PROJECT 1

CONFLICTS IN THE USE OF GEOGRAPHIC INFORMATION

Professor Harlan J. Onsrud
National Center for Geographic Information and Analysis &
Department of Spatial Information Science and Engineering
5711 Boardman Hall, Rm. 340
University of Maine
Orono, ME 04469-5711
Tel: (207) 581-2175
Fax: (207) 581-2206
Email: onsrud@spatial.maine.edu

I. Summary

The use of geographic information technologies is pervasive throughout business, government, industry and the scientific community in the United States. Conflicts are arising on a daily basis for those using geographic information systems and their affiliated databases, for those implementing such systems, and for those designing the next generations of spatial information technologies. Balancing among competing interests and resolving conflicts involved in the use of these technologies are growing problems for numerous parties within society. Among the problem domains of greatest concern in use of these technologies are those involving personal information privacy, intellectual property rights in geographic information, liability in the use of geographic data sets, public access to government geographic data sets, public goods aspects of geographic information in libraries, and sales of geographic information by government agencies.

Even if parties desire to act responsibly in resolving conflicts in these domains, appropriate actions frequently are not clear for the individuals or groups involved. Achieving one's own objectives in the use or development of these technologies is often difficult to do without causing substantial harms to other individuals or groups. Often the conflicts arising are not resolvable by resort to existing law or industry codes of conduct. In addition, use of expansive digital geographic data sets has spread well beyond those within professional communities that might be influenced by codes of conduct to users located within the broad consuming public, non-profit groups and myriad small businesses. At the core of the difficulty in resolving current geographic information use conflicts is the dearth of knowledge about which conflict arenas are of greatest concern to data subjects and others affected by such information systems and how the individuals and groups affected would prefer to have such conflicts resolved. We hypothesize that substantial differences exist regarding perceived benefits and harms between and among the various parties involved in or affected by the use and development of geographic information technologies.

A major objective of this research is to determine to what extent conflicts are perceived to exist by those using and creating geographic information systems and by those who are the subjects contained within such systems. Researchers will use web-based questionnaires to determine whether and to what extent interest and value choices differ among sampled groups of system developers, users, and data subjects within each of the major problem domains. Where significant differences are evidenced as existing, researchers will explore relevant conflict scenarios and their solutions through use of one-on-one interviews and focus groups. Through this process and for each group, preferences for resolving specific conflicts will be determined as well as guiding principles that participants would recommend. Researchers will compare the obtained results within and among the different interest groups and will use focus groups with data subject samples for confirmatory purposes relative to the reasonableness of suggested solutions. The solutions

also will be assessed against leading philosophical theories. From the results, researchers will critique, support, or expand existing ethical guidelines developed for geographic information system managers and developers. They also will comment on trends in the law and suggest appropriate factors and principles for law and policy makers to consider in light of the research findings. The gathered data and suggested principles will form the foundation for broad-ranging moral and ethical discussions within the geographic information science community.

II. Project Description

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1.1 Motivation for Research on Conflicts in the Use of Geographic Information: Background, Objectives, and Significance

The expansion in connectivity of information systems and the development of detailed databases is reshaping relationships among people, organizations, and government. The evolving information environment and the pervasiveness of databases is causing uncertainties, inconsistencies and confusion in how the law and public policies should be applied under new and continually changing circumstances. The law is subject to breaking down or being ignored when it varies too far from the common day experiences and expectations of members of society.

A major objective of this research is to determine to what extent conflicts with the interests of others are perceived to exist by those using and creating geographic information systems and by those who are data subjects within such information systems. Geographic information technologies are now in daily use throughout all major sectors of society and the extent and breadth of uses is increasing dramatically with each passing month. Such technologies are being used to navigate automobiles and emergency vehicles along optimal routes through busy city streets, profile and target consumer preferences (e.g., geomarketing), inventory and manage the physical facilities of utilities and city governments, explore new ways to visualize the human genome, track crime, track changes in the landscape (e.g., very recent commercial satellites are able to provide one-meter resolution multi-spectral images on successive daily passes) and a host of similar analysis, monitoring, design, maintenance, inventorying, routing, resource allocation, mapping and management tasks. Soon all cell phones, personal digital assistants, digital cameras, automobiles and similar mobile electronic devices will have embedded within them GPS receivers or alternative technologies for tracking and reporting location.

The first phase of the work plan described below focuses primarily on identifying the interests or values of individuals affected by the use of geographic information and identifying

important areas of practice where the interests or values of groups are strongly at odds with those of other groups. For instance, system developers, system users and data subjects represent three different communities of interest in the use of geographic information.

In areas where substantial disparities are determined to exist between groups, the nature of perceived conflicts in the societal use of geographic information will be explored more extensively. Thus the second phase of the work focuses on conflict scenarios that reflect real world problem situations in the areas identified as important in the first phase of the project and then exploring the resolution of such conflicts from the perspectives of the various groups.

Conflict situations to be addressed by this research are organized under the following general headings:

1. personal information privacy,
2. intellectual property rights in geographic information,
3. liability in the use of geographic data sets,
4. public access to government geographic data sets,
5. public goods aspects of networked geolibraries, and
6. claims of ownership and sale of geographic information by government agencies.

All of these categories have a primary focus on conflicts involving data or information. However, conflicts involving use or development of software, hardware, networks and on-line services that are intertwined with these data use issues also will be addressed. The term geographic data as used throughout this document is intended to be interpreted broadly and includes any data in any information system in which locations or spatial relations are key components in collecting, organizing, identifying, or processing the data.

