

UC Santa Barbara

NCGIA Technical Reports

Title

Multipurpose Land Information Systems Development Bibliography: A Community-wide Commitment to the Technology and its Ultimate Applications (97-1)

Permalink

<https://escholarship.org/uc/item/8z56c9xh>

Authors

Tulloch, David L.
Epstein, Earl F.
Niemann Jr., Bernard J.
et al.

Publication Date

1997-02-01

Multipurpose Land Information Systems
Development Bibliography:

A Community-wide Commitment to the Technology and its Ultimate
Applications

Technical Report 97-1

10 February 1997

by

David L. Tulloch ¹, Earl F. Epstein ², Bernard J. Niemann, Jr. ¹,
and Stephen J. Ventura ¹

¹ Land Information and Computer Graphics Facility
College of Agricultural and Life Sciences
University of Wisconsin -- Madison

² School of Natural Resources
College of Agriculture
The Ohio State University

An NCGIA Bibliography

Introduction

This bibliography attempts to bring together literature covering the many aspects of Multipurpose Land Information Systems (MPLIS) development. Our focus on MPLIS development comes from a concern that much of GIS adoption and diffusion research focuses on a single system within an organization instead of a network of resources within the context of a larger community. We have worked to broaden the view of MPLIS development to include the processes commonly referred to as initiation, implementation, operation and maintenance.

To reflect these issues, we have attempted to develop a bibliography that includes: (a) the concept of the community-wide value of MPLIS development and the products of these systems, (b) developmental factors and techniques, (c) studies of system status, and (d) the MPLIS development process or the adoption and diffusion of innovations and related technologies. A brief explanation of each of these topics is provided below along with specific examples from the bibliography.

Topical Explanations and Examples

Efficiency and effectiveness have been the primary objects of attention when evaluating investments in GIS/LIS (e.g., Antenucci *et al.* 1990; Dickinson and Calkins 1988; Obermeyer 1989; Onsrud 1989; Epstein and Duchesneau 1990; Smith and Tomlinson 1992; Gillespie 1994; Korte 1996; Moyer 1989; Rourk 1993). Recently, attention has turned to the benefits associated with the broader use of system products--beyond the organization and throughout the community. As a general trend, this is evidenced by the amount of research concerning community issues such as public access (e.g., Roitman 1990; Stipek and Torraca 1993) and concerns about the outcomes of the growing relationships between GIS and society (e.g., Pickles 1995; Sheppard 1995). These related outcomes have been characterized as equity (Kishor *et al.* 1990; Cowen 1994), decision making (Pinto and Onsrud 1995), and democratization (Mead 1994; Lang 1994).

As practitioners attempt to guide the development of an MPLIS, they encounter both problems and solutions. These experiences with factors affecting development have been characterized in both general project portrayals and specific efforts to isolate these technical, legal, socio-economic, and institutional factors (e.g., Portner 1982; Crosswell 1989, 1991; McRae 1989; Vastag, Thum and Niemann 1994; Ventura 1995). In the midst of this variety of research and practical literature there was an important effort to assay the literature, develop a relatively comprehensive lists of factors, and measure the perceived role played by each factor (Onsrud and Pinto 1993).

With so many communities developing systems at different rates, there has been great effort expended to measure and compare the status of some of these systems. These have included snapshot assessments of states and regions (Budic 1993; May 1994; Kuhlman 1994) as well as longitudinal studies of the expenditure and outcomes of the development process (Tulloch *et al.* 1996).

A related development has been the study of systems development as a linear process comprised of stages. This comes originally from sociology adoption and diffusion literature (Rogers 1963; Brown 1982) and has spread through the general technology literature (e.g., Churchman and Schainblatt, 1965; Raghaven and Chand 1989;

Cooper and Zmud 1990) as well as the GIS literature (Azad 1993; Aronoff 1989; Crain and MacDonald; Vastag, Thum, and Niemann 1994; with a partial summary provided by Anderson 1996).

The challenge now may be to develop a theory that weaves together these many elements. In a recent publication, Tulloch, Niemann and Epstein (1996) propose a model meant to serve that purpose. The authors hope that future research, especially with this perspective incorporated, will continue at such a rate that this bibliography can quickly be rendered obsolete.

Closing Thoughts

This bibliography is humbly offered as a helpful resource for those interested in examining MPLIS development and related topics. This is meant as neither a partisan effort -- having included the occasional contentious citation that some might prefer to not consider -- nor as a complete or final bibliography on this topic -- having made omissions by both deliberation and oversight. Of course, we would hope that future research will be such that this document will be eclipsed by a mountain of developments in this field.

Finally, we would like thank some friendly reviewers who may no longer recognize this document, but who provided some important insights concerning the potential content of early versions of this bibliography. Reviewers include Peter Crosswell, Harlan Onsrud, Joseph Ferreira, Zorica Nedovic-Budic and participants in the Mapping Science Committee's Workshop on the Future of Spatial Data and Society. We also express our appreciation to Dr. Michael Goodchild and NCGIA for showing an interest in this work and providing the support to make it a reality.

