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Clarifying the Complex

# GIS Best Practices for Facilities Management

Businesses are increasingly turning to geographic information systems (GIS) to manage and use facilities information to make decisions. Nearly all facilities information relates to a location in a map or floor plan. For example, cost centers, room assignments or classifications, hazardous materials locations, and fire and life safety information make most sense when viewed in geographic form. A geographic representation of data is much more powerful than tabular form. It shows valuable spatial relationships that are otherwise not easily communicated. When presented in GIS, understanding spatial relationships becomes intuitive.

Owners are challenged with managing a growing array of facilities information for burgeoning facilities portfolios. Information may reside in disparate systems, CAD files, spreadsheets or in the minds of long time facilities employees. GIS may serve as a platform to capture and consolidate facilities data with the ability to accommodate expanding data sets and facilities, for portfolios which may span the globe.

If you are considering GIS as a solution for managing facilities information, forethought and planning will help to ensure a successful implementation. The purpose of this document is to provide best practices in planning a GIS to promote a smooth implementation and maximize return on investment.

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# Best Practice No. 1, Enterprise GIS

*"Start with the end in mind." Stephen Covey [1].*

As technology evolved to support facilities management, freestanding platforms were developed to manage different pieces of information. Thus, facilities management data now resides in a variety of stove piped systems. These disparate systems do not typically share information with one another, even though they often serve a common business function. The knowledge to operate these systems and extract useful information is scattered across departments and work groups. Compartmentalization and lack of interoperability impede managers in their quest to harness the full power of the information they possess. As a result, the best information is not always available to make decisions. Opportunities for gains in efficiency are overlooked and businesses continue to operate facilities below optimum performance.The ideal solution is a one stop where all key pieces of information are readily available to users in a single Enterprise GIS (EGIS). An Enterprise solution will integrate multiple facets of facilities management throughout its various business process areas and data sources. Because EGIS solves a host of facilities management problems, it maximizes return on investment. EGIS streamlines and speeds the access and analysis of data. EGIS may serve as the system of record for facilities data or it may consume and integrate data from other systems and repositories.  Some of the more common facilities management data that may reside in an EGIS are listed below.


[1] Stephen R. Covey, Seven Habits of Highly Effective People: Powerful Lessons in Personal Change

- Maps and Floor Plans
- Real Property Inventory
- Space Inventory
- Asset Inventory
- Hazardous Materials Locations
- Fire and Life Safety
- Energy Use
- Operation and Maintenance (O&M) Costs
- Capital Planning
- Emergency Preparedness Information

When selecting an EGIS, it is important to consider the features required to support the business needs of the organization. Software features may vary widely among vendors, so it is necessary to not only possess knowledge of the organization's needs, but to also have familiarity with features of potential software. The following describes several features that are desirable for an EGIS.

## *Flexible Architecture*

Some organizations may be interested in managing a narrow set of information that will easily fit within an industry specific, off-the-shelf software product. For these organizations, the constraints imposed by a rigid software architecture are acceptable. Since the tolerances are close, the process of driving the round peg into the square hole is not unbearably uncomfortable. Minor adjustments to business processes are accepted as a fair trade for a ready solution and quick implementation.

EGIS, on the other hand, opens the door to limitless possibilities for managing different sets of information. Many businesses are interested in managing the information that is most important and potentially unique to them. In these cases, a flexible and readily scalable architecture is critical. Multi-instance software, where a distinct instance of the software is configured to the organization's data sets and hierarchy, offers the greatest flexibility for EGIS.

## *Integration*

To provide efficient Enterprise functionality, the EGIS must be capable of consuming data from a variety of external sources. Data may be drawn from accounting systems, computerized maintenance management systems (CMMS), geodatabases, Excel spreadsheets, Microsoft Access Databases and SQL Server Databases. Again, flexibility is key. The EGIS must be configurable to support the import of data from these various sources. An EGIS with an Application Programming Interface (API) may be leveraged to provide seamless integration for the exchange of information with other applications supporting this feature. The ability to configure the software to support the batch upload of documents and photographs is also highly desirable.

## *Roles and Permissions*

A well designed EGIS has the potential to provide crucial information to decision makers across the organization. It may serve as a platform through which maintenance personnel access PDFs of historic construction and renovation drawings. A space planner may use it to identify vacant space within a floor, building or across the portfolio. A construction manager may use the EGIS to locate fire barriers in an area designated for renovation. A facilities manager may use the EGIS to combine O&M costs with energy costs to compare facilities. The uses of an EGIS are endless.

However, all users will not need and may not desire access to all information. Executive managers may only have interest in space planning information. It may be desirable to restrict a building manager's access to information for the buildings they manage. The ability to control the views of data and edit access through roles and permissions is necessary to effectively use the EGIS across the organization.

## Best Practice No. 2, Standardization

Reliable, consistent data and processes are essential for an EGIS to serve as a trusted source of information for decision making. Standardization is a key element in ensuring consistency. Standards provide a common language for communicating, analyzing, reporting and exchanging information. Facilities managers should consider adopting a number of widely accepted standards to ensure the consistency of data and the repeatable processes required for sustainment.