Virtually all conflicts in the use of geographic information to be addressed by this study arise from choosing among “right versus right” in which any arguably appropriate or even laudable decision involves some harm to others. For instance, it may be appropriate to support economic efficiency in society by allowing commercial businesses to collect detailed data on the locations, movements, and purchase patterns of their customers without the knowledge or consent of consumers and to trade in such information*; even though* these actions harm at least some consumers through invasion of their personal privacy. Yet for others in society, the appropriate action is to support high levels of information privacy for all consumers; *even though* strong information privacy protection constrains the freedom of private businesses to better understand the needs of their customers and these constraints result in economic harm to the business.

Geomarketing and other forms of geotracking have become huge industries in the US and abroad in the past few years. Many in the geographic information community are aware of the numerous profiling and tracking actions that are taking place in the commercial sector and within government as a result of the new integrative powers provided by geographic information technologies. However, the geographic information scientific and development communities do not know the degree to which members of the general public would feel that their privacy is being impinged upon if they were informed of the data integration activities that are actually occurring. Informed consent versus non-consent of surveillance provides a point of reference for assessing the value of individual privacy. Nor does the research community have empirical evidence that geographic information technology developers, data collectors, and system users recognize that their practices may constitute invasive or harmful conduct from the perspectives of ethical theorists and from the perspectives of some and perhaps many of the people affected by their practices. In addition to the powerful linkage capabilities provided by new geographic information technologies, the implications of increasing spatial resolutions and levels of observational detail also are giving rise to privacy concerns.

The preceding two paragraphs highlight conflicts in regard to ***personal information privacy*** that have become much more pervasive throughout the geographic information community within the past few years. Clarke (1999), Marx (1998), Hernon (1997), Curry (1997), Ontario (1997) and Onsrud (1994) provide more extensive discussions of the range of privacy conflicts in the use of geographic information. There also is a burgeoning literature on information privacy issues generally. A search of "information privacy" on Uncover reveals over 400 professional journal articles published in just the past two years alone. Also witnessing

unprecedented growth in addressing information privacy issues are books, government reports, conferences and web sites (respective examples include *book:* Agre and Rotenburg (1998), *report:* U.S. Dept of Commerce (1997), *conference:* Cyberspace or Privacy: A New Legal Paradigm? http://www.stanford.edu/group/lawreview/symposium/index.html/, and *web site:* http://special.northernlight.com/privacy/index.html).

Similarly, as a result of the shifting technological environment, major shifts in power balances have recently occurred in each of the other five geographic information problem domains listed above. For a discussion of conflicts and societal harms related to competing claims over ***intellectual property*** in geographic information (i.e. copyright, other IP, and additional ownership claims based on contract or database legislation), see NRC (1999a), NRC (1999b), Onsrud and Lopez (1998), Pluijmers (1997), Karjala (1995) and Cho (1995). ***Liability*** issues and conflicts over responsibility for damages in the event of harms caused through the use of spatial technologies or databases are explored in Phillips (1999), Onsrud (1999), and Stewart, et. al. (1997). Public use of and ***access to government geographic databases*** is often the test case in local jurisdictions for resolving conflicts over access to government data generally. Such cases involve complex sets of tensions between citizens, government officials, non-profit groups and the commercial sector. Access to government geographic databases and the conflicts to which they give rise are discussed in Onsrud (1998b) and Onsrud (1998c) while access to government databases in general are discussed in Weis and Backlund (1997). (See also Los Angeles (1999)). To treat the works in ***geolibraries*** foremost as commodities harms other valuable societal functions of information. Conflicts and tensions between the "public goods" and "private commodity" aspects of geographic data in library or library-like online settings are discussed in NRC (1999c) and Onsrud (1998d). Finally, the ***sale of geographic data by government agencies*** and the imposition of restrictions on the use of data gathered at taxpayer expense continues as a highly contentious issue in jurisdictions across the entire nation as discussed in Perritt (1995), Onsrud (1998a), and, generally, NRC (1999a&b).

Due to space limitations, we will continue to use *"information privacy conflicts"* for examples in the remainder of this project description. However, the need is critical as well to determine whether and to what extent conflicts in each of the other identified problem areas are perceived as important by the affected parties and how those conflicts might be resolved.

Perception of the degree of harms caused to others through geographic data handling practices and the manner in which parties would prefer to have geographic data handling conflicts resolved is hypothesized as varying substantially from group to group. For instance, users of geographic information systems for business purposes such as marketing may have very different perceptions regarding the appropriateness of use and development actions from those whose buying and personal profiles are contained in the information systems.

Ethical codes of conduct developed in the information systems community primarily have been developed to date “by the profession for the profession.” Codes have been developed that list laudable principles to which system designers and practitioners are urged to aspire. However, ideals of conduct for information system professionals may have very little effect on the large numbers of day to day users of massive datasets that are unaware of such principles and are unlikely to self identify as information professionals bound by such principles. Professional codes in the information industry also have focused on primarily “right versus wrong” conduct. However, many of the most challenging conflict resolution problems arise when a decision maker must choose between a “right action” that is likely to cause harm to others and alternative “right actions” that also are likely to cause harms. This research, particularly in its later stages, focuses on such problem domains. Thus, this research typically will not address those information use conflict situations in which there is strong and widespread agreement throughout society that a particular use of geographic information is clearly acceptable or clearly unacceptable. It will address primarily those situations in which decision-makers face struggles in knowing the "right thing to do."

For geographic information interest conflicts identified in this research as being pervasive or problematic throughout significant segments of the industry or conflicts that are particularly important for some classes of stakeholders, preferences in resolving the conflicts will be identified

from the perspectives of each of the various groups. The various resolution approaches suggested by developers, users and data subjects will be compared with resolutions derived from deontological and teleological philosophical approaches and compared with resolutions suggested by practical ethicists as well as existing codes of practice for information professionals.

