

Topic Series 20 GIS Organizational Issues

In this topic, we'll consider some of the organizational issues in implementation of GIS. As we have discussed before, the first phases are very important.

You must: (overhead)

- 1) **create awareness**
- 2) determine the **needs** that GIS can fill
- 3) from the needs, **define requirements** based on current technology
- 4) then proceed with actual **implementation**
- 5) at the same time, provide for **education/management /maintenance**

Awareness (overhead)

Before determining needs, somebody in the organization must **champion the cause** of getting information for the betterment of the organization. A strong case must be made for the basic information and how it, with the system, will **improve operations** and **decision making**. This often begins with one or more people determining that geographic data are crucial to some operations. For example, the need to know the **distribution of stands** of different ages in order to establish sound harvest practices that reduce overall impact to an area. These first champions must **create awareness** and instigate agreement by management to **institute a formal needs assessment**.

Needs Assessment

Needs may start as a **set of concepts** that are **refined or built up** by **organizational survey**. This could be thought of as **seeding some ideas** to see if others will expand on them and help **justify the system**. The **educational aspect** of GIS actually begins here although it continues into the implementation of the system. Proponents of the system must provide enough **background** on system performance and examples of use to stimulate additional inputs for possible use that could help justify implementation.

Another key in justification is to **demonstrate efficiencies** in use of the GIS over present spatial data handling and analysis.

The **outcome of the needs assessment** gives life to the GIS by **justifying the system** in terms of:

- 1) **data,**
- 2) **processes**
- 3) **products**

that will directly benefit the organization and its clients.

Define System Requirements

(overhead)

The feedbacks from the needs assessment go into the next process to define all the requirements that must be filled to provide a system both useful and compatible with the corporate operating structure. The separate processes that follow insure that the final system that is installed is useful in short order without a massive start-up period that could monetarily cripple the organization.

System design - unless your organization is also in the business of software, this process primarily revolves around specifying the database structure and minimum software / hardware computing standards that must be met in the GIS. Assuming we will not do software development but will only specify the capabilities, lets then concentrate on the design specifications of the GIS system.

There are **two issues to address in design of the system**:

- 1) the technical specifications of the databases and how they must be handled by the software / hardware, and
- 2) the institutional issues (how will it be managed, by who, data access, etc.). These are interrelated issues and can not be addressed in an entirely independent way.

1) Technical specifications

These are the **database design and specifications of the hardware/software** environment that will be used to develop and manage the database. In developing the database, we first must consider the **basic type of data** that will be stored (**graphic and attribute**), then decide on **data structures** for each and how they will be **interrelated**, and last how can they be efficiently **manipulated and analyzed**. Always **select the software** based on these specifications **then worry about hardware** on which to implement. **Existing corporate databases** should be taken into account when doing the database design and software specifications (**compatibility issues**).

The data and software specifications lead to hardware specifications including the **computing environment, networking**, and so fourth. The computing components of the system should not be underestimated. The base system should be increased by several factors to accommodate unexpected short term computational and storage needs. These can be added later in the project but such additions may be more costly than if purchased with the original system (not always with memory or disc). Longer term additions can sometimes be added more cheaply with continued reduction of costs of discs or memory. The danger in waiting too long is that the system may become outdated and can not be updated without significant expense in upgrades. For example, the computer in my lab can not be upgraded to a larger disc without completely removing and discarding the older disc.

2) Institutional issues

These issues must address the **changes in personnel assignments**, addition of **new personnel, training, and continued maintenance and upgrades** of the database and computational environment. These are often the toughest things to get management to agree to. **A one-time expense for system installation is easily amortized. Long-term support** of the system in personnel and organization resources must be in-place before the system is purchased or it will surely fail.

One way to further insure better institutional support is to provide in the system design, adequate accessibility of the GIS as a resource to all parts of the organization that can benefit from its use.

Don't sell short the personnel resources. You need people for **data entry and maintenance, programming, system maintenance, and general users**. Some of these are people who wear more than one hat. But each segment of the GIS personnel community must be able to relate to the other segments and to the related needs of the organization.

