Geographic Information Systems and the State of Databases as they relate to Historic Resources

R. EPPICH, G. OSTERGREN, L. WERDEN
Getty Conservation Institute
1200 Getty Center Drive, Suite 700
Los Angeles, California USA 90049
reppich@getty.edu, gostergren@getty.edu, lwerden@getty.edu

Abstract. The effective management of information about historic resources is essential to their conservation and protection. As part of a larger project to develop a citywide historic resource survey methodology for the City of Los Angeles, the Getty Conservation Institute (GCI) examined data systems and Geographic Information Systems (GIS) that have been implemented in North America cities. Existing systems are broadly classified into three main types: parallel, dispersed, and centralized. A parallel GIS runs parallel to and entirely separate from a city's existing infrastructure, planning, and zoning GIS. A dispersed GIS is also an entirely separate system, but with a formalized data transfer protocol between the historic resource GIS and the city's primary GIS. With the centralized GIS approach, a city builds and maintains a single, central GIS that serves as the hub for all of its infrastructure, planning, zoning, and historic resource data. Each type is illustrated with examples herein and the advantages and disadvantages are highlighted.

1. Introduction

The sheer physical size of many American cities, limited budgets, and the large number and great diversity of historic resources make historic resource data management a significant challenge. Historic resource information management is necessary and valuable for historic preservation, city planning, building maintenance, economic development, and communication of information. Reliable, accurate, and accessible historic resource data facilitates better planning decisions, improves efficiency and coordination of preservation efforts, and heightens community awareness.

In 2002, the Getty Conservation Institute (GCI) initiated the Los Angeles Historic Resource Survey Project, working cooperatively with the City of Los Angeles and other stakeholders to research survey best practices and to develop a citywide historic resources survey methodology for Los

Angeles. Research addressed a range of issues related to survey methods and administration, including historic resources data collection and management. In addition to an assessment of Los Angeles's historic resource data management practices, the project team reviewed the types of data systems and Geographic Information Systems (GIS) used by other cities.

GIS was quickly identified as the primary data management tool used by most planning and building-permit departments. It was determined that fifty of the largest cities in the United States utilize some type of GIS for infrastructure management and zoning.

1.1 GEOGRAPHIC INFORMATION SYSTEMS

Geographic Information Systems are designed to help cities, states, and businesses efficiently manage and query data about the built environment. A GIS is a computer-based (hardware & software) system designed to manage, retrieve, display, and analyze the complex data related to physical places (e.g., buildings, monuments, parks, neighborhoods, and infrastructure such as streetlights). Each physical place has a unique geographic coordinate (spatial information) that can be linked to other pieces of information (non-spatial) about that location, such as historical facts, images, and physical descriptions. This spatial/non-spatial information integration is the most powerful function of a GIS and is crucial for several reasons:

- It offers city officials a powerful decision-making tool that can combine information from multiple sources (e.g., city planning, cultural heritage, building and safety, recreation parks, and general services) in one place.
- Complex data can be graphically presented in geographic maps at various scales (e.g., city districts, neighborhood blocks, parcels).
- Complex data can be analyzed according to location specifications.
- It provides each physical place in the city with a unique identifier within the database for efficient tracking.
- It allows for a public access component.

1.2 LOS ANGELES

When this study began in 2004, responsibility for historic resource data management was split between several Los Angeles city agencies. The Los Angeles Department of Cultural Affairs was responsible for maintaining a

database listing more than 750 locally designated Los Angeles Historic Cultural Monuments (HCMs), as well as individual properties designated at the state and federal levels (www.preservation.lacity.org/monuments). This database provided basic information such as monument names and numbers, addresses, and designation dates, but it did not have the capacity to perform dynamic functions, and updates and revisions had to be processed manually.

The Los Angeles Department of City Planning maintained Los Angeles's primary GIS, which served as the central system for data on the city's built environment, parcel, address, and special planning boundaries. This heavily used GIS was the city's principal tool for maintaining planning data and informing planning decisions. It included a web-based portal, the Zone Information and Map Access System (ZIMAS), which is useful for communicating data among agencies and to the public (http://zimas.lacity.org/). The planning department's GIS contained basic information about the city's HCMs and its local historic districts, or Historic Preservation Overlay Zones (HPOZs), but it did not include detailed data on these resources, in-depth information from historic resource surveys, or comprehensive records on properties listed at the state and national levels; therefore, it was of limited value in managing Los Angeles's historic resources.