A broader goal of this research is to provide lawmakers, policymakers and information professionals with knowledge about geographic information uses and value choices being made in everyday practice that are in agreement with or at odds with the mores and desires of the broad communities of interest affected by these systems. Thus, although the results of this research should be of great value to geographic information professionals, another primary goal is to provide new knowledge that will help guide the actions of all members in society in their use of geographic information technologies and databases. The conflict scenarios confronted in real life, the suggested solutions, and analysis of the various approaches suggested for resolving the conflicts will be fully reported for use as a basis for discussions within and among the communities affected.

The ethicist and moralist typically argue that ethical decisions and general ethical codes of conduct should *not* be developed through the taking of opinion polls. Rather, gathering data on the moral consensus of a matter is a step along the way in arriving at a solution. It is ethical theory and moral insights that should be primarily depended on in arriving at resolutions to choice conflicts. But of course, ethical theory and insights don't arise within a vacuum. Theory develops hand in hand with the experiences of life. After preferred means for resolving the conflicts have been identified through this research for various groups, any derived means for resolving conflicts must be evaluated and honed by assessing proposed actions through conformance with theory.

1.2. Present Knowledge

To explore the proposed research plans further we first need to define several terms. Ethics has been defined by some philosophers as "the science of conduct." Ethics may be construed as a science in the sense that its study involves rational inquiry and the overall goal is attainment of truth. Ethics also focuses on the study of *conduct* as opposed to *behavior*. Behavior refers to activities in which people engage whereas conduct is a subset of behavior "... in which persons make voluntary choices between alternative courses of action because they have decided that they ought to choose one of the alternatives rather than the other" (Johnson 1984, p. 2). In general and although not mutually exclusive, social scientists study behavior because they are interested in how people act whereas ethicists study conduct because they are interested in how people *ought* to act.

For clarity, philosophers generally use the term *ethics* when referring to theory and use the term *morals* when referring to behavior in practice. In common language (e.g. "professional ethics"), the term ethics is often substituted for the term morals. However, the use of the distinction by philosophers allows them to provide another definition of ethics: the theoretical examination of morals.

The scholarly study of ethics has two primary traditions. The first, termed *deontological* (concerning duty), is concerned with the rightness and wrongness of actions. Many ethicists have sought a single rule that would determine the rightness of actions and therefore would serve as a guide for our future actions (Johnson 1984, p. 8). The second tradition in the systematic study of ethics, termed *teleological* (concerning ends), is concerned with the results of actions and their goodness or badness. But in both cases, the suggested answers to "rightness" or to the highest "goods" to be sought in life have fallen far short of being generalizable across a broad range of social circumstances. Regardless, the theories derived through the primary lines of ethical study also have many areas of agreement and have great value in assessing behavior in the geographic information technology community. Such concepts as autonomy of the person, beneficence and nonmaleficence, rights of individuals, and some aspects of paternalism appear to have relevance across many of the theories of the ethicists (Applebaum and Lawton 1990, pp. 31-48). Thus, we suggest that once we know more about the current moral condition of geographic information technology use, any derived code of conduct, for instance, should be critiqued from a range of theoretical ethical perspectives. Rules derived from experience obtain their final validity and meaning from theory.

The social critiques of geographic information technology applications that we have seen to date in the literature have been primarily by moralists as opposed to ethicists. The moral reformer is dedicated to a cause and takes strong actions in furtherance of that cause. Stances taken to oppose the use of geographic information systems (GIS) and related technologies in war (Smith 1992), to encourage the continued publication of topographical maps on the grounds that they offer a more democratic and humanistic form of geographical knowledge than offered by GIS (Harley 1990), to oppose the use of certain cartographic techniques to "lie with maps" (Monmonier 1991) and to require privacy-sensitivity in the design and application of tracking technologies (Clarke 1999) are all moral stances. We are likely to see future moralists advocating use of GIS for a stronger defense, for increased access by people to marketplace goods and services, for protecting the environment, and perhaps for advocating more obscure causes such as protecting the interests of adult Caucasian males. Many of the moral causes, of course, may conflict with each other. The ethicist questions the underlying principles and theories upon which the moralist stands. Such questions may dampen furtherance of a moral cause but they also help us evaluate which moral causes have merit and may be worthy of our support.

Smith (1997) provides an in-depth review of the scholarly and professional literature that has shaped the discussion of ethics in library and information science, computer science, management information systems, and closely related fields for the preceding ten years. While she discusses the bounds of professional usage of such terms as information ethics, computer ethics, cyber ethics, and numerous related terms in the context of the scholarly literature, we avoid usage of most such terms in the remainder of this document in order to avoid the definitional discrepancies among the disciplines and to promote clarity in the discussion of our research tasks.

One productive approach suggested for theoretical and practical examination of specific conflicts is to analyze each conflict from the perspectives of three competing yet complementary ethical theory frameworks: 1. Values and Virtues, 2. Consequences and Contingencies, and 3. Rights and Responsibilities (Mertzman and Madsen, 1992). Prototypical philosophers associated with each of these theory frameworks respectively include Aristotle, Jeremy Bentham and John Stuart Mill, and Immanuel Kant. The scenarios addressed in phase two of this project will be assessed through comprehensive application of these three analytical frameworks. These theory assessments will aid the processes of articulating scenarios drawn from conflicts witnessed in practice and improving upon means for resolving the conflicts. Moral analysis through use of frameworks based on theory allows problems to be more clearly stated. In the resolution of many conflicts, competing ethical theories as analyzed though these frameworks are likely to arrive at the same or similar resolutions although the reasons why may be very different. Although practical budget limitations prevent us from doing so now, in later planned work we intend to invite several philosophers to evaluate the conflicts from the same and additional theory frameworks as well as to evaluate additional conflicts arising in cross-cultural settings.

