Negligence and Professional Malpractice Related to GIS Datasets

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INTRODUCTION

Chrisman (1991) has suggested that "error (in spatial data) is inescapable, it should be recognized as a fundamental dimension of data." Digital geologic data sets are not an exception to this truism. Typical errors include incorrect data, missing data, incorrect georeferencing, and incorrect documentation of the data. Although these types of errors can always occur, well-established methods are available to characterize them. Informing users of the data's reliability and the nature of errors in the dataset can contribute greatly to effective use of the data. Geologists and GIS professionals should develop and implement a comprehensive approach to addressing these issues.

Liability can arise when a person or company alleges harm (or an adverse outcome) resulting from a bad decision made on the basis of erroneous data. Liability and negligence can be related to contract law (Schultz, 1999; West Publishing Company, 1998), to common law (the law of torts, Phillips, 1996), or to legislative statutes (West Publishing Company, 1998; Creenan, 2003). Karnow (1996), a trial lawyer, has succinctly summarized the liability associated with errors: "When mistakes are made, one simply traces back the vector of causation to the negligent human agency that caused the error. Then in theory one sues that (human) for damages and is made whole. The sins of omission and commission are just as subject to condemnation as negligence, recklessness, malfeasance, or other human culpability.

This paper examines the nature of professional negligence and malpractice, and the liability exposure of individual geologists and GIS professionals related to their production of digital spatial data. Negligence is the failure to exercise reasonable care (a standard of care normally expected of someone engaged in that type of work), when harm results from this failure. Kauffman (1994) has reviewed the exposure of public officials in the U.S. to negligence charges and provides a useful overview of the situation. Onsrud (1999) has specifically addressed the role of negligence in assessing liability associated with GIS data sets, noting that: "Negligence is conduct that breaches a duty of care for the protection of others against unreasonable risk of harm. Each person owes a duty to act as a reasonable person would under same or similar circumstances. Thus, negligence does not involve intent to cause harm but only a failure to meet a sufficient degree of care." According to Creenan (2003) "the duty owed by the professional can be determined by agreement, law, or by the standard of care applicable to the profession… based on specialized education, knowledge and skill."

Onsrud (1999) defines malpractice as "when an individual does not perform to the expected standard of his profession." In addition, Onsrud asserts that "The greater the risk of harm involved the greater the care that a reasonable person can be expected to take. Under negligence, the duty to act reasonably to avoid foreseeable risks of physical injury extends to any person." Onsrud concludes that "in the U.S., it is probably safe to conclude that Government GIS offices assume at least some liability exposure in collecting and disseminating land-related data." Donohoe (2000) has reached a similar conclusion regarding liability exposure of professionals working for the government, noting that "the basic rule (in Australia) is that the tort liability of public authorities is governed by the same principles that apply to private individuals." Onsrud (1999) has pointed out the decline of sovereign immunity in the U.S. Sovereign immunity is a doctrine precluding law suits against the sovereign [government] without its consent. However, a growing body of case law suggests that individuals working for the government are becoming increasingly subject to tort actions (Doyle, and Redwood, 1999).

Perhaps surprisingly, the possibility of negligence related to digital geologic data may be greater than that related to the same data in paper form. Tarter (1992) has noted that "(the) myth of machine infallibility seems to create a demand for a higher standard of quality for machine readable data than for traditionally distributed information." Similarly Peritz (1986) has suggested that "the presumption of trustworthiness (of digital data) simply carries too much weight in our recently computerized society." As a consequence, courts may entertain claims of liability, negligence, or malpractice more readily if data is in digital form and indeed, if it is supplied via a GIS. Anderson and Stewart (1995) have observed "with a growing clientele that increasingly expects data from the computer to be 'right', the potential for exposure to a (law) suit by disgruntled customers is growing."

Standard of Care: The Concept of a Reasonable Person

As summarized by West Publishing Company (1998), under U.S. law "a person has acted negligently if he or she has departed from the conduct expected of a reasonably prudent person acting under similar circumstances. The hypothetical reasonable person provides an objective by which the conduct of others is judged. In law, the reasonable person is not an average person or a typical person but a composite of the community's judgment as to how the typical community member should behave in situations that might pose a threat of harm to the public." The concept of a "reasonable person" (or a "reasonable man") can be traced back to the 1856 case of *Blyth v. Birmingham Water Works* in which the judge concluded:

> "Negligence is the omission to do something which a reasonable man, guided upon those considerations which ordinarily regulate the conduct of human affairs, would do, or doing something which a prudent and reasonable man would not do. The defendants might have been liable for negligence, if, unintentionally, they omitted to do that which a reasonable person would have done, or did that which a person taking reasonable precautions would not have done."

