COM-16-5470
G. Kreizman

Research Note
20 May 2002

Commentary

The Value of GIS in Government

Use the Gartner Framework for E-Government Strategy Assessment to demonstrate the benefits of implementing a geographic information system.

Champions of geographic information system (GIS) implementation face the same challenges as those seeking to implement other forms of information technology — that is, how to demonstrate value to the business side of government institutions. However, a GIS implementation is saddled with financial baggage that sets it apart from other information systems:

- Heavy startup costs
- Data integration expenses
- Long payback periods

It is possible and necessary to quantify the financial benefits of GIS implementation. However, the value of GIS in government extends well beyond the economic realm. In "The Gartner Framework for E-Government Strategy Assessment" (R-15-7573), we provided a model to evaluate government IT strategies by assessing three areas:

- Operational efficiency
- Constituent service levels
- Political return

Each area has specific parameters of measurement that can be used, depending on their relevance to the application or initiative in question. In this *Research Note*, we will map potential GIS benefits against the parameters in these three areas. The value proposition presented to the enterprise must include measurable financial benefits or other operational efficiencies, improvements in constituent service, and political return.

GIS is an integrating technology; its value is realized when multiple data sources of good quality are layered on top of a base map to show the relationships between geography and a collection of economic, environmental, health, social and infrastructure factors. GIS implementations often begin, not at an enterprise level, but from organizational subunits that have recognized the value of GIS to that part of the

organization's mission. Silos can develop with isolated sources of data, duplicated network and platform infrastructure, and GIS software purchases that don't leverage the buying power of the organization.

GIS startup carries substantial costs for digital imaging, map digitization, data quality assurance, data quality control, data entry, and software and hardware purchase and implementation. Solid project management and supportive governance are essential to a successful GIS implementation and ongoing operations.

Data-related GIS startup tasks require significant effort and cost, and must be completed before the organization can realize cost savings. GIS implementation not only improves overall enterprise data quality, it can improve to data quality in the organizational subdivisions. However, the processes that evaluate and "scrub" the data must be ongoing and integrated with GIS-based use of that data. Otherwise, the accuracy and value of the data will be reduced over time. Use the IT and GIS governance processes to establish one data owner, and agree on service levels for data maintenance.

Operational Efficiency

The integrative nature of GIS can lead to the discovery of process inefficiencies, resulting in opportunities to re-engineer some processes and discontinue others. GIS can generate revenue opportunities that can offset costs. For example, government organizations are taking advantage of the Internet to sell maps and data to citizens and private-sector enterprises.

Use traditional methods — process modeling, analysis of benefit vs. cost, net present value and payback period analysis — to identify operational efficiencies and set value and payback expectations.

Attributes and Examples

Cost per Transaction (or Interaction)

- Drastically reduced cost of map production over time.
- Cost avoidance — availability of road maintenance and utility maintenance data in one system prevents tearing up recently paved road to perform utility maintenance.
- Reuse of data; for example, parcel data collected once is used to answer questions and notify constituents regarding real estate, tax assessment, zoning, environmental impact and awarding of permits.
- Physical storage space for maps — especially historical archives — is eliminated.
- GIS-enabled network analysis provides optimum routing of transportation (for example, school buses and sanitation vehicles), thereby reducing the number of vehicles, operators required and fuel consumed.

Cost — Revenue Enhancement

- Sale of maps and data generate revenue that can be used to reduce appropriations needed to operate the GIS.
- Land parcels previously not recorded in the tax system are "found" during GIS implementation or ongoing operational phases, resulting in increased tax revenue.
- Improved tax appraisal data leads to better decision making and avoids undervaluation of property.

Cost — Transactions per Employee

- Improved data quality decreases error rate for processes and time spent resolving errors.
- Time savings in calculations; for example, determining the acreage of forest or wetlands affected by an environmental action.

Time — Transaction Processing Time

- A geographic positioning system (GPS)-enabled vehicle location system integrated with GIS drastically reduces the time for fire or police response to incidents.

Organizational Change

- The implementation of an enterprise GIS model removes duplicative infrastructure and enables the re-allocation of support staff to other priorities.
- Enterprise data model allows primary owner of parcel data to maintain that data. The need to redundantly maintain data is decreased or eliminated

Constituent Service

This category is geared toward external-facing applications. The increasingly common practice of governments selling maps, data sets and geospatially referenced applications over the Web provides value to constituents. In the case of CIS, its integrative and visual nature helps sell that value. Here, the adage, "A picture is worth a thousand words," applies.

Attributes and Examples

Maturity — Service Depth

- The extent that maps can be obtained online instead of at a physical location
- New service or integration elements (for example, constituents can retrieve a map, or report a pothole, street light outage or health-related incident online).
- Integration of constituent case tracking and complaint history, with service systems, such as water and sewer, sanitation, and street repair.

Maturity — Push vs. Pull

- Subscription service for data and maps provides e-mail push to customers and automatically bills them.
- Automated form letter produced and sent to residents who live within a prescribed buffer area around an affected environmental impact area or re-zoned property.

Usefulness — Total Cost of Use

- Total cost for the constituent to receive real-time or near-real-time map production compared with cost of delivering service the traditional way (for example, a constituent physically coming to the office).

Usefulness — Value-to-Cost Ratio

- Value identified by constituent survey or focus group. Value is divided by the total cost of use.

Availability and Accessibility

- Aggregation of population data and demographics provides previously unavailable visualization of geographic areas that require new or upgraded services (for example, fire and public safety, health clinics, social benefits), and helps target scarce resources.

Success — Use of Online Services

- Map Web site statistics.

Success — Channel Impact

- Comparison of map Web site statistics with requests made through other channels.

Political Return

GIS, like other systems, cannot always be justified completely on financial grounds. Data for financial analysis may be missing or difficult to collect. However, tying GIS implementation to political objectives can help win support.

Attributes and Examples

Public Relations

- GIS provides the capability to perform previously impractical detailed-routing analysis to avoid populated areas when transporting hazardous materials, thus reducing risk.
- Citizens can access maps of environmentally sensitive areas containing specific such as the presence of a manufacturing plant or hazardous waste facility.
- Increased data availability and quality increase the appearance of accountability and improve constituent trust.
- Decreased response times for public-safety incidents produce measurable results, such as reduced fire damage and lives saved).
- Trends gleaned from GIS-based crime data on car thefts and drug arrests help target resources and measurably reduce crime.
- Geographically referenced emergency notification and response information regarding utilities, medical facilities and other public agencies is published before a disaster and updated afterward.
- GPS integration with GIS enables field workers to report site assessment and field work status in real-time following a disaster (also has operational efficiency and constituency service value).

Economic Development

- Site selection — Internet access and GIS-based integration allows prospective constituents to drill down to data about the site, taxes, infrastructure support, the labor workforce, and a video of the facility and the surrounding area.
- GIS-based tourism resources provide visitors with easy-to-use utility and information.

Increased Participation

- Web-based system to report and view location of health-related incidents fosters public participation and government response to constituent concerns.

Bottom Line: GIS payback periods are often longer than those of other information systems. Visible, measurable financial benefits often are realized only at individual organization subdivision levels. Use before-and-after measurements of financial gain, and constituent service and political return attributes to justify the value of GIS. Set expectations; focus on data integration and quality upfront. In addition to detailing financial and service benefits, demonstrate direct alignment with political goals.