STUART ELLIOT MADNICK

John Norris Maguire Professor of Information Technology
Sloan School of Management
and
Professor of Engineering Systems
Sloan School of Engineering

Massachusetts Institute of Technology

STUART ELLIOT MADNICK

John Norris Maguire Professor of Information Technology
Sloan School of Management
and
Professor of Engineering Systems
Sloan School of Engineering

Massachusetts Institute of Technology

Date of Birth: July 10, 1944
Place of Birth: Worcester, Massachusetts
Citizenship: U.S.A.

EDUCATION

B.S., Electrical Engineering, 1966, M.I.T.

M.S., Alfred P. Sloan School of Management, 1969, M.I.T.

M.S., Electrical Engineering, 1969, M.I.T.

Ph.D., Computer Science, 1972, M.I.T.

(Doctoral Thesis: Storage Hierarchy Systems).

PRINCIPAL FIELD OF INTEREST

Information Technologies (formerly called Management Information Systems)

NAME AND RANK OF OTHER SSM FACULTY IN SAME FIELD

Erik Brynjolfsson, Professor

Chris Dellarocas, Associate Professor

Benjamin Grosof, Assistant Professor

Thomas Malone, Professor

Wanda Orlikowski, Professor

John F. Rockart, Senior Lecturer

Peter Weill, Senior Lecturer

1. **SUMMARY OF NON-MIT EXPERIENCE**

2000   Visiting Professor, Victoria University, New Zealand

2000-01   Co-founder and Chairman of the Board, iAggregate Corporation, Cambridge, Massachusetts
           (merged with ArsDigita Corporation)
           (Developed web aggregation software based on co-authored technology patents, licensed from
           MIT)

1998-   Member of the Board, Oxford Global Resources

1993   Visiting Professor, Nanyang Technological University, Singapore
           Visiting Professor, Newcastle University, England
           Visiting Professor, Technion, Israel
           (On sabbatical from MIT, approximately 6 weeks at each university)

1985   Visiting Scholar in Computer Science, Harvard University, Faculty of Arts and Sciences
           (On sabbatical from MIT)

1985-   Co-founder and Director, HML, Ltd., Hexham, Northumberland, England
           (Operate a luxury hotel and restaurant in an 14th century English castle)

1985-86   Co-founder and Member of the Board, Cambridge Institute for Information Systems, Inc.,
           Cambridge, Massachusetts (subsequently re-named: Cambridge Technology Group)
           (Develop and deliver executive education in the field of information systems)

1983-85   Co-founder and Vice-Chairman of the Board, Knoware, Inc., Cambridge, Massachusetts
           (Develop strategy for educational personal computer software)

1980-   Founder, Systems Engineering & Management Corp., Cambridge, Massachusetts
           (Consulting in the field of information systems)

1978-85   Co-founder and Member of the Board, Advanced Information Systems & Services, Inc.,
           Cambridge, Massachusetts
           (Develop course curriculum, printed material, and video-tape material for the study of modern
           information systems)

1972-75   Co-founder, Member of the Board and Technical Advisor, MITROL, Inc., Waltham,
           Massachusetts
           (Responsible for the design and development of advanced interactive manufacturing
           information systems. MITROL was acquired as a subsidiary by General Electric's Information
           Systems Company)

1971-72   Principal Engineer, Honeywell Advanced Systems and Technology Organization, Waltham,
           Massachusetts
           (Performed research on advanced information management systems)

1970-71   Principal Scientist, Honeywell Information Sciences Center, Cambridge, Massachusetts
           (Performed research on the design and specification of future computer systems)

1968-70   Manager of Systems Development, International Computation, Inc. (INTERCOMP),
           Cambridge, Massachusetts
           (Responsible for the design and implementation of medical information systems and

laboratory automation. INTERCOMP was acquired by Logicon, Inc.)

1967-69   Associate Engineer and Consultant, Lockheed Missiles and Space Company, Palo Alto Research Laboratory, Palo Alto, California
(One of the designers of the DIALOG and RECON information retrieval systems)

1966-71   Systems Programmer & Consultant, IBM Cambridge Scientific Center, Cambridge, Massachusetts
(Responsible for development of various aspects of the CP-67/CMS and VM/370 time-sharing systems with specific responsibility for the file system and SCRIPT/370 text processing system)

2. **SUMMARY OF MIT APPOINTMENTS**

2000-   Professor of Engineering Systems, School of Engineering (joint appointment)

1989-   John Norris Maguire Professor of Information Technologies, Sloan School of Management

1988-93   Leaders for Manufacturing Professor of Management Science, Sloan School of Management

1987-   Professor, Sloan School of Management *

1976-87   Associate Professor, Sloan School of Management *

1972-76   Assistant Professor, Sloan School of Management *

1971-72   Instructor, Department of Electrical Engineering (Developed Operating Systems course, conducted research in advanced computer systems, supervised theses).

1968-71   Research Assistant, Project MAC
            (Group leader Advanced Operating System project, organized 5.686, 6.79, and IAP seminars, and Instructor for Information Systems course).

1966-68   Teaching Assistant, Sloan School of Management

1965-66   Data Processing Consultant, Student Aid Center
            (Design of scholarship and loan assignment programs and data analysis packages).

1965-66   Systems Programmer, Civil Engineering Department
            (Development of minimum path algorithms and data extraction packages for survey data).

1963-65   Programmer, Mechanical Engineering Department.
            (Analysis of structure of materials by computer techniques and graphic output of vector force fields).

1963-65   Special Guide, M.I.T. Computation Center

*   Details of research and teaching activities in the Sloan School are provided in the following sections.

3. **COMMITTEES**

DEPARTMENT COMMITTEES

1988-	Executive Committee, International Financial Services Research Center (IFSRC)
1986-98,2001-02	Head, Information Technologies Group (formerly the Management Information Systems Group)
1981-82	Member, Sloan School Task Force on New Programs and Task Force Management Science
1981-	Member, Doctoral Program Committee
1979-84	Head, Management Information Systems Group
1979-84	Steering Committee, Management Science Area
1979-84	Coordinator, MIS Doctoral General Examinations
1976-96	Executive Committee, Center for Information Systems Research (CISR)
1975-	Chairman, Committee for the Search and Recruiting of MIS Faculty
1974-	Member, Center for Information Systems Research
1973-84	Chairman, East Campus Computer Services Committee
1972-	Freshman Advisor
1972-75	Coordinator, Undergraduate Research Opportunities Program (UROP)
1972-75	Member, Undergraduate Program Committee

INSTITUTE COMMITTEES

1981-82	Member, MIT Office Automation Planning Committee and Long Range Planning Sub-committee
1972-	Member, Freshman Advisory Council (FAC)

LABORATORY FOR COMPUTER SCIENCE

1976-96	Affiliate Member

MANAGEMENT OF MAJOR RESEARCH INITIATIVES

1990-	Co-Head, Total Data Quality Management (TDQM) Initiative
1992-	Co-Director, PROductivity From Information Technology (PROFIT) Program

4. CONSULTING ACTIVITIES

1974	A. D. Little
1995-96	Alternative Resources
1977-87	American Telephone & Telegraph Co
1995-96	Analysis Group
2001	Artery-Pilot Bird
1997-98	Bankers Trust
1974	Borg-Warner Corporation
1992	Bull Info Sys
2000-01	Cerylion Corp
2000-01	Chestnut Partners
1982-84, 1997-98	Citibank
1975	Computer Corporation of America (CCA)
1976-77	Computer Sciences Corporation
1992	Dangel & Co
1975	Data General Corporation
1977	Dean Witter & Co., Inc.
1996-97	Deutsche Bank, Morgan Grenfeld
1996-00	FIAT/ISVOR
1972	Foxboro, Inc.
1973	G. A. Saxton
1975	G. S. Grumman & Associates, Inc.
1998-99	Gatsby & Hannah (Ceska Sporitelna v. Unisys Corporation)
1980-81	H. H. Aerospace Corporation
1972-73	Honeywell Information Systems, Inc.
1994	IBM AS/400 Group
1972-73	IBM New England Development Center
1990	Index Group
1999	In-Q-It (CIA)
1973	Intermetrics
1983-84	Israeli Embassy, Washington, D.C. (*)
1995	John Hancock
1990	Lotus Development Corp
1972	Martin-Marietta, Inc
1983-84	Massachusetts Dental Association (*)
1976	McCaffery, Seligman & von Simpson, Inc.
1983-84	MIT Admissions Office (*)
1995	MITRE
1972	Naval Underwater Systems Center
2000-01	NERA (Microsoft Class Action and Microsoft European Commission)
1973	Olivetti

1992-94	Open Environment Corporation
1973	Pennsylvania Department of Education
1974-75	Q. E. D. Information Sciences, Inc. (in conjunction with Babson College)
1974	Research and Consulting, Inc.
1996-98	San Paolo Bank - Italy
1974	Shell Oil Company
1973	Software et Engineering des Systems d'Informatique et d'Automatique (SESA)
1998-99	Sullivan & Cromwell (Bristol v. Microsoft)
1998-99	T. F. Software
1998-99	Teradyne
2000	UNUM Provident
2000-01	Weil, Gotshal & Mange, LLP (AA v AC Arbitration)

(*) = without compensation.

5. **PROFESSIONAL ACTIVITIES**

Associate Editor,
> *ACM Transactions on Database Systems*, 1975-86.
> *International Journal of Computers and Data Bases, 1975.*
> *Performance Evaluation Review, 1972-74.*

Board of Governors,
> IEEE Computer Society (40,000 members), 1979-81.

Chairman,
> IEEE Technical Committee on Database Engineering, 1980-82.

Committee Member,
> ANSI/SPARC Operating System Command Language Task Group (OSCLTG), 1975-76.
> ARPA Technical Review of Datacomputer Project, 1975.
> IEEE Technical Committee on Database Engineering, 1975-78.
> Task Force on Engineering of Software (Sponsored by NSF), 1975.

Conference Co-Chairman,
> Third International Conference on Very Large Data Bases (VLDB), Tokyo, Japan, October 1977.
> Thirteenth International Conference on Very Large Data Bases (VLDB), Brighton, England, September 1987.
> Executive Committee, VLDB Endowment.

Moderator,
> "Programming Languages Workshop: Network Languages", NOC-69 (Network of Computers-69) sponsored by NSA, Washington, DC, October 1969.

Panelist,
> Information Systems Panel, MIT Sponsored Conference, "Technological Innovation and Economic Development: Has the U.S. Lost the Initiative?", Washington, DC, April 1976.
> "The Interaction of New Technology and Systems Architecture", National Computer Conference, Anaheim, CA, May 1975.
> "Virtual Computer Systems", National Computer Conference, New York, NY, 1973.
> "Virtual Computer Systems", IEEE Computer Conference, Boston, MA, September 1971.

Program Committee,
> ACM-SIGMOD International Conference on Management of Data, Washington, DC, June 1976.
> Conference on Applications Development Systems, San Jose, CA, March 1980.
> IEEE International Computer Software and Applications Conference (COMPSAC 77), Chicago, IL, November 1977.
> International Conference on Applications of Databases, June 1994.
> International Conference on Entity-Relationship Approach to Systems Analysis and Design, Los Angeles, CA, December 1979.
> International Conference on Management of Data, Santa Monica, CA, May 1980.
> International Conference on Very Large Data Bases, Boston, MA, September 1975.
> International Conference on Data Bases: Improving Usability and Responsiveness, Haifa, Israel, August 1978.
> International Workshop on Data Base Machines, San Diego, CA, September 1982.
> Sixth Workshop on Computer Architecture for Non-Numeric Processing, Hyeres, France, June 1981.