1.3. Longer Term Goals and Work in Progress

This work is a logical extension of the writing and research programs on law and information policy for spatial databases accomplished by Professor Onsrud over the past ten years as a research scientist with the National Center for Geographic Information and Analysis and a faculty member with the Department of Spatial Information Science and Engineering at the University of Maine. Much of his work has involved leading teams of researchers and graduate students in developing law and information policy research agendas and in accomplishing follow-up case study and survey work. The proposed project sits at the core of his primary research interests in information systems law and policy. Dr. Onsrud has written articles or hosted conferences on each of the six major problem domain areas to be addressed by this research. While his past research work has focused primarily on observing "information systems law in action" and developing prospective models for better balancing the needs of parties interested in using geographic datasets and information systems (e.g. Onsrud et. al. 1994 and 1996), this research project provides an opportunity to reflect on and apply ethical theory frameworks as a complement to the other research theory frameworks he works from and provides an opportunity to do so while addressing pressing issues confronting the discipline and society. Drawing on

ethical theory frameworks in addition to legal frameworks is likely to better inform the numerous law and policy research issues that remain as major challenges for the geographic information science community.

1.4. Workplan

The phases listed below outline the two-year work plan for the project. We view the outlined methods as being highly complementary to the more typical social science research methodology of investigating specific conflict cases in great depth contemporaneous with analysis and reflection on actual and alternative actions and outcomes (e.g. the detailed cases referenced at http://onlineethics.org/cases/index.html)). This project is a precursor to detailed factual exploration of specific cases since we are still at the stage of investigating which areas of conflict are of greatest concern to those affected by geographic information technologies. In addition, the exploration of scenarios drawn from life has been an excellent means for exploring and teaching practical ethics (e.g. Pritchard, Shrag, and numerous discussion cases at http://onlineethics.org/cases/index.html)

Phase 1 - Identifying values within communities of shared interest in the use of geographic information and disparities among communities

Conflicts are being confronted by users and designers of geographic information technologies and their affiliated databases on a daily basis. Visible and widely discussed quandaries over the use of digital geographic information are readily evident in practice within the following problem domains:

1. personal information privacy,
2. intellectual property rights in geographic information,
3. liability in the use of geographic data sets,
4. public access to government geographic data sets,
5. public goods aspects of networked geolibraries, and
6. claims of ownership and sale of geographic information by government agencies.

All six problem domains will be addressed by this research because of the strong interplay between the six domains and the desire to gather evidence of which domains and sub-issues within each encompass those conflicts that are of greatest concern to those affected by geographic information technologies.

In each of the problem domains, our methodological approach for testing whether various groups perceive conflicts to exist will be to set up pairs of statements that involve competing value choices. For instance, the following two statements might be posed for a conflict test under the topic of "privacy in the government sector."

QUESTION: In the use and development of geographic datasets and technologies, how important is each of the following goals?

1. Government should be allowed to cross-match data about individuals and their locations to accomplish governmental functions

unimportant goal	minor goal	moderate goal	important goal	highly important goal
1	2	3	4	5

2. The privacy of individuals who may be identifiable in government data sets should be protected

unimportant goal	minor goal	moderate goal	important goal	highly important goal
1	2	3	4	5

If an individual ranks responses to both of these items as highly important, a strong conflict in values exists for that respondent. The values expressed by each statement are highly important

to the respondent yet strong support for one value works against strong support of the other. This clash of competing values suggests the potential for significant conflict. That is, the more freedom we give government to cross-match data, the more potential exists for inappropriate intrusion by government into the private lives of individuals. Conversely, the more we protect the information privacy of citizens the greater the difficulty government has in making its information operations run efficiently, such as for catching fraudulent claims which harm all taxpayers and which cross-matching among agencies has been so effective in accomplishing.

If the individual responding to the two items had ranked the goal of one statement as high and the other as low, there would be little potential for conflict between the goals in the mind of that respondent since one of the goals is relatively unimportant. If both are ranked low, again not much potential for a conflict is indicated for that respondent since neither of the values is of substantial importance to that respondent.

Even though two competing goals might be both ranked as highly important, this does not mean that the competing goals necessarily give rise to major conflicts for decision-makers. When looking at very specific scenarios confronted in day to day practice, perhaps resolutions which are non-obvious at present eventually may be arrived at that strongly support both goals while causing negligible harm to the involved stakeholders. However, disparities in values either internal to a group with shared interests or among different groups affected by the outcome of a decision, suggest areas of practice in which conflicts are more likely to be problematic.

Frequently, more than two statements will be used on the questionnaire to test the existence and extent of value disparities. In other instances a single statement will be relevant in testing more than one competing set of values. Fifty statements on a single questionnaire should be adequate for testing for the existence and extent of value disparities in each of the six problem domain areas listed above. While the research team will know which questions test for which specific conflicts, the order of the statements will be randomized so that respondents should not recognize duality relationships among the questions.

Chong (1996) provides an extensive discussion of *values* versus *interests* in the positions that individuals and groups take relative to social conflicts. While we have used the term values in the preceding paragraphs, our intent in this initial work is not to attempt to identify or explain whether actors are influenced or motivated by self interest, values, group identification, pragmatism, inertia or other factors of individual or group behavior. Rather, our purpose simply is to gather evidence of significant conflicts or lack of such evidence in regard to actual use of geographic information in society.