### *Data Structure*

Structuring the EGIS to follow the organizational hierarchy is typically the best way to arrange data for navigation, viewing and rolling up in reports. Standardizing the hierarchy across systems will establish a common language for understanding the structure of the

organization and its relationship to data. In cases where the organizational hierarchy is established in an existing system such as a CMMS, an EGIS with a flexible architecture may be configured to match the unique hierarchy. Hierarchical data, such as facilities groups or campuses, and facilities may then be imported from the CMMS to the EGIS.

It is a surprising fact that many large facilities holders do not employ or use room numbers in a consistent fashion. Room numbers are essential to tracking a variety of information such as cost centers, occupant locations, asset locations and work order locations. Even though facilities may lack signs, room numbers may be assigned in virtual form and then used in an EGIS. An EGIS with a flexible architecture may be configured to support the assignment of multiple numbers for a single room, thus accommodating a signage room number, and an architectural plan room number as well as the virtual room number.

## *CAD Standards*

CAD maps and floor plan files often serve as a source of data that is converted to geodata and consumed in GIS. The quantity and complexity of information residing in CAD can be significant. Without standards, variations in CAD are virtually limitless. In addition to creating difficulties for users of the CAD files, inconsistencies also impact processes for converting the CAD to GIS. Programming scripts and automated processes are usually employed when converting large amounts of data from CAD to GIS. The data must be in a consistent format across all CAD files for the script to work as a repeatable process.

Facilitated by the National Institute of Building Sciences (NIBS), the U.S. National CAD Standard (NCS) provides a consistent format for organizing data in CAD. Since its inception in 1997, the NCS has been embraced throughout most of the building design and construction industry, including support by the American Institute of Architects (AIA), the Construction Specifications Institute (CSI), and the Department of Defense (DoD)

Tri-Service CADD/GIS Technology Center. The NCS prescribes layer names, discipline designators, line weights, pen assignments, and the graphic organization of construction drawing sheets. It is also intended to facilitate the exchange of data between current and future CAD software to help guarantee the continued usefulness of current CAD files. Adopting the NCS is the best place to begin to ensure that the data residing in the CAD files will be in a consistent format for extraction and use in an EGIS.

CAD technology has evolved to support data relationships that promote greater consistency while smoothing the processes required for conversion to GIS. CAD has moved from line-based drawings to objects. Graphical representations created in CAD as objects embody a database of characteristics that may be exported for use in an EGIS. Current versions of CAD are also equipped with drawing management features that use external references (xrefs) to other CAD files as a means of creating and maintaining projects. Businesses desiring to capture and extract data from CAD should consider organization-wide adoption of a CAD version supporting objects and projects.

## *Space Measurements*

With its roots in commercial real estate, the Building Owners and Managers Association International (BOMA) has long been concerned with the measurement of space. BOMA published its first space measurement standards in 1915, and continues to refine these standards. BOMA space measurements are embedded in current versions of object-based CAD. Gross, net and usable areas are calculated in the CAD through assignment of BOMA space classifications. CAD may be configured to apply BOMA space measurements in association with a wider range of space classifications, such as the Open Standards Consortium for Real Estate (OSCRE) space classifications. When this data is captured in the CAD, it may be exported for use in the EGIS. Consistent formatting supports repeatable processes to sustain the EGIS.

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## *Space Classifications*

Some industries have well established space classifications. First published by the National Center for Education Statistics (NCES) in 1973, the Postsecondary Education Facilities Inventory and Classification Manual (FICM) is used throughout higher education to classify space. Each branch of the military has its own system employing category codes to classify space. The Open Standards Consortium for Real Estate (OSCRE) developed a space classification system that is gaining acceptance in the commercial world. OSCRE may be applied in the absence of other industry standards.

OSCRE describes each space in a facility according to the use for which it is designed and outfitted. OSCRE classifies space in three levels, where each level has a code and a name. Level I is comprised of major space classes for different space characteristics and uses, which are widely used across industries. Levels II and III are additional sub-classifications, which provide greater differentiation. Level III is mostly user defined. OSCRE space classifications are tied to the BOMA space measurement standards.

The following table provides an example of how spaces may be classified using OSCRE Level I and II classifications. Standard space classifications enables the roll up of data in reports and provides more consistent results in searches, which may be reduced to domains (pick lists), within the EGIS. Adoption of a space classification system is recommended for organizations planning to use an EGIS to manage space information.

| Hospital Room Native Names | OSCRE Level I | OSCRE Level II |
|---|---|---|
| Clean Utility, Electrical Room, Equipment Room, Mechanical Room, Telephone Room, Utility Room | 2100 - Core Building Service | 2140 - Utility Equipment Room |
| Dining Room, Dishwashing Room, Kitchen, Food Prep Room | 4200 - Personnel Service | 4210 - Food Service |
| Admission, Check In, Sign In | 5300 - Medical Practice | 5310 - Admission |
| Exam Room, Treatment, Treatment Room | 5300 - Medical Practice | 5360 - Treatment and Examination |

## *Version Control*

Managing the vast array of files and documents used in an EGIS implementation can be demanding, particularly when dynamic processes are involved, such as with CAD files. In the case of CAD, multiple parties may edit and update information in the file that is ultimately placed in EGIS. Processes must be repeated over time as the CAD file is changed to reflect renovations and additions, or changes in the object data such as department or cost center assignment of rooms.