Bibliography

- Abler, R.E. 1993. "Everything in its Place: GPS, GIS, and Geography in the 1990s." *Professional Geographer*, 45:2, 131-139.
- Anderson, C.S. 1996. "GIS Development Process: A Framework for Considering the Initiation, Acquisition, and Incorporation of GIS Technology." *URISA Journal*, 8:1, 10-26.
- Antenucci, J.C., K. Brown, P.L. Crosswell, M.J. Kevany, and H. Archer. 1991. *Geographic Information Systems : A Guide To The Technology*. New York : Van Nostrand Reinhold.
- Aronoff, S. 1989. *Geographic Information Systems: A Management Perspective*. Ottawa, Ontario: WDL Publications.
- Azad, B. 1993. "Exemplary Systems in Government: 1992." *URISA Journal*, 5:1, 78-80.
- Azad, Bijan. 1993. "Theory and Measurement In GIS Implementation Research: Critique and Proposals." *3rd International Conference of Computers in Urban Planning and Management*. July 23-25, Atlanta, GA. Unpublished.
- Bellin, D. 1993. "The Economic Value of Information." *Knowledge: Creation, Diffusion, Utilization*, 15:2, 233-240.
- Benbasat, I., D.K. Goldstein and M. Mead. 1987. "The Case Research Strategy in Studies of Information Systems." *MIS Quarterly*, 11:3, 369-386.
- Bie, S. 1984. "Organizational Needs for Technological Advancement." *Cartographica*, 21, 44-50.
- Bingham, R.D. 1976. *The Adoption of Innovation by Local Government.*, Lexington, Massachusetts: Lexington Books.
- Blaut, J.M. 1987. "Diffusionism: A Uniformitarian Critique." *Annals of the Association of American Geographers*, 77, 30-47.
- Blinn, C.R., L.P. Queen, L.R. Hegstad, and D.J. Fitzpatrick. 1992. "Systematic Development of Education and Training Programs: A Key to Successful GIS Development." *URISA Journal*, 4:2, 59-67.
- Brown, K. 1991. "State Legislatures Promote GIS Use." *URISA Journal*, 3:1, 61-66.
- Brown, L.A. 1981. *Innovation Diffusion: A New Perspective*. New York: Methuen.

- Brown, P., and D. Friedley. 1988. "Assessing Organizational Preparedness for a Comprehensive, Distributed LIS/GIS." in *1988 URISA Conference Proceedings*, Vol. 2: 22-36.
- Brussard, Bas K. 1989. "A New Planning Approach for Intergovernmental Information Systems." *1989 URISA Conference Proceedings*, Vol. 4: 149-159. Boston, Mass.
- Budic, Z.D. 1993. "GIS Use Among Southeastern Local Governments." *URISA Journal*, 5:1, 4-17.
- Budic, Z.D. 1993. "Human and Institutional Factors in GIS Implementation by Local Governments." Ph.D. Dissertation, Department of City and Regional Planning, University of North Carolina at Chapel Hill.
- Budic, Z.D. 1994. "Effectiveness of Geographic Information Systems in Local Government Planning." *Journal of the American Planning Association*, 60, 244-263.
- Campbell, H. 1990. "The Organizational Implications of Geographic Information Systems for British Local Government." *European Geographic Information Systems Conference Proceedings*. Amsterdam, 1990.
- Campbell, H., and I. Masser. 1992. "GIS in Local Government: Some Findings from Great Britain." *International Journal of Geographical Information Systems*, 6, 529-546.
- Campbell, H., and I. Masser. 1995. *GIS and Organizations: How Effective Are GIS in Practice?* London: Taylor and Francis.
- Chrisman, N.R., D.D. Moyer and B.J. Niemann. 1990. "Concept for a Multipurpose Land Information System," in Niemann and Moyer (eds.), *A Primer on Multipurpose Land Information Systems*. Wisconsin Land Information Report 4. Institute for Environmental Studies Report 133. University of Wisconsin-Madison.
- Chrisman, N.R. 1987. "Design of Geographic Systems Based on Social and Cultural Goals." *Photogrammetric Engineering and Remote Systems Association*, 53, 1367-1370.
- Churchman, C.W., and A.H. Schainblatt. 1965. "The Researcher and the Manager: A Dialectic of Implementation." *Management Science*, 11:4, B69-87.
- Clapp, J.L., J.D. McLaughlin, J.G. Sullivan and A. Vonderohe. 1989. "Toward a Method for the Evaluation of Multipurpose Land Information Systems." *URISA Journal*, 1, 39-45.
- Clapp, J.L., and B.E. Weisman. 1988. "Integrating Land Information Statewide: The Wisconsin Land Records Committee Endeavor," in Niemann and Moyer (eds.), *A*