Once all components of the system have been specified, the organization can solicit proposals for the GIS.

Solicitation of proposals -all of the information that comes out of the final design is drawn up into a proposal solicitation **based on the technical specifications**. This solicitation should outline the mandatory (minimum requirements) of the system. The proposals are evaluated and narrowed down to the best applicants that meet the minimum requirements.

Evaluation/benchmark - this is done to test the systems that meet the minimum requirements.

This process may be as simple as a consultant doing a evaluation of two or three software packages to satisfy the need for small-scale GIS to the elaborate process such as used by the U.S. Forest Service in project 615. The 615 process specified GIS implemented with full office automation and networking capabilities with a wide range of integrated systems with different capabilities based on the size of each office. The entire 615 process took over two years from the design stages through benchmarking of the competitive vendors offerings. The successful proposal was based on multiple large corporations who pooled resources to meet all the Forest Service requirements.

Implementation

(overhead)

Implementation of the GIS is usually phased in to make sure that the operational system has been "debugged." This usually means for large installations that the system is tested during a pilot phase and adjustments are made to the design (should be accommodated in the successful bidders package of initial support). Once everything is working smoothly, the organization can go to full implementation which, early on, should include extensive training if the GIS is to be immediately useful.

The steps in the implementation process are: **(be aware of stages of technology acceptance throughout)**

- 1. Pilot phase**
- 2. Design adjustment**
- 3. Full implementation**
 - a. Management (must be defined 1st; responsibilities, security, etc.)**
 - b. Training (should start before completion of design adjustment)**
 - c. Data entry / conversion**
 - d. Application development (including tools for users)**
 - e. Quality control (throughout)**

Education/Management/Maintenance **(overhead)**

These processes and planning for these actually start in needs assessment and the requirements definition phases of GIS in the organization.

Education - of new users and system administrators should be specified in the requirements. This should include, when practical **formal** and **on-the-job** training. Most hardware/software vendors provide training at **their facilities** and sometimes **on-site**. **Self-taught** programs (i.e. arc/info) work OK if there is enough time to devote to them.

The main drawback to most formal training programs is that they do not directly address the needs or specific operations of the organization.

Another training scenario is to utilize already skilled people in the organization to **mentor** those who are coming up to speed.

Management - must be consistent with operations and cause minimum conflicts with users. Ideally, GIS management, which entails data updates, accessibility, etc. should be transparent to the users.

Maintenance - should be planned to coincide with off hours. These operations include **periodic backups** of the databases, hardware/software **upgrades**, peripherals maintenance and **repairs**. These things should be regularly scheduled just like oil changes on a car. If your systems person has other duties, it is generally more efficient to plan upgrades to occur all at once rather than piecemeal. Otherwise, that person will be constantly fighting system problems and will not be able to do the rest of his/her job.

Organizational Considerations

In order to successfully implement GIS in an organization, you must do your homework up front and present convincing evidence that this technology can be effectively and economically incorporated into the operation. Too many companies have been badly burned by adopting “cure-all” technology without consideration of implementation, operating, and maintenance costs as compared to dollars budgeted to the system. Bottom line: they did not get what they expected for their money. The trap is often set by glitzy / glamorous presentation of capabilities.

An implementation plan should address:

- 1) System acquisition costs,
- 2) Data requirements / costs,
- 3) Database design,
- 4) Database development,
- 5) Installation / Implementation timetable and costs,
- 6) Life cycle,
- 7) Operation costs,
- 8) Personnel costs,
- 9) Training needs and costs, and
- 10) Application customization costs.

Implementation Pitfalls include:

- 1) Failure to identify and involve users / managers in implementation process.
- 2) Failure to match system capabilities with organization needs.
- 3) Failure to identify total costs of implementation.
- 4) Failure to conduct a pilot (benchmark the system with your data and needs).
- 5) Giving total responsibility of GIS to Data Processing Department
- 6) Failure to provide training.