The MetroGIS Initiative: Lessons from a Successful Geospatial Data Collaborative

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ABSTRACT: Each year, a growing number of organizations discover the value of Geographic Information Systems and related technologies. Effectively and efficiently achieving the benefits of GIS, however, depend upon the availability of reliable and affordable geospatial data. MetroGIS was launched in 1995 to promote collaborative data development, integration and sharing within the Minneapolis-St. Paul Metropolitan Area, Minnesota, USA. Seven years later, it made considerable progress towards achieving its collaboration vision. This paper presents an overview of MetroGIS's objectives, its organizational structure, its operating characteristics and the benefits achieved. Finally, it offers insights relevant to similar collaborative ventures elsewhere hoping to participate in a Global Spatial Data Infrastructure.

Introduction

MetroGIS is a multi-participant, geodata collaborative serving the seven-county, 3000-square mile, Twin City Metropolitan Area in Minnesota, USA (Figure 1). Conceived in 1995, MetroGIS has successfully sustained the effort to meet its ambitious goals of bringing data producers and users together to generate significant benefits to both since that time. This paper documents the MetroGIS experience and explores the important organizational, financial, and operating issues that affect the prospects for success of other multiparticipant data collaboratives that already exist or may emerge in the future to comprise the Global Spatial Data Infrastructure.

The Origins of MetroGIS

Minnesota organizations have a long tradition of cooperative development and use of GIS technology to address issues that significantly affect quality of life, dating back to the late 1960s. This legacy provided a rich environment for an ambitious regional geodata collaborative, primed to respond to a compelling need and a willing leader.

Both conditions emerged in 1994, when the Metropolitan Council of the Greater Minneapolis–St. Paul Area,[1] a regional government agency with taxing and regulatory authorities, recognized its need for parcel-level data to meet its responsibilities, especially in the areas of land use planning and growth management. Moreover, to allow policy makers to focus on the quality of their decisions, the data had to be as accurate and current as data maintained by local governments**.**

When Metropolitan Council staff recommended collaborating with the seven metro area counties rather than developing and maintaining the data for council use only, the council was prepared to provide the needed leadership. Collaboration promised not only to be an effective solution from both cost and functional perspectives, but also to be consistent with the council's corporate goals.

The Council's decision coincided with two significant conditions that made the region ripe for the MetroGIS initiative:

(1) six of seven the counties, several of the larger cities, some regional agencies, and state agencies had made large investments in GIS technology, and

(2) other organizations had made significant additional investments, precipitated by the significant drop in GIS costs during the early 1990s.

The result was a plethora of conflicting data access policies, complex and inconsistent licensing requirements, and duplicated development efforts. Where data documentation existed, it varied significantly in quality and format. By 1995, GIS was becoming widely recognized by public agencies as a valuable tool to support their business functions, accompanied by a growing awareness of efficiencies potentially gained through shared data, adopted standards, and improved data documentation (metadata).

In October 1995, the Metropolitan Council and the Minnesota Land Management Information Center (LMIC)[2] co-hosted two forums to explore cooperation opportunities. Participants demonstrated strong support for pursuing the concept of a regional GIS initiative. In December, the Metropolitan Council hosted a strategic planning retreat to clarify expectations and to explore strategies for developing a regional GIS initiative. Following the retreat, participants began work on "next steps."

