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Title of Paper

The Integration of GIS into an Engineering Firm

Authors' Names

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Abstract

Schoor DePalma, a Consulting Engineering firm headquartered in New Jersey, has embraced GIS technology both internally and externally. The Information Technology department was charged with better integrating the GIS technology to all departments. This paper explores the independent and interconnected roles of both IT and GIS within this engineering initiative. As part of this initiative various levels of users were identified and tools/solutions were developed to support the differing needs of those users. Some of these tools included a data clearinghouse, intranet data viewers, CAD/GIS integration, standard mapping tools, and specific departmental solutions. As this paper unfolds, the benefits of this integration will be identified and analyzed. Where possible the value of the benefits will be expressed and shared with the readers. As the paper draws to a close it will be obvious that the integration of technology, spatial information, and engineering create effective and efficient problem solving.

Paper Body

Company Background

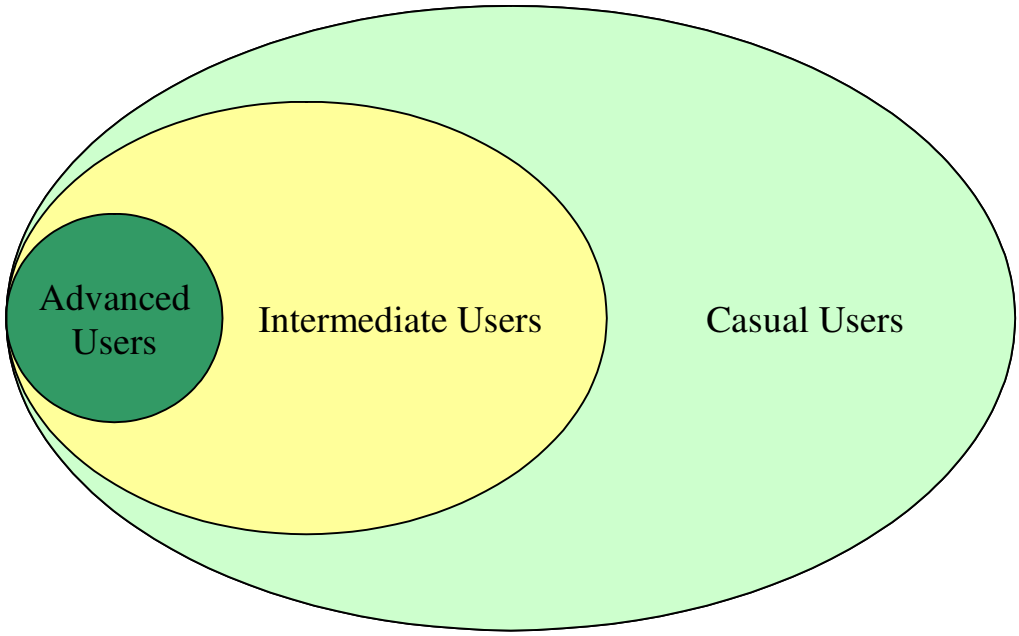
Schoor DePalma, founded in 1968, is one of the premier engineering and consulting firms in the Mid-Atlantic region. In 1989, Schoor DePalma instituted an Employee Stock Ownership Plan ("ESOP") and our employees are considered Co-Owners. Our main focus is helping our clients improve the quality of life for their communities and residents. We provide unsurpassed consulting service expertise in local, regional, and statewide issues for Public and Private clientele from 12 office locations throughout NJ, PA, and NY. We currently employ 650+ employees that are divided within 8 Engineering Divisions - Real Estate Development, Facilities, Environmental, Water Resources, Municipal Services, Construction Inspection, Transportation, and Traffic Planning & Engineering.

Identified Users

In the early years of GIS, the use was limited to governmental or university settings using powerful computers. The GIS software vendor primarily focused on providing tools for the advanced user and required that the user to have a high level of skill and training in order to use the tools efficiently to complete a task. As computing power increased, computer related technologies prices decreased, and computer systems permitted custom

development, the vendors began focusing on providing out-of-the-box desktop solutions and custom application development tools for the casual user. This brought GIS to the masses.

