

HOW DO LOCAL GOVERNMENTS SHARE AND COORDINATE GEOGRAPHIC INFORMATION? ISSUES IN THE UNITED STATES

Francis Harvey¹ David Tulloch²

¹University of Minnesota, Minneapolis, MN, USA

²Rutgers University, New Brunswick, NJ, USA

ABSTRACT

This paper reports results of a project establishing best practices of local government geographic information sharing and coordination in the context of the United States' National Spatial Data Infrastructure (NSDI). Sharing of geographic information within this framework can promote cost-effective data collection and utility for a larger number of agencies and communities. Bearing in mind that geographic information infrastructures are not placed in an ideal universe, but in a political environment, this paper presents local government perspectives on data sharing and coordination. Understanding these perspectives is an important element in developing supporting institutions for these relationships. The results of this project suggest that local governments remain largely unaware of SDI concepts and assess the benefits of sharing geographic information in a limited time frame and with an emphasis on supporting and maintaining existing administrative and political relationships. Best practices need to better connect local government needs and constraints to SDI policy issues.

KEYWORDS: Institutions, local governments, data sharing and coordination

LOCAL GOVERNMENT SHARING AND COORDINATION

Global developments of Geographic Information Infrastructures (GII) (or SDI¹) pose new opportunities and challenges for local governments. It is important to point out that the impact of the developing infrastructures on local government cartographic production and research are considerable. In a data rich environment, GIS users and cartographers face many opportunities that ironically may also constrain their activities. Local governments often lack the means to evaluate data accessed from the NSDI. Well-intending staff may produce cartographic materials that demonstrate substantial errors or are misleading. Hardly moot questions, their relevance pales however when considering the limited penetration of the NSDI.

The United States of America National Spatial Data Infrastructure (NSDI) is one of the oldest and most studied GII. Examining local government participation in the NSDI provides a valuable way for people in the U.S. and in other countries to gain insight into GII dynamics. This paper describes the results of a research project conducted in 2002 by Drs. Francis Harvey and David Tulloch (Harvey & Tulloch, 2003). The focus of this project was establishing best practices of local government data sharing and coordination. The starting point was the many studies of the NSDI and its precursors. Previous studies (Calkins & Obermeyer, 1991; Campbell & Masser, 1995; Masser & Campbell, 1994) generally suggest that policy and financial issues lie at the forefront of concerns among local governments. Previous research with local governments suggests that parallel to these issues, there are other problems that arise in establishing cooperative frameworks between agencies (Harvey, 2000, 2001). For instance, pride of ownership is mentioned as a critical intangible issue for local government staff who feel squeezed by state and federal guidelines and standards. Without some manifest form of control over the information they

¹ We use the terms GII and SDI interchangeably.

produce, local agencies may avoid or hinder involvement. The cooperation between local government agencies reflects complex political and organizational situations that are frequently based on mutual arrangements and political calculation.

Previous research (Harvey, 2000) has also suggested that local governments have little awareness of the NSDI and very limited understanding of what the NSDI is. Further, even local governments with significant NSDI awareness and previous contact with the Federal Geographic Data Committee (FGDC) and other federal agencies on GIS matters also expressed that they saw little support for their needs in the existing NSDI. Most local governments expressed a pragmatic viewpoint: Informal sharing arrangements were working fine; introducing geographic information technology and standards would lead to unwarranted expenses.

At the same time, local government staff also indicated the significance of existing organizational and political relationships. Existing political, institutional, professional, and legislative relationships, although as intangible as pride of ownership in the NSDI, in fact, largely determine the geographic information activities at local government agencies. Sharing and coordination are largely informal activities that correspond to these relationships. When formal arrangements are used, they occur only at the final stages of establishing sharing or cooperation agreements; they manifest administrative procedures and/or legal requirements. This situation poses an interesting conundrum for developing local government participation in the NSDI.