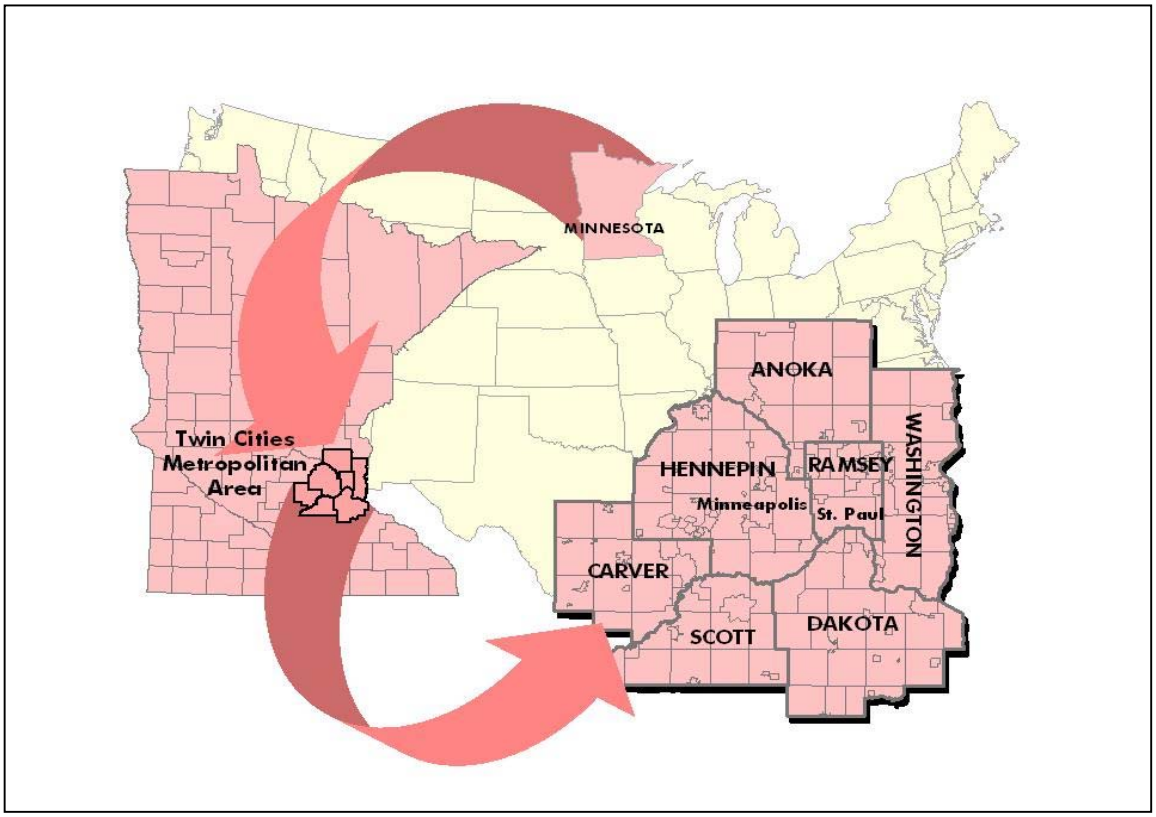

Figure 1: MetroGIS's Service Area

Clarifying Purpose

The first step was to agree on a mission and an implementation strategy, which were accomplished through an intensive consensus building process. The seemingly simple vision that emerged, with unanimous support of participants, has guided MetroGIS since that time:

> "*Provide an ongoing, stakeholder-governed, metro-wide mechanism through which participants easily and equitably share geographically referenced graphic and associated attribute data that are accurate, current, secure, of common benefit, and readily usable*."

Next, five strategic projects[3] were initiated to clarify the form and functions of the collaboration. Begun in 1996, these were essentially completed by 2000. They focused on developing and sustaining effective solutions to meeting common geospatial information needs of nearly 300 units of government serving the Twin City Metropolitan Area.

From its inception, MetroGIS has supported National Spatial Data Infrastructure (NSDI) principles, which continue to underpin its work. MetroGIS has especially emphasized the role of "area integrators" responsible for assembling data from two or more primary producers into solutions covering the region's geographic extent. MetroGIS also has adopted the NSDI "skyline" concept by assembling data with varying spatial accuracies into regional datasets without changing the spatial characteristics of the original data.

Identifying Core MetroGIS Functions

The MetroGIS approach assumes that effective collaborations depend not simply on good will but on good sense: the investments required to assemble and manage aggregated data are real and cannot be justified by good will alone. This premise guided MetroGIS as it developed its business plan and priorities. Priorities were derived using a rigorous process involving all of the region's stakeholder interests, including not only GIS professionals but also elected public officials. These public officials, who make up the MetroGIS Policy Board provided the ultimate reality check!

MetroGIS's business plan[4] identifies five "mission critical" functions and 13 additional priority functions. The highest priority function is to "promote and endorse voluntary policies, which foster coordination among the region's organizations." Maintaining a data "clearinghouse" service and fostering regional solutions to common business information needs of the MetroGIS community also are high priorities.

The data clearinghouse function, MetroGIS DataFinder (www.datafinder.org), was developed in collaboration with the Minnesota Land Management Information Center.[5] It includes a registered node of the NSDI Geospatial Data Clearinghouse, complying with NSDI standards for data documentation, indexing, and searching. Its state-of-the-art data downloading service (DataFinder Café) implements Web Mapping Services that allow users to self-select geographic extent, choose from numerous themes and attributes, and download data in a variety of formats. The Café's downloading service also provides security features that restrict access where appropriate. An eCommerce extension is under investigation to allow collection of fees from non-government users. LMIC is now exploring extensions to Café as a state enterprise web service.