At Schoor DePalma we have begun to focus on providing the technology to a majority of our Co-Owners. Similar to many other Firms, the use of GIS at Schoor DePalma started within a single highly skilled department. As GIS technology and information became more commonplace, our Engineers began to recognize GIS as a tool that can aid their business functions. The users of GIS technology at Schoor DePalma are classified into three distinct types - Advanced, Intermediate, and Casual. Each level utilizing the technology to satisfy different business functions and requiring different levels of support from the IT and GIS departments.



- Advanced User Level
  - Reserved for GIS Department Co-Owners, (10 users) - perform Complex Analysis, Data Development, Strategic Planning, Mapping Products, etc using the entire ESRI product line

- Intermediate User Level
  - Reserved for Engineering Department, Technical Co-Owners, (20 users) - perform Basic Map Generation and Analysis using ArcGIS ArcView

- Casual User Level
  - Reserved for Engineering and Management Co-owners, (250+ users) - perform on-the-fly ad-hoc map mapping visualization, generation, and output using web-based tools

Responsibilities of Information Technology and GIS Co-Owners

As the use of GIS technologies and related datasets has become more prevalent within Schoor DePalma, most of our traditional Engineering professionals have developed a need to incorporate GIS into their work processes. In reaction to this, the Information Technology Department had a responsibility to provide non-GIS Professionals access to GIS technologies and datasets (Vector & Raster). The objectives were to provide the following:

- GIS related education for engineering technical and non-technical staff
- Distribute GIS technology and software to users with the greatest need
- Create tools that permit casual users to utilize geographic information on their desktops

The results of these objectives will permit our Engineers to continue to effectively and efficiently promote corporate health and growth. In order to satisfy the needs of our Engineering staff, the IT department provides the following services to our Co-Owners:

- Technical Help Desk Support – All user levels
- ESRI Certified ArcGIS Training – Intermediate users
- Implementation, Design, and Planning Support of Operational Projects – Advanced users
- Identify opportunities and solutions to improve the productivity of GIS use – All user levels
- Facilitate CADD/GIS Integration – All user levels
- Map Viewer / Focused Tool Development – Casual/Intermediate users
- Clearinghouse Maintenance – Casual/Intermediate users

In addition to the services provided by our IT department, Schoor DePalma has a full-service GIS department which has a wide range of expertise with integrating GIS solutions from enterprise-wide projects to single applications for the various clients. Our Engineering staff utilize the GIS personnel for any aspects of GIS related development including but not limited to needs assessment, implementation plan development, acquisition of mapping, data conversion and development, database design and development, and custom and web-based application development. The GIS data, databases, support mapping, and applications that are developed provide our Engineers the information needed to permit our clients to focus on the development of their communities and management of the information which is utilized on a daily basis. The GIS Department also offers a sales point for future projects and technologies. Many of the efforts that service internal clients are useful in assisting the GIS Department's external clientele's needs.

Tools and Solutions – General GIS Education of Engineers and Managers

The first step towards the successful incorporation of GIS technologies at Schoor DePalma was to educate our Managers and Engineers that their project is part of a bigger picture. The area that a project is located most likely has numerous data layers available that could be utilized to supplement engineering practices. This involved providing information at the proposal stage or prior to the project's kick-off regarding the availability and limitations of the needed data elements. GIS data could be utilized as the starting point for their projects. Once the design has been completed the information could then be incorporated into an enterprise-wide GIS as a new layer or as an update to existing layers. The IT Department works with the Project Managers to determine the best process to facilitate the exchange of CADD and GIS data to meet the needs and requirements of the project's specifications.

