Chapter XI

Geographic Information Systems in the Public Sector

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ABSTRACT

Geographic information systems emerged in the 1970s and have become significant decision-making tools as their capabilities have been enhanced. This chapter includes a brief discussion of various GIS applications and a more detailed discussion of issues that public managers should consider when evaluating implementation of a geographic information system. GIS applications provide benefits at the basic level in terms of producing maps efficiently, at the planning level through the use of database applications, and at the management decision-making level through an ability to access relational databases for policy-level decisions. In considering the capacity of GIS in the public sector, concise definitions of the major application theories—vector and raster—are offered to provide a basic understanding of the analytical process and GIS toolkit aspects. Issues impacting GIS implementation include needs assessment, project planning, access to public records, liability issues, public and private partnerships, dissemination of information, and privacy issues. Public managers should be aware of difficulties associated with justification of costs associated with GIS implementation and that a hesitancy exists on the part of GIS program managers to share missteps and implementation failures.

GEOGRAPHIC INFORMATION SYSTEMS

The term "geographic information system" (GIS) can be traced to the 1970s when it was first used to describe a variety of techniques used to create maps as an aid in the analysis of data. This application was an outgrowth of the development of various tools such as computer-aided mapping (CAM) and computer-aided design (CAD) systems used primarily by cartographers, draftsmen, and engineers to produce detailed and accurate maps. Through the application of CAM and CAD programs, very precise maps could be drawn and updated quickly to reflect changes in infrastructure, political boundaries, and topography. Cartographers found these new techniques to be an especially efficient addition to their craft. As the use and availability of these techniques increased, other disciplines found new applications for the technology. Public agencies and private-sector organizations discovered that these applications provided the foundation for spatial analysis of geographic data stored in large databases. This application of spatial (location) analysis allowed policy analysts to display economic, demographic, and other data in graphic or map form, which enhanced their ability to understand and communicate complex relationships (Huxhold, 1991).

GIS systems involve a combination of computer hardware with a variety of software applications, trained personnel, implementation of a methodology (raster and/or vector-based), and the creation and maintenance of an extensive relational database support system. Relational databases are characterized by the ability to integrate information from one function, such as a street network, with information from a variety of other functions, such as utility services, property assessments, zoning codes, property ownership, and demographic data. A true GIS has the ability to access a large relational database and create a graphic display for almost any combination of data. This might include a map of blighted or substandard housing, attendance zones for elementary schools, land-use patterns, residential income levels, or any of a multitude of other factors. Implementation of a GIS involves a managerial commitment to data-driven decision making as an aid in reducing uncertainty. Through the incorporation of a wide variety of social, economic, physical resource, land-form, and other data into an integrated methodology, the potential exists to improve the quality of decision making in the public sector (O'Looney, 2000). The utility of GIS for decision making is directly related to the quality of information contained in the database. Inaccurate or obsolete information in the database will produce flawed maps with potentially adverse effects when used in decision making. This means that geographic information systems involve a significant long-term investment in people, hardware, software, and training as well as continuous database development and maintenance.