In 1996 the MetroGIS community identified 13 priority common information needs.[6] The process is described later in this paper. Thus far, nine regional (seven-county) datasets have been completed that address priority common information needs. Work will be completed in 2003 for three additional regional datasets.

Major Accomplishments

MetroGIS has made significant progress toward fulfilling its vision. After seven years, MetroGIS's accomplishments include:

- ✓ Improved decision support through more accessible data that meets user needs.
- ✓ Completed or substantial progress towards regional solutions for nine of MetroGIS's initial thirteen top information needs: jurisdictional boundaries; street addresses; where people live; parcels and parcel identifiers; highway and road networks; census boundaries; lakes, wetlands, and water courses; land cover; and planned (future) land use.
- ✓ Implemented MetroGIS DataFinder as a registered NSDI clearinghouse node and the DataFinder Café as an innovative web mapping and data downloading application. More than 100 separate entities use DataFinder daily, and usage is steadily increasing—an average of over 700 datasets are downloaded monthly.
- ✓ Developed data content standards for each regional information need solution.
- ✓ Endorsed and fostered use of standards for FGDC compliant metadata, a regional projection and coordinate system, coding components for the jurisdictional boundary datasets, spatial accuracy testing, and reporting for spatial accuracy.
- ✓ Executed agreements providing access for government and academic organizations to parcel and other geospatial data produced by all of the region's counties and the Metropolitan Council, without fee and subject to identical access requirements
- ✓ Received Minnesota Governor's Commendations for two "Exemplary GIS Projects" (Regional Street Centerline and Regional Land Cover data solutions).
- ✓ Awarded ESRI's 2001 Geography Network Challenge Grand Prize for its transportation Web mapping service (http://www.datafinder.org/website/DF_Transportation/viewer.htm).
- ✓ Maintained active involvement by key stakeholders at the policy, management, and technical levels—many since MetroGIS's inception, nearly seven years ago.

How MetroGIS is Structured

Much of the success of MetroGIS is derived from its organizational structure and active membership, sustained over a long period of time plus financial support from the Metropolitan Council. The organizational structure, procedures and practices of MetroGIS continue to evolve and are profiled below.

Organization. The organization of MetroGIS has been relatively stable since its beginning, though the initial structure was simplified several years ago to improve operational efficiencies. It is comprised of a Policy Board, a Coordinating Committee, and a Technical Committee, supported by MetroGIS staff working under the umbrella of the Metropolitan Council.[7]

The MetroGIS Policy Board, created in January 1997, is comprised of twelve elected officials, each representing a core stakeholder or stakeholder community. The Board provides policy guidance and a political reality check for all MetroGIS actions. Its members include representatives from each of the seven metropolitan counties and from organizations representing cities, school districts, and watershed districts. The Metropolitan Council also is represented. Governing bodies of represented organizations have formally endorsed the MetroGIS mission and designate its appointee(s).

The Coordinating Committee, comprised of more than twenty managers and administrators from a cross section of interests and organizations, recommends courses of action to the Policy Board concerning

design, implementation, and operation of MetroGIS. It is supported by the Technical Advisory Team, which may designate workgroups to work on specific issues. The Coordinating Committee and the Technical Advisory Team are composed of persons with broad expertise and perspective, including GIS and other relevant organizational policy, data access, data content, and data standards.

The Policy Board's Operating Guidelines[8] provide a basic structure for MetroGIS governance. The Board and Coordinating Committee meet quarterly. The Technical Advisory Team and workgroups meet as needed to complete their work, which is generally assigned by the Coordinating Committee. Teams report to the Coordinating Committee, which recommends actions to the Policy Board.

Membership. MetroGIS recognizes three classes of stakeholders in its operating guidelines: essential participant, system enhancer, and secondary beneficiary. Regardless of status, all organizations involved in geospatial activities within the Twin Cities area are encouraged to participate in MetroGIS through the Technical Advisory Team and its workgroups. Membership on the Coordinating Committee and Policy Board are governed by the MetroGIS operating guidelines, which are designed to ensure a balance between data users and data producers, as well as across stakeholder classes. All essential participants are represented on the Policy Board.

Legal authority. MetroGIS has no legal standing, but relies on an informal, voluntary structure for participants collaboratively develop and implement regional solutions to common geodata needs. The option of forming a legal entity has been investigated twice, most recently during early 2001. Both times, the Policy Board concluded that MetroGIS was functioning effectively and that formalization of its structure was not needed until the benefits of changing had been clearly demonstrated.

