conference, October 2003, Bethlehem, PA*, (with P. Christian).
34. "Development of a Software Tool to Improve Performance of Packaging Operations through Short Interval Scheduling", *Packaging Technology and Science, Published Online October 2003, John Wiley & Sons, Inc.*, (with P. Christian, M. Ramirez-Valdivia, P. Frederick and B. Aksoy).
35. "Careful With That Warehouse", *Industrial Engineer, September 2003 Issue*, (with J. Klemperer and S. Sundararajan).
36. "eLearning Activities for Teaching Manufacturing System", *International Conference on Engineering Education, July 2003, Valencia, Spain*, (with M. S. Ahmed, N. L. Baskin and G. L. Tonkay).
37. "Introducing Freshman to the Field of Industrial Engineering through the Use of Collaborative Project Experiences", *Proceedings of the 2003 American Society for Engineering Education Annual Conference and Exposition, Session 3657, June 2003, Nashville, TN*, (with G. L. Tonkay and E. O. Goll).
38. "Made in the USA or Sourced in China?" *Manufacturing Insights, Fall 2003, Issue 10*, (with S. Sundararajan and J. Feskanin).
39. "The Creation of eLearning Materials Based on Real World Content", *International Conference on Engineering Education, Paper #0106, Session 3, August 2002, Manchester, UK*, (with M. S. Ahmed, N. L. Baskin, G. L. Tonkay and A. G. Wittchen).
40. "University and Manufacturing Industry Collaboration at Lehigh University's Enterprise Systems Center", *International Conference on University and Manufacturing Industry Collaboration Proceedings, The Advanced Manufacturing Institute, August 2002, Kansas State University*, (with A. Wittchen and G. L. Tonkay).
41. "Web-Based Learning Activities in Manufacturing Systems", *Proceedings of the 2002 American Society for Engineering Education Annual Conference and Exposition, Session 3563, June 2002, Montreal, Canada*, (with M. S. Ahmed, N. L. Baskin, G. L. Tonkay and A. G. Wittchen).
42. "Web-Based Learning Activities in Manufacturing Systems", *2002 Teaching, Learning and Technology Roundtable Conference, Wayne State University*, (with M.S. Ahmed, N. L. Baskin, G. L. Tonkay and A. G. Wittchen).
43. "Partnering for Excellence: Industry/University Programs at Lehigh University's Enterprise Systems Center", *Proceedings of the 2002 Conference for Industry and Education Collaboration, Session 3433, February 2002, Sarasota, Florida*, (with A. Wittchen).
44. "Development of a Software Tool to Improve Performance of Packaging Operations through Short Interval Scheduling", *Packaging Technology and Science Journal, John Wiley and Sons, Inc., March 2001*, (with P. Christian, M. Ramirez-Valdivia, P. Frederick and B. Aksoy).



45. "Design and Implementation of a Cellular Manufacturing Process: A Simulation Modeling Approach", *International Journal of Industrial Engineering*, ISSN 1072-4761, October 2000, (with M. T. Ramirez-Valdivia, P. Christian and V. Govande).
46. "Simulation Modeling for Design and Implementation of Cellular Printing-Finishing Process," *Proceedings of the 4<sup>th</sup> Annual International Conference on Industrial Engineering Theory, Applications and Practice*, November 1999, San Antonio, TX (with M. Ramirez-Valdivia, P. Christian and V. Govande).
47. "Advantage through Agility," *IIE Solutions*, November 1999 (with P. Christian, V. Govande and W. Staehle).
48. "Age of Agile Manufacturing Puts Quality to the Test," *Quality Progress*, May 1999 (with P. Christian).
49. "An Integrated Approach to Process Design and Continuous Improvement of a Food Processing Facility," *Proceedings of the 12<sup>th</sup> Conference with Industry, Manufacturing Processes for the 21<sup>st</sup> Century*, Bethlehem, PA, May 1998 (with V. Govande, P. Christian, L. Schuek).
50. "Integrated Product & Process Development Utilizing FEM-based Modeling of Forging Operations," *Proceedings of the 12<sup>th</sup> Conference with Industry, Manufacturing Processes for the 21<sup>st</sup> Century*, Bethlehem, PA, May 1998 (with V. Govande, J. Jannone, J. Ko and R. Novotny).