RESEARCH QUESTIONS

Given the importance of informal arrangements and local governments' limited knowledge and use of the NSDI the main question for this project was: How do local governments successfully share geospatial data and coordinate geographic information activities? Related to this question, we sought to determine the factors and obstacles local governments found in their GI sharing and coordination. Many of the issues we raised in surveys and interviews had two components: First, at a descriptive level, identifying types of data shared and sharing and coordination partners. Second, establishing how sharing and coordination occurred and what worked best (and worst). Given the importance of informal arrangements, we were particularly interested in examining the role of standards and metadata.

METHODOLOGY

The methodology is divided into three distinct approaches according to the different survey methods used. To establish best practices, the research project relied on two forms of data acquisition. In-depth interviews were held in 6 areas (see below). These in-depth interviews provided great detail complemented by more tightly-focused surveys of local governments. Overall, 89 individuals were surveyed using a basic set of thirteen questions. Responses were either collected by phone, fax-back, or email. Most surveys were conducted in the summer of 2002 whereas the interviews were dispersed through the year. The interviews and survey methodologies are discussed in more detail below.

Interview Methodology

The interviews were divided into three distinct phases. In phase one we examined the experiences of data sharing participants with local sharing and coordination arrangements. Objectives of this phase were the determination of strategies and key issues in demonstration projects that have worked and find out what strategies failed and the problems that were resolved and continue to have impacts.

In phase two, interviews were conducted at a variety of local governments to determine how they share geospatial data and coordinate geographic information activities. These interviews were held with numerous local government agencies. Interviews throughout the entire data sharing

network provided substantive insights into the contexts and practices of sharing and coordination *in situ*. We included large and small local governments representing a diverse geography and worked to ensure that legislative and political differences at the regional and state level could be identified for comparison. In addition to these primary interviews, we also conducted several focused interviews to examine specific data sharing and coordination practices we had been referred to.

Primary Interviews

The primary interviews generally involved multiple days of on-site interviews throughout the entire data sharing network. Major interviews involved both researchers. The focused interviews involved a single researcher interviewing only the central data producers. Additional follow-up was then conducted by phone from the researcher's home.

Primary interviews were conducted in the following areas (see Figure 1):

- Lexington-Fayette Urban County, KY (January 2002)
- San Diego County, CA (March 2002)
- Dane County, WI (June 2002)
- Southeastern Wisconsin (June 2002)

The primary interviews provided insights into data sharing and coordination practices. To insure we gained insights into the network during three to four day visits, we initially contacted the primary GIS unit of the county or region several months in advance asking their permission to conduct a set of interviews. If they agreed, we also asked for the names and contact information for a variety of information sharing and coordination partners. We then contacted these individuals and/or agencies and arranged appointments during a three day period. A week before traveling to the destination we emailed an advance copy of interview questions to all scheduled interviewees.