Funding. Without legal status and no dedicated revenue source, MetroGIS relies upon stakeholders for funding, contracting and legal services, and official standing to receive and spend funds. The Metropolitan Council has provided most of the funding to date, supplemented by grants, and administers the MetroGIS budget.

Staffing. MetroGIS maintains a full-time staff that works under the umbrella of the Metropolitan Council, which also provides some administrative, technical and legal services to MetroGIS. The Council rules govern salary, benefits, and professional development. Several other organizations also have assumed responsibilities on behalf of MetroGIS community for specific program needs.

Technology. MetroGIS establishes no hardware or software standards for its stakeholders, but assumes that they will make choices that meet their business needs. However, when a stakeholder elects to undertake a custodial role on behalf of MetroGIS, the end product must be readily usable by all major GIS platforms in use in the seven-county area.

Decision making. MetroGIS's operating guidelines provide a minimal set of rules to govern its decision making. These rules include no provisions for conflict resolution. Rather, MetroGIS relies on three principles to guide its decision making process:

- ✓ Encourage a consensus-based process involving all Policy Board members for matters fundamental to the long-term success of MetroGIS.
- ✓ Seek the powers and resources needed to develop and sustain MetroGIS through a voluntary, collaborative, and cooperative process.
- ✓ Require a super majority of 75 percent of Coordinating Committee members for recommendations to the Policy Board and, if not a unanimous, forward dissenting opinions with the recommendation.

Fulfilling the Data Collaboration Goal

The MetroGIS business strategy assumes no data development or data ownership, but focuses on collaborative solutions to meeting the region's data needs. MetroGIS offers a forum for geodata users to collectively define their common business information needs, agree upon technical data specifications, recommend institutional roles and responsibilities to address these needs, and then pursue commonly agreed on strategies to meet them.

The Business Information Needs Process. The method used to establish common data goals, referred to as MetroGIS's Business Information Needs Process[9], was devised and implemented in 1996. It emphasizes "business information" rather than data, focusing on information needed to achieve business goals. Once a general information statement is chosen (e.g., I need to know how a property can be developed), data needs can be specified. The business need may imply several data needs (e.g., parcels and zoning).

The process brings data users and producers together as a workgroup to collectively define appropriate data sources that address each of the priority common information needs, and roles and responsibilities required to assemble, maintain, document, monitor user satisfaction, and distribute regional data on behalf of MetroGIS. Making its recommendation through the Technical Advisory Team to the Coordinating Committee, the workgroup suggests an organization(s) with a related business need and appropriate expertise as primary and regional custodians. If accepted by the Coordinating Committee, the recommendation is forwarded to the Policy Board. When approved, the formal action adopted by the Board consists of:

1. Specifications for the regional data set
2. Custodian roles and responsibilities
3. A Data Custodian willing to carry out the roles and responsibilities.

The MetroGIS Business Information Needs Process embodies concepts promoted in the *NSDI Framework Handbook*.[10] Participation by the designated primary and regional custodians is voluntary. Only a letter of intent, to ensure a clear understanding of expectations of the affected custodian organization(s), is requested of the custodian candidate(s) prior to Policy Board action. To date, no organization has refused to accept the roles and responsibilities requested of it by the Policy Board.

The Data Custodian. The Data Custodian role is key to the operational success of MetroGIS, especially as MetroGIS has no legal standing and has no technical staff. Selecting an appropriate one – technically capable and committed to the role – is a significant challenge. The following principles underlie the custodian's roles and responsibilities.

- ✓ MetroGIS components are decentralized, but data services should appear to users as a "One Stop Shop." Metadata either should be posted directly on MetroGIS DataFinder or on an Internet node that can be searched through DataFinder searches. The actual data and associated web mapping services can be located wherever the custodian chooses so long as the functionality complies with MetroGIS policy. MetroGIS is not the owner or custodian of any of the components, including DataFinder.
- ✓ No organization is expected to carry out a MetroGIS function that does not meet an internal business need without appropriate compensation. MetroGIS prefers to institutionalize collaborative roles by incorporating them into the day-to-day routines of member organizations.
- ✓ The regional custodian may not modify data submitted by a primary producer, except for projections needed to assemble with primary data from other sources. Users are expected to report data anomalies to primary producers so that corrections can be made to the source data.