Tools and Solutions – Integration of CADD and GIS

Over last few years the gap between GIS and CADD has become increasingly smaller. The software vendors have improved the functionality which transfers data from one format to another. This has permitted the Engineer and GIS Analyst alike to import and export data from/to CADD and GIS for use within traditional CADD projects and GIS initiatives such as:

- Transportation Studies
- Water and Sewer Improvements
- Environmental Constraint Investigations
- Utility Systems for Asset Management (water, sewer, gas)
- Survey Data for Stream/Watershed Analysis
- Land Record Management

Tools and Solutions – In-House Certified ArcGIS Training

Our engineering departments have recognized that GIS could be utilized within their workflow and have begun to request that Co-Owners within those departments utilize desktop GIS software to solve business functions. Prior to installing ArcGIS ArcView on any Co-Owner's desktop, Schoor DePalma requires that a mandatory two (2) day, ESRI certified, training course be completed. The training occurs in our in-house training room and covers fundamental GIS concepts, how to manipulate geo-referenced spatial and tabular data, query a GIS database, and present data clearly and efficiently using maps. This course introduces participants to ArcGIS and will ensure that the users have an understanding of tools and functionality of ArcGIS necessary to be considered an intermediate user of the software. In the past year, we have trained 20+ Co-Owners and 15+ clients.

Tools and Solutions – Clearinghouse for GIS Data (Prototype)

To aid the education of our Co-Owners and the integration of CADD/GIS, we have created a prototype GIS Data clearinghouse. The clearinghouse will store commonly available GIS datasets and metadata that can be readily accessed via our Corporate

Intranet site. The site provides users the data available for a specific project area and users can review the metadata to gain an understanding of the data's use and limitations. This data is downloaded to a project folder for use within the project to complete the necessary analysis and map compilation

Tools and Solutions – General Mapping Viewers for Casual Users

Taking the lead from the software vendors who want to get GIS to masses, Schoor DePalma recognized that a majority of our Co-Owners would benefit from having access to geographic data and databases. Utilizing standard web-based GIS development tools, we created applications that permit users to access information without having to be a GIS expert. These applications display standard information in an easy to use format on our Corporate Intranet site. We provide basic functionality such as layer control, zoom, pan, identify, query, and printing. Some of the tools currently being utilized by Co-Owners are as follows:

- Employee locator – Our office services and IT departments utilize an employee locator to manage and locate the employees. The site permits users to query by name, department, and division, display employee data, highlights vacant space, and permits users to be moved from one space to another.

- Anti-degradation stream locator – Our environmental departments use a web-based interface that aides in the quick identification of the newly updated Surface Water Quality Standards for all of New Jersey's mapped watercourses. The viewer uses data from the State of New Jersey and is intended to provide users the ability to make an initial assessment of a site.

- Orthophoto finder – The State of New Jersey released 2002 aerial photography for the entire state. To aid in the distribution of the 9000+ images from our network, we provide Co-Owners access to the images via a web-based interface. Users select a municipality and hyperlinks for the resulting images for that municipality are displayed. These images are downloaded to project folders and are intended to be used to supplement engineering designs in either CADD or ArcGIS.

- Corporate mapping viewers – We provide Corporate Management tools to view financial and demographic data. These tools permit management to visualize and analyze corporate information that has historically been viewed as tabular spreadsheets.

Benefits

- Efficient response to client requests
- Better coordination between inter-department projects
- Integrated GIS aides future efforts
- Better understanding that projects may be part of a bigger picture
- Listing of readily available common datasets provides users with instant information regarding availability of data thus reducing time spent researching data for a project or area
- Access to Metadata for datasets to promote understanding of the use and/or limitation of the data

Conclusion

The successful assimilation of technology, spatial information, and engineering principles into an engineering firm can be summarized by the following formula:

$$\sum \text{IT} + \text{GIS} + \text{Engineering}$$

$$\text{Effective and Efficient Problem Solving}$$

Acknowledgments

None

Appendixes

None

End Notes

None

References

None

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