The populations to be surveyed using the described method include the following:

Group A. Geographic data producers (a. commercial sector, b. government sector)
Group B. Geographic information system managers (a. commercial sector, b. gov't sector)
Group C. Users of digital geographic information (a. commercial sector, b. government sector, c. academic sector/scientists)
Group D. Subjects in geographic information system databases

A draft questionnaire will be prepared and the items used to test each hypothesized conflict will be reviewed and critiqued by three academics involved in social science geographic information research in the United States. These reviewers include Drs. Will Craig, Jeffrey Pinto and Francis Harvey. These reviewers have all been involved in past or ongoing "GIS and Society" research efforts, are very familiar with the questionnaire, focus group, and other methodological approaches being pursued in this project, and all have agreed to act as consultants to the project. Dr. Will Craig is former director of the University of Minnesota Center for Survey Research (MCSR), an organization that continues to report to him. He co-led a recent research specialist meeting on "Geographic Information Science and Society" as part of the NSF-sponsored NCGIA Varenius project and continues to be heavily involved in professional conduct research. He serves as Ethics Advocate to the Social Science and Policy Review Council at the University of Minnesota. Dr. Jeffrey Pinto, Breene Fellow and Professor of Management in the School of Business at Penn State Erie is a well established survey methodologist with extensive survey and case study research experiences in geographic information technology settings as well as academic training and experiences with focus group methods. He has accomplished several funded research

projects on geographic information science topics, including two through NSF on facilitators of inter-organizational data sharing. His research interests in diffusion of innovations and inter-organizational sharing are highly germane to several of the problem domain areas to be addressed by this project, particularly in regard to geographic information conflicts involving interactions with or among parties within organizations (e.g., businesses, government agencies, libraries). Dr.Francis Harvey, as well, has been actively involved in GIS and Society research as part of the NSF-sponsored NCGIA Varenius project and has just begun a research project addressing local organizational perspectives of the National Spatial Data Infrastructure. He views himself by education and inclination as primarily a social scientist but is also well steeped in the tools and techniques of geographic information systems. Past work has included cross-cultural comparisons of GIS implementation issues and the history of systems thinking in geography.

While other consultants could have been invited to join this project, these three were chosen because with the PI they represent four distinct disciplines in which uses of geographic information technologies are pervasive (i.e., engineering, urban and regional science, business, and geography), each of the individuals has access to first year college students across a wide range of disciplines and backgrounds (see references to Group D in the work plan below), they are geographically distributed, they are each enthused about the project, and all are interested in this project as the first stage leading to a future cross-cultural study addressing similar conflicts in an international context.

For survey Groups A, B and C listed above, the questionnaire will be posted on the web and requests to complete it will be distributed by electronic mail when e-mail addresses are available. For those parties for which we are unable to acquire e-mail addresses, requests to respond to the questionnaire will be distributed through the regular mail. For both the electronic and regular mailings we will use Dillman's total design method (1978) for repetitive mailings.

Regardless of how they receive the request, all respondents will be encouraged to respond to the web-based version of the questionnaire rather than returning a paper version, although they will also have this option. Electronic distribution of requests and web-based returns greatly decrease mailing costs as well as tabulation efforts. Using these methods, we recently accomplished a web-based survey of U.S. academics involved in the use of geographic databases for research and found that most respondents highly preferred filling out questionnaires on-line rather than completing paper questionnaires. (That web-based form is at www.spatial.maine.edu/~bvanloen/Questionnaire/survey.htm)

For geographic data producers and system managers (Groups A and B) our intent will be to contact the entire population of organizations and agencies that we are able to identify in the U.S. For geographic data users (Group C) sampling may need to be used due to the large population. We already have very good initial contact lists for all of the commercial and government sector subgroups in these categories due to recent thesis work that involved surveying them (Johnson 1995, Lopez 1996, Pluijmers 1997, Hartung 1997).

For group C, sample sizes for subgroups of mailings will be assessed against Fowler's suggestions for analyzing populations of interest (Fowler 1993,1995). Due to the ease of reaching parties by e-mail in the U.S. we see little difficulty in reaching the desired percentage of the identifiable population. For the academic sector we will contact the entire population of academic scientists using digital geographic data that we are able to identify. For the other groups, if necessary, we will consider stratifying the populations into sampling subgroups that are logical for the factors we wish to test. We have based our mailing budget on educated guesses regarding populations to be contacted and splits among electronic and hardcopy mailing requirements.

Under Group D, virtually all individuals in industrialized nations are the subjects whose economic and social activities are being collected and analyzed through geographic information systems and closely related technologies. Our plan is to use first year college students from numerous disciplines during their first weeks on campus as an important sub-population of the general public. Again, web-based submissions are likely the most efficient method to obtain responses from first year college students in their first couple weeks on campus. In addition to the University of Maine effort, the three consultants on the project will coordinate responses from first year students from across academic disciplines at their respective universities.

Using young people on college campuses as an important sub-population of the general public is likely to result in responses that differ from the responses one would acquire if a broad public survey was administered. However, it is the younger generation of educated individuals who will be most intimately involved in developing and using the next generations of information systems. Therefore the opinions and value judgements of this college oriented age group regarding the appropriateness of geographic information handling capabilities is particularly germane to this research project. Age and gender will be response items on the questionnaire and we will be able to segregate responses based on these variables. Seeking responses from the data subject community (i.e., the general public) throughout a broad range of ages will be accomplished only in a very limited manner. A check on response differences by age will be accomplished through on-the-street surveys in local shopping areas where there is no need for respondents to identify themselves but where gender and approximate age may be observed. Because on-the-street surveys must contain far fewer items, only a subset of items from the full questionnaire will be used with each respondent although all items will be covered by the cumulative responses.

For population Groups A through C above, the final question on the web-questionnaire will ask: "Would you be willing to participate in a phone survey with the objective of developing rules for resolving conflicts on topics such as those suggested by this questionnaire?"

Responses in Phase 1 will identify the areas of possible contention that are of greatest significance to the groups surveyed and will provide strong evidence of differences and similarities in value perceptions among those that have stakes in the use of geographic information technologies. Statistical analysis of the responses will be accomplished using standard statistical assessment and testing methodologies. Dr. Jeffrey Pinto will further act as a consultant on the appropriateness of the statistical techniques chosen.