- ✓ Intellectual property rights and responsibilities remain with the primary producers, which decide access rules within the context of the MetroGIS process for each regional data solution.
- ✓ Designated regional data custodians are responsible for creating and maintaining metadata for regional solutions compliant with FGDC clearinghouse requirements and submitting metadata to the MetroGIS DataFinder. The Metropolitan Council is the regional custodian for MetroGIS DataFinder.

MetroGIS Costs And Expenses

The Metropolitan Council concluded early on that it would be difficult to obtain significant financial contributions from other stakeholders until they acknowledged the benefits of a regional GIS to their respective organizations. By agreeing to fund MetroGIS during the start-up period, the council cleared the way for all essential stakeholders , regardless of their willingness or ability to contribute financial resources, to actively participate in the strategic decisions that have shaped MetroGIS.

Serving as primary sponsor, the Metropolitan Council invested more than $3.2 million in project and staff expenses to support MetroGIS between 1996 through 2001 and has agreed to provide an additional $800,000 for MetroGIS through 2003. The council hired a new full-time staff position in August 1995 to facilitate creation of the experimental regional GIS initiative, now known as MetroGIS. In addition, the council assigned several members of its GIS technical and administrative staff to MetroGIS, equivalent to approximately three additional full-time MetroGIS support positions. The council has provided most of the funding for outreach and coordination, pilot projects, and strategic projects necessary to acquire the institutional and technical knowledge needed to implement a regional data-sharing mechanism.

On a case-by-case basis, other organizations also have contributed funds, staff, or technical services to meet specific. Notable financial contributions include $380,000 from the Minnesota Department of Transportation to acquire a data license and maintenance agreement for a regional addressable street network dataset. Two federal NSDI grants also have been important: a $100,000 Framework Demonstration grant for MetroGIS's Fair-Share Financial Model and Organizational Structure Project, and an $18,000 Web Mapping Services Project grant.

The Metropolitan Council had anticipated that MetroGIS beneficiaries would agree to share the costs of the effort after the start-up period. A subscription fee for major beneficiaries was investigated in 2000 as part of MetroGIS's initial business planning initiative. Although the subscription fee for the Metropolitan Council, the largest beneficiary, would account for more than half of the total, MetroGIS stakeholders did not firmly support the cost sharing model. The concept was judged to be premature for the business planning period through December 2003. The "fair-share" funding concept for MetroGIS financing will be revisited in the future, possibly during the 2004 budget cycle.

Notwithstanding the financial support provided by the Metropolitan Council, volunteer contributions represent an even greater investment. MetroGIS could not succeed without several hundred willing GIS technicians, managers, and elected officials who represent the stakeholder community and who have collectively volunteered time to craft solutions acceptable to all relevant and affected parties. Volunteers have attended numerous meetings to investigate options and recommend policy, prototyped GIS techniques needed to assemble geospatial data from multiple sources, drafted agreements and licenses, designed and administered surveys, and promoted MetroGIS's vision and policies at public meetings.

MetroGIS Benefits

MetroGIS has been extremely conscious of the importance of documenting its benefits. Indeed, the long-term commitment of its key stakeholders may depend upon well-documented benefits derived from collaboration. The following are among the MetroGIS benefits documented in studies conducted to date, including one funded by the FGDC grant.[11]

- ✓ Decision support has improved because of more accessible data that meets user needs.
- ✓ Data-sharing activity has expanded.
- ✓ Efforts to use data from multiple sources have been reduced.
- ✓ Time expended to locate existing data has been reduced.
- ✓ Commitments to data content standards have been strengthened.
- ✓ Commitments to metadata have been strengthened.
- ✓ Benefits of data sharing are more widely understood.
- ✓ Benefits of collaboration are more widely understood.
- ✓ Informal professional working relationships have been enhanced.
- ✓ GIS is becoming recognized as a basic business tool throughout the metro area.

Challenges Ahead In 2002 And Beyond

The MetroGIS vision that emerged out of public forums and strategic planning events held in late 1995 and early 1996 continues to drive the active involvement of organizations within the Twin Cities metropolitan region. In some respects, notwithstanding the benefits that have been realized to date, MetroGIS remains an experiment in progress. The following are some of the more evident challenges and issues that must be overcome, presented in no particular order:

Secure adequate and stable long-term funding. The Metropolitan Council has pledged to support MetroGIS through 2003, consistent with MetroGIS's current business plan. The average annual cost for maintaining the current level of support for MetroGIS's collaboration functions is between in the $375,000 to $425,000 range, depending upon the level of staff support for committees and the pace of development for some technical needs related to regional data solutions, Web site maintenance, and data distribution. These costs are for collaboration activities only; above and beyond what stakeholders currently spend for their own GIS programs. To prepare for the 2004 planning and budget discussions, the concept of equitably distributing collaboration costs among the major beneficiaries will be evaluated for a second time. Stable long-term financing cannot be achieved until these equity issues are resolved.