- Primer on Multipurpose Land Information Systems*. Wisconsin Land Information Report 4. Institute for Environmental Studies Report 133. University of Wisconsin-Madison.
- Coffeen, S. 1994. "Using GIS to Support the 'Reverse Urbanization' Process: A Case Study of the Presidio," in *1994 URISA Conference Proceedings*, 517-526.
- Cooper, Randolph B., and Robert W. Zmud. 1990. "Information Technology Implementation Research: A Technology Diffusion Approach." *Management Science*. 36:2, 123-139.
- Coppock, J.T., and D.W. Rhind. 1991. "The History of GIS," in D. J Maquire, M. F. Goodchild, and D. W. Rhind (eds.), *Geographical Information Systems* (Vol. 1: 21-43) New York: Wiley.
- Cowen, David J. 1994. "The Importance of GIS for the Average Person," in *GIS in Government: The Federal Perspective*, Proceedings of the First Federal Geographic Technology Conference, Washington DC, 7-11.
- Craglia, M. 1994. "GIS Diffusion in Local Government in Europe, Knutsford 27-31 October 1993." *GISDATA Newsletter*, 3 (March): 3-6.
- Craig, W.J. 1992. "Why We Couldn't Get the Data We Wanted." *URISA Journal*, 4:2, 71-78.
- Craig, W.J. 1994. "The Rising Tide of GIS in Minnesota." *URISA Journal*, 6:1, 75-80.
- Crain, I.K., and C.L. MacDonald. 1984. "From Land Inventory to Land Management." *Cartographica*, 21, 40-46.
- Croswell, P.L. 1989. "Facing Reality in GIS Implementation: Lessons Learned and Obstacles to be Overcome," in *1989 URISA Conference Proceedings*, 4, 15-35.
- Croswell, P.L. 1991. "Obstacles to GIS Implementation and Guidelines to Increase the Opportunities for Success." *URISA Journal*, 3:1, 43-56.
- Cullis, B.J. 1995. "A Strategy for Assessing Organizational GIS Adoption Success." *GIS/LIS '94: Conference Proceedings*, 208-217.
- Cullis, B.J. 1995. "Mapping Organizational GIS Use: A Practical Metric for Assessing the Impact of Adoption." *GIS/LIS '95: Conference Proceedings*, 217-224.
- Curry, Michael. 1994. "Image, Practice and the Hidden Impacts of Geographic Information Systems." *Progress in Human Geography*, 18:44, 441-459.
- Davies, S. 1979. *The Diffusion of Process Innovations*. Cambridge: Cambridge University Press.

- de Neufville, R., and J. Croissant. 1990. "A Policy for Technology Leadership." *URISA Journal*, 2: 2, 7-15.
- Dearing, J., and G. Meyer. 1994. "An Exploratory Tool for Predicting Adoption Decisions." *Science Communication* 16:1, 43-57.
- Dickinson, H.J. 1989. "Techniques for Establishing the Value of Geographic Information and Geographic Information System." *GIS/LIS '89: Conference Proceedings*, Orlando, FL, 412-420.
- Dickinson, H.J. 1989. *Selective Bibliography: Value of Information.*, NCGIA Technical Paper, NCGIA, Santa Barbara, CA.
- Dickinson, H.J., and H. Calkins. 1988. "The Economic Evaluation of Implementing a GIS." *International Journal of Geographic Information Systems*, 4:4, 307-327.
- Douven, W., M. Grothe, P. Nilkamp and H. Scholten. 1993. "Urban and Regional Planning Models and GIS," in Masser and Onsrud (eds.), *Diffusion and Use of Geographic Information Technologies*. Dordrecht: Kluwer Academic Press.
- Downs, G.W., and L.B. Mohr. 1976. "Conceptual Issues in the Study of Innovations." *Administrative Science Quarterly*, 21: 700-714.
- Dueker, K.J., and D. Kjerne. 1989. "Multipurpose Cadastre: Terms and Definitions," in *ASPRS/ACSM Annual Convention Technical Papers*, Vol. 5, 94-103.
- Eason, Ken. 1988. *Information Technology and Organisational Change*. London: Taylor and Francis.
- Epstein, E.F. 1993. "Control of Public Information," Chapter 17, in *Institutions Sharing Information*, Proceedings of the I-9 Specialists Conference, NCGIA, San Diego, February 1992.
- Epstein, E.F., and P.M. Brown. 1989. "Introduction to Multipurpose Land Information Systems," Chapter 1, in *Multipurpose Land Information System: The Guidebook*, P.M. Brown and D.D. Moyer (eds.), Washington, DC: The Federal Geodetic Control Committee.
- Epstein, E.F., and T.D. Duchesneau. 1984. *The Use and Value of a Geodetic Reference System*, Rockville, MD: National Geodetic Control Committee, US Department of Commerce.
- Epstein, E.F., and T.D. Duchesneau. 1990. "Use and Value of a Geodetic Reference System." *URISA Journal*, 2:1, 11-25.
- Evans, Don. 1987. "Distributed Data Processing in a Municipality: How to Make it a Win-Win Proposition," in *1987 URISA Conference Proceedings*, Vol. 3: 157-168. Ft. Lauderdale, FL.