51. "Algorithms to Minimize Completion Time Variance in a Two Machine Flowshop," *Proceedings of 23<sup>rd</sup> International Conference on Computers and Industrial Engineering*, Chicago, IL, March 1998 (with C. Marangos, V. Govande and G. Srinivasan).
52. "Application of a Decision Support System for Operational Decisions," *Proceedings of 23<sup>rd</sup> International Conference on Computers and Industrial Engineering*, Chicago, IL, March 1998 (with S. Sundararajan, G. Srinivasan and W. Staehle).
53. "Analysis and Development of Manufacturing Cell Design Algorithms – A Case Study Perspective," *Proceedings of the 2<sup>nd</sup> Annual International Conference on Industrial Engineering Applications and Practice*, November 12-15, 1997, San Diego, CA, ISBN 0-9654599-2-6, (with K. Cowan, V. Govande and G. Srinivasan).
54. "Application of FEM-based Modeling of Open-Die Forging to Product and Process Development," *Steel Forgings: Second Volume, ASTM STP 1259*, E. G. Nisbett and A. S. Melilli, Eds. American Society of Testing and Materials, 1997 (with W. Reese II, C. D. Ronemus, K. Huang, V. Govande and T. Veerabadran).
55. "Agile Maintenance Management", *Proceedings of the 14<sup>th</sup> Annual International Maintenance Conference*, Institute of Industrial Engineers, International Industrial Engineering, August 3-7, 1997, Atlanta, GA (with S. Sunararajan, R. Sedlak and G. Srinivasan).
56. "Regional Growth Through Agile Industry Clusters," *Proceedings of the 11<sup>th</sup> Annual Manufacturing Systems Engineering Conference with Industry*, April 28-29, 1997, Bethlehem, PA (with J. Feeney, H. R. Gustafson, S. Sundararajan). Abstract Review Only.
57. "Cellular Manufacturing – Current Implementation Practices and Future Directions," *Proceedings of the 11<sup>th</sup> Conference on Strategic Technologies for Global Manufacturing*, Center for Manufacturing Systems Engineering, Lehigh University, Bethlehem, PA, April 1997 (with V. Govande, S. Sundararajan and G. Srinivasan).
58. "Application of FEM-based Modeling of Open-Die Forging to Product and Process Development," *Proceedings of the Second Symposium of Steel Forging*, New Orleans, LA, November 1996 (with W. Reese II, C. D. Romenus, K. Huang, V. Govande and T. Veerabadran).
59. "Models for Industry, Academia and Government Cooperation in an Agile Manufacturing Environment," *Proceedings of the ASEE Annual Conference*, Washington, D.C., June 1996 (with V. Govande, J. Montemurro, R. Nagel, K. Laubach, and A. Swanger).

60. "Teaching New Manufacturing Technologies Using Distanced Delivery Methods." *Proceedings of International Conference on Education in Manufacturing*, San Diego, CA March 1996
61. "Reinventing Government: Applying the Agile Paradigm to the Public Sector," *Proceedings of Agile Manufacturing Enterprise Forum 4<sup>th</sup> Annual Conference* in Atlanta, GA, 1995 (with J. Montemurro).
62. "Distanced Delivery and Multiple Teaching Methods for Manufacturing Engineering Education," *Proceedings of the ASEE Annual Conference*, June 1995 (with J. Montemurro and A. Swanger).
63. "Agile People: Realizing and Training Highly Mobile Workforce," *Proceedings of Agile Manufacturing Enterprise Forum 4<sup>th</sup> Annual Conference* in Atlanta, GA, 1995 (with P. Robson and G. Mehrotra).
64. "Development of Manufacturing Systems Curricula in the Greenfield Paradigm," *Proceedings of the Frontiers in Education Conference*, Society of Manufacturing Engineering, Anaheim, California, November 1994 (with A. Swanger and J. Montemurro).
65. "Agile Manufacturing Curriculum Development for Undergraduate Engineers," *Proceedings of the ASEE Annual Conference*, Alberta, Canada, June 1994 (with J. Leidner, Jr.).
66. "Symbolic Timer Window-based Dynamic Routing Control for Multiple Speed AGV's," *Proceedings of the 3<sup>rd</sup> Industrial Engineering Research Conference*, Atlanta, GA, May 1994 (with M. Jo).