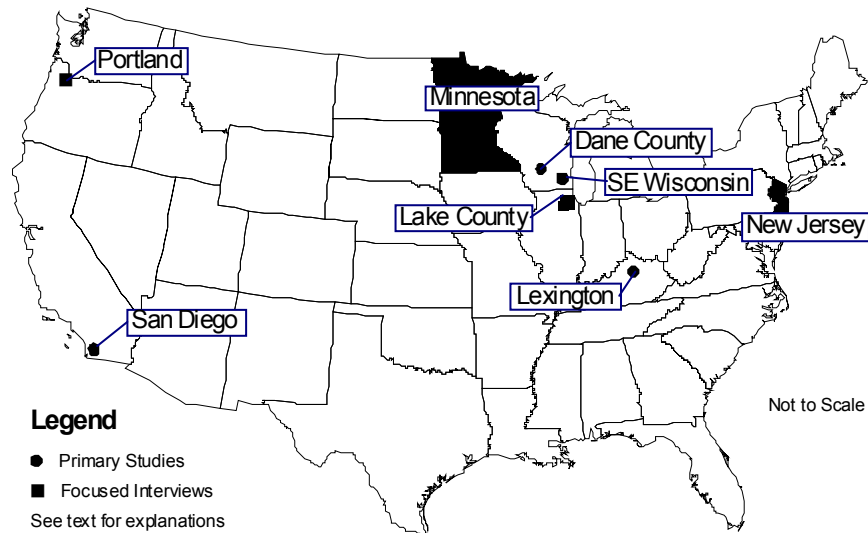


Figure 1 Map indicating locations of interviews and surveys

During each primary interview, the first interview was always with our main contact person/agency. We wanted to establish their representation of the data sharing and coordination arrangements and environment in their area and develop an overview of legal, administrative, financial, political and statutory issues impacting data sharing and coordination. We then followed with between three and five interviews of data sharing and coordination “partners.” Before concluding all face-to-face interviews and departing, we scheduled a final interview with our main contact to clarify any questions we had and to ask for more specific information that would help us document the areas sharing and coordination practices. All interviews were audio taped, after prior consent of interviewees, to assure reliable interpretations and aid later study and comparison of interviews.

Focused Interviews

Although the primary interviews provided a wealth of information, we realized we should also contact areas that had been indicated to us by interviewees as exemplarily sharing and coordination models. Lacking the time to pursue comprehensive sets of interviews, we chose to focus on the main contact person/agency with the same questions we raised in the primary questions. The results of these interviews complement the primary interviews by broadening our perspectives.

Two focused interviews were held (see Figure 1):

Lake County, IL (August 2002)
Portland, OR (March 2002)

Multi-Modal Survey Methodology

While the interviews are exceedingly well suited for in-depth understanding of data sharing and coordination practices, they are less well suited to distinguish the representativeness of each case and situation for the general issues. For this reason, an important part of our hybrid methodology was conducting surveys of county-level GIS users and developers in Minnesota and New Jersey.

The surveys were based on the questions asked in interviews, but revised to focus on basic sharing and coordination issues (formal policy, costs, partners, experience, knowledge of metadata, standards, and the NSDI). Obviously, the responses lack the detail of the interviews, but respondents desire to share could still be overwhelming. It is worth noting that the ten question interviews would sometimes last over thirty minutes.

Of the 87 surveys distributed to all counties in Minnesota, we received 70 responses, or a response rate of 80%. This extremely high response rate is in large part attributable to the multi-modal survey method and the interest of respondents. Only 13% of respondents were contacted twice. Surveys were completed via phone (21%), fax (39%), and email (40%).

The distribution of surveys in New Jersey followed a somewhat different approach due to the strong geographic and economic relationships to surrounding states. The process began with all New Jersey counties and then municipalities known to us to have produced GIS products. As sharing networks were identified, the interviews reached out to members of those networks (primarily users relying on the local government data) including federal, state and municipal agencies, both those with dedicated GIS staff, and those with personnel who used GIS tangentially. Within New Jersey, the response rate was lower (only about 17 surveys fully completed).

Parallel to these interviews, additional similar interviews were also conducted with about 20 New Jersey non-profit organizations that rely on local and state government geospatial data. These interviews provided additional information and helped guide the identification of known data

producers. This helped make the process of identifying likely data producers in New Jersey much easier.

In distinction to the multi-modal survey methods used in Minnesota, all survey data collection occurred through telephone interviews, usually cold-calling to request a 10-15 minute on-the-spot interview with GIS personnel. Interviews were semi-structured, generally following the survey order, interviewees deviated from the survey order to describe specific projects or to explain the relationships between sharing agencies. Some interviews lasted as long as 25-30 minutes.

Interviewees generally were eager to participate, though a few were wary of discussing data policies, or used sub-contractors to develop GIS products and therefore didn't know enough about geo-spatial data to discuss data issues. Those individuals who were willing to be interviewed typically were forthcoming about data sharing policies and interested in the results of the study.

Results

The research results focus on articulating best practices for local governments. This includes generic best practices and specific practices by type and situation of local government. These best practices would also document strategies that have failed. These results will not only point to the "ideals" of GI sharing and coordination, but also indicate approaches that didn't work and problems that derailed GIS projects.

These best practices will be invaluable inputs for local government GIS implementation and consortia building, and participation in the NSDI. They will also be useful as insights into local government practices for policy development at local, regional, state, and federal levels.