- Ezigbalike, Innocent F. D., David Coleman, Rodney H. Cooper, and John D. McLaughlin. 1988. "A Land Information System Development Methodolgy," in *1988 URISA Conference Proceedings*, Vol. 3: 282-296, Los Angeles, California.
- Felleman, J. 1994. "Deep Information: The Emerging Role of State Land Information Systems In Environmental Sustainability." *URISA Journal*, 6:2, 11-24.
- Ferguson, C.W. 1994. "GIS and Improvement Alternatives: Process Improvement vs. Reengineering." *GIS/LIS '94: Conference Proceedings*, 305-311.
- Fletcher, P.T., S.I. Bretschneider, and D.A. Marchand. 1992. *Managing Information Technology: Transforming County Governments in the 1990's*. New York: Syracuse University, School of Information Studies.
- Florio, E., and J.R. Demartini. 1993. "The Use of Information by Policymakers at the Local Community Level." *Knowledge: Creation, Diffusion, Utilization*, 15:1, 106-123.
- Foley, M.E. 1988. "Beyond the Bits, Bytes, and Black Boxes: Institutional Issues in Successful LIS/GIS Management." *GIS/LIS '88: Conference Proceedings*, Vol. 2: 608-617, San Antonio.
- French, S.P. and L.L. Wiggins. 1989. "Computer Adoption and Use in California Planning Agencies: Implications for Education." *Journal of Planning Education and Research*, 8:2, 97-108.
- French, S.P., and L.L. Wiggins. 1990. "California Planning Agency Experiences with Automated Mapping and Geographic Information Systems," in *Environment and Planning B: Planning and Design*, 17, 441-450.
- Gillespie, S.R. 1994. "Measuring The Benfits of GIS Use: Two Transportation Case Studies." *URISA Journal*, 6:2, 62-67.
- Ginzberg, M.J. 1981. "Key Recurrent Issues in the MIS Implementation Process." *MIS Quarterly*. 5:2, 47-59.
- Godschalk, D.R., and Z. Budic. 1994. "Implementation and Management Effectiveness in Adoption of GIS Technology in Local Governments." *Computers, Environment and Urban Systems*, 18:5, 285-304.
- Goodman, P.S. 1993. "Implementation of New Information Technology," in Masser and Onsrud (eds.), *Diffusion and Use of Geographic Information Technologies*. Dordrecht: Kluwer Academic Press.
- Guile, B.R. 1985. *Information Technologies and Social Transformation*, Washington, D. C.: National Academy Press.

- Guptile, S. (ed.) 1988. *A Process for Evaluating Geographic Information Systems*, FICCDC Technology Exchange Working Group, Technical Report 1, USGS Open-File Report 88-105, Washington, D.C.: USGS.
- Hägerstrand, Torsten. 1952. "The Propagation of Innovation Waves." *Lund Studies in Geography: Ser. B Human Geography No. 4*. Lund, Sweden: Department of Geography, The Royal University of Lund.
- Hall, S.S. 1993. *Mapping the Next Millenium: How Computer-driven Cartography is Revolutionizing the Face of Science*, New York: Vintage Books.
- Hall, P., and P. Preston. 1988. *The Carrier Wave: New Information Technology and the geography of innovation, 1846-2003*. London, Unwin Hyman.
- Hunter, G.J., and M.F. Goodchild. 1993. "Managing Uncertainty in Spatial Databases: Putting Theory into Practice," in 1993 *URISA Conference Proceedings*, 1-14.
- Huxhold, W.E. 1984. "Modernizing Land Information Systems for City Planning and Management: Problems and Opportunities," in Niemann (ed.), *Seminar on the Multipurpose Cadastre: Modernizing Land Information Systems in North America* Wisconsin Land Information Report 1. Institute for Environmental Studies Report 123. University of Wisconsin-Madison.
- Huxhold, W.E. 1993. "The Application of Research and Development from the Information Systems Field to GIS Implementation in Local Government: Some Theories on Successful Adoption and Use of GIS Technology," in Masser and Onsrud (eds.), *Diffusion and Use of Geographic Information Technologies*. Dordrecht: Kluwer Academic Press.
- Huysmans, Jan H.B.M. 1970. *The Implementation of Operations Research*. New York: Wiley-Interscience.
- Innis, J.E., and David M. Simpson. 1993. "Implementing GIS for Planning: Lessons from History of Technological Innovation." *APA Journal*, 59:2, 230-236.
- Jacobs, H. 1989. "Implementing Local Multipurpose Land Information Systems: Political-Economic Research Issues." *Computers, Environment, and Urban Systems* , 13, 3-13.
- Jeffress, G. 1991. *Land Ownership Information Use in Real Property Market Transactions*. Unpublished Ph.D. dissertation, University of Maine.
- Jeffress, G.A., and L.C. Holstein. 1993. "An International Survey of Real Property Transaction Recording Costs and Some Charactersitics: A Preliminary Evaluation." *URISA Journal*, 5:1, 53-66.