Both the researchers and the University take very seriously their responsibilities to human subjects. All research instruments, procedures, and the intended reporting of data and results will be thoroughly reviewed by the PI, the academic consultants, and the University IRB Review Committee. In addition, Schrag (n.d.) has compiled a useful set of cases and commentaries regarding research ethics, including several human subjects cases, while Thomas (1996) raises issues regarding the collection of social science data in cyberspace. Discussion of these materials and the Belmont Report (1979) will be incorporated into the weekly meetings with the graduate student working on the project as well as in our fall semester course in Research Methods (SIE 502). Thus the involved graduate student and presentations about the work in the research methods course should act as further checks on protection of the interests of the study participants.

Phase 2 - Investigation of approaches that might be used to resolve conflicts in the use of geographic information

How would people resolve the conflicts of greatest importance to the group they most closely associate with? How would people resolve a conflict that they perceive as minor but the resolution of which may be viewed as very important by another group? For instance software designers often give little regard to how their software will be applied to different situations in practice (other than their primary market) but data subjects might care very much whether certain functions were built into the software in order to allow their personal information privacy to be protected if used in some applications.

To determine how various groups might resolve conflicts and to elicit suggested guidelines, the following research activities will be accomplished:

a. **Articulate more lengthy conflict scenarios drawn from practice.** A minimum of three conflict scenarios will be described in each of the six problem domain areas listed in Phase 1. For those substantive areas identified in the survey of Phase 1 as being of particular concern or importance, additional scenarios will be described as warranted. Each description will consist of several paragraphs followed by a limited number of open questions.
   These scenarios and questions will be similar in form to those developed and used by Parker, Swope and Baker (1990) in opinion gathering leading to the development of the ACM Code of Ethics and Professional Conduct (1992). A similar approach was used by Watkins (1999). Samples of such scenarios in a geographic information context across several of the problem

domain areas may be found in Onsrud (1995). A truncated version of one such example is shown in Figure 1. Notice that the scenario presented in Figure 1 is a real world scenario drawn from actual situations being observed in the geographic information systems community. This scenario is "invented" only from the perspective that the grocery store chain and other parties are not named and the situation may be drawn from more than one witnessed occurrence in actual practice.

Personal Information Privacy

In order to cash checks at large regional grocery store chains and discount store chains, customers must fill out an application that requests their name, address, phone number, and driver's license number. The application explicitly states that information about the applicant may be transferred to other parties if required by law or the management determines the transfer to be appropriate.

For the past year, all the major chain stores in a local region have been keeping track with their check-out scanners of the complete purchase histories of all of their customers who have purchased goods by check or credit card. In recent weeks, the businesses have come together to cross-match their files for their mutual benefit. In order to increase the value of the customer files for marketing purposes, the stores have already cross-matched each purchase history with the age, height and gender of each individual (acquired from their driver's license record filed with the state), the scanned photos of many of the customers (acquired from the photos required for receiving discount cards at some of the stores), and the social security numbers of almost all the customers (readily obtainable from other commercial databases.)

A local engineering firm with considerable geographic information technology expertise has been hired to cross-match these files with additional information accessible through government public records. The intent of the consortium is to sell access to the resultant files to other parties throughout the nation who may have a business interest in them.

Specifically, the engineering firm has cross-matched the current customer profiles and addresses with taxing, assessment, and facilities records for each household, provided detailed cadastral information on the parcel (including the boundaries of each parcel and its current owner), and cross-matched the ZIP+4 designation for each household (along with the affiliated census data at the block level). In delivering its final datasets to the consortium of chain store businesses, the engineering firm has strongly urged that information in the files that was tied or might be tied to specific individuals should be transferred to third parties only with the explicit consent of the individuals identified.

Please check <u>all items</u> that apply to the actions of the individual indicated and provide your beliefs, opinions, or reasons in the provided spaces.

Party: Chain Store Merchants **Conduct:** Developing a database that allows merchants to construct detailed personal and household profiles for each customer.

This conduct is:
___ beneficial for society; ___ legal; ___not unethical; ___unethical; ___should be illegal; ___ is illegal

Factors or reasoning relevant to your beliefs or opinion:

Party: Chain Store Merchants **Conduct:** Selling detailed data on their customers to third parties.

This conduct is:
___ beneficial for society; ___ legal; ___not unethical; ___unethical; ___should be illegal; ___ is illegal

Factors or reasoning relevant to your beliefs or opinion:

Party: Engineering Firm **Conduct:** Cross-matching information from government files to allow more detailed profiling of individuals

This conduct is:
___ beneficial for society; ___ legal; ___not unethical; ___unethical; ___should be illegal; ___ is illegal

Factors or reasoning relevant to your beliefs or opinion:

Statements, General Guidelines, or Principles you can suggest that might be useful in dealing with this or similar conflicts in the future:

Figure 1. Sample Ethical Conflict Scenario in the Use of Geographic Information

The scenarios must be realistic and reflective of actual conflicts occurring in day to day practice. Therefore many of the scenarios will reflect the "dilemmas" that many of those involved with geographic information use feel they are confronted with in every day practice. These situations involve choosing not so much between "right and wrong" or "good and bad" but between one shade of right and another shade of right. That is, regardless of the decision path chosen, someone is harmed by the path taken and no solutions for fairly resolving the dilemmas appear to be evident. A wealth of such conflicts is readily evident in the day-to-day decision making occurring in practice.