Referee,
ACM Computing Surveys, 1977-83.
ACM Transactions on Database Systems, 1976.
Annals of Economic and Social Measurement, 1975.
Communications of the ACM, 1974-78.
IBM Journal of Research and Development, 1974.
IBM Systems Journal, 1974-78.
IEEE Transactions on Computers, 1975-83.
IEEE Transactions on Software Engineering, 1976-78.
International Conference on Applications of Databases, 1994.
National Computer Conference, 1975.
NSF Research Proposals, 1977-78.
Operations Research, 1975.
Symposium on Operating Systems Principles, 1975.
U.S. Army Research Office Proposals, 1977-78.
USA-Japan Computer Conference,1975.
VLDB IV Conference, 1978.

Reviewer,
ACM Computing Reviews, 1968-78.
Computer Science and Applied Mathematics Series, Prentice-Hall, Inc., 1978.
Computer Series Textbooks, Houghton-Mifflin Company, 1973.
Computer Series Textbooks, Allyn and Bacon, Inc., 1973.

Session Chairman,
"Case Studies", Twelfth International Conference on Very Large Data Bases, Kyoto, Japan, August 1986.
ACM-SIGMOD Conference on Management of Data, Boston, MA, May 1979.
"Performance Evaluation Panel", International Symposium on Computer Performance Modeling, Measurement, and Evaluation, Cambridge, MA, March 1976.
"System and Memory Architecture", International Conference on Very Large Data Bases, Boston, MA, September 1975.

Session Organizer,
"Impact of New Technology on Hierarchical Memory and Storage Systems", IEEE International Conference, New York, NY, April 1975.
"Microprogramming Techniques", IEEE Computer Conference, Boston, MA, September 1971.
"Processor Memory Switch Architectures", National Computer Conference, Anaheim, CA, May 1975.
"Strategic Uses of Very Large Data Bases", VLDB '87, Brighton, England, September 1987.

Steering Committee,
Workshop on Information Technology & Systems (WITS), 1991-

Trustee,
Very Large Data Base (VLDB) Foundation, 1982-
[Treasurer, 1990-92; Vice President 1992-]

6. **PROFESSIONAL SOCIETIES**

The Institute of Management Science (TIMS).

Institute for Electrical and Electronics Engineers (IEEE)
and its Technical Committee on Data Base Engineering (TC-DBE) and Technical Committee on Software Engineering (TC-SE).

Association for Computing Machinery (ACM)
and its Special Interest Groups (SIGs) on Business Data Processing (SIGBDP), Programming Languages (SIGPLAN), Microprogramming (SIGMICRO), Minicomputers (SIGMINI), Performance Evaluation (SIGMETRICS), Operating Systems (SIGOPS), Computer Architecture (SIGARCH), and Management of Data (SIGMOD).

Association for the Advancement of Medical Instrumentation (AAMI).

American Production and Inventory Control Society (APICS).

The Society for Management Information Systems (SMIS).

Sigma Xi, The Scientific Research Society.

The Boston Computer Society.

7. SUBJECTS TAUGHT

7.1 REGULAR TEACHING

15.515 Information and Decision Systems I
        Spring 1973

15.561 Introduction to Computer and Information Systems
        Summer 1978
        Summer 1977
        Summer 1976   [C=4.3   P=4.5]
        Fall 1975   [C=3.8   P=4.2]
        Summer 1975   [C=4.2   P=4.6]
        Fall 1974   [C=3.8   P=3.9]

15.564 Management Information Technology I
        Spring 1987   [C=4.63/4.19   P=4.79/4.05]
        Fall 1986   [C=4.58/4.16   P=4.95/3.97]
        Spring 1986   [C=4.46/4.12   P=4.73/4.04]
        Fall 1984   [C=4.62/4.15   P=4.71/3.97]
        Spring 1984   [C=4.55/4.17   P=4.88/3.97]
        Fall 1983   [C=4.67/4.11   P=4.82/3.97]
        Spring 1983   [C=4.43/4.05   P=4.86/4.00]
        Fall 1982   [C=4.79/3.97   P=4.94/3.98]
        Spring 1982   [C=4.50/4.06   P=4.61/3.84]
        Fall 1981   [C=4.42/3.82   P=4.63/4.00]
        Spring 1981   [C=4.86/3.99   P=4.86/3.84]
        Fall 1980   [C=4.74/3.80   P=4.70/3.68]
        Spring 1980   [C=4.20/3.91   P=4.40/3.81]
        Fall 1979   [C=4.56/3.83   P=4.88/3.66]
        Fall 1975   [C=4.6   P=4.6]
        Fall 1974   [C=4.2   P=4.0]
        Spring 1974   [C=4.5   P=4.9]
        Fall 1973   [C=4.5   P=4.6]

15.565 Management Information Technology II
        Spring 1979   [C=4.89/4.01   P=4.56/3.76]
        Spring 1978   [C=4.50   P=4.75]
        Fall 1977   [C=3.8   P=3.7]
        Spring 1977   [C=4.2   P=4.3]
        Fall 1976   [C=4.3   P=4.5]

15.568 Management Information Systems
        Fall 1972

15.571 Advanced Computer Systems
        Spring 1975   [C=4.3   P=4.6]
        Fall 1974   [C=5.0   P=5.0]
        Spring 1973

15.579 Communications & Connectivity
        Fall 1987   [C=x.x   P=y.y]

15.599 Doctoral Workshop in MIS
            Spring 1986   [C=4.00   P=3.83]

15.963 Management Information Systems Practicum
            Spring 1977

15.967 Seminar on Advanced Information Systems Topics
            Spring 1978   [C=4.67   P=4.00]

15.THP   Structured Thesis: Gaining Strategic Advantage Through Composite
            Information Systems
                Spring 1986

Notes:

1. The numbers immediately following the term indicate Sloan Student Evaluation Ratings for
    the subject. This information is available for most subjects in the period 1974-86.

2. The number after the C= is the rating for "content", the number after the P= is the rating for
    "presentation". Both ratings are on a 5-point scale with 5=excellent and 1=poor.

3. The number after the / indicates the mean rating for all Sloan subjects and faculty, when
    that data is available. (Thus, P=4.86/4.00 means the students evaluated my presentation as
    4.86 out of 5.00 compared with a mean evaluation of 4.00 out of 5.00 for all Sloan faculty that
    term). For periods where term-by-term mean ratings are not available, the mean rating for
    all subjects and faculty were about 3.76 for "content" and 3.58 for "presentation".

4. During these years considerable effort has been spent on curriculum development for the
    "core" MIS subjects 15.561, 15.564, 15.565, and 15.571. This effort to revise and improve
    these subjects appears to have been fruitful based upon measures such as significant
    increases in enrollment and high student evaluation ratings. Textbooks, supplemental
    materials, and computer projects for 15.564, 15.565, and 15.571 have been developed to
    facilitate the teaching of these subjects at other universities.

1978-83	Information Systems Technology, MIT Special Summer Session Program (15.65s)
	Summer 1984 [C=4.91 P=4.96]
	Summer 1983 [C=4.69 P=4.84]
	Summer 1982 [C=4.48 P=4.86]
1978-82	Advanced Software Concepts: Operating Systems (15.25s)
	Summer 1981 [C=4.81 P=4.90]
1979	White Collar Crime II: Computer Security, Ohio State University, May 1979.
1977	Computer Based Information Systems Technology -- Database Systems, Telecommunications, and Performance Evaluation, MIT Special Summer Session Program (15.56s)
1977	Advanced Software Concepts -- Operating Systems, MIT Special Summer Session Program (15.57s)
1975	Tutorial on Operating Systems, University of California at Riverside, Applied Science Program
1975	Data Base Systems Management, University of Maryland, 1975 Summer Institute
1975-86	Current Issues in Information Systems Research: A Managerial Perspective, MIT Center for Information Systems Research Program
1973-76	Advanced Software Engineering -- Focusing on Operating Systems, MIT Special Summer Session Program (15.25s)
1974-75	Advanced Programming Techniques, Babson College, Electronic Data Processing Education Program (EDPEP)
1971-75	Seminar on Computer Architecture, MIT January Independent Activity Period (IAP) course

8. **THESIS SUPERVISION**

DOCTORAL

1. "Metrics For Object-Oriented Software Design", Shyam Chidamber, 1994 (Reader)
2. "Personal Portable Technologies, Job Characteristics, and Worker Effectiveness: A Field Study of Service Personnel", Keri Ostrofsky, 1992 (Reader/Harvard Business School)
3. "A Knowledge-Based Preprocessor for Approximate Joins in Improperly Designed Transaction Databases", Lloyd Brodsky, 1990 (Supervisor)
4. "Knowledge Processing for a Construction Management Database", Ming-Teh Wang, December 1988 (Reader)
5. "Performance Evaluation of the INFOPLEX Database Computer: A Flow Unbalanced General Queueing Network Analysis", Rich Wang, August 1984 (Supervisor)
6. "The Dynamics of Software Development Project Management: A Systems Dynamics Perspective", Tarek Abdel-Hamid, January 1984 (Supervisor)
7. "The Hierarchical Database Decomposition Approach to Database Concurrency Control", Mei Hsu, October 1983 (Supervisor)
8. "The Value of Monitoring and Information Requirements Analysis", Michael Treacy, 1983 (Reader)
9. "A Systematic Methodology for Designing the Architecture of Complex Software Systems", Sidney Huff, 1979 (Supervisor)
10. "Data Storage Hierarchy Systems for Data Base Computers", Chat-Yu Lam, 1979 (Supervisor)
11. "Influence from Information Technology on Industry Cycles: A Case Study in Manufacturing Industry", John Morecroft, 1979 (Reader)
12. "Design Issues in Distributed Management Information Systems", Jacob Akoka, 1978 (Reader)
13. "GPES: A General Purpose Process Engineering System", Mohammad Arab-Ismaili, 1978 (Reader)
14. "A Systematic Approach to the Design and Structuring of Complex Software Systems", Rafael Andreu, 1978 (Supervisor)
15. "Performance Evaluation of a Multiprocessor in a Real Time Environment", Jaynarayan Lala, 1976 (Reader)
16. "Timepattern Analysis in School Scheduling", James Linderman, 1975 (Supervisor)
17. "Program Restructuring for Virtual Memory Systems", Jerry Johnson, 1974 (Supervisor)

18.   "An Open Architecture for Data Environments Based on Context Interchange", Maria Elena Neira, 1995 (Supervisor)

19.   "Information Technology education: Developing Client Server Material for the Sloan Master's Program", Beville Graham St. Clair Jones, 1994 (Supervisor)

20.   "Analysis of the Strategic Information Technology Track with Emphasis on Internships", Jens Haupt, 1994 (Supervisor)

21.   "A CIM Integration Framework for Pharmeceutical Operations", Parkson Chao, 1992 (Supervisor)

22.   "Enterprise Systems Management in a Distributed Computing Environment", Charles H. Rutledge, Jr., 1992 (Supervisor)

23.   "Data Browser Interface for the Composite Information System", Thomas H. Parker, 1991 (Supervisor)

24.   "Technologies and Policies for the Integration of Financial Services Industry Across the European Communities", Usman A. Ghani, 1991 (Supervisor)

25.   "The Design of Global Financial Systems: A Case Study", Shailendra Krishna, 1990 (Supervisor)

26.   "Duplicate Entry Detection in Mailing and Participating Lists", Herber Regal Norckauer, Jr., 1990 (Supervisor)