- Jeffress, G.A. 1992. *1992 Survey: A Study of the Adoption of Geographic Information Systems in Local Government*. National Center for Geographic Information and Analysis: University of Maine.
- Jeffress, Gary A., and Dennis C. Conway. 1989. "G.I.S. Innovation Diffusion." *GIS/LIS '89: Conference Proceedings*, Vol II: 430-437.
- Johnston, C.A. 1992. "GIS Technology in Ecological Research." *Encyclopedia of Earth System Science*, San Diego: Academic Press.
- Judd, D. 1995. "Thoughts on Implementing a GIS." *Earth Observation Magazine* (March) 50-51.
- Kaplan, B. and D. Duchon. 1988. "Combining Qualitative and Quantitative Methods in Information Systems Research: A Case Study." *MIS Quarterly*, 571-586.
- Katz, Elliot, *et al.*. 1963. "Traditions of Research on the Diffusion of Innovations." *American Sociological Review*, 28: 237-253.
- Keenan, B. 1992. "Exemplary Systems in Government: A Summary." *URISA Journal*, 4:1, 78-81.
- Keller, C.P. 1990. "Issues to Consider When Developing or Selecting a GIS Curriculum." *GIS/LIS '90: Conference Proceedings*, Vancouver, BC, 53-59.
- Kishor, P. 1989. *Geographic Information Systems in Developing Countries: a "Look Before You Leap" Caveat to Technology Transfer*, Unpublished master's thesis, University of Wisconsin-Madison.
- Kishor, P., B.J. Niemann, D.D. Moyer, S.J. Ventura, R.W. Martin, and P.G. Thum. 1990. "Lessons from CONSOIL Evaluating GIS/LIS." *Wisconsin Land Information Newsletter* 6:1, 1-11.
- Klepper, Michael, and Wallace Payne. 1993 "GIS on the Fire Truck: A Practical Example of the New GIS Data Publishing Paradigm," in *1993 URISA Conference Proceedings*, Vol. 1: 113-121.
- Kolb, David A, and Alan L. Frohman. 1970. "An Organization Development Approach to Consulting." *Sloan Management Review*, 12: 1, 51-65.
- Korte, G. 1996. "Weighing GIS Benefits with Financial Analysis," *GIS World*, 9:7 (July), 48-52.
- Kraemer, K.L. and W.H. Dutton. 1991. "Survey Research in the Study of Management Information Systems," in Kraemer (ed.), *The Information Systems Research Challenge: Survey Research Methods*. Boston: Harvard Business School. Vol. 3, 3-57.

- Kraemer, K.L., J.L. King, D.E. Dunkel, and J.P. Lane. 1989. *Managing Information Systems: Change and Control in Organizational Computing*. San Francisco: Jossey-Bass Publishers.
- Kuhlman, K. 1993. "Building a Framework to Characterize Land Records Modernization," in *1993 URISA Conference Proceedings*, 146-151.
- Kuhlman, K. 1994. *Measuring the Influences on Land Records Modernization in Wisconsin Counties*, Unpublished master's thesis, University of Wisconsin-Madison.
- Lake, R.W. 1993. "Planning and Applied Geography: Positivism, Ethics, and Geographic Information Systems." *Progress in Human Geography*, 17:3, 404-413.
- Lang, L. 1995. "The Democratization of GIS." *GIS World*, 8:4 (April), 62-67.
- Larsen, B., J. Clapp, A.H. Miller, B.J. Niemann, and A.L. Ziegler. 1978. *Land Records: The Cost to the Citizen to Maintain the Present Land Information Base: A Case Study of Wisconsin*, Madison: Department of Administration, Office of Program & Management Analysis.
- Laudon, K.C. and J.P. Laudon. 1995 *Essentials of Management Information Systems: Organization and Technology*. Englewood Cliffs, NJ: Prentice Hall, Inc.
- Leonard-Barton, D. 1985. "Implementing New Technology." *Harvard Business Review*, 63, 102-110.
- Leonard-Barton, D. 1987. "Implementing Structured Software Methodologies: A Case of Innovation in Process Technology." *Interfaces*, 17:7, 6-17.
- Lubar, S. 1993. *Info-Culture*, Boston: Houghton Mifflin Company.
- Mackaay, E. 1982. *Economics of Information and Law*, Boston: Kluwer - Nijhoff Publishing.
- Maggio, R.C. 1991. "Planning for a GIS Installation in a Local Government." *GIS/LIS '91: Conference Proceedings*, Vol. 1: 413-420.
- Maguire, D.J. 1991. "An Overview and Definition of GIS," in *Geographical Information Systems*, Vol. 1, Maguire, D.J., M.F. Goodchild, & D.W. Rhind (eds.), New York: Wiley.
- Maguire, D.J., M.F. Goodchild, & D.W. Rhind (eds.). 1991. *Geographical Information Systems*, Vol. 1, New York: Wiley.
- Martin, D. 1991. *Geographic Information Systems and their Socioeconomic Applications*. Andover, Hants, England: Routledge, Capman and Hall.