While the application of the work of Parker, Swope and Baker leading to a code of conduct has engendered some controversy, we believe the approach, particularly as adapted, has substantial merit in eliciting initial information on value choices by segments of society. Their work was severely critiqued primarily because they used an ambiguous ethical/unethical dichotomy on their primary survey instrument. We have steadfastly avoided the use of those poles as well as the term "ethical" on our instruments. While we use a legal/illegal dichotomy, all actions that we describe drawn from practice will in fact be legal. From past experience we know that many people assume that certain described activities must be rare or are not typical in practice because of the assumption that such activities must certainly be illegal, when in fact they are not. Further, unlike both the Parker, et. al. (1992) and Watkins (1999) studies, participants in this study will not be limited to individuals within the discipline.

b. Review the scenarios from a substantive issue bias perspective. In this step the scenarios will be reviewed by individuals who take strong positions regarding specific outcomes. Thus the scenarios will be reviewed by people who self identify as public interest advocates, commercial interest advocates, government information system advocates, privacy advocates and similar advocates depending on the specific scenarios being reviewed. These individuals will suggest changes to the scenario statements in order to remove language or phrasing biases that might unfairly lead toward specific or very constrained conclusions. Identification of advocates for specific information policy positions is readily evident from the literature. As with the academic collaborators, these individuals will receive compensation as consultants for their time and effort.

c. Gain responses to the conflict scenarios. The developed scenarios will be placed on a questionnaire to be used with those individuals from Phase 1 who responded favorably to participating further in the research. However, because the questions following each scenario are open-ended, the responses to the questions will be gathered in person or over the phone rather than through the mail. Several people in each of the groups listed above will be interviewed. For instance, in Group A at least five commercial and five government producers of geographic data will be interviewed in person or by phone. Do the responses suggest consistency within a group on how conflicts should be resolved? Consistency among all groups (A through D)? What are the inconsistencies? What values does each concerned group appear to be drawing on in resolving the conflicts in the scenarios? What guidelines does each group suggest would be appropriate for all parties to follow in resolving such conflicts?

After collecting the phone survey data or contemporaneously with this collection process, two to three prearranged focus groups will be held in conjunction with each of several national conferences. These focus groups each will contain five individuals with a mix of geographic data producers, information system managers, and users of digital geographic data (i.e., groups A through C). These focus groups will explore the same set of questions used in the phone interviews to determine whether similar or alternative means for resolving the conflicts are suggested. This exploration is qualitative in nature. However, it is important to recognize that the amount of direction provided by the interviewer influences the type and quality of data obtained from the group. In this instance, as with the phone interviews, participants will be discussing scenarios determined to be in areas of importance from the previous wide scale survey work and not what they as a group might deem as being most important.

The focus group sessions will be facilitated by Dr. Onsrud with the graduate student as observer for some sessions. The uses, limitations and protocols of the explicit focus group

processes will be intensely reviewed and critiqued by the academic consultants prior to accomplishing the first focus group session. The graduate student will be intensely involved in this methodological critique process as well. We will run a test focus group session (using local volunteers from groups A through C) prior to running the focus group sessions at the national conferences.

Focus group results are often arrived at by analyzing transcripts of focus group discussions, such as through various forms of content analysis, and then drawing conclusions. However, there are instances when transcripts are unnecessary because the results of the group discussions are rather straightforward and further detailed analysis is not required (Stewart and Shamdasani 1990). Because the focus groups will be organized around the same survey instrument used in the one-on-one interviews, the focus group work being proposed here is highly structured and directed at very explicit scenarios with open-ended questions asking about very specific parties and their actions. We are seeking opinions and principles for future actions from our participants and the expectation is that they will be able to state and summarize these in a rather straightforward manner.

In regard to our primary sub-population of data subjects from the general public (i.e. group D), we will do phone surveys of approximately twenty students on each campus addressing the same scenarios. We will also carry out on each campus a single focus group session with each focus group having five students from mixed disciplines to test if responses from mixed groups are significantly different from the accumulated responses from separate individuals. Although focus groups are most often used for exploratory research, they also have a place as confirmatory tools (Stewart and Shamdasani 1990). Here the focus groups will be used to determine whether resolutions suggested by individual respondents to the phone surveys (Groups A through D) and to the previous exploratory focus groups (Groups A through C) are on the mark or would likely be controversial or rejected by the larger population. Thus, in this instance we will assess focus group reactions to not only the scenarios but to the suggested resolutions derived from the previous interviews. A typical focus group for this purpose will involve five first year students; one each from social science, humanities, engineering, business and science. Dr. Onsrud will run these sessions aided by the academic consultants at each campus visited. If proposed principles for resolving ethical conflicts extracted and developed from a variety of sources (see bottom of Figure 1) do not play well with a small group that is relatively representative of the group that will be most engaged in and affected by the technologies (i.e. young educated members of the public), however small, there is a need to reconsider the principles.

Phase 3 - Comparing practice with theory

Once we have evidence of how conflicts are being resolved or are likely to be resolved in day to day practice by the individuals in Groups A through C, we can compare these results with those arrived at by resort to theory and with the general preferences expressed by young educated people drawn from across a broad range of disciplinary interests. Each of the conflicts will be resolved by addressing them in the context of:

(1) leading theories for resolving ethical conflicts as expressed in the philosophy literature (see the ethical assessment framework methods described in Section 2)
(2) guidelines for resolving ethical conflicts as being taught to businesses and corporations by practical ethicists (For instance, Kidder (1995) for resolving "right" vs "right" dilemmas),
(3) existing professional codes of conduct (For instance, the ACM Code of Ethics and Professional Conduct, the Association of Information Technology Professionals Code of Ethics, etc. See http://onlineethics.org/codes/codes.html) and
(4) current mores of society.

Note that items 1, 2, and 3 may be accomplished immediately after the scenarios are finalized in Phase 2. Under item 4, the responses by first year college students who are serving as our primary sub-population of information system data subjects will provide an indication of how they would like to have information handled in geographic information systems relative to the

conflicts in each of the six major problem domain areas. Although philosophical arguments might lead in one direction, current values of this sub-population of the general public might lead in another and be very germane.