In order to determine whether incorporating historic resource data into the city planning department's GIS was advantageous the authors researched the methods used in other cities.

2. Methods of using GIS for Historic Resource Management

To assess the uses of technology in historic resource management, the authors carried out research, evaluated web sites, visited city government preservation offices, and conducted telephone interviews with city officials. Historic Resource GIS systems were reviewed and broadly classified into three categories: parallel, dispersed, and centralized.

To date, a number of local governments such as Chicago, Illinois, Tallahassee-Leon County, Florida, and Riverside and Ontario, California, have used these approaches to implement Geographic Information Systems for the management and promotion of their historic resources. These approaches are described below.

2.1 PARALLEL GIS

In this approach, a city develops a new, discrete GIS specifically for historic resource management, in effect creating an independent system that is

parallel to and separate from a city's existing infrastructure, planning, and zoning GIS. All historic resource data collection, maintenance, and uses are conducted independently of the city's ongoing GIS operations.

This approach has several advantages. It is usually quick to implement because it does not have to comply with existing city data specifications, and is generally lower in cost and utilizes fewer technological and human resources than an integrated system. Historic resource officials enjoy flexibility and freedom in creating the GIS without other city agencies' oversight or input. This approach also tends to be less complicated to design and use since the system serves only one purpose.

However, the parallel (but separate) GIS approach has some disadvantages. The key disadvantages are that interagency communication and data transfer about issues impacting historic resources can be difficult or nonexistent and historic resource management is isolated from the city's core decision-making processes. For instance, development planning and permit approvals affecting historic resources can be significantly compromised since these decisions may be processed through agencies not linked to the separate historic resource GIS. Updating information between the historic resource GIS and the city GIS is a manual process and data must be entered into each system separately. Lag time in updating information between separate agencies and databases can result in administrative inefficiencies and conflicts, including issuance of building/demolition permits based on out-of-date or incomplete data.

The City of Chicago has implemented a parallel historic resource information system with their Chicago Landmarks database. Data is not transmitted between this database and the city's infrastructure/planning GIS. The Chicago Landmarks database, although maintained as a *parallel* information system and not a true GIS, manages and represents the city's landmarks extremely well on its web site. The interface is easy to read and understand, and contains multiple images of the landmarks with clear (though static) maps. This interface could serve as a good model for other cities (http://www.ci.chi.il.us/Landmarks/).

2.2 DISPERSED GIS

This is a slight variation of the parallel GIS approach. A city creates its historic resource GIS in consultation with the city's infrastructure planning GIS personnel, but the historic resource GIS remains a *completely separate* information system. In the dispersed GIS approach, there is a formalized communication and data transfer protocol between the city GIS and the historic resource GIS. The advantages of the dispersed approach are similar

to the parallel approach—less oversight from other city agencies and more control by historic resource personnel. Perhaps the most significant advantage is that a dispersed GIS containing large amounts of data can be up and running relatively quickly.

As cities using a dispersed GIS for historic resource management must maintain two separate information systems *managed by two separate agencies*, the approach suffers from many of the same disadvantages as the parallel approach. These disadvantages include inconsistent data transfer between agencies, segregation of historic resource data from other city data, and a division of personnel and financial resources. The most serious disadvantage of a dispersed and separate information system is that it suggests that historic resources are not perceived by decision makers to be as crucial as other resources within the city. Interestingly, from the perspective of historic resource officers, the dispersed approach enjoys fewer advantages than the parallel approach since formalized data and communication transfers with the city GIS often give historic resource officials less flexibility and control.

The City of Riverside, California, has implemented a dispersed GIS system with its Historic Resources Inventory (http://olmsted.riversideca.gov/historic/). The Historic Resources Inventory uses data from their planning GIS. Although responsibilities for both systems remain separate, information is shared regularly and there is regular interdepartmental communication. Riverside has successfully incorporated historic resource information into its on-line GIS. Riverside's system is currently a well functioning dispersed GIS independent from the city's main GIS. Riverside's protocols such as formalized data transfer between city departments and regular updates between staff can serve as a model for cities with dispersed systems.