27.   "Name Management Strategy for Database Integration", Almudena Arcelus, 1990 (Supervisor)

28.   "The Reality of Systems Development: A Case Study at the Sloan School of Management", Leslie Lafer McCafferty, 1990 (Supervisor)

29.   "Risk Management in Japanese Banks", Nemoto Takehiko, 1990 (Supervisor)

30.   "Technologies and Policies for the Development of Composite Information Systems in Decentralized Organizations", Bertrand Rigaldes, 1990 (Supervisor)

31.   "Use of Heterogeneous Data Sources: Three Case Studies", David B. Godes, 1989 (Supervisor)

32.   "A Knowledge-Based Approach Toward Integrating International On-Line Databases", Maria L. Paget, 1989 (Supervisor)

33.   "Multi-Attribute Partitioning Methods for Associative Database Systems", Harold A. Stern, 1989 (Supervisor)

34.   "Networking and Connectivity in an Engineering Company", Maurice El-Khaouam, 1988 (Supervisor)

35.   "Strategic Impact of Communication Networks of the Financial Services Industry", Anand S. Parikh, 1988 (Supervisor)

36.   "Distributed Database Systems: A Comparison between ORACLE and INGRES", Robert W. Gref, III, 1987 (Supervisor)

37.   "Standards for Data Exchange in an Integrated Environment: A Methodological Approach", Maher Kallel, 1987 (Supervisor)

38.   "Interfacing Objects and Databases", Samuel P. Levine, 1987 (Supervisor)

39.   "Gaining Strategic Advantage through Composite Information Systems", Joseph L. Massimo, III, 1987 (Supervisor)

40.   "Integrating Systems for Financial Institutions using Composite Information Systems", Maria de las Nieves Rincon, 1987 (Supervisor)

41.   "A Knowledge-Based System for Resolving Semantic Conflicts: A Problem of Integrating

Heterogeneous DBMS's", Marina Pocaterra Silva, 1987 (Supervisor)

42. "Data Communications Networks: A Comparative Evaluation of the MIT and Harvard Environments", Philip Seung-Ho Yoo, 1987 (Supervisor)

43. "A Study of Development Methodologies for Communications Software", Bruce Gobioff, 1984 (Supervisor)

44. "Transaction Analysis as a Basis for the Rapid Development of Management Information Systems for Small Businesses", David C. Hite, III, 1984 (Supervisor)

45. "SCRIPT to RUNOFF Conversion Program", Ly Thien Hoang, 1983 (Supervisor)

46. "An Information System to Support Admissions", Keith Woodward, 1982 (Supervisor)

47. "A Comparative Study of Software Design Methodologies", Michael Yeh, 1982 (Supervisor)

48. "INFOSAM - A Sample Database Management System", Bruce Blumberg, 1981 (Supervisor)

49. "A Job Queueing Program for the Management Information Systems Courses", Richard Denker, 1980 (Supervisor)

50. "Virtual Information in the INFOPLEX Database Computer", Larry Krakauer, 1980 (Supervisor)

51. "Charge-Back in the Distributed Network", Theresa Ravese, 1980 (Supervisor)

52. "Properties of Reference Algorithms for Multi-Level Storage Hierarchies", Michael Abraham, 1979 (Supervisor)

53. "A Closer Look at Database Access Patterns", Susanne Robidoux, 1979 (Supervisor)

54. "Evaluating Database Management Systems: A Framework and Application to the Veteran's Administration Hospital", Mohammad Dadashzadeh, 1978 (Supervisor)

55. "An Investigation of Cluster Analysis Techniques as a Means of Structuring Specifications in the Design of Complex Systems", Tim Holden, 1978 (Supervisor)

56. "Locality in Logical Database Systems: A Framework for Analysis", Edward McCabe, 1978 (Supervisor)

57. "Centralization vs. Decentralization of Information Systems for the City of Boston", Thomas DeCanio, 1977 (Supervisor)

58. "A Methodology to Aid in the Centralization-Decentralization Decision for Large Decentralized Organizations", John Hussey, 1977 (Supervisor)

59. "Planning the Installation of a Data Base Management System", Luther Goodie, 1977 (Supervisor)

60. "Hospital Information Systems: A Guide for Management Planning", Eric Kurtz, 1977 (Supervisor)

61. "Software Package Evaluation: Application to a Personnel System for the City of Boston", Susan Prytherch, 1977 (Supervisor)

62. "Investigation of a Large-Scale Distributed Database", Anthony Smith, 1977 (Supervisor)

63. "Computerization of Boston City Hall's Personnel System", Rinaldo Spinella, 1977 (Supervisor)

64. "Selecting a Minicomputer: A Framework and Application to the Sloan School of Management", Barry Zack, 1977 (Supervisor)

65. "A Decision Framework for Consumer-Oriented Electronic Funds Transfer Systems", Richard Carrion and Robert Smith, 1976 (Supervisor)

66. "A Framework for Computer-Based Evaluation of Highway Projects in Developing Countries", Jean-Michael Fay, 1975 (Supervisor)

67. "Simulation of IBM/370 Input/Output", Antonio Gillineau, 1976 (Supervisor)

68. "Materials Requirements Planning: A Study", Ajit Kanodia, 1976 (Supervisor)

69. "A Grading Report Generator", Ronald Law, 1976 (Supervisor)

70. "The Family of Operating Systems: A Test Case", Rosita Russell, 1976 (Supervisor)

71. "A Study of the Application of Computer Technology in Retail Stores", Robert Klimm and James Montgomery, 1975 (Supervisor)

72. "Decision Rules for the Automated Generation of Storage Strategies in Data Management Systems", Grant Smith, 1975 (Supervisor)

73. "Management Information Systems -- A Comparison of the Network and Relational Models of Data", Charles Ziering, Jr., 1975 (Supervisor)

74. "Computer Services for Business Schools: A Procedure for Analysis and Application to the Sloan School of Management", Doron Holtzer and Loretta Patzelt, 1974 (Supervisor)

75. "Centralize or Decentralize? A Study of the Data Processing Requirements of the Research Department of the Federal Reserve Bank of Boston", Donald Isaacs, 1974 (Supervisor)

76. "A Parameterized Model for Selecting the Optimum File Organization in Multi-Attribute Retrieval Systems", Jack Shachat, 1974 (Supervisor)

77. "Virtual Information in General Data Base Systems", Howard Schutzman, 1974 (Supervisor)

78. "Specification and Design of a Flexible Information Management System for Large Data Bases", Nicola Szasz, 1974 (Supervisor)

79. "Examination and Modeling of a Prototype Information System", Richard Akemann, 1973 (Supervisor)

80. "Manufacturing Information Systems and Requirements Planning: An Analytical Survey", Samuel Lasry, 1973 (Supervisor)

81. "A Model of a Multiprogrammed Demand Paging Computer System", Judith Piggins, 1973 (Supervisor)

82. "Computer Security: A Comprehensive and Annotated Bibliography", John Scherf, 1973 (Supervisor)

83. "Multiprogramming in a Page on Demand Computer System: Performance Models and Evaluation", David Schwatz, 1973 (supervisor)

84. "An Evaluation of Text Processing Systems", David Urbani, 1973 (Supervisor)

85. "An Intelligent Mechanism for Non-Primary Foreign Key Joints in the CIS / TK System", Bonnie Catherine Scurlock, 1991 (Supervisor)

86. "The Strategic Implementation of a Data Dictionary within Information Systems Architectures: The Insurance Company Case", Dino E. Browne, 1991 (Supervisor)

87. "An Enhanced Architecture for Composite Information Systems", Rebecca Y. Kao and Terence M. Sim, 1990 (Supervisor)

88. "Enhancement of the Communication Server in the Composite Information System", Boniface Ayisi Makatiani, 1990 (Supervisor)

89. "Local Query Processor Manager for the Composite Information Systems / Tool Kit", Min-yuan Tung, 1990 (Supervisor)

90. "The Role of Composite Information Systems: The Citibank Case", Dana Rachel Pressman, 1990 (Supervisor)

91. "An Architecture, Design, and Implementation of a Communications Server to Access Disparate Databases", Francis C. K. Gan, 1989 (Supervisor)

92. "Optimizing Information Retrieval From Disparate Menu Driven Systems", Howard L. Gerber, 1989 (Supervisor)

93. "Addition of a New RDBMS to the 'Access Field' of the CIS/TK System", Gautam A. Gidwani, 1989 (Supervisor)

94. "PC Front End and Network Back End for the Composite Information System Tool Kit", Wilberto Martinez, 1989 (Supervisor)

95. "Data Connectivity for the Composite Information System / Tool Kit", Toon King Wong, 1989 (Supervisor) [Recipient of the 1989 Award for the Best Computer Science Thesis in the MIT EECS Department]

96. "Enhancing Application Model Capabilities on a Composite Information System", Dennis G. Vidach, 1989 (Supervisor)

97. "Leaders for Manufacturing Program Electronic Mail Network", James C. Yao, 1989 (Supervisor)

98. "Parallel Sorting and Relational Data Base Operators on the Connection Machine", Abel Tong, 1985 (Supervisor)

99. "MIT Faculty Club Information System", Ridvan Akkurt, 1983 (Supervisor)

100. "A Classification Scheme for Database Machine Architectures", Herbert Stortz, Jr., 1983 (Supervisor)

101. "A Relational View Facility for the INFOPLEX Database Computer", Brian Feldman, 1982 (Supervisor)

102. "Virtual Information Facility of the INFOPLEX Software Test Vehicle (Part I)", Jameson Lee, 1982 (Supervisor)

103. "N-ary Level Design of the INFOPLEX Software Test Vehicle", David Lui, 1982 (Supervisor)

104. "Virtual Information Facility of the INFOPLEX Software Test Vehicle (Part II)", Peter Lu, 1982 (Supervisor)

105. "Shell: A Simulator for the Software Test Vehicle of the INFOPLEX Database Computer", Tak To, 1981 (Supervisor)

106. "Design and Implementation of an IBM Assembly Language Assembler", Hong Ong, 1980 (Supervisor)

107. "Hierarchical File System Functions on Time Sharing Minicomputers", Michael D'Amato, 1975 (Supervisor)

108.   "Cost Reduction of Student Programming Exercises", Paul Gregory III, 1975 (Supervisor)

109.   "A Placement Office Student Reservation System", Margaret Krupp, 1975 (Supervisor)

110.   "A FORTRAN Simulator of the IBM System/370 Computer", Howell Richards, 1975 (Supervisor)

111.   "A Computer Based Student Information System -- Sloan School of Management", Fehmi Sami, 1975 (Supervisor)

112.   "A Direct Linking Loader", Michael Share, 1975 (Supervisor)

113.   "Simulation of a Multiple Processor IBM System/370 with Associated I/O Equipment", William Silver, 1975 (Supervisor)

114.   "Interconnecting IBM 2741 Communications Terminals to Prime-300 Computers", John Woodward, 1975 (Supervisor)

115.   "Virtual Fields in a Database Management System", Charles Ziering, Jr., 1975 (Supervisor)

116.   "The Design of a Generalized Data Base Management System", Matthew Fowler, 1974 (Supervisor)

117.   "A Device Management Simulator", Michael Knaur, 1973 (Supervisor)

118.   "POS -- Pedagogical Operating System", Richard Swift, 1973 (Supervisor)

119.   "A Design Analysis of Dynamic Linking and Loading of Microprograms", John Wright, 1973 (Supervisor)

* To save space, only theses for which I was the Supervisor have been included in the Masters and Bachelors sections above. Theses for which I was only a Reader have been omitted.