67. "Intelligent Error Detection in Robotic Assembly Work Cells," *Proceedings of the Second Industrial Engineering Research Conference*, Los Angeles, CA, 1993 (with M. Jo).
68. "Building a Flexible Manufacturing System (FMS) Simulation Model in a PC Environment," *Proceedings of the 21<sup>st</sup> Annual Conference on Simulation and Modeling*, Pittsburgh, PA, 1990 (with C. Marathe).
69. "The Microcomputer Application of SIMAN and SLAM II in a Manufacturing Shop: A User's Comparison," *Proceedings of the Annual Conference on Modeling and Simulation*, Pittsburgh, PA, 1988 (with C. Marathe).
70. "The Interrelationship of Parts Classification and Gripper Design for Automated Assembly," *Proceedings of the CAD/CAM, Robotics and Factories of the Future Technical Conference*, The International Society of Productivity Enhancement, Detroit, MI, 1988 (with F. L. Bracken and G. E. Insolia).
71. "Simulation, Modeling for Manufacturing Production Scheduling," *Proceedings of the 19<sup>th</sup> Annual Pittsburgh Conference on Modeling and Simulation*, January 1988.
72. "The Ben Franklin Partnership, Pennsylvania Universities and Industries: Case Study of a Cooperative Program," *UPCAEDM Proceedings*, Ohio State University, June 1987 (with M. Bolton, D. Hansen and A. Wittchen).
73. "Human Factors' Aspects of Robotic Safety," *Proceedings of the Robotic Industries Association Annual Conference*, Chicago, IL, April 1986.
74. "Using Simulation for Processing Planning," *Computers in Manufacturing Processes*, Vol. 1, No. S46, New York, Auerbach Publishers, Inc., 1986.
75. "University/Industry Cooperation in the Implementation of New Technologies," *Proceedings of the Tenth IBM University Study Conference*, San Jose, CA, November 1985.
76. "CAD/CAM and Robotics," *Proceedings of the Ninth Annual IBM Academic Information Systems Conference*, Atlanta, GA, November 1984.
77. "Building a CAD/CAM Partnership with Industry," *Proceedings of the National Conference on University Program in Computer Aided Engineering, Design, and Manufacturing*, Brigham Young University, August 1984 (with M. Bolton).
78. "A CIM Laboratory for Education and Research," *Proceedings of the 1983 Robotech Conference*, Tampa, FL, October 1983.

79. "Design Considerations and Utilization of the Computer-Aided Manufacturing Laboratory Facility at Lehigh University," *National Conference on University Programs in Computer-Aided Engineering, Design and Manufacturing*, Brigham Young University, April 1983, pp. 157-160 (Printed in Proceedings).
80. "CAM Laboratory for Education and Research," *Computer and Automated Systems Association of SME, CAD/CAM Technology*, December 1982, pp. 15-17.
81. "Automated Factories in the Year 2000," *Industrial Engineering*, Volume 12, No. 11, pp. 34-40, November 1980 (with Mikell P. Groover).
82. "The Selection of Microcomputers for Industrial Data Acquisition," *Journal Computers Industrial Engineering*, 4(1): pp. 1-10, 1980 (with L. Brown).
83. "The Application of Computer Simulation Techniques to Industrial Packaging Lines," *Proceedings of the Annual Winter Simulation Conference*, pp. 721-26, 1978 (with T. Brinker).
84. "Use of Small Computers for Manufacturing Control," *Proceedings of American Society of Mechanical Engineers 32<sup>nd</sup> Annual Management Executive' Conference*, October 15-18, 1978.
85. "Group Technology – Overview and Critique of Coding Techniques," *Proceedings of the Spring Annual Conference AIIE*, May 1978, pp. 266-275 (with S. Sharma and A. F. Gould).
86. "The Selection of Microcomputers for Industrial Data Acquisition," *Proceedings of the AIIE Systems Engineering Conference*, Norcross, GA, 1977 (with L. Brown).
87. "Some Considerations in the Prior Planning and Design of Machining Data Bases for Interfacing with a Process Planning System," *The Proceedings of the Computer-Aided Process Planning Conference*, Computer-Aided Manufacturing-International, Inc., Cambridge, Massachusetts, February 1977.
