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Managing Geographic Information Systems in the Public Sector

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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. 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.

The term "geographic information system" (GIS) was first used in the 1970s to describe a variety of techniques that could be used to create maps as an aid in the analysis of data for public agencies. This application was an outgrowth of the development of tools such as computer-aided mapping (CAM) and computer-aided design (CAD) systems used primarily by cartographers, draftsmen and engineers to produce very detailed and accurate

maps and drawings in an efficient manner. With the application of CAM and CAD programs, very precise maps could be drawn and updated quickly and efficiently to reflect changes in infrastructure, political boundaries and topography. Surveyors and 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. Urban planners and economic development directors found that CAM and CAD 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 techniques differ somewhat from CAM and CAD type applications in that the spatial analysis of data for decision makers can be effectively conducted with a tolerance for lower levels of accuracy than can the work of surveyors and draftsmen. An error of a few feet or a few yards usually has little impact on decisions relating to demographic characteristics, land use or economic development issues. But an error of even a few feet in a map indicating the path of a water main, a sewer line, or a property boundary can have significant impacts for construction and maintenance purposes. Errors in property boundary lines have the potential for significant legal consequences arising from litigation. This means that the ultimate purpose for creating a GIS should serve as a guide for selecting hardware, software and implementation strategies.

The foundation of a geographic information system involves both the creation and maintenance of an extensive relational database. 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. The utility of a GIS for decisionmaking is directly related to the level of current information contained in the database. Obsolete information in the database will produce obsolete maps. This means that a geographic information systems involves a commitment to direct sufficient resources for database development and revision.

GIS Applications

The literature concerning GIS contains an expansive array of public sector applications. This is due to the fact that geography (physical, social and political) has a profound impact on the activities of government agencies. Diverse activities such as establihsing bus transportation routes, school attendance zones, election precincts, police station siting, and infrastructure construction and maintenance have all been performed with the aid of geographic information systems. The following examples of public sector GIS applications illustrate the utility, adaptability, and flexibility of this technique for public managers.

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