Sharing/Coordination

As previous studies indicate, sharing of geographic information is wide-spread and pervasive at all levels of government. The results from this research underscore this finding. Of all 57 survey respondents, only one respondent from the counties that used GIS was not sure if they share data. This county also had no installed GIS software/hardware. All other counties indicated varying degrees of sharing, ranging between one to fifteen or more partners, with whom they regularly share data.

Coordination is, however, another issue. Responses to this question took into consideration that we were considering joint activities including data acquisition, processing and dissemination. Clearly, the complexity of organizing these activities can partially explain that over half of the respondents do not coordinate any geographic information activities. That close to half of the respondents coordinate activities, however, suggests that coordination becomes a significant activity, largely with state agencies. Sharing and coordination activities with other counties and municipalities are far less common.

Data Distribution

The most common forms of data distribution, as would be expected, are provision of data in electronic format, either by web (ftp) or email. Almost as frequent is the distribution of data on CD/tape. Very few respondents indicated that they review requests for data, although more often they would request a simple written request.

Most striking is the lack of distinction between different request categories (same jurisdiction, another local government, known government agency, or state agency). Preferred data distribution is the same for all categories. However, different categories face different conditions. Half of the respondents in Minnesota who were involved in data sharing indicated that they applied conditions to data distribution, the other half did not. About 9% do not share data. In New Jersey 13 respondents required an agreement, two did not, and six indicated the question was not applicable.

The conditions for data distribution vary, but a few specific issues emerge from responses in Minnesota and New Jersey. Perhaps the most common condition placed on shared data is “No further distribution.” The reasons for this range from economic protection to control over data, but seem largely to reflect concerns for potential misuse of data. This explains why liability is also a common concern. Although liability release forms are uncommon, these two conditions are often woven together in a disclaimer. Disclaimers can be specific: “data only used for requested purpose & not shared w/others w/o permission” or broader: “data use & acceptance; no guarantee of format; copyright; no resell or redistribution via web; no responsibility for manipulated data.” In all disclaimers, statements about the quality of data are infrequent, whereas statements about the quality limits or lack of known quality are commonplace. Other conditions include requirements that the data source be indicated in all products, either in the form of a citation or reference note. Data privacy also appears as a condition, but is largely affected through data sharing policy and practice, e.g., “no sharing of address data outside of the county.”

In spite of increased availability of data over the internet and more formalized data request procedures, informal sharing still plays the dominant role in many places. For example, in one rural Minnesota county that largely shares data with the state DOT and municipalities within the county, informal sharing predominates. In their words, an “I owe you one” is the usual agreement for sharing.

Use and Role of Standards

The clear indication that 40 respondents in Minnesota relied on standards, 19 did not, and 12 indicated standards were not applicable, or possibly used, or simply unknown merits the principle question “what are standards?” Examining the detailed remarks to this question, it is plain that standards are understood in a myriad number of ways. For some respondents standards are documentation of metadata: “do our best to document the metadata for each layer and identify the positional accuracy.” Other respondents coordinate standards usage with others: “confer w/ contracting agency, GIS Users Group to use same stds and software compatibility.” Some respondents have even developed their own standards to specifically address their prerogatives: “personal standards higher than state & fed; nothing written in stone.” At the same time this response highlights that standards are always changing. For a variety of reasons, the use and role of standards can change very quickly.

Metadata was the most common standard mentioned by respondents in New Jersey. Those who actively maintain metadata mentioned other standards such as XML, GRASS, ARC, State Plane Coordinates, etc. In New Jersey 48% indicated they used metadata compared to 60% in Minnesota. While the FGDC Content Standard for Digital Geographic Metadata (CSDGM) is certainly recognized, many respondents use it partially, modify it, or have developed their own formats.