88. "Economic Analysis of Metal Cutting Data Base Designs," *AIIE Systems Engineering Conference Proceedings*, December 1976.
89. "Analysis and Design of Computer Integrated Manufacturing Systems," *Society of Manufacturing Engineers*, Dearborn, Michigan, Paper No. MS76-197, May 1976.
90. "An Economic Model to Evaluate Multilevel Metal Cutting Data Base Designs," *Proceedings of the Third International Conference on Production Research*, Amherst, MA, August 1975.
91. "Application of Computer Analysis in a Job Shop," *Proceedings of Conference on Productivity Enhancement in Cutting and Forming Operation*, Society of Carbide Engineers, Dearborn, MI, 1975.
92. "The Development of a System for Quantitative Cutting Tool Analysis Using Interactive Computer Graphics," *Society of Manufacturing Engineers Paper No. MS75-197*, Dearborn, MI, 1975.
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### **Invited and Other Conference Presentations:**

1. "Enterprise Systems Center Current Program Successes and Potential Future Initiates with National Coalitions", Presentation given to Kevin Kelly and Jaspar Thompson of Van Scoyoc, LLP, November 20, 2005.
2. "Agile Manufacturing Program", Presentation given to Rebecca Bagley, Deputy Secretary for Technology Investment, PA Department of Community and Economic Development, September 8, 2005.
3. "Enterprise Systems Center Innovations in Educational Collaboratory and Design and Research Initiatives with Industry", Presentation given to Michael Rosenstein, Sr. Government Affairs Specialist and Debra Kisela, Government Affairs Specialist, September 7, 2005.
4. "Building Successful Manufacturing Programs with Industry, Universities, and Government Partnerships", Presentation given at the National Coalition for Manufacturing Innovation Conference, July 29, 2005.
5. "Interdisciplinary Programs at Lehigh University", Presented to Leo Hanifin, Dean of Engineering, University of Detroit-Mercy, June 8, 2005.
6. "Agile Manufacturing Program", Presented to the Representative Brett Feese, Chairman, PA House Appropriations Committee, April 27, 2005.
7. "Minor in Engineering", Presented to the Board of Trustees, Lehigh University, February 4, 2005.
8. "Development of the Engineering minor Laboratory Courses", (EMC2) at Lehigh University, Presentation to P.C. Rossin College of Engineering and Applied Science Advisory Board, November 5, 2004.
9. "Opportunities for Collaboration with the Enterprise Systems Center at Lehigh University", Presentation to Michael Walmer and Ed Kottcamp of Electron Energy Corporation, September 28, 2004.
10. "The Enterprise Systems Center at Lehigh University", Presentation given to the PA House Education Committee, August 25, 2004.
11. Presentation given at the Enterprise Systems Center for State Secretary, Stephen Schmerin, Department of Labor, June 29, 2004.

12. "Gaining a Competitive Advantage Through Agile Manufacturing Practices", Kraft Foods, Lehigh Valley, December 1998 (with P. Christian, V. Govande, and W. Staehle).
13. "Quality and Technology in the Age of Agile Manufacturing", Quality Engineering Conference at Stevens Institute of Technology, NJ, April 23, 1998 (with P. Christian).
14. "Agile PA Initiatives", presented to the Commonwealth of Pennsylvania House Appropriations Chairman and Committee and Senior Government Affairs Specialists, November 1997.
15. "Distance Learning in a Teaching Factory Environment – A University Perspective", presented to the NCATC Conference View '97 via V-Tel, October 1997.
16. "Creating a High Performance Culture", presented at the American Competitiveness in the Global Economy – Interactive Workshop, Iacocca Leadership Series, September 1997.
17. "Tactical Implementation", presented at the Implementing Rapid Prototyping for New Project Introduction Seminar, June 1997, Rauch Business Center, Lehigh University, in cooperation with ProtoCAM.
18. "Careers in Technical Fields", presented to the Nitschmann Middle School, March 1997.
19. "Educational Technology Enables Engineering Education", Council on Competitiveness, Workforce and Technology Task Force, Focus Group, January 1997, Washington, D.C.
20. "Creating High Performance Cultures" by Emory W. Zimmers, Jr., presented at the American Competitiveness in the Global Economy – Interactive Workshop, Iacocca Leadership Series, September 1997.