Document benefits. Demonstrating tangible benefits continues to be important as issues of funding equity are directly tied to perceived benefit. MetroGIS benefits stakeholders who depend on other organizations for data, especially those that depend on data from more than one data producer. A Performance Measures program[12] was implemented in April 2002 to more clearly document cost savings and efficiency improvements and more broadly convey these benefits to the stakeholder organizations. School districts and watershed districts are good examples, especially when their jurisdictions cross county lines. Regional, state, and federal agencies also have acknowledged the value of not internalizing cost to assemble and merge data from multiple sources (e.g., parcel data from seven counties). However, many of Minnesota's primary data producers, especially counties, depend only marginally on other organizations for the data they need. The case for county participation— essential for MetroGIS success—would be strengthened significantly if the benefits of collaborative data distribution tools and procedures can be more convincingly documented.

Develop practical regional data specifications. MetroGIS has identified its highest priority information needs based upon public forums and formal surveys, and has worked to develop clear and practical specifications for data that meet those needs. Some of the specifications parallel those for NSDI Framework data, but others reflect local priorities. Regional data specifications and custodial responsibilities have been defined and implemented for several of the highest priority MetroGIS

information needs, several others remain to be addressed. Developing workable data specifications that receive consensus support requires a significant investment in time, resources, and personnel. This challenge has no obvious solution.

Consider extending the MetroGIS mission from data to applications. Implementing solutions to common data needs is of little value unless the data user can efficiently access that data. MetroGIS DataFinder was developed to satisfy this core need. Implementation of this robust Internet-based data discovery and delivery tool has created demand for online access to applications that process the data. The MetroGIS Policy Board must consider whether or not to extend the data sharing mission to include the development of applications.

Respect costs of collaboration. MetroGIS participants, whether active on its Policy Board, its Coordinating Committee, or its working committees, have made a huge time investment to develop and support MetroGIS. MetroGIS must continue to respect the amount of time required of by stakeholders volunteers to participate in MetroGIS activities. MetroGIS must achieve effective collaboration and sustain a trusted process without transforming MetroGIS into another level of bureaucracy.

Adapt to state data practice laws. A state Information Policy Task Force recommended some significant changes to Minnesota laws governing data access, privacy, intellectual property, and cost recovery in a 1999 legislative report. Though the legislature has not yet approved these recommendations, it may in the future. Some directly affect the current practice of governments to charge cost recovery fees for data development, fees that have been temporarily waived for government and academic users through MetroGIS. Waiving the right to recover development costs presents a double edged challenge: While eliminating fees potentially removes a major barrier to data access, it may also curtail funding for geodata development and constrain MetroGIS from using subscriptions and fees as revenue sources to support its work.

Replace "Data-Sharing" incentives. MetroGIS participants have enjoyed an open data-sharing environment for the past several years, largely because of agreements between the Metropolitan Council and each of the seven MetroGIS counties. In exchange for a negotiated amount of funding to use for data maintenance and technical work that both meets its needs and addresses a MetroGIS need, each county agreed to make its geodata available to government and academic organizations doing business within the metropolitan region. Several counties that had previously charged fees for data have waived them for MetroGIS participants in return for the negotiated project funding. Continued data-sharing incentives may be needed to maintain the current open data-sharing environment for the MetroGIS community.

Strengthen local users groups. Local GIS users groups exist within each of the seven Metro Area counties, in part, due to MetroGIS incentives. The findings of Dr. William Craig's 1999 Benefits Study[13] clearly demonstrated that gathering people together to discuss sharing data leads to increased awareness of each other's situation and mutual trust. These, in turn, translate into increased data sharing. Local user groups also nurture champions to advocate data sharing at the regional levels and higher.

Maintain focus. Keeping focused on the basic MetroGIS vision remains a challenge, especially as the real and perceived successes of MetroGIS become increasingly apparent to organizations elsewhere. MetroGIS was created to meet regional and local needs. MetroGIS staff members have been actively involved with Minnesota organizations seeking improved coordination, with NSDI events sponsored by FGDC, and with the emerging National Geodata Alliance.[14] For the most part, all parties benefit, but maintaining focus on MetroGIS needs is, at times, a balancing act that requires constant attention.