The standard of a "reasonable person" has never been clearly defined and this is perhaps the great strength of the concept. As pointed out by the judge in *Carlson v. Chochinov* (1947) (quoted in Duhaime, 1996) "the ideal of that person exists only in the minds of men, and exists in different forms in the minds of different men. The standard is therefore far from fixed or stable. But it is the best all-round guide that the law can devise."

The standards of care expected of professionals are higher than those imposed on an average citizen. A professional is expected to demonstrate "due diligence" and a minimum level of expertise and performance determined by norms for a particular profession. Duhaime (1996) states "Compliance with customs, such as professional customs, generally will exonerate a defendant as it provides excellent proof of what is "reasonable" conduct. But, beware: judges are fully enabled to find a custom as lacking in providing reasonable care and, therefore, so would the conduct that may have been guided by that custom." A new South Australian negligence law reform proposal (Turner and Groom, 2003) suggests the following criteria: "A person who provides a professional service incurs no liability in negligence if… the provider acted in a manner that was widely accepted in Australia by members of the same profession as competent professional practice." Creenan (2003) has pointed out that even in a state with strong professional licensing statutes (Pennsylvania) the professional standard of care is gauged by expert witnesses and not by statute. There is only limited case law relevant to malpractice or negligence related to GIS data files or geologic maps. This lack of judgments may be misleading as most such cases are likely to be settled out of court.

STRATEGIES TO LIMIT LIABILITY ASSOCIATED WITH DIGITAL DATA

Anecdotal and some survey data reveal that attaching disclaimer statements to digital data sets is the main strategy used by geologists and GIS professionals to address liability issues related to the data. Disclaimer statements are certainly proliferating on GIS and Geospatial Data Clearing House Web sites. The following disclaimer statements associated with digital geologic data sets were found on the Internet:

- *You may use the digital maps made available from this agency if you assume complete legal and ethical responsibility for the problems resulting from their use.*
- *NO WARRANTY: The (agency) provide these GIS data "as is". The (agency) makes no guarantee or warranty concerning the accuracy of the information. The (agency) makes no warranties, expressed or implied, as to any matter whatsoever, including but not limited to the condition of the product or its fitness for any particular purpose. The burden for determining fitness of use lies entirely with the user.*
- *LIABILITY: The entire risk as to the usage of this data is assumed by the end user.*
- *The (agency) makes no representations or warranty expressed or implied with respect to its accuracy, completeness, or usefulness for any particular purpose or scale. The agency assumes no liability for damage resulting from the use of any information, method or process disclosed in this data set, map or text, and urges independent site-specific verification of the information contained herein.*

Only the last of these disclaimer statements gives the end user any hint as to how they might evaluate their risk in using the data, by suggesting an independent site specific investigation.

Dansby (1992) has used case law to examine the liability related to making GIS data available to the public. Dansby's arguments suggest that disclaimers in general are likely to be ineffective as protection against negligence or malpractice law suites. Fogl (1998) and Reid et al (1996) have reached similar conclusions.

Rather than disclaiming responsibility, statements directed at customers are best used to clarify their expectations of the data. Dansby (1992) noted that explanations of data accuracy and its limitations on usability can be effective (though such explanations are not disclaimers in a legal sense). Such warnings modify the reliance and reasonable expectations of those receiving the data. A geologist or GIS professional cannot be held responsible for the inevitable errors that occur in any real world database. However, a professional does have a responsibility to prevent systematic patterns of error, data poorly characterized as to error or other aspects of quality, or data that somehow gives the user a false or misleading impression of its quality.

Development of a Customer Friendly "Disclaimer"

Autenucci and others (1991) have concluded that to avoid legal liability for GIS data "the objective of a map disclaimer (should be) to alert users that errors are possible and that they need to consider the degree of reliance appropriate for their purpose". Traditionally the metadata associated with digital data has been the mechanism by which users were made aware of the possible errors in data sets. Metadata can play a key role in management of liability. For example, the Ventura County California Planning Division's Metadata Policy states: "from the (data) producer's perspective metadata is a means of declaring data limitations and serves as a form of liability insurance."

To follow up on Dansby's (1992) suggestion that the explanation of the limitations of the data set is more useful than a disclaimer, the following statement was developed by the author to integrate aspects of metadata information with a customer friendly statement:

This data set was created for a particular regulatory or scientific purpose and cannot be expected to have the accuracy, resolution, completeness, or other characteristics appropriate for all the applications that potential users of the data may contemplate.