9. RESEARCH PROJECT SUPERVISION

2000-2002   MITRE Corporation, "The Semantic Web", $240,000.

2000-2002   Banco Santander Central Hispano (BSCH), "Financial Services and the Web: MIT Research Initiative," $800,000, September 2000 – August 2002 (OSP 6891291).

2000-2002   Center for eBusiness @MIT / Surugua Bank, "The Impact of the Internet on the Future of the Financial Services Industry," $300,000, July 2000 – May 2002 (OSP 6890004).

1999-2001   Center for eBusiness @MIT / Fleet Bank, "Universal Financial Aggregator," $125,000, April 1999 – April 2001 (OSP 6890007).

1999-2000   Merrill Lynch, "Digital Factory," $500,000, Jan 1999 – December 2000 (OSP 6856603).

1999-2000   Citibank, "Citibank Research," $50,000, July 1999 – Feb 2000 (OSP 6868200).

1998-2000   PricewaterhouseCoopers, "International Laboratory for Intelligent Information Integration," $550K, Feb 1998 – December 2000 (OSP 6665400).

1998-1999   Air Force, Lean Sustainment Initiative.

1998-1999   PriceWaterhoseCoopers, "XML and Web Wrapping," Yearly budget $125,000. Co-Principal Investigator.

1997-1999   Merrill Lynch, "Context Interchange and Web Wrapping: Application to Financial Research and Trading Systems," Yearly budget $140,000. Co-Principal Investigator.

1992-1998   DARPA, "Context Interchange: Using Knowledge about Data to Integrate Disparate Sources," Total budget $2,100,000. Co-Principal Investigator.

1994-1998   Primark, "Context and Data Quality Issues in Financial Information Systems," Project with TASC, Yearly Budget $105,000. Co-Principal Investigator.

1996-1997   DLA, "Context Interchange: Application to Logistics," Total Budget $800,000. Co-Principal Investigator.

1995-1997   TRW, "COIN and InfoWeb," Project with TRW, Yearly Budget $95,000. Co-Principal Investigator.

1991   International Financial Services Research Center grant, "Semantic
            Reconciliation in Evolving Databases," Direct funding $108,000.Co-
            Principal Investigator.

Principal Investigator, **Composite Information Systems**, October 1986 through present.

Sponsor:	MIT Center for Transportation Systems (CTS)	
	U.S. Department of Transportation (DOT)	
	U.S. Air Force (USAF)	
Funding:	$ 487,000	OSP Account 98474; October 1986 - October 1987
Sponsor:	Citibank	
Funding:	$ 29,000	OSP Account 98728; December 1986 - June 1987

Principal Investigator, **Research on the INFOPLEX Database Computer Architecture**, April 1978 through December 1986.

Sponsor:	National Science Foundation (NSF)	
Funding:	$ 122,451	OSP Account 86482; April 1978 - December 1980
Sponsor:	Naval Electronic Systems Command (NAVELEX)	
Funding:	$128,517	OSP Account 96965; September 1985 - February 1987
	164,116	OSP Account 93754; May 1983 - February 1985
	269,139	OSP Account 91445; September 1981 - August 1983
	164,152	OSP Account 89928; June 1980 - February 1982
	25,982	OSP Account 89137; March 1980 - December 1981
	68,056	OSP Account 89136; January 1980 - April 1981
	28,675	OSP Account 87606; January 1979 - December 1979

Co-Principal Investigator (with Prof. John Donovan), **Use of Virtual Machines for the Development of Decision Support Systems**, October 1977 through December 1978.

Sponsor:	Rome Air Development Center (RADC)	
Funding:	$ 64,084	OSP Account 85727; October 1977 - December 1978

Principal Investigator, **Systematic Approach to the Design of Complex Software Systems**, March 1977 through May 1984.

Sponsor:	Naval Electronic Systems Command (NAVELEX)	
Funding:	$ 37,899	OSP Account 87769; April 1979 - March 1980
	$ 66,617	OSP Account 86505; April 1978 - March 1979
	$ 13,700	OSP Account 85519; April 1977 - March 1978
Sponsor:	National Aeronautics and Space Agency (NASA)	
Funding:	$ 38,104	OSP Account 93763; June 1983 - July 1984

Principal Investigator, **Tailored Information Systems**, July 1974 through December 1978

Sponsor:	IBM/MIT Grant	
Funding:	$ 12,000	OSP Account 86150; January 1978 - December 1978
	$ 35,000	OSP Account; July 1974 - December 1977

Co-Principal Investigator (with Prof. John Donovan), **Design of a Family of Operating Systems**, July 1974 through December 1976

      Sponsor: Naval Electronic Systems Command (NAVELEX)
      Funding: $ 386,371   OSP Account; July 1974 - December 1976

Project Supervisor, **Sloan Information Systems Security Project**, January 1973 through December 1973

      Sponsor: IBM Data Security Study
      Funding: $ 102,000   OSP Account; January 1973 - December 1973

TOTAL FUNDING: $ 2,297,691

10. **PUBLICATIONS**

10.1 BOOKS AND MONOGRAPHS

1.   *Software Project Dynamics: An Integrated Approach* (with T.K. Abdel-Hamid), Prentice-Hall, 1991, ISBN 0-13-822040-9, 264 pp.
        -- Received the Jay Wright Forrester Award for "Best Contribution to the field of System Dynamics in the preceding five years" awarded by the System Dynamics Society, 1994.

2.   *The Strategic Use of Information Technology* (Editor), Oxford University Press, 1987, 206 pages.

3.   *Computer Security: Problems and Solutions* (with D.K. Hsiao and D.S. Kerr), ACM Monograph Series (Academic Press), 1979, 331 pp.
        -- Russian edition, published by MNP, Moscow, USSR, 1982, 264 pp.

4.   *Software Projects: Pedagogical Aids for Software Education and Research* (with J.J. Donovan), McGraw-Hill, 1977, 509 pp.

5.   *Operating Systems* (with J.J. Donovan), McGraw-Hill, 1974, 640 pp.
        (Adopted as textbook by over 100 colleges and universities).
          --Japanese edition, published by Nippon Computer Kyokai, 1976, 713 pp.
          --International Student Edition, published by McGraw-Hill Kogakusha, Ltd.,1978, 640 pp.
          --Russian edition, published by MNP, Moscow, USSR, 1978, 792 pp.
          --Czechoslovakian edition, published by SNTL Nakladatelstvi Technicke Literatury, 1981, 590 pp.
          --Polish edition, published by Panstwowe Wydawnictwo Nankowe, Warszawa, Poland, 1984, 625 pp.
          --Spanish edition scheduled for publication.
          --*Instructor's Manual to Accompany Operating Systems*, McGraw-Hill, 1974, 159 pp.

10.2 BOOK CHAPTERS

6.   "Chapter 6: The MIT Context Interchange Project" in *Data Quality*, Ed: R.Y. Wang, M. Ziad, and Y.W. Lee, Kluwer Academic Publishers, 2000, pp. 79-92 {earlier version appeared as "Metadata Jones and the Tower of Babel: The Challenge of Large-Scale Heterogeneity," in *Proceedings of the IEEE Meta-data Conference*, April 1999 [SWP #4069, CISL #99-04]}.

7.   "The Elusive Silver Lining: How We Fail to Learn from Software Development Failures" (with T.K. Abdel-Hamid), republished in *Modelling for Management 1: Simulation in Support of Systems Thinking*, (Dartmouth Publishing Company, Ltd; Hants, England), 1997, pp. 443-452.

8.   "Context Interchange Network Prototype" (with A. Darawala, C. Goh, S. Hofmeister, and M. Siegel) in *Database Applications Semantics*, Chapman & hall (London, UK), October 1996 [SWP #3797, CISL #95-01].

9.   "Chapter 2: Information Technology Platform for the 1990s", *The Corporation of the 1990's: Information Technology and Organizational Transformation,* Edited by Michael S. Scott Morton, Oxford University Press, 1990 (pp. 27-60). [SWP # 3061-89-MS]

10.   "Future Artificial Intelligence Requirements for Intelligent Database Systems" (with M.L. Brodie, D. Bobrow, V. Lesser, D. Tsichritzis, and C. Hewitt), *Expert Database Systems* Benjamin/Cummings, 1989.

11.   "Perspectives on the Effective Use, Planning, and Impact of Information Technology," *The Strategic Use of Information Technology*, Oxford University Press, 1987 (pp. 3-14). [SWP # 1868-87]

12.	"Structure and Capabilities of Key Personal Computer Operating Systems" (with M. Hsu), *Insights into Personal Computers*, IEEE Press, 1985.

10.3 REFEREED ARTICLES

13.	"Parallel (on the fly) Reading of an Entire Database Copy" (with S. Bhalla), to appear in the *International Journal of Computer Research:* Special Issue on Practical Applications of Parallel Computing, Vol. 10, No. 4; and as chapter on "Applied Parallel Computing" in *Advances in Computing: Theory and Practice*, to be published by Nova Science Books and Journals.

14.	"Asynchronous Reading of Consistent Copy of a Large Database" (with S. Bhalla), to appear in "Applied Parallel Computing" in *Advances in Computing: Theory and Practice,* Nova Science Books and Journals. [SWP #4152, CISL #00-08]

15.	"Application, Architecture, and Operation of the Context Interchange System" (with S. Bressan, C. Goh, N. Levina, A. Shah, M. Siegel), to appear in *Applied Intelligence: The International Journal of Artificial Intelligence, Neutral Networks, and Complex Problem-Solving Technologies*.

16.	"Integrating Information from Global Systems: Challenges of Effectively Exploiting the Information SuperHighway", to appear in *Journal of Organizational Computing*.

17.	"DIRECT: A System for Mining Data Value Conversion Rules from Disparate Sources (with W. Fan, H. Lu, and D.W. Cheung), *Decision Support Systems* (in press), 2001. [SWP #xxx, CISL #xxx]

18.	"Discovering and Reconciling Value Conflicts for Numerical Data Integration," (with W. Fan, H. Lu, D. Cheung), to appear in *Information Systems Journal*, Vol. 26, No. 8, pp. 635-656, November 2001. [SWP #4153, CISL #00-09]

19.	"Improving the Quality of Corporate Household Data: Current Practices and Research Directions" (with R. Wang, F. Dravis, and X. Chen), *Proceedings of the Sixth International Conference on Information Quality* (IQ2001, Cambridge), November 2001, pp. 92-104.[SWP #xxx, CISL #xxx]

20.	"The Misguided Silver Bullet: What XML will and will NOT do to help Information Integration," *Proceedings of the Third International Conference on Information Integration and Web-based Applications and Services* (IIWAS2001; Linz, Austria), published by Osterreichische Computer Gesellschaft (ISBM 3-85403-157-2), September 2001, pp. 61-72. [SWP #xxx, CISL #01-08]

21.	"Knowledge Representation Architecture for Context Interchange Mediation: Fixed Income Securities Investment Examples" (with A. Moulton, M. Siegel), *Proceedings of the First International Workshop on Electronic Business Hubs:* XML, Metadata, Ontologies, and Business Knowledge on the Web (WEBH; Munich, Germany), published by IEEE (ISBN 0-7695-1230-5, ISSN 1529-4188), September 2001, pp. 50-54. [SWP #4169, CISL #01-05]

22.	"Corporate Household Data: Research Directions" (with X. Chen, J. Funk, and R. Wang), Proceedings of the Americans Conference on Information Systems (AMCIS, boston), August 2001. [SWP #4166, CISL WP #01-03, TDQM WP#2001-08]

23. "Cross-Organizational Data Quality and Semantic Integrity: Learning and Reasoning about Data Semantics with Context Interchange Mediation" (with A. Moulton and M. Siegel), *Proceedings of the Americans Conference on Information Systems* (AMCIS, Boston), August 2001 [SWP #4167, CISL #01-04].