Keys To Success: "The MetroGIS Way"

Few GIS collaborations with the scope and diversity of MetroGIS have achieved its sustained success, perhaps none. MetroGIS should properly be recognized as an appropriate model for other organizations participating in developing the Global Spatial Data Infrastructure. Though other collaborations will necessarily differ to meet the needs of their participants, "The MetroGIS Way" has been guided by a fundamental premise and several strategic policies that we believe apply to similar efforts elsewhere.

Fundamental Premise: Organizational Self Interest

MetroGIS assumes that organizations cooperate out of self-interest. Very early on, participants agreed to support the "data-sharing" ideal only if it met their own business needs. Data sharing, though considered a laudable goal by some, was not a significant business need for any participant. In other words, MetroGIS must serve a diverse collection of functional ends, not data sharing for its own sake.

The principal MetroGIS stakeholders are the Metropolitan Council, other regional agencies, and local units of government—counties, cities, school districts, and watershed districts—few of which need geodata for the same purpose or use it in the same form. Understanding clearly their business needs and how geospatial data supported those needs became an early MetroGIS priority. Moreover, many government organizations could not allow collaboration to distract them from their other priorities. Operationally, these conditions framed the principal challenge for MetroGIS: meet the common geodata needs of stakeholders without costing them more in resources or time than the alternative of developing or assembling the data they need from others on their own.

Strategic Policies

Based on this "self-interest" assumption, MetroGIS is guided by several strategic policies that are identified and described here as practical tips for others to consider:

Secure champions. Broadly supported "proven practices" don't just happen. Sustained collaboration requires leadership and participation from organizations with related business needs, leadership from knowledgeable and respected individuals with a passion for the possible, hard work and significant funding. Coordinating support for MetroGIS cannot be a job responsibility in addition to "regular duties," but must be "job one" for a person or persons with appropriate skills and the enthusiasm needed to maintain momentum and keep key parties actively engaged. The organization must nurture leadership from within as well as recruit others who have been involved in the rich tradition of GIS experimentation. It takes time to build the required support, and it takes advocates at all levels in all key organizations to institutionalize new practices — a requirement for sustainable success.

Achieve broad support of vision and expectations. Early on, collective agreement was reached on a community vision, and MetroGIS continually monitors progress towards it. Three activities were extremely beneficial to achieving maintaining a common understanding of the MetroGIS vision and clarifying desired outcomes: the initial strategic planning retreat, the identification of common business needs, and the identification of priority functions. These activities involved intensive consensus-building processes using formal methodologies.[15] They were successful because the they were guided by knowledgeable, dedicated, and highly trained professionals.

Active involvement of policy makers. Elected officials were empowered early to maintain policy focus on the broader public good, broaden understanding of the issues and benefits, provide direction for strategic initiatives, provide a reality check for proposed courses of action, identify appropriate areas for collaboration, advocate for MetroGIS when needed and, of course, set policy. The MetroGIS Policy Board was created shortly after the vision was developed and before any initiatives were undertaken.

Maintain focus on common business information needs. MetroGIS identified common business information needs of key stakeholder organizations through a broadly collaborative process. Its regional geodata strategy focused on meeting these common geodata needs and developing an effective means to search and retrieve the data. The initial MetroGIS strategy did not include development or support of geodata applications. This assumption is under review as part of the MetroGIS Business Plan Update. That said, the early focus on data and data sharing accounts for the substantial progress made with limited resources. Had applications been added to the mix earlier, critical focus would have been lost.

Promote understanding. MetroGIS activities are regularly communicated through a variety of means with its policy maker, manager, and technical communities. To help Policy Board members better understand the value of geospatial data and the use of GIS, each Board meeting includes a demonstration focusing on benefits gained through data sharing and collaboration. County-based GIS user groups are fostered and encouraged to "bubble-up" issues that are beyond their ability to effectively address. Fostering a clear understanding of the issues, opportunities, and collective objectives by the entire community (i.e., being prepared when opportunity presents itself) may well broaden the reach of "good luck," which also clearly has its place.

Seek consensus on policy decisions. No single organization or minority faction can be perceived as "driving the bus." Consensus among Policy Board members is sought for action on issues and opportunities fundamental to MetroGIS's success. Organizations that have related business needs must actively participate to institutionalize the roles and responsibilities desired by the MetroGIS community.