Phase 4 - Guidelines for Practice

In this phase of the research an extensive report will be prepared that describes the survey methods used and the specific conflicts that arose as being of greatest concern to the sub-groups surveyed. The specific conflict scenarios selected in response to the survey results will be set forth and the responses gathered from the one-on-one interviews for resolving the scenarios and the suggested guiding principles will be summarized for each subgroup. These will be compared and contrasted with the responses from the mixed discipline focus group sessions at conferences and the mixed focus group sessions on campuses. The theoretical examination of the specific conflicts relative to the ethical theory frameworks as described in Section 1.2 also will be completed and reported during this phase. The goal is to provide comprehensive and fully reported documentation that may be used for conflict, values, and ethics discussions within and outside of the discipline.

Do the comparisons made in Phase 3 suggest a need for revised codes of practice or new codes of practice in the GIS community in the U.S.? Based on the research results, what specific suggestions might we make for disciplines involved in advancing geographic information science and those involved in using geographic information systems?

In this phase, the research team also will explicitly create a draft set of guidelines for three distinct groups involved in the use of geographic information; 1. information system designers, 2. collectors of information, and 3. users and managers of information. The guidelines derived from this research will be compared with existing ethical guidelines already developed for information system managers and with guidelines being advocated by practical ethicists for the operation of corporations generally. The promotion of the final guidelines is discussed in Section 1.6.

1.5. Broader Impacts of the Work

Impact on Education: As noted in the work plan, the graduate student funded on the project will be heavily involved in the research tasks and will work very closely with the principal investigator. Dr. Onsrud has extensive expertise in the education of graduate research assistants and has established mechanisms through which graduate students become well integrated into the learning process about geographic information research. He holds regular weekly meetings as well as informal get-togethers with all of his graduate students as a group to discuss research-related questions. The PI also holds regularly scheduled one-on-one meetings with graduate research assistants to monitor progress and advise them on research directions. This particular student will gain experience in researching and using questionnaire, interview and focus group methodologies and will be well exposed to the literature on research ethics. All graduate research assistants participate in a two-semester graduate course focusing on research methods where students learn about research design generally and measures for successful completion. Graduate students are involved in publishing research results early on in their program. Usually by the end of their first year as graduate students, graduate students have completed a research paper to be submitted to a refereed outlet. Feedback through the external referee process is used to improve and re-direct the students' work if necessary.

Impact on Science: Geographic information technologies are used across numerous disciplinary domains by both scientists and practitioners. Thus, codes of conduct or ethical insights advanced through this project could affect the handling of geographic data in many science domains. In addition, the development of digital libraries and the National Spatial Data Infrastructure (NSDI) will have large consequences for science and society as our geographic information infrastructures continue to move from cartographic to digital media. Answers to questions regarding copyright, liability, personal information privacy and access to government databases will impact the development of these resources for science in substantial ways. With

insights into likely individual and group responses, scientists can lead towards developments that better align with society's values and ethical treatment for all.

Impact on Society: As outlined in the work plan, using the results of the data gathering and analyses of the data, researchers will critique, support, or expand existing ethical guidelines developed for geographic information system managers and developers. They also will comment on trends in the law and suggest appropriate factors and principles for law and policy makers to consider in light of the research findings. Thus, although of primary interest to GI science practitioners and scientists, this work provides foundation data and analyses that will better inform society's ethical and legal assessment processes generally in regard to the handling of geographic information and its associated technologies.

Substantial anecdotal evidence suggests that designers of geographic information technologies and developers and users of geographic information throughout all major economic sectors are pursuing objectives that have impacts in conflict with the general mores of society or that would be exposed as inappropriate if subjected to moral analysis by ethicists. Legal and ethical frameworks are required by which the expectations and welfare requirements of widely disparate members of society may be better accommodated in resolving conflicts. This work takes a substantial step towards the development of such frameworks.

1.6. Dissemination of Results

Each of the four research phases described in Section 1.4 should generate one or more research articles suitable for publication in the refereed literature. The principal investigator will take the lead in developing draft articles but all academics involved in accomplishing the research will be invited to join in creating and co-authoring articles. We also believe that a special issue of one of the major GI science journals on the topics addressed by this project would be highly desirable. With the reputation of the PI and the other involved researchers there should be little difficulty in arranging for such an issue.

Our preference regarding all outlets will be for publications in peer reviewed print or electronic journals whereby the articles may also be maintained and made available openly on one or more university web servers. From experience, publishers when pressed are willing to allow authors to retain copies on their web sites. Thus, we expect little difficulty in ensuring that the results of the research will be widely accessible.

In addition to any articles and bibliographies produced during the course of the research, we will place the questionnaire and focus group data results on the web so that this data is openly available to other researchers. Provision of this data will of course be subject to limitations outlined during the human subjects IRB Review as well as any additional limitations that the research team feels are appropriate and advisable for further protecting the privacy of survey and focus group respondents as discussed in Section 1.4. We will also investigate archiving of the quantitative data with the Inter-university Consortium for Political and Social Research (ICPSR).

In selecting the academic consultants for this project, we purposely chose investigators who are highly respected members of the primary professional organizations affiliated with geographic information science. Among these professional organizations include the University Consortium for Geographic Information Science (UCGIS), the Urban and Regional Information Systems Association (URISA), American Association of Geographers (AAG), ACSM, and ASPRS. Upon completing the research, the involved consultants will be closely involved in promoting adaptation or development of professional codes of conduct to respond to the study and evaluation results. We will specifically organize panel and paper presentations at the conferences of these organizations as a means of engaging the broader GIS professional communities

However, it is not just codes of professional practice that should be honed and improved upon through the results of this research. The results should contribute to informing policy development and law making ... and thus potentially affect the daily decision making of the large numbers of regular users of geographic information databases throughout society. The Principal Investigator is regularly called upon to sit on National Research Council Study Committees and similar national committees providing information policy direction to Congress. The results of this project will be made available for consideration and incorporation into any continuing and future

studies on information policy issues for national and international law making bodies with which the project team becomes aware.

At the end of the project the compiled findings, articles, and data sets will be cross-referenced on-line and will form a valuable set of teaching materials.