24. "Information Aggregation – a Value-Added E-Service", (with H. Zhu and M. Siegel), *Proceedings of the 5th International Conference on Technology, Policy, and Innovation* – Theme: "Critical Infrastructures", Delft, the Netherlands, June 26-29, 2001.[SWP #4165, CISL #01-02]

25. "The Caméléon Approach to the Interoperability of Web Sources and Traditional Relational Databases," *Proceedings of the Workshop on Information Technology and Systems*, December 2000.

26. "The Caméléon Web Wrapper Engine" (with A. Firat and M. Siegel), Proceedings of the VLDB2000 Workshop on Technologies for E-Services, September 14-15, 2000. [SWP #4128, CISL #00-03]

27. "Context Knowledge Representation and Reasoning in the Context Interchange System" (with S. Bressan, C. Goh, N. Levina, A. Shah, M. Siegel), *Applied Intelligence: The International Journal of Artificial Intelligence, Neutral Networks, and Complex Problem-Solving Technologies*, Vol. 12, No. 2, September 2000, pp. 165-179. [SWP #4133, CISL #00-04]

28. "Information Integration with Attribution Support for Corporate Profiles" (with T. Lee, M. Chams, R. Nado, and M. Siegel), *Proceedings of the International Conference on Information and Knowledge Management*, November 1999, pp. 423-429 [SWP #4098, CISL #99-05].

29. "e-Commerce Bargain-Hunting with an *unBun* Model" (with R. Yahalom), *Proceedings of the International Conference on Cooperative Information Systems* (CoopIS'99), September 1999, pp. 186-196. [SWP #4067, CISL #99-02]

30. "Context Interchange: New Features and Formalisms for the Intelligent Integration of Information" (with C.H. Goh, S. Bressan, M. Siegel), *ACM Transactions on Office Information Systems*, July 1999. [SWP #3941, CISL #97-03]

31. "Metadata Jones and the Tower of Babel: The Challenge of Large-Scale Heterogeneity," *Proceedings of the IEEE Meta-data Conference*, April 1999 [SWP #4069, CISL #99-04] (also at http://computer.org/conferen/proceed/meta/1999/papers/84/smadnick.html)

32. "Source Attribution for Querying Against Semi-Structure Documents" (with T. Lee and S. Bressan), *Proceedings of the ACM Workshop on Web Information and Data Management* (WIDM'98), Washington, DC, November 6, 1998, pp. 33-39. [SWP #4042, CISL #99-01]

33. "Context Interchange on Wall Street" (with A. Moulton and M. Siegel), *Proceedings of the International Conference on Cooperative Information Systems* (CoopIS'98), September 1998, pp. 271-279.

34. "Using an Active Conceptual Model for Mediating Analytic Information Exchange in the Fixed Income Securities Industry" (with A. Moulton, S. Bressan, and M. Siegel), April, 1998, accepted for publication in the *Proceedings of the 17th International Conference on Conceptual Modeling* (ER'98), Singapore, November 1998. [SWP #4023, CISL #98-04].

35. "Discovering and Reconciling Semantic Conflicts: A Data Mining Perspective" (with H. Lu, W. Fan, C.H. Goh, D.W. Cheung), *Proceedings of the IFIP 2.6 Conference on Database Semantics*, October 1997; also in *Data Mining and Reverse Engineering: Searching for Semantics*, Chapman & Hall, 1998. [SWP #3957, CISL #97-04]

36. "Incorporating Generalized Quantifiers into Description Logic for Representing Data Source Contents" (with S.Y. Tu), *Proceedings of the IFIP 2.6 Conference on Database Semantics*, October 1997; also in *Data Mining and Reverse Engineering: Searching for Semantics*, Chapman & Hall, 1998. [SWP #3998, CISL #98-01]

37. "A Procedure for Mediation of Queries to Sources in Disparate Context" (with S. Bressan, C.H. Goh, T. Lee, and M. Siegel), *Proceedings of the International Logic Programming Symposium*, October 1997. [SWP #3964, CISL #97-09]

38. "Overview of a Prolog Implementation of the COntext INterchange Mediator" (with S. Bressan, K. Fynn, C. Goh, T. Pena, and M. Siegel), *Proceedings of the Fifth International Conference and Exhibition on the Practical Applications of Prolog*, London, England, April 1997. [SWP #3980, CISL #97-13]

39. "The Context Mediator Prototype" (with S. Bressan, C. Goh, K. Fynn, M. Jakobisiak, K. Hussein, H. Kon, T. Lee, T. Pena, J. Qu, A. Shum, and M. Siegel), *Proceedings of the ACM Conference on the Management of Data (SIGMOD '97)*, February 1997 [SWP #3490, CISL #97-02].

40. "Database in the Internet Age", *Database Programming & Design*, Vol. 10, No. 1, January 1997, pp. 28-33.

41. "Conceptualizing Semantic Interoperability: A Perspective from the Knowledge Level" (with J. Lee and M. Siegel), *International Journal of Cooperative Information Systems* [Special Issue of Formal Methods in Cooperative Information Systems], Vol. 5, No. 4, December 1996.

42. "Resolving Context Heterogeneity: Applying Insights from Semantics and Ontology" (with J. Lee), *Proceedings of the Workshop on Information Technology & Systems*, December 1996.

43. "The Context Interchange Approach to Large Scale Data Integration: Benefits and Challenges" (with J. Lee and M. Siegel), *Proceedings of the International Conference on Data Engineering*, August 1996.

44. "Are We Moving Toward an Information SuperHighway or a Tower of Babel? The Challenge of Large-Scale Semantic Heterogeneity", *Proceedings of the IEEE International Conference on Data Engineering*, February 1996, pp. 2-8 [also reprinted in *21st* (a Web 'Zine at http://www.vxm.com/), Vol. 1, No. 6, April 1996, pp. Speed 1-10. [SWP #3888, CISL #96-01]

45. "Why Not One Big Database? Principles for Data Ownership" (with M. Van Alstyne and E. Brynjolfsson), *Decision Support Systems*, Vol. 15, December 1995, pp. 267-284. [SWP #3695, CISL #94-03]

46. "Integrating Territories: Information Systems Integration and Territorial Rationality" (with Y.W. Lee), *Proceedings of the ACM SIGCPR Conference (Cincinnati, Ohio)*, April 1992, pp. 221-231.

47.   "Composite Information Systems: Technologies for Resolving Semantic Heterogenities" (with M. Siegel and A. Gupta), *Proceedings of the Workshop on Information Technology and Systems* (Cambridge, Mass.), December 1991.

48.   "The Elusive Silver Lining: How We Fail to Learn from Failures in Software Development" (with T. Abdel-Hamid) to appear in the *Sloan Management Review*.

49.   "A Polygen Model for Developing Heterogeneous Database Systems with Source Tagging Capabilities" (with R. Wang) to appear in the *Proceedings of the ICIS Conference* (Copenhagen, Denmark), December 1990. [SWP # MSA-3119-90]

50.   "A Source Tagging Theory for Heterogeneous Database Systems" (with R. Wang), *Proceedings of the ICIS Conference* (Copenhagen, Denmark), December 1990. [Sloan Working Paper WP# MSA-3119-90]

51.   "Beyond the Globalization of Information Technology: The Life of an Organization and the Role of Information Technology" (with Y.W. Lee and Y.R. Wang), *Proceedings of the American Management Conference* (Orlando, FL), August 1990. [Received **JITM/AM Conference Best Paper Award**].

52.   "A Polygen Model for Heterogeneous Database Systems: The Source Tagging Perspective" (with R. Wang), *Proceedings of the VLDB Conference* (Brisbane, Australia), August 1990. [SWP # 3119-90-MSA]

53.   "The Composite Information Systems Laboratory (CISL) Project at MIT" (with M. Siegel and Y.R. Wang) to appear in *IEEE Data Engineering*, June 1990.

54.   "A Taxonomy for Classifying Commercial Approaches to Information Integration in Heterogeneous Environment" (with A. Gupta) to appear in *IEEE Data Engineering*, June 1990.

55.   "Schema Integration Using Metadata" (with M. Siegel), *Proceedings of the 1989 NSF Workshop on Heterogeneous Databases* (Evanston, IL), December 1989. [SWP # 3092-89-MS; IFSRC No. 119-89]

56.   "CISL: Composing Answers from Disparate Information Systems" (with R. Wang et. al.), *Proceedings of the 1989 NSF Workshop on Heterogeneous Databases* (Evanston, IL), December 1989. [SWP # 3091-89-MS; CISR No. 202; IFSRC No. 118-89]

57.   "Lessons Learned from Modeling the Dynamics of Software Development" (with T. Abdel-Hamid), *Communications of the ACM*, Vol. 32, No. 12, December 1989, pp. 1426-1438, 1455; also in *Software Project Management: Readings and Cases* (editor C. Kemerer), Irwin, 1997, pp. 144-163. [SWP # 2069-88; CISR No. 184]

58.   "Maintaining Valid Schema Integration in Evolving Heterogeneous Database Systems" (with M. Siegel) submitted to *IEEE Office Knowledge Engineering*, Vol. 3, No. 2, August 1989, pp. 9-16.

59.   "Facilitating Connectivity in Composite Information Systems" (with Y.R. Wang), *ACM Database*, Vol. 20, No. 3, Fall 1989. [SWP # 1975-88]

60.   "Software Productivity: Potential, Actual, and Perceived"   (with T. Abdel-Hamid), *Systems Dynamics Review*, Vol. 5, No. 2, Summer 1989, pp. 93-113. [SWP # 2075-88; CISR No. 179]

61.   "Hierarchical Timestamping Algorithm" (with M. Hsu), *Information Systems,* Vol. 14, No. 2, 1989,

pp. 119-129. [SWP # 1876-87]

62.   "The Inter-Database Instance Identification Problem in Integrating Autonomous Systems" (with Y.R. Wang) *Proceedings of the Fifth International Data Engineering Conference* (Los Angeles, CA), February 1989.

63.   "An Integrative System Dynamics Perspective of Software Project Management: Examples of Project Estimation and Scheduling Experiments" (with T. Abdel-Hamid) *Proceedings of the 1989 Society for Computer Simulation Western Multi-Conference.* [SWP # 1871-87; CISR No. 152]

64.   "A Temporal and Spatial Locality Theory for Characterizing Very Large Data Bases" (with A. Moulton), *Proceedings of the Hawaii International Conference on System Sciences,* January 1989. [SWP # 1864-87]

65.   "Motivating Strategic Alliance for Composite Information Systems: The Case of a Major Regional Hospital" (with C. Osborn and Y.R. Wang), *Journal of Management Information Science*, Vol. 6, No. 3, Winter 1989/90, pp. 99-117. [also appeared in *Proceedings of the 1989 Hawaii International Conference on System Sciences (HICSS)*, January 1989 -- Nominated for **Best Paper at HICSS**.] [SWP # 2031-88; CISR No. 203]

66.   "Inter-Database Instance Identification in Composite Information Systems" (with Y.R. Wang and D.C. Horton), *Proceedings of the Hawaii International Conference on System Sciences*, January 1989. [SWP # 2029-88]

67.   "Evolution Towards Strategic Applications of Data Bases Through Composite Information Systems" (with Y. Wang), *Journal of MIS,* Vol. 5, No. 2, Fall 1988, pp. 5-22. [SWP # 1862-87; CISR No. 170]

68.   "Shifting Timestamps for Concurrency Control in an Information Hierarchy" (with M. Hsu), *Information Processing Letters*, Vol. 27, May 1988, pp. 291-297. [SWP # 1875-87]

69.   "Future Artificial Intelligence Requirements for Intelligent Database Systems" (with M.L. Brodie, D. Bobrow, V. Lesser, D. Tsichritzis, and C. Hewitt), *Proceedings of the Expert Database Systems*, April 1988.