2.3 CENTRALIZED GIS

A smaller number of local governments were found to utilize the centralized GIS approach, which is somewhat more difficult and costly to implement than either parallel or dispersed systems, though it is potentially the most advantageous long-term approach. In the centralized GIS approach, a city commits to building and maintaining *one* central GIS that serves as the hub for all of its infrastructure, planning, zoning, *and historic resource data*. All agencies, regardless of domain, are required to input information into this central system using a standard data protocol/specification. Technical resources are generally pooled into one department or agency to support the entire effort, as opposed to maintaining technical support staff in many

agencies for specialized data management resulting in overall efficiencies and creating a "one-stop shop" for all city data.

By combining resources and data, a centralized GIS creates a powerful tool for city government, the public, and businesses. The following are the advantages of this system:

- It allows for seamless integration of data dealing with the built environment from all sources within a local government.
- Data is automatically updated, making it as accurate and reliable as possible.
- All agencies make decisions based on the same information, regardless of the information source.
- Historic resource data is part of the central database and cannot be overlooked in planning, zoning, permit, or demolition queries or approvals. This is especially valuable at the start of master planning or development assessment.
- Because historic resource data is easily accessible to a wider number of users, not just historic resource officials, it is easier to facilitate greater awareness of its importance.
- The standardization of data protocols and specifications used by all agencies ensures that data produced by ongoing and future historic resource surveys are consistent and useable by the overall information system.
- One agency is responsible for oversight, thereby assuring proper maintenance and greater quality control.
- The pooling of technical resources and talent into one responsible agency also streamlines the overall budget for ongoing technical support.

There are a several challenges to a centralized GIS. Planning and implementation are more difficult, costly, and time consuming than stand-alone systems. Implementation requires a strong commitment by senior officials to integrating historic resource data with other infrastructure, planning, and zoning data. Development and adoption of standard data protocols and specifications for use by all city agencies requires significant time, organization, and professional oversight. Central GIS technical staff must be trained in the specific requirements of integrating historic resource data to ensure that the system is useful to the historic resource community. Development of data standards for a centralized system rather than a separate historic resources system may be more intensive and require more

planning, and data input may initially take longer to accomplish, but the investment will ultimately result in greater efficiencies.

Tallahassee-Leon County, Florida, and Ontario, California, are two local governments that have successfully implemented the centralized GIS approach. Tallahassee-Leon County started development of its GIS in 1990; the system was operational a year later and is in a constant state of improvement. This is an excellent system in which more than eighteen city and county agencies contribute to, maintain, and use a centralized GIS that includes historic resources. It is accessible for both input and distribution via the Internet; however, it has many different Internet "entry" points that could create some confusion. (www.tlcgis.org).

The City of Ontario, California, also utilizes an integrated, centralized system. One advantageous feature of Ontario's system is its ability to output data onto the official State of California Department of Parks and Recreation historic resources Primary Record forms (DPR523a) and National Register forms, as well as Certified Local Government reports. It is also a useful example in determining which data fields should be accounted for in databases to meet local, state, and federal standards. Tallahassee-Leon County's and Ontario's GIS systems are scalable and can serve as models for cities of any size.
(www.ci.ontario.ca.us/index.cfm/2836).

3. Conclusion

During the preparation of this paper, a great deal was learned from various cities and government agencies about the use of GIS in the management of historic resource information, which can help guide other cities in their efforts to build sustainable information systems.

As one of the largest, most dynamic cities in the United States, Los Angeles faces significant challenges in efficiently and effectively managing its historic resource data. In 2004, the city's historic resource data system was static, limited in capacity and scope, and segregated from the core of the city's planning and development decision making.

Fortunately, the Los Angeles Department of City Planning has an excellent GIS system and was well positioned to develop a centralized, universally integrated GIS that includes historic resource data. The centralized GIS approach was clearly the most robust solution, offering Los Angeles significant advantages over and either a parallel historic resources GIS system or the hybrid, dispersed approach. Integrating historic resource information into this existing system would allow city agencies, property

owners, and businesses access to consistent and reliable data on these important resources in combination with other city data.

Since 2006, Los Angeles's historic resource data management practices have been moving toward this centralized GIS approach, with responsibility for maintaining all historic resource data now located within the City Planning Department (www.preservation.la). The department has incorporated much of the city's historic resource data into its existing GIS system and is committed to maintaining a single system for all land use data, including historic resource information.