21. "Agility in Action", presented to the Lt. Governor of Pennsylvania, October 1997.
22. "Distance Learning in a Teaching Factory Environment – A University Perspective" presented to the NCATC Conference View '97, via V-Tel, October 1997.
23. "Learning Technologies & Their Implication for Lucent Technologies Corp." presented to Center for Occupational Research and Development (CORD), March 1996.
24. "Workforce Education: Meeting New Challenges", presented at Rauch Business Center, June 1996, for Lehigh University Alumni Reunion Group.
25. "Workforce Development: A University Perspective" presented at the "Technology 21" Advance Manufacturing Network Executive Meeting, October 1996 for the Industry-led Technology Strategy Development for the Commonwealth of PA.
26. "Learning Technologies: Creating the Education and Training the Revolution", presented October 1996, Iacocca Institute Leadership Series
27. "The Role of Technology in the Learning Process", presented to the National Council on Competitiveness, Washington, D.C., November 1996.
28. "Agility Strategies and Improved Logistics Systems" presented to the Policy Council, Department of Logistics, Office of the Under Secretary of Defense, Pentagon, Washington, D.C., May 1995.
29. "New Approaches to Manufacturing Education" presented to Mayor Rendell of Philadelphia, staff and business leaders, regarding S.E. Pennsylvania Training Center, Ogontz Avenue Revitalization Project and Lehigh University's funded assistance in this project, September, 1995.
30. "University Graduates and the Emerging Challenges of the Global Business Enterprise", Presentation for Business-Higher Education Forum (BHEF), October 1995.
31. "New Paradigms in Manufacturing Education and Distanced Learning, presented to selected faculty and staff of the Community College of Philadelphia, October 1995.
32. "Productivity and Manufacturing Efficiency Improvements for Wheel Repair", Final Report for Advanced Machine Company, 1995.

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34. "Reinventing Government: Applying the Agile Paradigm to the Public Sector – The Pennsylvania Initiative", *Agility Forum Conference*, 1994 (with J. Montemurro).
35. "Case Studies in Technology Transfer", presented to the World Bank in Washington, D.C., January 1990.
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37. "New Developments in CIM", presented to the American Production and Inventory Control Society, Schuylkill Chapter, March 1989.
38. "The Application of Technology to Traditional Industries", Coalition of Northeast Governors, Rye Brook, NY, July 1986.
39. "The Integration of a Computer Graphics System to an NC Machine Tool", CASA/SME Lehigh Valley Conference, Spring 1986 (with T. Iobst).
40. "Future Trends in Manufacturing Technology", Price Waterhouse, Inc. Valley Forge, PA, May 1986.
41. "Engineers and Their Fields," *Talk of the Town* program, WFMZ-TV – Channel 69, January 30, 1986, Allentown, PA.
42. "Simulation Analysis for Automated Manufacturing", *Simulation Conference*, Long Beach, CA 1986.
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44. "Computer-Integrated Manufacturing (CIM): Overview, Development and Implementation at Lehigh University", *Erie Engineer's Week*, Erie, PA, 1985.
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46. "CAD/CAM", Mack Trucks, Inc. CAD/CAM Liaison Program, Allentown, PA, February 1984.
47. "CAD/CAM Systems Overview and What is the Future Concerning Robots?", *Lehigh University Board of Trustees*, Skytop, PA, 1984.
48. "Research Needs in CAD/CAM", *Industrial Research Institute, Inc.*, Hilton Head Island, SC, November 1984.
49. "Basic Digital Techniques", *Manufacturing Productivity Education Committee (MAPEC) Module NSF Grant*, Purdue University, April 1980 (with L. Plebani).
50. "Computer-Aided Design", *Manufacturing Productivity Education Committee (MAPEC) Module NSF Grant*, Purdue University, 1980 (with L. Plebani).
51. "Comparison of Simulation Using Computer Graphics and Laboratory Experimentation in the Study of Manufacturing Processes", *American Society of Engineering Education Conference*, November 1975.
52. "Manufacturing and the Application of Computer Technology", *East-Central Tool Exposition and Engineering Conference*, Society of Manufacturing Engineers, Pittsburgh, PA, November 18-20, 1975.