70.   "A Framework of Composite Information Systems for Strategic Advantage" (with Y. Wang), *Proceedings of the Hawaii International Conference on System Sciences,* Vol. III: *Decision Support and Knowledge Based Systems*, January 1988. [SWP # 1937-87; CISR No. 172]

71.   "Integrating Disparate Databases for Composite Answers" (with Y.R. Wang), *Proceedings of the Hawaii International Conference on System Sciences,* Vol. II: Software, January 1988. [SWP # 1936-87; CISR No. 171]

72.   "Key Concerns of Executives Making IS Decisions" (with Y.R. Wang), *Proceedings of the Hawaii International Conference on System Sciences,* Vol. IV: Applications, January 1988 [SWP # 1861-87]

73.   "A Conceptual Model for Integrated Autonomous Processing: An International Bank's Experience with Large Databases (with W. Frank, Y. Wang), *Proceeding of the International Conference on Information Systems*, December 1987. [SWP # 1866-87; CISR No. 173]

74.   "The Economics of Software Quality Assurance: A Systems Dynamics Based Simulation Approach" (with T. Abdel-Hamid), *The Annals of the Society of Logistics Engineers,* Vol. No. 2,

October 1987. [SWP # 1977-88; CISR No. 174]

75.   "Performance Analysis of Multi-microprocessor Systems" (with Y. Wang), *IEEE Transactions on Industrial Electronics*, Vol. IE-34, No. 3, August 1987.

76.   "On the Portability of Quantitative Software Estimation Models" (with T.K. Abdel-Hamid), *Information & Management*, Vol. 13, No. 1, August 1987. [SWP # 1977-88; CISR No. 174]

77.   "A Microcomputer-Based Image Database Management System" (with B. Prasad, A. Gupta, and H. Toong), *IEEE Transactions on Industrial Electronics*, Vol. IE-34, No. 1, February 1987 [CISR No. 146]

78.   "Modeling the INFOPLEX Database Computer: A Multiprocessor System with Unbalanced Flows" (with Y.R. Wang), *Proceedings of the Advanced Database Symposium*, August 1986.

79.   "Impact of Schedule Estimation on Software Project Behavior" (with T.K. Abdel-Hamid), *IEEE Software*, Vol. 3, No. 4, July 1986.

80.   "A Microcomputer-Based Image Database Management System" (with B. Prasad, A. Gupta, and H. Toong), *IEEE Transactions on Industrial Electronics*, Vol. IE-34, No. 1, February 1987.

81.   "Modeling Multiprocessor Computer Systems with Unbalanced Flows" (with Y.R. Wang), *ACM Performance Evaluation Review*, Vol. 14, No. 1, May 1986.

82.   "INFOPLEX: Research in a High-Performance Database Computer" (with M. Hsu), *IEEE Database Engineering*, Vol. 9, No. 1, March 1986.

83.   "A Graph-Decomposition Method Based on the Density-Contour Clustering Model" (with M.A. Wong and J.M. Lattin), *Computer Science and Statistics: Proceedings of the 14th Symposium on the Interface*, Springer-Verlag, 1984.

84.   "The Dynamics of Software Project Scheduling: A Systems Dynamics Perspective" (with T. Abdel-Hamid), *Communications of the ACM*, Vol. 26, No. 5, May 1983.

85.   "An Integrative Approach to Modeling the Software Management Process: A Basis for Identifying Problems and Evaluating Tools and Techniques" (with T. Abdel-Hamid), *Proceedings of the IEEE Computer Society Workshop on Software Engineering Technology Transfer*, April 1983.

86.   "Hierarchical Database Decomposition - A Technique for Database Concurrency Control" (with M. Hsu), *Proceedings of the ACM Symposium on Principles of Database Systems*, March 1983.

87.   "The Dynamics of Software Project Scheduling" (with T. Abdel-Hamid), *Proceedings of the International Conference on Information Systems*, December 1982.

88.   "A Model of Software Project Management Dynamics" (with T. Abdel-Hamid), *Proceedings of the IEEE International Computer Software and Applications Conference*, November 1982.

89.   "A Study of the Multi-Cache Consistency Problems in Multi-Processor Computer Systems" (with T. Abdel-Hamid), *Proceedings of the Sixth Workshop on Computer Architecture for Non-Numeric Processing*, June 1981.

90.   "Recent Research Results on the INFOPLEX Intelligent Memory System Project", *Proceedings of the International Congress on Applied Systems Research and Cybernetics*, December 1980.

91.   "The INFOPLEX Database Computer: Concepts and Directions", *Proceedings of the IEEE Computer Conference*, February 1979.

92.   "Properties of Storage Hierarchy Systems with Multiple Page Sizes and Redundant Data" (with C. Lam), *ACM Transactions on Data Base Systems*, December 1978.

93.   "Operating Systems Security: Current Research" (with D.K. Hsiao and K.S. Kerr), *Proceedings of the IEEE Computer Software and Applications Conference*, November 1978.

94.   "Management Policies and Procedures Needed for Effective Computer Security", *Sloan Management Review*, Vol. 20, No. 1, Fall 1978.

95.   "Privacy and Security of Data Communications and Databases" (with D.K. Hsiao and D.S. Kerr), *Proceedings of the Fourth International Conference on Very Large Data Bases*, September 1978.

96.   "Database Machine Architecture in the Context of Information Technology Evolution" (with D.K. Hsiao), *Proceedings of the Third International Conference on Very Large Data Bases*, October 1977.

97.   "Trends in Computers and Computing: The Information Utility", *Science*, Vol. 195, No. 4283, March 18, 1977.

98.   "Institutional and Ad-Hoc Decision Support Systems and Their Effective Use" (with J.J. Donovan), *Data Base*, Vol. 8, No. 3, January 1977.

99.   "Virtual Machine Advantages in Security, Integrity, and Decision Support Systems" (with J.J. Donovan), *IBM Systems Journal*, Vol. 15, No. 3, August 1976.

100.   "The Hierarchical Approach to Information System Security" (with J.J. Donovan), *IBM Systems Journal*, Vol. 14, No. 2, May 1975.

101.   "An Application of a Generalized Management Information System to Energy Policy and Decision Making: The User's View" (with J.J. Donovan, L.M. Gutentag, and G.N. Smith), *Proceedings AFIPS 1975 National Computer Conference*, Vol. 44, May 1975.

102.   "INFOPLEX -- Hierarchical Decomposition of a Large Information Management System Using a Microprocessor Complex", *Proceedings AFIPS 1975 National Computer Conference*, Vol. 44, May 1975.

103.   "Design of a General Hierarchical Storage System", *Proceedings of the International Convention and Exposition of the Institute of Electrical Engineers*, April 1975.

104.   "Virtual Information in Data Base Systems" (with H. Schutzman and J. Folinus), *SIGFIDET*, Vol. 6, No. 3, May 1974.

105.   "The Future of Computers", *Technology Review*, Vol. 75, No. 8, August 1973.

106.   "Recent Technical Advances in the Computer Industry and Their Future Impact", *Sloan Management Review*, Vol. 14, No. 3, Spring 1973.

107.   "Application and Analysis of the Virtual Machine Approach to Information System Security and Isolation" (with J.J. Donovan), *Proceedings of the ACM Workshop on Virtual Computer Systems*, Harvard University, Cambridge, MA, March 1973.

108. "Program Parallelism Based upon Computation Schemata" (with H.D. Toong), *Proceedings of the 6th International Congress on Cybernetics*, Association Internationale de Cybernetique, Namur (Belgique), 1972.

109. "What is Microprogramming?", *Proceedings of the IEEE Computer Conference*, September 1971.

110. "Design and Construction of a Pedogogical Microprogrammable Computer", *Proceedings of the 3rd Annual Workshop on Microprogramming* (Buffalo, NY), October 1970.

111. "Development of a Computer-Based Sensor System", *Proceedings of the Hawaii International Conference on Systems Science*, January 1970.

112. "A Modular Approach to File System Design" (with J.W. Alsop), *Proceedings of the 1969 Spring Joint Computer Conference*, Vol. 34, May 1969.

113. "Time-Sharing Systems: Virtual Machine Concept vs. Conventional Approach", *Modern Data Systems*, Vol. 2, No. 3, March 1969.

114. "A Modular Approach to File System Design" (with J.W. Alsop), *IAG Quarterly*, IFIP Amsterdam, No. 3, 1969.

115. "Design Strategies for File Systems: A Working Model", *File Organization - Selected Papers from FILE-68*, IFIP Administrative Data Processing Group, 1969.

116. "SCRIPT, An Online Manuscript Processing System" (with G.A. Moulton), *IEEE Transactions on Engineering Writing and Speech*, Vol. EWS-11, No. 2, August 1968.

117. "Multi-Processor Software Lockout", *Proceedings of the 1968 ACM National Conference*, August 1968.

118. "String Processing Techniques", *Communications of the ACM*, Vol. 10, No. 7, July 1967.

10.4 OTHER EXTERNAL PUBLICATIONS

119. "A Graph-Partitioning Method of Decomposing Complex Software Design Problems into Manageable Subproblems" (with T. Wong and J. Lattin), *Proceedings of the 14th Interface Symposium Between Computer Science and Statistics*, July 1982.

120. "Computer Security and Privacy" (with D.K. Hsiao and D.S. Kerr), *Naval Research Review*, 1978.

121. "Comments on the Past, Present, and Future of Information Systems Research Activities", *Proceedings of a Symposium on Technological Innovation*, April 1976.

122. "A Modular Approach to File System Design" (with J.W. Alsop, edited by P. Freeman), *Software Systems Principles: A Survey*, Science Research Associates, 1975.

123. Project Supervisor of nine of twelve papers (co-author of two papers) in *Data Security and Data Processing*, (Vol. 4, Study Results: MIT), published by IBM (Form Number 6320-1374), June 1974.

124. "MIS -- Problems Plus a Solution", *Computer Forum Report*, Vol. 1, No. 4, July 1969.

10.5 WORKING PAPERS AND TECHNICAL REPORTS

Note: Working papers distributed through the National Technical Information System (NTIS) can be obtained by writing to: NTIS, 5282 Port Royal Rd., Springfield, Virginia 22161. This includes the Knowledge-Based Integrated Information Systems Engineering (KBIISE) Project Series (8 volumes), printed by MIT for the U.S. Air Force and U.S. Department of Transportation.

125.   "An Accounting Model-Based Approach to Semantic Reconciliation in Heterogeneous Database Systems" (with R. Wang).

126.   "A Polygen Data Model for Data Source Tagging in Composite Information Systems" (with R. Wang) [SWP # 3100-89-MSA; IFSRC No. 120-89], December 1989.

127.   "An Architectural Comparison of Contemporary Approaches and Products for Integrating Heterogeneous Information Systems" (with A. Gupta, C. Poulsen, and T. Wingfield) [SWP # 3084-89 and IFSRC No. 110-89], November 1989.