A comprehensive effort has been made to characterize the accuracy, resolution, and completeness of this data set. The statistical measurement of error and the estimates of resolution and completeness are detailed in the metadata. Also, included in the metadata is a review of the methodologies used to measure and/or estimate these parameters.

This data is supplied in an attempt to support economic development, assure public safety, and preserve the environment. Before using this data, you should read the following summary of how to use the accuracy, resolution, and completeness information (contained in the metadata) to assess the "fitness of use" of this data set for your application. You should assess decide whether the documented reliability of this data set meets the needs of your particular application. You may contact us to help you in your evaluation. In particular, please consider:

Accuracy—The accuracy of each entity in this data set has been estimated by taking a random sample and remeasuring the parameters using a more accurate method such as GPS for location. The accuracy is computed based on the National Spatial Data Standard and is expressed at the 95 percent confidence level. (You should consider how the accuracy of this data compares with the requirements of your application)

Resolution—The resolution of the data is defined as the smallest entity recorded in the data set. (You should consider the resolution needs of your application in the context of the resolution of this data).

Completeness—The completeness of this data set has three components:

(i) The percent completeness of the data set with respect to area covered, or to the number of entities captured versus entities in existence (as determined by statistical sampling).
(ii) The completeness of categorization of the data. For example, a land-use map that consisted of five categories and lumped 40 percent of land use types into an "other land use" category, would be incomplete.
(iii) The completeness of verification of the data. This measure of completeness addresses the extent to which the data has been checked by some specified process.

We encourage you to contact us to collaborate with you in making a "fitness of use" evaluation. By adding the results of this analysis to our metadata, we hope to enable other potential users of this data to understand its strengths and limitations.

To be effective, such a statement should direct end users toward information that characterizes the data in both a quantitative and qualitative fashion. In addition, geologists should supply concrete examples and/or methodologies that assist the end user in assessing the fitness of the data for a particular use.

DISCUSSION AND CONCLUSIONS

Unfortunately, much geologic data was collected for a limited purpose and do not have the accuracy or completeness that many end users would prefer or need. For example, end-users conducting field work based on high accuracy GPS devices may be using geologic data collected on a topographic map base with far less accuracy. To address such problems, efforts should be directed towards adequate characterization of the accuracy, the resolution, and the completeness of the data sets. By characterizing the quality of the data in such a way that the end user can understand its limitations, a geologist or GIS professional can reduce personal liability and increase the utility of the data. Unfortunately most data producers have chosen to rely on disclaimers rather than attempting to use metadata to limit liability. For example in Mason and Masters' (1999) survey of spatial data producers in Australia, 64 percent supplied disclaimers and only 34 percent supplied metadata.

Onsrud (1999) has suggested that judges recognize that mistakes and blunders are inevitable. Error-free data, ideal for all applications, is not the court's expectation. Rather, courts are likely to ask questions in the form:

- Are the data collected and assembled in a competent manner, reflecting best practices of the profession?
- Is a good faith effort made to characterize the data quality in terms of accuracy and completeness?
- Are data quality information presented in such a way that a reasonable person could be expected to gauge the appropriateness of the data for a particular purpose?
- Are nationally accepted data formats for metadata standards followed?
- Are the standards implemented in a reasonable and competent manner?

Uncertainty in the information used to make decisions implies a risk associated with such decisions. This is the nexus between uncertainty analysis in GIS and risk management. To reduce the risk, the key aim has to be to increase the quality of the decisions based on the data. To achieve this, it may be more important to improve the characterization of the data than to improve the spatial accuracy of the data. The risk of inappropriate usage increases as digital geologic data becomes common in decision-making.

For a geologist or GIS professional, whose job involves the creation and distribution of digital data sets, addressing liability issues should be a major component of a personal risk management plan. Strategies to minimize the possibility of negligence actions should include:

- Creating comprehensive metadata, for all datasets that you produce, that meet or exceed national standards.
- Facilitating the effective use of metadata by customers through education and training.
- Educating yourself in appropriate aspects of quality management, quality measurement, and liability.
- Keeping accurate records on how data is produced and characterized. Following Kauffman (1994), ask the question "if taken to court, how can I prove that I did what I said I did?"
- Consider acquiring personal malpractice insurance (Epstein et al, 1998) if you have a position with clear responsibility over datasets.

In conclusion, professional scientists involved in producing digital spatial data have a professional exposure to negligence and malpractice suits. Recent reviews of the case law have suggested that professionals can be held accountable for the accuracy and reliability of digital spatial data and can be found negligent for failure to take sufficient care. Authors of digital data are responsible for adequately characterizing the data's reliability, accuracy and completeness. The standard of care expected is that of "due diligence" and the minimum level of professional care determined by norms for a particular profession.

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