Data Sharing Agreements and Policy

Responses to the question about attempts to organize data sharing and/or provide policy for data sharing clearly indicate the tensions local governments face. While data sharing organization and/or policy are common (40 respondents in Minnesota indicated they have some organization or policy for data sharing, 25 do not, and only six indicated the issue is not applicable), it is not equivocally implemented nor resisted. On the extremes, negative responses indicate a strict limitation of sharing: “do not share other than what is required by law.” Positive responses to this question point to vastly different sharing philosophy: “our policy is that we share data freely w/ gov’t entities.” Regardless of the actual policy or arrangements respondents overwhelmingly refer to serious concerns and problems facing data sharing arrangements and policies. Problems range from difficult relationships with state and federal agencies, funding, priorities and tangible deliverables for county activities, desire to coordinate with sharing partners, data sensitivity, data

privacy, etc. Few respondents indicated a completely free and open data sharing arrangement or policy. Even those with FTP or Web sites made clear that the sites were only accessible on the intranet, or required a previous agreement.

In New Jersey more can be said about the specifics of data sharing arrangements and policies. New Jersey counties (and others, like Rutgers University and non-profits) tend to use standard New Jersey Department of Environmental Protection (NJDEP) sharing agreements. Specifically, a common approach is to modify the NJDEP's shrinkwrap agreement included with its freely-distributed data CDs and downloadable data. This reflects the fact that NJDEP is probably the most visible data sharing organization in the state.

Knowledge of NSDI

As previous studies have indicated, the NSDI is still widely unknown. About 46% of the Minnesota respondents indicated that they have heard of the National Spatial Data Infrastructure. 36% had not heard of the NSDI and 10% said it was not applicable. In New Jersey, 61% of the respondents indicated they heard of the NSDI. Only 1% had not heard of the NSDI, but 29% said it was not applicable. While these results by themselves suggest a variability in the knowledge of the NSDI in local governments across the United States, comments made by respondents who had heard of the NSDI in both Minnesota and New Jersey suggests some fundamental misunderstandings of the NSDI and an overall very limited knowledge of the NSDI. Demonstrating less misunderstanding, but a frankness that underscores the lack of understanding, another respondent said, "heard of it but don't have a whole lot of info about it."

Risks of Data Sharing

The limited knowledge of the NSDI and misunderstanding of its concepts is all the more troubling considering the concerns with risks of data sharing. Liability is one perspective on the problem. Overall respondents took a far more nuanced perspective by balancing risks with benefits. In Oregon, the extensive use of GIS data in planning activities seemed to open up more risks: "we can't control whether the data is the best for a client's intended use" i.e. earthquake data at wrong scale for use, planners use county data that is incomplete. The agencies that dealt to some degree with private organizations (HMDC, Green Acres) saw specific risks affecting property value such as the distribution of certain data could drive up the price of properties they want to obtain; or the release of sensitive data such as hazardous waste sites might cause problems.

Most respondents in New Jersey consider that the issue of risks is not applicable (seven out of 21 responses). In Minnesota the picture is far different: 75% of the Minnesota respondents identified some form of risk with data sharing. Only 1% found no risks and 24% considered that the risk issue is not applicable. Responses to this question in Minnesota indicated a wide-variety of risks. The most common risk was misuse of data followed by misrepresentation. Specific risks were also mentioned, for example, the misuse of feedlot data.

CONCLUSION

The findings from this research project suggest that best practices need to reflect and respond to existing mandates and activities. The following list of best practices are broadly relevant to local governments, but with limitations. The application of best practices involves a great deal of learning: learning by reading about other group's experiences, learning by talking at conferences and meetings with other professionals, but mainly learning by doing. It is ultimately the specific circumstances and possibilities unique to each data sharing and coordination activity that define best practices.

With these caveats in mind, the following seven key points summarize the best practice findings of this research project.

Context matters

Different institutions require different responses. There is clearly no single best practice for all situations. Decisions about whether data sharing should be formal or informal may depend on where you are. No matter how badly you want to give away the data, if you work in “Tammany Hall,” you can’t. Some isolated systems may be able to rely on a hub and spoke model while some complex multi-jurisdictional landscape may require fairly sophisticated models to ensure that data is available in appropriate and fulfilling ways.