- Masser, I., H. Campbell, and M. Craglia (eds.). 1996. *GIS Diffusion: The Adoption and Use of Geographical Information Systems in Local Government in Europe*. London, Taylor & Francis.
- Masser, I. and H. Campbell. 1994. "Monitoring the Take-Up of GIS in British Local Government," in *1994 URISA Conference Proceedings*, 745-754.
- Masser, I. and H.J. Onsrud (eds.). 1993. "Diffusion and Use of Geographic Information Technologies: An Introduction," in Masser and Onsrud (eds.), *Diffusion and Use of Geographic Information Technologies*. Dordrecht: Kluwer Academic Press.
- Masser, I., and H. Campbell. 1993. "The Impact of GIS on Local Government in Great Britain," Chapter 20, in *Geographical Information Handling - Research and Applications*, New York: John Wiley & Sons.
- Masser, I., and H.J. Onsrud (eds.). 1993. *Diffusion and Use of Geographic Information Systems*, Kluwer: Dordrecht.
- May, J.W. 1994. "Automated Mapping and GIS in Florida Local Planning Agencies," in *1994 URISA Conference Proceedings*, 755-770.
- Mayo, J.S. 1985. "The Evolution of Information Technologies." *Information Technologies and Social Transformation*, Bruce R. Guile (ed.), Washington, D. C.: National Academy Press.
- McHaffie, P.H. 1995. "Manufacturing Metaphors: Public Cartography, the Market, and Democracy," Chapter 6, in *Ground Truth: The Social Implications of Geographic Information Systems*, J. Pickles (ed.), New York: The Guilford Press.
- McRae, Stephen D. 1989. "GIS Design and the Questions Users Should Be Asking." *GIS/LIS '89: Conference Proceedings*, Vol. II: 528-537.
- Mead, R.A. 1994. "Field-Level Diffusion Eases GIS Implementation Efforts." *GIS World*, 7:11 (November), 50-52.
- Miller, A.H. 1990. "The Wisconsin Land Information Association: A Professional Organization for State-Wide GIS Coordination." *URISA Journal*, 2:1, 54-57.
- Mohr, L.B. 1969. "Determinants of Innovations in Organizations." *American Political Science Review*, 63:1, 11-126.
- Moyer, D.D. 1977. *An Economic Analysis of the Land Title Record System..* Unpublished Ph.D. dissertation, University of Wisconsin - Madison.
- Moyer, D.D. 1989. "Why Implement a Multipurpose Land Information System," Chapter 7, in *Multipurpose Land Information System: The Guidebook*, P.M. Brown and D.D. Moyer (eds.), Washington, DC: The Federal Geodetic Control Committee.

- Moyer, D.D. 1990. *White Paper: The Benefits and Costs of Modernizing Local Land Information Systems in Wisconsin*. Land Information and Computer Graphics Facility, University of Wisconsin-Madison.
- Moyer, D.D., and B.J. Niemann. 1990. "Economic Impacts of LIS Technology on Sustainable Natural Resource and Agricultural Management," *Proceedings of the Annual Convention of the ACSM-ASPRS*, Vol. 3, 221-230.
- Myers, S., and D.G. Marquis. 1969. *Successful Industrial Innovations: A Study of Factors Underlying Innovation in Selected Firms*. Washington D.C.: U.S. Government Printing Office.
- Nedovic-Budic, Z. 1995. "Mechanisms for Coordinating Development and Use of GIS Databases: A Research Framework," in *1995 URISA Conference Proceedings*, Vol. I: 662-674.
- Niemann, B.J., S.J. Ventura, D.D. Moyer, J. Licht, W.A. Chatterton, and H.M. Jacobs. 1988. "Research Needs: The Interaction of Land and Geographic Information System Technology and Society," in *1988 URISA Conference Proceedings*, Vol. I: 1-16.
- Northrip, Alana, *et al.* 1990. "Payoffs from Computerization Over Time," *Public Administration Review*, September/October.
- Obermeyer, N.J. 1994. "Spatial Conflicts in the Information Age," in *1994 URISA Conference Proceedings*, 269-282.
- Obermeyer, N.J., and J.K. Pinto. 1994. *Managing Geographic Information Systems*, New York: The Guilford Press.
- Obermeyer, N.J. 1989. "A Systematic Approach to the Taxonomy of Geographic Information Use." *GIS/LIS '89: Conference Proceedings*, Vol. II: 421-429.
- Onsrud, H.J. 1995. "Experiences in Acquisition, Implementation, and Use of GIS in U.S. Local Governments: A Sampler of Academic Studies and Findings." (Co-Authors: B. Azad, M. Brown, Z. Budic, H. Calkins, D. Godschalk, S. French, J. Johnson, B. Niemann, J. Pinto, B. Sandberg, S. Ventura, R. Wetherbee, L. Wiggins.), *1995 URISA Conference Proceedings*, 626-636.
- Onsrud, H.J., and J.K. Pinto. 1993. "Evaluating Correlates of GIS Adoption Success and the Decision Process of GIS Acquisition." *URISA Journal*, 5:1, 18-39.
- Onsrud, H.J., J.K. Pinto, and B. Azad. 1993. *Testing Technology Transfer Hypotheses in GIS Environments Using a Case Study Approach*, NCGIA Technical Report 93-8.
- Onsrud, H.J., J.K. Pinto, and B. Azad. 1992. "Case Study Research Methods for Geographic Information Systems." *URISA Journal*, 4:1, 32-44.