Version control is a file management tool that records changes to a file or set of files over time so that specific versions may be recalled later. Version control software requires a check out of files for editing. Once the file is edited and checked in, both the old and new versions of the file are saved. A history of ownership and edits is recorded. Version control eliminates extraneous and potentially confusing copies of files. It supports accountability by maintaining a history of ownership and the changes made.

In the event of error, changes may be rolled back by reverting to an earlier version of the file. Version control should be considered by any organization handling large amounts of files and data in a dynamic environment such as an EGIS implementation.

## Best Practice No. 3, Know Your Data Requirements

Finite resources dictate a prudent approach in selecting data to be placed in the EGIS. It is important to resist the temptation to throw the kitchen sink at the EGIS without forethought of how the data will be collected, maintained and used. Business needs, costs and practical issues such as staffing should be considered. Data that becomes stale over time will be of little use. The EGIS must be fed and nurtured to provide sustained value to the organization.

Data residing in existing systems that must be maintained to support business processes may represent low hanging fruit for import to the EGIS. In the case of data that must be separately collected and maintained, the resources required to do so must be weighed against the value of the data. In performing a cost-benefit analysis, risk and cost avoidance should also be considered.

Basic real property data as well as operation and maintenance (O&M) cost information for sites and buildings may be imported from a financial or real property accounting

system. If data from the accounting systems is not readily accessible or does not provide information at the desired level of granularity (for example, costs not tracked by building) other systems may serve as a source of data. Real property and O&M cost information may be available in a CMMS. It may be necessary to extract data from multiple sources to produce a comprehensive picture of a given topic. For example, O&M cost information from a CMMS may be combined with energy cost data from another source to produce a total operating cost for each building. When combined with the real property information, energy and total O&M cost intensities ($/sq. ft.) may be calculated to compare and benchmark buildings. This comparative data is a starting place to identify and explore opportunities for gains in efficiency and cost savings.

Code and regulatory requirements may be a prime driver in selecting data. Fire and life safety information such as locations of fire barrier and fire doors, fire suppression coverage and maximum exit access travel distances may be placed in an EGIS. An EGIS is also useful to represent and track asbestos and hazardous materials locations and related data. By placing this data in a widely accessible platform, maintenance and construction managers will have access to information to avoid violating the integrity of fire barriers or disturbing hazardous materials.

Maps with buildings and site features, such as parking lots, represented as geometries is perhaps the most basic form of implementing an EGIS. The EGIS may be configured to reflect the organizational hierarchy and data may be associated with the buildings and site features. The addition of floor plans to the EGIS provides a comprehensive view of the organization's data, within and outside the buildings.  When floor plans are added to the EGIS, the effort to input and maintain data greatly increases, but so does the opportunity to track different types of data and provide more granular spatial associations.

With floor plans represented in the EGIS, data may be associated with a floor or with a room. Room level associations provide the greatest utility for managing data. In addition to managing basic information such as the room name and number, other information may be associated with the room such as department, cost center, occupant, hazardous materials and available utility services.

Prospective adopters of EGIS should evaluate what data is most important in meeting its business goals, the level of granularity required, their ability to maintain the data and the value of the data to the organization. An EGIS with a flexible architecture will support an incremental approach to building out and populating the EGIS with data.

## Summary

Choosing an EGIS with a flexible architecture will provide the opportunity to manage the widest array of data according to the organization's needs. The ability to integrate data from other systems and sources, and configurable roles and permissions are key features to look for when acquiring an EGIS. Adoption of standards for CAD, space measurement and space classification will promote the consistent and repeatable processes required for the EGIS to serve as a trusted source of information for decision making. Version control should be considered when handling large amounts of files and documents, particularly when dynamic processes are involved, such as CAD.

Ultimately, an organization considering implementation of an EGIS should evaluate what data is most important, the level of granularity required and their ability to maintain the data. An incremental approach may be considered in growing the EGIS. With proper planning, an EGIS may serve as a one stop strategic planning tool that may be used across the organization to manage operations and guide facilities investment decisions to improve its bottom line.

## R&K Solutions

Established in 1984, R&K Solutions is a leading global provider of facilities professional services and software. R&K offers GoRPM®, its enterprise GIS facilities management software, as a configurable solution supporting features described in this document. For more information on GoRPM, please visit http://www.rksolutions.com/gorpm/ or contact R&K at 1-877-753-6486 or sales@rksolutions.com.

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