GIS AND SOCIETY

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Summary

Geographic information systems technology (GIS) has successfully met many needs of society. The technology was built on early business and scientific computers of the 1960s and initially created resource maps for use in environmental planning and management, parcel maps for land data systems, drawings for computer-assisted design, and images from space. Since then, GIS has grown to support many applications for government, the private sector, natural resource management, community groups, and individuals. The benefits of these applications have been significant. Benefits can be measured as efficiency (doing things quicker and with less effort), effectiveness (doing things better), and equity (sharing benefits widely and equally).

These benefits have come at a price. Technical solutions have been adopted in some areas that are flawed or that cause harm to society. Usually a social or a technology gate filters out such flawed solutions, but too often these gates, which work well for some parts of society, ignore other parts of society and do them harm. Another cost is the dollar investment in the technology, data, staff training, and reorganization to utilize the technology. Sometimes technical solutions preclude human experience and expertise. Some of these costs are expected and accepted; others are unintended and undesirable.

The future of GIS is promising. Data is becoming more available, more usable, and (at least in the United States) cheaper. More geographic information is being delivered over the Internet and, since it is imbedded in familiar technology, this makes it available to people without technical backgrounds. The technology is beginning to incorporate more kinds of information, thereby broadening the base of understanding and making for better decisions. GIS professionals will become more aware of ethics and their responsibilities to society. Vigilance is required to ensure that progress is made on all fronts.

1. Introduction

The phrase *GIS and society* implies a relationship between a technology and society. It is appropriate to think about this as a two-way relationship, each side affecting the other. This relationship can be seen as the pull of society and the push of technology; society has needs and technologists supply solutions (see Figure 1). Society has many needs including survival, quality of life, and power. Scientists work on a massive range of innovations which they hope will meet those needs. A "technology gate" determines which innovations are successful and a "social gate" establishes which innovations are acceptable to society. When the gates work well, society's needs are fulfilled by the technology. Some flaws sneak through and society needs to be aware of those flaws to avoid harm from the technology.
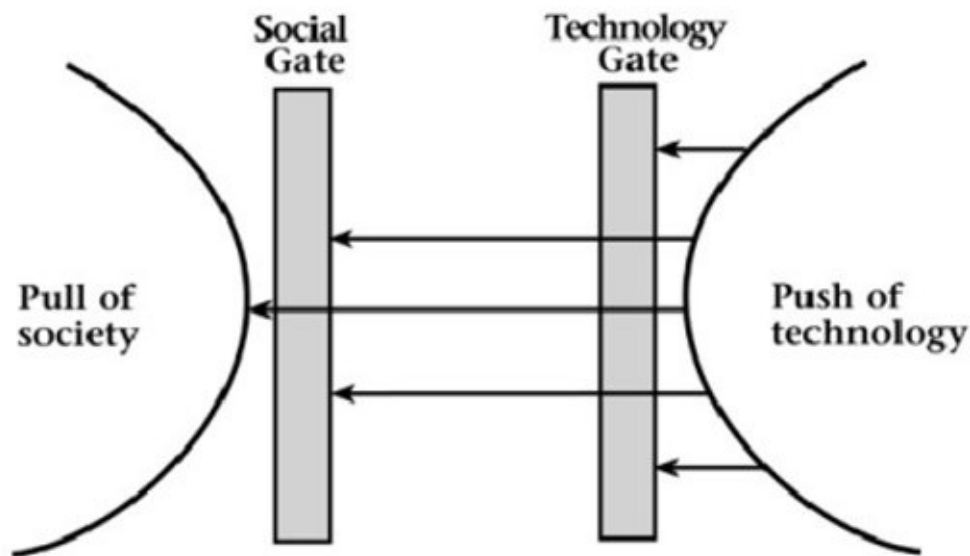

Figure 1. The flow of innovations into society. The social gate consists of economics, common good, public receptivity, and regulations and legislation. The technology gate consists of R & D prowess, R & D management, past investments, prior innovations, and constricting standards. Source: adapted from Mayo. Reprinted with permission from *Information Technologies and Social Transformation.* Copyright 1985 by the National Academy of Sciences. Courtesy of the National Academy Press, Washington, D.C.

In the academic community, there is an ongoing debate over *GIS and society* between those focused on action and those focused on reflection. The first group wants to improve the science of GIS and its application. The second worries more about ethics and the distortions in understanding caused by relying on such a purely technical tool, distortions that negatively affect poor people, people of color, and other groups. At root, this is a debate between positivists and social theorists, and includes a struggle between quantitative and qualitative researchers. The book *Ground Truth* fully articulated this struggle. Until that book appeared in 1995, academic warfare on this topic was uncivilized, complete with minefields, sniping, and vitriolic toxins. Since the book's publication, both sides have seen a degree of wisdom in the stance of the other side, and only a few renegades continue to believe in their utter righteousness and the complete evil of the opposition.

This article will show how GIS has come to address critical societal issues. The following section will present the history of the early development of the technology, including its original uses. The third section will present a range of current applications of the technology to show how society is using it. The fourth section will discuss the costs and benefits of using the technology, including many of the societal concerns raised by social theorists. The fifth section will discuss data issues, specifically public policies around data that constraint the implementation of the technology or open up opportunities. The last section will discuss future developments that will make the technology more useful and, it is hoped, more responsive to the concerns of its critics.

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Biographical Sketch

William J. Craig has had a long involvement with GIS. He was project and systems director of one of the world's first GIS, the Minnesota Land Management Information System (now a part of state government). He was president of URISA (the Urban and Regional Information Systems Association) in 1986/1987 and president of the University Consortium for Geographic Information Science (UCGIS) in 1996. He also chaired the first International GIS/LIS Conference; held in San Antonio in 1988.

Craig remains active in numerous local and nation policy groups. He was immediate past-chair of the coordinating committee of MetroGIS, a regional data sharing organization, and vice chair of the state of Minnesota's Governor's Council on Geographic Information. He is chair of UCGIS' Policy and Legislation committee. He serves on the Mapping Science Committee of the National Research Council (a standing committee) and recently served on a research committee on Data for Place-Based Decision Making.

His major research interests are: investigating barriers to data sharing and means to overcome them, measuring the benefits of GIS, and exploring the impact of GIS on community-based organizations. He has co-edited a new book being published by Taylor and Francis: *Community Participation and Geographic Information Systems*.

Craig has an undergraduate degree in mathematics and a Ph.D. in geography from the University of Minnesota. He is Associate Director of the Center for Urban and Regional Affairs at that university. He is also co-director of the university's Master of Geographic Information Science program.