- Onsrud, H.J. 1992. *NCGIA Research Initiative 9: Scientific Report for the Specialist Meeting, 26-29 February 1992, San Diego, California*, compiled and edited by H.J. Onsrud and G. Rushton with H.W. Calkins, NCGIA: Santa Barbara, CA.
- Onsrud, H.J. and J.K. Pinto. 1991. "Diffusion of Geographic Information Innovations." *International Journal of Geographic Information Systems*, 5:4, 447-467.
- Onsrud, H.J. 1989. *Use and Value of Geographic Information: initiative four specialist meeting*, NCGIA Technical Paper, Report and Proceedings, compiled and edited by H.J. Onsrud, H.W. Calkins, N.J. Obermeyer, NCGIA: Santa Barbara, CA.
- Parr, D.M. 1994. "Gauging Information Systems: Information Engineering for the Knowledge Society." *URISA Journal*, 6:2, 73-77.
- Pavitt, K. "What We Know About the Strategic Management of Technology." *California Management Review*, 32:3, 17-26.
- Perry, J.L. and K.L. Kraemer. 1979. *Technological Innovation in American Local Governments: The Case of Computing*, New York: Pergamon Press.
- Pickles, J. (ed.). 1995. *Ground Truth: The Social Implications of Geographic Information Systems*, New York: The Guilford Press.
- Pinto, J.K., and H.J. Onsrud. 1995. "Sharing Geographic Information Across Organizational Boundaries: A Research Framework," in *1995 URISA Conference Proceedings*, Vol. I: 688-694.
- Pinto, J.K., and B. Azad. 1994. "The Role of Organizational Politics in GIS Implementation." *URISA Journal*, 6:2, 35-61.
- Poe, G.L., R.C. Bishop, and J.A. Cochrane. 1992. "Benefit-Cost Principles for Land Information Systems." *URISA Journal*, 4:2, 20-31.
- Portner, J., and B.J. Niemann. 1983. "Autonomous Behavior: Its Implications to Land Records Modernization in the United States," in *Proceedings of the XVII International Congress of Surveyors (F. I. G.)*, Sofia, Bulgaria, June 19-28.
- Portner, J., and B.J. Niemann. 1983. "Belief Differences Among Land Records Officials and Users: Implications for Land Records Modernization," in *1983 URISA Conference Proceedings*, 121-135.
- Portner, J. 1982. *Beliefs Regarding Issues Relating to Land Records*. Unpublished master's thesis, University of Wisconsin - Madison.
- Portner, J., and B.J. Niemann. 1982. "Beliefs Regarding Issues Relating to Land Information," in *1982 URISA Conference Proceedings*, 325-331.

- Raghaven, Sridhar A., and Donald R. Chand. 1989. "Diffusing Software-Engineering Methods." *IEEE Software*. 6:4 (July), 81-90.
- Rice, R.E., and E.M. Rogers. 1980. "Re-invention in the Innovation Process." *Knowledge: Creation, Diffusion, Utilization*, 1, 499-514.
- Robey, D. 1987. "Implementation and the Organizational Impacts of Information Systems." *Interfaces* 17:3 (May-June), 72-84.
- Rogers, E.M. 1995. *Diffusion of Innovations*. New York: The Free Press.
- Rogers, E.M. 1993. "The Diffusion of Innovations Model," in Masser and Onsrud (eds.), *Diffusion and Use of Geographic Information Technologies*. Dordrecht: Kluwer Academic Press.
- Rogers, E.M. and F.F. Shoemaker. 1971. *Communications of Innovations*. New York: The Free Press.
- Rogers, E.M. 1962. *The Diffusion of Innovations*, New York: Free Press of Glencoe.
- Roitman, Howard. 1990. "Legal Issues in Providing Public Access to an AMS: Case Studies and Variances." *URISA Journal* , 2:1, 38-45.
- Rourk, Richard W. 1993. "How Good is GIS? An Evaluation of GIS Operational Effectiveness on Local Government," in *1993 URISA Conference Proceedings*, Vol. 2: 10-23.
- Rumor, M. 1993. "The Use of Geographic Information Technology in the City of Padova," in Masser and Onsrud (eds.), *Diffusion and Use of Geographic Information Technologies*. Dordrecht: Kluwer Academic Press.
- Ryan, Bruce, and Neal C. Gross. 1943. "The Diffusion of Hybrid Seed Corn In Two Iowa Communities." *Rural Sociology*, 8: 15-24.
- Saarinen, A.O. 1987. "Improving Information Systems Development Success under Different Organizational Conditions," in *1987 URISA Conference Proceedings*, Vol. II: 1- 12.
- Schultz, R.L., D.P. Slevin, and J.K. Pinto. 1987. "Strategy and Tactics in a Process Model of Project Implementation." *Interfaces*. 17:3, 34-46.
- Sheppard, E. 1995. "Geographic Information Systems and Society: Towards a Research Agenda." *Cartography and Geograhic Information Systems*, 22, 5-16.
- Sinton, D. 1991. "Reflections on 25 years of GIS." *GIS World*. Special insert.
- Smith, D.A., and Tomlinson, R.F. 1992. "Assessing the Costs and Benefits of Geographical Information Systems: Methodological and Implementation Issues." *International Journal of Geographic Information Systems*, 6:3, 247-56.