Represent diverse perspectives. MetroGIS's decision-making derives from work performed by broadly representative committees and workgroups, composed of committed managers and technical staff with appropriate expertise who identify common needs, develop work programs, and formulate solutions to these needs. Data producers and users are involved in all aspects of the collaborative's decision making. No single organization or faction dominates.

Document stakeholder benefits. Identifying and documenting stakeholder benefits in a manner readily understandable by the various stakeholder communities is fundamental to strengthening commitments to MetroGIS, whether or not the benefits can be precisely measured. MetroGIS encourages testimonials[16] from its stakeholders and seeks out opportunities to collaborate with the academic community to identify and document the benefits of collaboration.

Acknowledge fair-share contribution options. Contributions to the sustained operation of the regional collaborative from any one stakeholder may be in the form of funding, data, or people and equipment.

Align with internal business needs. No stakeholder organization will be asked to perform a function for the collaborative that exceeds its internal business needs. Stated another way, all solutions must have their roots in actions consistent with day-to-day business functions.

Maintain an institutional memory. Champions at all levels of the collaborative have left and will continue to leave MetroGIS, and stakeholders may not be able to keep abreast of all of the breadth of activities MetroGIS is engaged in. Creditable documentation of meetings, policy decisions, studies, and so forth is critical to maintaining a course consistent with previously agreed on policy and direction.[17]

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1 The Metropolitan Council's responsibilities include running the regional bus system, collecting and treating waste water and managing water resources preservation, overseeing growth management policy, planning regional parks, and administering funds that provide housing opportunities for low- and moderate-income families. See http://www.metrocouncil.org.

2 For more about the Minnesota Land Management Information Center, see http://www.lmic.state.mn.us.

3 See http://www.metrogis.org/about/history/strategic_initiatives.shtml for descriptions of strategic projects and their outcomes.

4 See http://www.metrogis.org/about/ business_planning/index.shtml#part2 for the MetroGIS business plan adopted in April, 2000. An update is scheduled for the Fall, 2002. The originally endorsed mission critical functions are expected to continue to guide the efforts MetroGIS for the foreseeable future.

5 See http://www.metrogis.org/data/datafinder/index.shtml for explanations of phases of development from 1997 through 2002.

6 See http://www.metrogis.org/data/index.shtml for the adopted specifications and custodial responsibilities for solutions that have been implemented and the status of regional solutions in progress.

7 See http://www.metrogis.org/about/org_structure.pdf for a diagram of MetroGIS's structure.

8 See http://www.metrogis.org/about/history/ops_guidelines.pdf for the MetroGIS Operating Guidelines.

9 See http://www.metrogis.org/data/about/index.shtml#data_needs for a description of the MetroGIS Business Information Needs Process.

10 See http://fgdc.gov/framework/frameworkintroguide/ for more about the NSDI Framework Handbook.

11 See http://www.metrogis.org/benefits/quotes/index.shtml for summaries of the studies, testimonials, and several short quotes attesting to the value of MetroGIS to stakeholder organizations.

12 The adopted plan can be viewed at http://www.metrogis.org/benefits/perf_measure/index.shtml.

13 The abstract for Dr. Craig's study is provided in the Minnesota section of the document at http://www.fgdc.gov/publications/documents/geninfo/funding98.pdf. A slide presentation summary of the study conclusions is available at http://www.metrogis.org/benefits/studies/index.shtml.

14 The Staff Coordinator, a member of the Policy Board and a member of the Coordinating Committee participated on the GDA Drafting Committee from February 2000 to September 2000. The chair of the Policy Board also was elected to serve as a chapter member of the National Board of the Trustees, effective November 2001.

15 Dr. John Bryson and his colleague Charles Finn from the Humphrey Institute at the University of Minnesota facilitated MetroGIS's initial strategic planning retreat in December 1995. They used a "cognitive mapping" approach described in Bryson's book Strategic Planning for Public and Non-Profit Organizations, Revised Edition (San Francisco: Jossey-Bass, 1995). Consensus was reached on common priority business information needs through a 6-month process that involved business object modeling and a rigorous survey methodology. Consensus was reached on functional priorities using matrix analysis techniques. Dr. David Arbeit, Director of the Minnesota LMIC, and Dr. William Craig, Associate Director of the Center for Urban and Regional Affairs, University of Minnesota, designed the surveys and supervised the analysis.

16 See http://www.metrogis.org/benefits/testimonials/index.shtml for stakeholder testimonials about the value of MetroGIS.

17 MetroGIS staff take seriously the need to document the process and outcome of collective decision making. All such documentation is posted on MetroGIS's general web site at http://www.metrogis.org.