The integration of historic resource data with infrastructure and zoning data from other municipal agencies serves a multiplicity of purposes. It allows city agencies to develop significantly more comprehensive building and planning policies while providing infrastructure plans and information about the effects of development on historic resources. Finally, the creation of a comprehensive, integrated historic resources and land use planning GIS facilitates the development of a graphic presentation tool making information about historic resources and their locations readily accessible to city staff and the public.

Each model has its advantages and disadvantages. The parallel GIS approach shows results very early and can be extremely cost effective. This model also allows city historic preservation officers freedom in designing systems that meet specific, specialized needs. However, information on historic resources is separate from other infrastructure data and may result in some data inconsistencies. The dispersed approach offers some of the same advantages and disadvantages as the parallel approach, though data transfer between the separate systems is somewhat more formalized resulting in better alignment of two data sets. Although it is possible to move data between separate systems in both of these models, it is often difficult and time consuming as data must be entered twice. The centralized GIS approach is more complicated, and takes longer and is more costly to implement, but it offers the best long term expandable solution by fully integrating historic resource data into a central planning tool. Integrating historic resource data with infrastructure information creates a powerful resource for local governments in evaluating planning projects and making development decisions that may impact preservation outcomes.

Each city must carefully consider whether integration of historic resource data with other infrastructure data into a GIS is the best solution. Any decision will also be dependant on the specific situation and resources. By identifying and describing these three models and their limitations the authors hope that historic preservation offices can make informed decisions and select the model that works best for their city.

REFERENCES

Pamuk, A. 2006. *Mapping Global Cities: GIS Methods in Urban Analysis.* Redlands, CA: ESRI Press.

O'Looney, J. 2000. *Beyond Maps: GIS and Decision Making in Local Government.* Redlands, CA: ESRI Press

Hansen, J.; C. McFadin, and B. Thomas. "Capturing Historic Preservation in Riverside, California." In ESRI Conference 2005.

Blumenfeld, J. 2007. "Los Angeles, California, Department of City Planning Mapping System." In *ArcNews Online* Fall 2007. Available from www.esri.com/news/arcnews/fall07articles/los-angeles-california.html

INTERVIEWS (With affiliation as of January 2004)

Jerry L. Blum, City of Ontario, California, Planning Department
John Butcher, City of Los Angeles Department of City Planning
Jacob Coble, Tallahassee–Leon County, Florida, GIS Central
Oscar Diaz, City of Los Angeles Department of Building and Safety
Janet Hansen, City of Riverside, California, Planning and Building Department, Historic Preservation Program
John Karnuth, City of Chicago Department of Planning and Development, Strategic Planning Division
Geoffrey Starns, City of Ontario, California, Planning Department
Meredith Taussig, City of Chicago Department of Planning and Development, Landmarks Division
John Thomas, State of California Office of Historic Preservation
Cathy Walstrom, City of Ontario, California, Planning Department

WEBSITES

California Department of Historic Preservation. http://ohp.parks.ca.gov/

Chicago Illinois Department of Plannng. Chicago Landmarks 2008. http://www.ci.chi.il.us/Landmarks

City of Dallas GIS. 2008. http://geodallas.co.dallas.ia.us/geodallas/framesetup.asp

City of Houston GIS. 2008. http://pwegis.pwe.ci.houston.tx.us/

City of Philadelphia GIS. 2008. http://citymaps.phila.gov/citymaps/default.aspx

City of Phoenix Arizona GIS. 2008 http://www.maricopa.gov/assessor/gisPortal/gis_portal.asp

City of San Antonio GIS. 2008. http://maps.sanantonio.gov/

City of San Diego GIS. San Diego data website 2008. http://www.sangis.org/

City of San Jose GIS. San Jose website [Web Page]. 2008. Available at: http://www.sanjoseca.gov/gis/

Los Angeles Department of City Planning. Zone Infomation and Zone Access System 2008. http://zimas.lacity.org/

Los Angeles Office of Historic Resources. Designated Historic Cultural Monuments 2008. www.preservation.lacity.org/monuments

New York City GIS. 2008. http://www.nysgis.state.ny.us/gisdata/

Riverside California Department of City Planning. Historic Resources Inventory 2008. http://olmsted.riversideca.gov/historic/

Talahassee -Leon County GIS. 2008. http://olmsted.riversideca.gov/historic/