128.   "Connectivity Among Information Systems" (editor, with Y. R. Wang), *CIS* Vol. I (Release 3), Published by MIT Sloan School CISL Project, December 1988, 143 pp.

129.   *Knowledge-Based Integrated Information Systems Engineering: Highlights and Bibliography* (editor, with A. Gupta), KBIISE Vol. 1, (NTIS No. A195-850, 200 pp.), 1987.

130.   *Knowledge-Based Integrated Information Systems Development Methodologies Plan* (editor, with A. Gupta), KBIISE Vol. 2, (NTIS No. A195-851, 342 pp.), 1987.

131.   *Integrating Distributed Homogeneous and Heterogeneous Databases: Prototypes* (editor, with A. Gupta), KBIISE Vol. 3, (NTIS No. A195-852, 218 pp.), 1987.

132.   *Object-Oriented Approach to Integrating Database Semantics* (editor, with A. Gupta), KBIISE Vol. 4, (NTIS No. A195-853, 296 pp.), 1987.

133.   *Integrating Images, Applications, and Communications Networks* (editor, with A. Gupta), KBIISE Vol. 5, (NTIS No. A195-854, 342 pp.), 1987.

134.   *Strategic, Organizational, and Standardization Aspects of Integrated Information Systems* (editor, with A. Gupta), KBIISE Vol. 6, (NTIS No. A195-855, 256 pp.), 1987.

135.   *Integrating Information Systems in a Major Decentralized International Corporation* (editor, with A. Gupta), KBIISE Vol. 7, (NTIS No. A195-856, 283 pp.), 1987.

136.   *Technical Opinions Regarding Knowledge-Based Integrated Information Systems Engineering* (editor, with A. Gupta), KBIISE Vol. 8, (NTIS No. A195-857, 350 pp.), 1987.

137.   "Modeling the INFOPLEX Database Computer" (with Y. Wang), IMS Technical Report 23, (8 pp.), February 1987.

138.   "Modeling Multiprocessor Computer Systems with Unbalanced Flows" (with Y. Wang), IMS Technical Report 22, (NTIS No. AD-A177967, 7 pp.), February 1987.

139.   "Time Slice Manipulation in Information Hierarchy" (with M. Hsu), IMS Technical Report 21, (NTIS No. AD-A177949, 11 pp.), February 1987.

140.   "Concurrent Operations in Extendible Hashing" (with M. Hsu and W. Yang), IMS Technical

Report 20, (NTIS No. AD-A177974, 7 pp.), February 1987.

141. "Design of a Data Storage Hierarchy: DSH-III -- Software and Hardware" (with M. Abraham), IMS Technical Report 19, (NTIS No. AD-A166287, 122 pp.), March 1986.

142. "Hardware Feasibility of INFOPLEX Design Strategy" (with H. Toong and A. Gupta), IMS Technical Report 18, (NTIS No. AD-A163506, 33 pp.), March 1985.

143. "IMS Design -- Alternatives, Analysis, and Strategies" (with M. Abraham), IMS Technical Report 17, (NTIS No. AD-A163505, 55 pp.), December 1985.

144. "The Hierarchical Database Decomposition Approach to Database Concurrency Control" (with M. Hsu), IMS Technical Report 16, (NTIS No. AD-A150-612, 287 pp.), December 1984.

145. "Performance Evaluation of Distributed Systems with Unbalanced Flows: An Analysis of the INFOPLEX Data Storage Hierarchy" (with Y. Wang), IMS Technical Report 15, (NTIS No. AD-A150-528, 267 pp.), July 1984.

146. "Queuing Network Systems with Unbalanced Flows and Their Applications to Performance Evaluation of Highly Parallel Distributed Information Systems" (with Y. Wang), IMS Technical Report 14, (NTIS No. AD-A158-052, 36 pp.), August 1984.

147. "Performance Evaluation of the INFOPLEX Database Computer Using Operational Analysis" (with Y. Wang), IMS Technical Report 13, (NTIS No. AD-A137-301, 68 pp.), April 1981.

148. "Hierarchical Database Decomposition: A Technique for Database Concurrency Control" (with M. Hsu), IMS Technical Report 12, (NTIS No. AD-A134-356, 61 pp.), December 1982.

149. "Virtual Information Facility of the INFOPLEX Software Test Vehicle (Part II)" (with P. Lu), IMS Technical Report 11, (NTIS No. AD-A116-502, 144 pp.), May 1982.

150. "Virtual Information Facility of the INFOPLEX Software Test Vehicle (Part I)" (with J. Lee), IMS Technical Report 10, (NTIS No. AD-A116-503, 180 pp.), May 1982.

151. "FSTV: The Software Test Vehicle for the Functional Hierarchy of the INFOPLEX Database Computer" (with M. Hsu), IMS Technical Report 9, (NTIS No. AD-A116-591, 270 pp.), January 1982.

152. "SHELL: A Simulator for the Software Test Vehicle of the INFOPLEX Database Computer" (with T. To), IMS Technical Report 8, (NTIS No. AD-A116-592, 161 pp.), January 1982.

153. "INFOSAM: A Sample Database Management System" (with B. Blumberg), IMS Technical Report 7, (NTIS No. AD-A116-593, 331 pp.), December 1981.

154. "Examining the Interlocking Structure of the Corporate Network: An Application of a High-Density Clustering Model on a Graph" (with J. Lattin), SDM Technical Report 16, (NTIS No. AD-A105-832, 55 pp.), September 1981.

155. "A Study of the Multicache Consistency Problem in Multiprocessor Computer Systems" (with T.K. Abdel-Hamid), IMS Technical Report 6, (23 pp.).

156. "A Preliminary Architectural Design for the Functional Hierarchy of the INFOPLEX Database Computer" (with M. Hsu), IMS Technical Report 5, (NTIS No. AD-A102-924, 181 pp.), November

1980.

157.   "Implementation and Evaluation of a Graph Partitioning Technique Based on a High-Density Clustering Model" (with J. Lattin), SDM Technical Report 15, (NTIS No. AD-A099-221, 61 pp.).

158.   "A Graph Decomposition Technique Based on a High-Density Clustering Model on Graphs" (with T. Wong), SDM Technical Report 14, (NTIS No. AD-A090-348, 34 pp.), July 1980.

159.   "A Systematic Approach to Complex Systems Design: An Application to Printed Circuit Board Test System Design" (with P. Tung), SDM Technical Report 13, (NTIS No. AD-A090-707, 191 pp.), February 1980.

160.   "Understanding the Computer (Little Man Computer)", 1979, (Spanish Translation, 1981; French Translation, 1985).

161.   "A Systematic Methodology for Designing the Architecture of Complex Software Systems" (with S. Huff), SDM Technical Report 12, (NTIS No. AD-A074-911, 604 pp.), September 1979.

162.   "Architectural Design of a New MIT Budgeting System: An Application of the Systematic Design Methodology" (with S. Huff), SDM Technical Report 11, (NTIS No. AD-A071-748, 150 pp.).

163.   "Data Storage Hierarchy Systems for Data Base Computers" (with C. Lam), INFOPLEX Technical Report 3, August 1979.

164.   "Simulation Studies of the DSH-11 Data Storage Hierarchy" (with C. Lam), IMS Technical Report 4, (NTIS No. AD-A074-503, 128 pp.), June 1979.

165.   "The IMS Data Storage Hierarchy: DSH-11" (with C. Lam), IMS Technical Report 3, (NTIS No. AD-A073-376, 43 pp.), June 1979.

166.   "The IMS Data Storage Hierarchy: DSH-1" (with C. Lam), IMS Technical Report 2, (NTIS No. AD-A073-375, 36 pp.), June 1979.

167.   "The Intelligent Memory System Architecture Research Directions" (with C. Lam), IMS Technical Report 1, (NTIS No. AD-A073-485, 36 pp.), June 1979.

168.   "A Normative Cost-Benefit Analysis of the Systematic Design Methodology" (with S. Huff), SDM Technical Report 10, (NTIS No. AD-A072-355, 72 pp.), May 1979.

169.   "Analysis Techniques for Use with the Extended SDM Model" (with S. Huff), SDM Technical Report 9, (NTIS No.AD-A071-647, 123 pp.), May 1979.

170.   "Use of Virtual Machines in the Development of Decision Support Systems" (with C. Lam and T.K. Abdel-Hamid), DSS Technical Report No. 7, May 1979.

171.   "Decomposition of Weighted Graphs Using the Interchange Partitioning Algorithm" (with S. Huff), SDM Technical Report 8, (NTIS No. AD-A069-549, 88 pp.), March 1979.

172.   "Final Report on the Use of Virtual Machines in the Development of Decision Support Systems" (with T.K. Abdel-Hamid and C. Lam), DSS Technical Report 6, January 1979.

173.   "Properties of Storage Hierarchy Systems with Multiple Page Sizes and Redundant Data" (with C. Lam), INFOPLEX Technical Report 2, December 1978.

174. "Software Architecture and Semantics of Requirements" (with S.L. Huff), Working Paper, November 1978.

175. "INFOPLEX Data Base Computer Architecture Concepts and Directions" (with C. Lam), INFOPLEX Technical Report 1, August 1978.

176. "An Extended Model for a Systematic Approach to the Design of Complex Systems" (with S.L. Huff), SDM Technical Report 7, (NTIS No. AD-A058-565, 63 pp.), July 1978.

177. "COMPDATA: A Generalized High-Level Data Language System - Preliminary Investigations" (with C. Lam), DSS Technical Report 5, July 1978.

178. "Preliminary Investigations of a SPO Decision Support System" (with C. Lam), DSS Technical Report 4, July 1978.

179. "An Approach to Constructing Functional Requirement Statements for System Architectural Design" (with S.L. Huff), SDM Technical Report 6, (NTIS No. AD-A057-802, 87 pp.), June 1978.

180. "A Systematic Approach to Designing Complex Systems: Application to Software Operating Systems" (with T. Holden), SDM Technical Report 5, (NTIS No. AD-A055-481, 314 pp.), May 1978.

181. "Composite Information Systems: A New Concept in Information Systems" (with C. Lam), DSS Technical Report 3 and SWP # 993-78, May 1978.

182. "Strategies for Interfacing Virtual Machines: A Case Study" (with C. Lam), DSS Technical Report 2, March 1978.

183. "Use of Virtual Machines for Development of Decision Support Systems: Strategies for Interfacing Virtual Machines" (with C. Lam), DSS Technical Report 1, March 1978.

184. "Completing the Requirements Set as a Means Towards Better Design Frameworks: A Follow-up Exercise in Software Architectural Design" (with R. Andreu), SDM Technical Report 4, (NTIS No. AD-A049-782, 80 pp.), December 1977.

185. "An Exercise in Software Architectural Design: From Requirements to Design Problem Structure" (with R. Andreu), SDM Technical Report 3, (NTIS No. AD-A048-765, 121 pp.), November 1977.

186. "Solving Decomposition Problems: Alternative Techniques and Description of Supporting Tools" (with R. Andreu), SDM Technical Report 2, (NTIS No. AD-A048-759, 48 pp.), September 1977.

187. "Set Decomposition: Cluster Analysis and Graph Decomposition Techniques" (with R. Andreu), SDM Technical Report 1, (NTIS No. AD-A044-769, 82 pp.), September 1977.

188. "A Systematic Approach to the Design of Complex Systems: Application to DBMS Design and Evaluation" (with R. Andreu), CISR Report 32, and SWP #. 920-77, March 1977.

189. "Concepts and Facilities" (with R. Goldberg and J. Donovan), FOS Technical Report 22, (275 pp.), February 1976.