- Somers, R. 1996. "How to Implement a GIS." *Geo Info Systems*, 6:1 (January), 18-21.
- Somers, R. 1994. "Alternative GIS Development Strategies." *GIS/LIS '94: Conference Proceedings*, 706-715.
- Somers, R. 1994. Book review of *Profiting From a Geographic Information System*, Gilbert H. Castle (ed.), *URISA Journal*, 6:1, 90-94.
- Somers, R. 1989. "Organizational Change for Successful GIS Implementation," in *1989 URISA Conference Proceedings*, Vol. II: 39-51. Boston, Mass.
- Sprecher, M.H. 1994. "ICMA Survey Dissects Local Government IT Use." *URISA Journal*, 6:2, 92-94.
- Srinivasan, A., and J.G. Davis. 1987. "A Reassessment of Implementation Process Models." *Interfaces*, 17:3 (May-June), 64-71.
- Steger, W.A. 1991. "A Framework to Value Information Systems." *URISA Journal*, 3:1, 33-42.
- Steinitz, C. 1993. "GIS: A Personal Historical Perspective - Part 2: A Framework for Theory and Practice in Landscape Planning." *GIS Europe*, 2:6 (July), 42-45.
- Steinitz, C. 1993. "GIS: A Personal Historical Perspective - Part 3: The Changing Face of GIS from 1965-1993." *GIS Europe*, 2:7 (1993), 38-40.
- Steinitz, C. 1993. "GIS: A Personal Historical Perspective." *GIS Europe*. 2:5 (June), 19-22.
- Stipek, L., and D. Torrance. 1993. "Implementing and Assessing the Value of Direct Public Access to the Loudon County, Virginia Geographic Information System," in *1993 URISA Conference Proceedings*, Vol. 2: 202-208.
- Thrall, G.I. 1995. "The Stages of Reasoning." *Geo Info Systems*. 5:2 (February), 46-51.
- Tomlinson, R.F. 1988. "The Impact of the Transition From Analogue to Digital Cartographic Representation." *The American Cartographer*, 15:3 (July), 249-261.
- Tulloch, D.L., B.J. Niemann, S.J. Ventura, and E F. Epstein. 1996. "Measuring GIS/LIS Progress In Local Governments: Land Records Modernization And Its Outcomes." *1996 ESRI Users Conference Proceedings* (CD-ROM), Palm Springs, CA.
- Tulloch, David L., Earl F. Epstein, and Bernard J. Niemann, Jr. 1996. "A Model of MPLIS Development in Communities: Forces, Factors, Stages, Indicators, and Benefits," *GIS/LIS '96: Proceedings*, 325-348.

- Tulloch, David L., Bernard J. Niemann, Jr., Stephen J. Ventura, Earl F. Epstein, Frederick W. Limp and Shelby Johnson. 1996. "Comparative Study Of Land Records Modernization In Multiple States," *GIS/LIS '96: Proceedings*, 128-141.
- Tulloch, D.L., B.J. Niemann, S.J. Ventura, A.H. Harmans-Shah, E.F. Epstein, and W. Holland. 1995. "Land Records Modernization in Local Governments," in *1995 URISA Conference Proceedings*, 487-496.
- van der Leeuw, S.E., and R. Torrence (eds.). 1989. *What's New? A Closer Look at the Process of Innovation*. London: Unwin Hyman.
- Vastag, P.H., P.G. Thum, B.J. Niemann. 1994. "Project LOCALIS: Implementing LIS/GIS in Local Government." *URISA Journal*, 6:2, 78-83.
- Ventura, S.J. 1991. *Implementation of Land Information Systems in Local Government - Steps Towards Land Records Modernization in Wisconsin*, Madison, WI: Wisconsin State Cartographer's Office.
- Ventura, S., P.K. Kishor, B.J. Niemann, K. Kuhlman, E. Epstein, and W. Holland. 1993. "Laws That Drive Change: GIS/LIS Development by Local Governments and the Wisconsin Land Information Program." *GIS/LIS '93: Conference Proceedings*, Vol. II: 681-690.
- Ventura, Stephen J. 1989. "Framework for Evaluating GIS Implementation." *GIS/LIS '89 Conference Proceedings*, Vol. II: 825-836.
- Ventura, Stephen J. 1995. "The Use of Geographic Information Systems in Local Government." *Public Administrative Review*, 55: 5, 461-467.
- Veregin, H. 1995. "Computer Innovation and Adoption in Geography: A Critique of Conventional Technological Models," Chapter 5, in *Ground Truth: The Social Implications Geographic Information Systems*, New York: Guilford Press.
- von Hippel, E. 1988. *The Sources of Innovation*. New York: Oxford University Press.
- Williams, J. 1993. "Reinventing the Consortium," in *1993 URISA Conference Proceedings*, Vol. 2: 193-201.
- Wirick, D.W., G.E. Montgomery, D.C. Wagman, and J. Spiers. *The Use of Information Systems to Transform Utilities and Regulatory Commissions: The Application of Geographic Information Systems*. Columbus: The National Regulatory Research Institute, 1995.
- Worrall, L. 1994. "Justifying Investment in GIS: A Local Government Perspective," *International Journal of Geographic Information Systems*, 8:6, 545-565.
- Zajac, G. 1993. "Assessing Needs and Establishing Data Standards for Multiple Platform Environments," in *1993 URISA Conference Proceedings*, 180-187.

- Zaltman, G., R. Duncan, and J. Holbeck. 1973. *Innovations and Organizations*. New York: John Wiley & Sons.
- Zwart, P.R. 1993. "Embodied GIS -- A Concept for GIS Diffusion," in Masser and Onsrud (eds.), *Diffusion and Use of Geographic Information Technologies*. Dordrecht: Kluwer Academic Press, 195-204.
- Zwart, P.R. 1992. "Mature GIS -- or Taking G out of GIS," SIRC '92 Conference, Spatial Information Research Centre, Otago, New Zealand.
- Zwart, P.R. 1988. "Some Observations on the Real Impact of Integrated Land Information Systems Upon Public Decision Making in Australia," in 1988 *URISA Conference Proceedings*, Vol. 1: 68-79.