

# **Incorporating Management of GIS Implementations in Higher Education**

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**Abstract** - Most GIS programs are linked to Geography or Environmental Studies programs at institutions of higher education. Courses in such programs are divided in three general areas: GIS and cartography fundamentals; GIS technology and programming; and GIS applications in various areas (such as environment, public policy, transportation). Students graduate from such programs with extensive knowledge in GIS and its application. They however lack the background to effectively manage their own work and that of others when involved in GIS implementations in industry and government.

The author believes there is a need to provide these students with an additional course in Management of GIS Implementations. The course would include topics discussing GIS project and program management that include: ethics, legal issues, strategic planning, funding, budgeting, organization and staffing, outside resources, architectural design and application development, multi-organizational GIS efforts, the role of the Geographic Information Officer (GIO) and GIS strategic alliances.

The content and suggested positioning of such a course as part of a Business School is discussed.

## **1 Introduction**

A survey of existing GIS programs in GIS at the university level lack coverage of the management of GIS implementations. There is a need to provide these students with an additional course in Management of GIS Implementations. The course would include topics discussing GIS project and program management that include:

- Ethics and Legal Issues in GIS
- GIS Strategic Planning
- GIS Project Management

- GIS Funding
- GIS Budgeting
- Organization and Staffing
- Managing Outside Resources in GIS Projects
- GIS Data / Database Management
- Managing GIS Architecture Design and Implementation
- Managing GIS Application Development
- Managing Multi-Departmental EGIS Efforts
- Managing the Multi-Organizational EGIS Effort
- The Geographic Information Officer (GIO)
- GIS Strategic Alliances

The following sections present a brief look at some of these topics in terms of both content and motivation.

### **Ethics and Legal Issues in GIS**

Ethics and legal issues are an integral part of any GIS implementation. The success and respectability of the implementation depends on whether the system has a strong code of ethics and adheres to all laws governing how the implementation is created, maintained, and enhanced. We will first discuss how ethics affect GIS implementation. We also explore GIS implementations and the law.

### **GIS Strategic Planning**

A strategic plan determines where an organization is, where it desires to be over the next several years, and how it is going to get there. GIS strategic plans involve the implementation and integration of GIS into these business strategies. The scope of GIS strategic plans include changes in business processes. Competitive advantage, increased efficiency, and greater effectiveness are key goals. GIS strategic plans address important questions such as why GIS is needed, how will it be implemented, when will it be implemented, who will work on it, and what business processes are aided by GIS.

## **GIS Project Management**

A GIS Implementation should be viewed as an implementation of a series of projects with limited scope and timeframes. This simplifies the management of the GIS implementation. There is therefore a need to cover this topic of project management in general with GIS examples to illustrate its importance as part of such a course.

## **GIS Funding**

GIS funding incorporates all aspects of a GIS project where financing must be obtained. All GIS projects will contain some element of cost. After these costs must be estimated, funding must be obtained and the disbursement of funds must be managed. Estimating costs is a large part of obtaining funding. This is especially important when one considers that more than half of computer system projects' costs nearly double from the original budget and that almost 32 percent of all development projects are cancelled before they are finished. Unless the costs are accurately estimated, the amount of funding required to complete a GIS project will be unknown. Moreover, management must continually manage the budget and find various sources of funding that will be flexible enough to provide sufficient funds as a project grows. It is therefore important to discuss GIS funding in such a course.

## **GIS Budgeting**

In general, budgeting is very similar other activities involved in the implementation of GIS and it is the key driver for many of these activities. GIS-related hardware, software, data collection/ cleanup/storage, staffing, costs, and funding are the key components of a GIS budget. Personnel (in terms of manpower, man-hour/month/year), time, fiscal year, and wages are additional components to consider.

## **Organization and Staffing**

Human resources are key to the success of any GIS implementation. Resource selection, training, allocation, scheduling and monitoring are discussed.

## **Managing Outside Resources in GIS Projects**

Organizations implementing GIS may in many instances require outside human resources to complement existing staff. Selecting appropriate outside resources, forming contractual arrangements with them, and managing their activities is discussed.

## **GIS Data / Database Management**

GIS implementations require the collection, creation, storage and analysis of GIS data. This data is likely to be stored in GIS databases. Issues pertaining to the management of these databases and the management of the human resources responsible for these databases must be understood.

## **Managing GIS Architecture Design and Implementation**

GIS software is complex and flexible at the same time. Major GIS software vendors have structured their software offerings in a modular and scalable fashion. The software components offered by these vendors may be assembled together according to each organizations business needs. Managing the design of such an environment based on business needs is critical.

## **Managing GIS Application Development**

Organizations may need custom GIS solutions. The process of managing the customization of existing GIS software packages either in-house or as an outsourced activity is discussed.

## **Managing Multi-Departmental EGIS Efforts**

Many organizations may benefit from GIS deployment in more than one department. These benefits are substantially magnified when the GIS data management and analysis effort is integrated across these departments. Managing the certain and operations of such multi-departmental GIS efforts is discussed in the proposed course.

## **Managing the Multi-Organizational EGIS Effort**

Organizations that collaborate with others across a common supply chain (for example: manufacturer – distributor – retailer) may choose to deploy a GIS environment across these different organizations to coordinate activities. Managing deployment and operations of a GIS system across multiple organizations is a complex and challenging undertaking that is discussed in the course.

## **The Geographic Information Officer (GIO)**

Organizations that rely on GIS in a substantial manner should consider placing the person leading the GIS effort in a key position in the organization. The role and positioning of such a Geographic Information Officer is discussed.

## **GIS Strategic Alliances**

Organizations may benefit from GIS knowledge, data, custom software or procedures, which may be available at other organizations. Forming strategic alliances with these organizations may lead to sharing of existing benefits and knowledge across organizations. The process of forming and managing such alliances is discussed as the last topic in the proposed course.