190. "Computer Program Design Specifications" (with L. Goodman and J. Donovan), FOS Technical Report 16, (41 pp.), September 1976.

191.   "Computer Program Performance Specification" (with M. Wilens and J. Donovan), FOS technical Report 15, (29 pp.), September 1976.

192.   "Automated Synchronous Scheduler Generator" (with P. Chen and J. Donovan), FOS Technical Report 14, (40 pp.), February 1977.

193.   "Family of Operating Systems: Test Case Report" (with R. Russel and J. Donovan), FOS Technical Report 12, (74 pp.), September 1976.

194.   "Sample Implementation Specifications for an FOS Member" (with J. DeTreville, L. Goodman, M. Tersoff, and J. Donovan), FOS Technical Report 10, (541 pp.), May 1976.

195.   "Modules and Levels Report" (with J. DeTreville and J. Donovan), FOS Technical Report 8, (80 pp.), September 1976.

196.   "Operating Systems Interface" (with L. Goodman and J. Donovan), FOS Technical Report 7, (58 pp.), September 1976.

197.   "A Survey of Navy Tactical Computer Applications and Executives" (with D. Punj and J.D. DeTreville), FOS Report 101-D and CISR Report 19, (NTIS No. AD-A021-074, 320 pp.), October 1975.

198.   "Storage Hierarchy Systems", MIT Project MAC Report MAC-TR-107 (NTIS No. AD-760-001, 155 pp.), April 1973.

199.   "An Approach to Information System Isolation and Security in a Shared Facility" (with J.J. Donovan), [SWP # 648-73], March 1973.

200.   "Recent Technical Advances in the Computer Industry and Their Future Impact", [SWP # 645-73], February 1973.

201.   "On the Design of BORAM Devices for Paging Systems", Internal Project MAC Memorandum, February 1972.

202.   "Design Strategies for File Systems", MIT Project MAC Report MAC-TR-78 (NTIS No. AD-714-269, 106 pp.), October 1970.

203.   "CMS/360 SNOBOL User's Manual", IBM Cambridge Scientific Center Report, November 1967.

204.   "String Processing Techniques on the IBM System/360: Techniques and Examples", IBM Cambridge Scientific Center Report 36.Y05, June 1966.

205.   "SPL/I: A String Processing Language", IBM Cambridge Scientific Center Report 36.006, June 1966.

10.6 VIDEO-TAPE AND SOFTWARE PUBLICATIONS

206.   *Knoware: How to Succeed in Computers Without Really Trying* (with J.J. Donovan), published by Knoware Learning Systems, Inc., 1983, 3 diskettes for IBM PC and Apple-II computers (named "Best Product of the Month" by *Personal Software* magazine, March 1984).

207.   *Knowonder* (with J.J. Donovan), published by Knoware Learning Systems, Inc., 1985, 3 diskettes

for IBM PC and Apple-II computers.

208.   *Information Issues and Technologies for Management* (with J.J. Donovan), published by McGraw-Hill/Edutronics, 1982, 13 broadcast quality edited videotapes totalling 18 hours in length, plus 300 pp. of student study guide and supplemental notes.

209.   *Basic Systems and Applications Programming* (with J.J. Donovan), published by McGraw-Hill/Edutronics, 1982, 21 broadcast quality edited videotapes totalling 24 hours in length plus 300 pages of student study guide and supplemental notes.

10.7 BOOKS IN PROGRESS

Complete drafts of the following books exist and are being used in Sloan School subjects 15.564, 15.565, and 15.65s. Although publication arrangements have been made with McGraw-Hill, a considerable amount of editing and polishing is still expected before publication.

210.   *Information Processing Systems* (with J.J. Donovan), 260 draft pp.

211.   *Basic Systems Programming* (with J.J. Donovan), 495 draft pp.

212.   *Information Systems Technology*, (with J.J. Donovan), 714 draft pp.

10.8 ARTICLES IN PROGRESS

Complete drafts of the following papers exist. Some editing and revisions are still in progress.

213.   "Why is it Difficult to Integrate Information Systems: Integrating Contending Territories" (with Y.W. Lee), submitted to *Proceedings of the 13th Annual International Conference on Information Systems* (Dallas, TX).

214.
        "A contextualized Model of Data for Multi-Source Database Systems: Toward Quality Data by Design" (with Y. R. Wang), submitted to Proceedings of the 13th Annual International Conference on Information Systems (Dallas, TX).

215.   "Metadata Requirements in Resolving Semantic Heterogeneities" (with M. Siegel), submitted to *SIGMOD Record.*

216.   "A Model-Based Approach for Resolving Semantic Heterogeneity" (with Y. R. Wang), submitted to *Proceedings of the Workshop on Multidatabases and Semantic Interoperability.*

217.   "Integrating Evolving Information Systems: Managing the Meaning of Data" (with M. Siegel), to be submitted to *MIS Quarterly.*

218.   "The Integrative System Dynamics Perspective to Software Project Management: Arguments for an Alternative Research Paradigm" (with T. Abdel-Hamid), to be submitted to *ACM Computing Surveys.*

219.   "Modeling the Dynamics of Software Project Management" (with T.K. Abdel-Hamid), submitted to the *IEEE Computer.*   [SWP # 1980-88; CISR No. 163]

220.   "Organizational Learning in the Globalization of Information Technology: The Case of a Major International Bank" (with Y. W. Lee and Y. R. Wang), submitted to the *Journal of Information Technology Management.*

221. "Where Does the Data Come From: Managing Data Integration with Source Tagging Capabilities" (with R. Wang), submitted to *Information Systems Research (ISR)*.

222. "A Temporal and Spatial Locality Theory for Characterizing Very Large Data Bases" (with A. Moulton), to be submitted to the *Computer Journal*.

223. "A Framework and Comparative Study of Distributed Heterogeneous Database Management Systems" (with S. Bhalla, B.E. Prasad, A. Gupta), submitted to *ACM Computing Surveys*. [SWP # 1981-88]

224. "Implementing Message Oriented Transaction Processing for Distributed Database Management Systems" (with S. Bhalla), to be submitted to *IEEE Transactions on Software Engineering*.

225. "Connectivity Among Information Systems" (with Y.R. Wang), submitted to *Journal of Management Information Systems*. [SWP # 2025-88; CISR No. 176]

226. "Concept Agents in CIS/TK: A Tool Kit for Composite Information Systems" (with Y. R. Wang, D.C. Horton, and T.K. Wong), submitted to the *International Computer Symposium 88* (Taipei, Taiwan).

227. "Logical Connectivity: Applications, Requirements, and An Architecture" (with Y.R. Wang), submitted to *Proceedings of the 1991 Hawaii International Conference on System Sciences*. [SWP # 2061-88; CISR No. 183]

228. "Identification and Reconciliation of Semantic Conflicts Using Metadata" (with M. Siegel), submitted to the *Proceedings of the VLDB Conference* (Brisbane, Australia). [SWP # 3102-89-MSA]

229. "Globalizing Information Systems Technology: Learning to Connect and Connecting to Learn in a Bank" (with Y. Lee and R. Wang), submitted to the *Proceedings of the ICIS Conference*.

230. "Semantic Reconciliation Using Metadata" (with M. Siegel), submitted to *Proceedings of the 1991 Hawaii International Conference on System Sciences*.

231. "Global Query Processing in Composite Information Systems" (with Y.R. Wang), to be submitted to the *International Conference on Information Systems*. [SWP # 3015-89-MS]

232. "Implementing Message Oriented Transaction Processing for Distributed Database Management Systems" (with S. Bhalla), to be submitted to *IEEE Transactions on Software Engineering*. [SWP # 2022-88]

233. "A Product Form Solution for Queuing Networks with Unbalanced Flows" (with R. Wang), Working Paper, Nov. 1988.

234. "Critical Needs and Approaches for Integration of Heterogeneous Information Systems in Logistics" (with A. Gupta, et. al.), Working Paper, March 1989.

11.   ORAL AND OTHER NON-PUBLISHED PRESENTATIONS

"The Dynamics of Software Project Scheduling: A Systems Dynamics Perspective", International Conference on Information Systems (CIS), Ann Arbor, MI, December 1982.

"A Model of Software Project Management Dynamics", IEEE International Computer Software and Applications Conference (COMPSAC), Chicago, IL, November 1982.

"A Study of the Multi-cache Consistency Problem in Multi-Processor Computer Systems", 6th Workshop on Computer Architecture for Non-Numeric Processing, Hyeres, France, June 1981.

"Recent Research Results on the INFOPLEX Intelligent Memory System Project", International Congress on Applied Systems Research and Cybernetics, Acapulco, Mexico, December 1980.

"The INFOPLEX Database Computer: Concepts and Directions", IEEE Computer Conference (COMPCON 79), San Francisco, CA, February 1979.

"Database Machine Architecture in the Context of Information Technology Evolution", 3rd International Conference on Very Large Data Bases, Tokyo, Japan, October 1977.

"Applications of Composite Information Systems", The Institute of Management Sciences (TIMS) Boston Chapter Meeting, Cambridge, MA, April 1977; and Evolving Information Systems, M.I.T. Industrial Liaison Program Symposia, Cambridge, MA, May 1977.

"Advances in Software and Hardware Technology and Their Future Impact on DP Practices", Data Processing Management Association (DPMA) NECON 76 Conference, Bedford, NH, May 1976.

"INFOPLEX -- A Modular Computer Architecture to Support Large Scale Information Systems", ACM Golden Gate Chapter, San Francisco, CA, February 1976.

"The Role of Storage Hierarchy in Data Base Management", IEEE Computer Conference, San Francisco, CA, February 1976.

"New Concepts in Data-Base Management: Application of the New Technology", 38th American Society for Information Science (ASIS) Annual Conference, Boston, MA, October 1975.

"INFOPLEX -- Hierarchical Decomposition of a Large Information Management System Using a Microprocessor Complex", National Computer Conference (NCC), Anaheim, CA, May 1975.

"Design of a General Hierarchical Storage System", IEEE International Conference, New York, NY, April 1975.

"Important Areas in the Future of Microprocessors", First National Micro-processor Conference", Boston, MA, December 1974.

"Impact of Computer Advances on Business and Management", The Management of Social and Technological Change (1974 Sloan Convocation), Cambridge, MA, October 1974.

"User Requirements for Security and Conversion Considerations", Information Privacy and Computer Security, M.I.T. Industrial Liaison Program Symposia, Cambridge, MA, September 1974.

"Design and Construction of a Pedogogical Microprogrammable Computer", 3rd Annual Workshop on Microprogramming, Buffalo, NY, October 1970.

"Program Parallelism Based upon Computation Schemata", 6th International Congress on Cybernetics, Namur, Belgium, September 1970.

"Design and Construction of a Pedogogical Microprogrammable Computer", Grenoble Workshop on Microprogramming, Grenoble, France, July 1970.

"Development of Computer-Based Sensor Systems", Third Hawaii International Conference on System Sciences, Honolulu, Hawaii, January 1970.

"Analysis of Modern File Systems", British Computer Society Symposium -- Datafair 69, Manchester, England, August 1969.

"A Modular Approach to File System Design", Spring Joint Computer Conference (SJCC), Boston, MA, May 1969.

"Hierarchical File System Organization", Honeywell Programming Systems Division, 2nd Annual Software Symposium, April 1969.

"Design Strategies for File Systems: A Working Model", FILE-68 International Seminar on File Organization, Helsingor, Denmark, November 1968.

"Multi-Processor Software Lockout", ACM National Conference, Las Vegas, NV, August 1968.