Attitudes vary

When asked whether they charged for geographic information, some people asked, “Why?” When asked if they shared data, some people asked, “Why?” Some people saw the data itself as the source of their power. Some people saw giving it away as their source of power. Sharing scares some people. Some people have concerns about the risks involved -- liability is a big concern. (But some URISA folks are suggesting that liability goes up when you charge.)

Charging for data can cost more than you think

(or be wary of the ripple effect) Sometimes, when you think you are making money off of your data, you are really costing yourself in the long run. Charging for data can have primary, secondary, and tertiary economic effects that you should be aware of before you chose a restrictive access policy.

Bigger is better

Generally speaking, the larger organizations seemed more likely to share, to have developed metadata to participate in a larger SDI, and to be involved in the NSDI.

Where there's metadata, there's data

While not all data come with metadata. We found that folks who kept metadata almost always had lots of data and it generally seemed to be data worth getting. But many agencies admitted to using standards that were not FGDC compliant.

Sometimes, it's all about who you know

A number of institutions explicitly admitted to sharing data freely with people they know and trust, while making it difficult for others to gain access. It became clear in some places that almost everybody had studied at the same school, so that even if they weren’t classmates they shared the same favorite faculty. These personal connections seemed to really overcome some other limitations. It can also be about how you treat them. When you are working environment with central control of data access, you clearly need to treat the GIS ‘dictator’ nicely. If he/she shuts you out, it can be very hard to get back in.

Sharing is easy, not sharing is hard

Just giving your data away can turn out to be the easier and more affordable route. Copying someone else’s shrink-wrap agreement and leaving your data on the web page can be pretty simple. Dealing with lawsuits, chasing down “illegal data launderers,” and negotiating iron-clad license agreements can be very hard and unrewarding work. Some agencies seem to spend more time and energy dealing with preventing “data theft” than they make in their cost recovery charges.

Local government staff suggest in conjunction with these best practices, there are other issues that arise in establishing cooperative frameworks between agencies. For instance, pride of ownership is mentioned as a critical intangible issue for local governments who feel squeezed by state and federal guidelines and standards that do not reflect local needs. Without some manifest

form of control over the information they produce, local agencies may avoid or hinder involvement. The cooperation between local government agencies reflects complex political and organizational situations that are frequently based on mutual arrangements and constrained by distrust or political maneuvering. Future work should explore whether these issues are adequately accounted for by existing NSDI policy.

ACKNOWLEDGEMENTS

The U.S. Federal Geographic Data Committee provided financial support for the research project upon which this article is based. Dr. David Tulloch is co-PI and co-author of the report (2003) on which much of this paper is based. A previous version of this paper was presented at the 2003 International Cartographic Congress in Durban, South Africa.

BIBLIOGRAPHY

- Calkins, H. W., & Obermeyer, N. J. (1991). Taxonomy for Surveying the Use and Value of Geographical Information. *International Journal of Geographical Information Systems*, vol. 5 no. 3, 341-351.
- Campbell, H., & Masser, I. (1995). *GIS and Organizations. How Effective Are GIS in Practice?* London: Taylor & Francis.
- Harvey, F. (2000, Sep 2000). *Potentials and Pitfalls for Vertical Integration for the NSDI. Final Report of a Survey of Local Government Perspectives*. Retrieved June 2004, from <http://www.tc.umn.edu/~harve024/research/fw-comp.PDF>.
- Harvey, F. (2001, May 2001). NSDI from the Trenches. *Local Government Perspectives. Geospatial Solutions*, 11, 38-40.
- Harvey, F., & Tulloch, D. (2003). *Building the NSDI at the Base: Establishing Best Sharing and Coordination Practices among Local Governments* (Report). Minneapolis, MN and New Brunswick, NJ: University of Minnesota. Retrieved June 2004, from <http://www.tc.umn.edu/~fharvey/research/fw-comp.pdf>.
- Masser, I., & Campbell, H. (1994). Information Sharing and the Implementation of GIS: Some Key Issues. In M. F. Worboys (Ed.), *Innovations in GIS 1* (pp. 217-227). London: Taylor & Francis.