

BIOGRAPHICAL INFORMATION

Arthur Spencer
Executive Vice President
Utilities & Communications Division, Intergraph Mapping and Geospatial Solutions

Specific Responsibilities

Arthur Spencer has over twenty years experience in the engineering, mapping, and geospatial industries and is currently the executive vice president responsible for the day-to-day operations of Utilities & Communications within Intergraph Mapping and Geospatial Solutions.

Mr. Spencer joined Intergraph in 1988 and has held various positions. For six years, he was based in Hong Kong and Singapore, where he directed regional sales support, marketing, systems consulting, and implementation services related to the utility and communications industries. Prior to that assignment, Mr. Spencer was project manager and principal consultant for geospatial implementations using the FRAMME software platform.

Past Experience

Before joining Intergraph, Mr. Spencer practiced civil engineering and was responsible for the design of major airports, highways, land development, and drainage projects throughout the United States.

At Michael Baker, Jr. Inc.. Mr. Spencer was Project Manager of geospatial system development, data conversion, and stereo mapping projects. He was responsible for daily management of mapping and conversion operations for large conversion projects lasting several years

As a Civil Engineering professional, Mr. Spencer was responsible for design tasks for major airports, highways, land development, and drainage projects. He managed field surveys, mapping, and engineering design operations.

Educational Information

Bachelor of Science, Industrial Technology; University of Southern Mississippi
Bachelor of Science, Civil Engineering; West Virginia Institute of Technology

Professional Memberships

Registered professional engineer in the states of Alabama and Mississippi.
Tau Beta Pi Engineering Honor Society
Alpha Chi Engineering Honor Society
Geospatial Information Technology Association (GITA)
Society of Cable Telecommunications Engineers (SCTE)
Telecommunications Industry Association (TIA)

IMPLEMENTING GEOSPATIAL RESOURCE MANAGEMENT

HOW TO MAXIMIZE THE BENEFITS

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ABSTRACT

Utilities and communications companies have embraced the concept of Geospatial Resource Management (GRM), in which systems cooperate seamlessly to manage planning, design and maintenance, construction, and network and field operations, achieving optimal use of customer and asset-related data. While experience has shown that enterprisewide integration of geospatial technology with other key corporate systems helps provide the necessary justification for investment, there are many gradations of GRM implementation, with resulting proportional benefits. Depending on the extent of the integration and availability of the data, GRM can boost the return on investment into exponential figures. This paper will look at the historical process of implementing a GRM – from applications that are related to design engineering, project planning and outage and workforce management, to associated fieldwork and customer service activities. In addition to the standard issues related to linking disparate technologies, we will review factors involving departmental workflows, and quality control and data integrity concerns. The degree to which companies have systems that ensure the best possible data sharing between all personnel involved in delivering services is determined by the degree to which they value an enterprisewide view over a departmental one.

INTRODUCTION

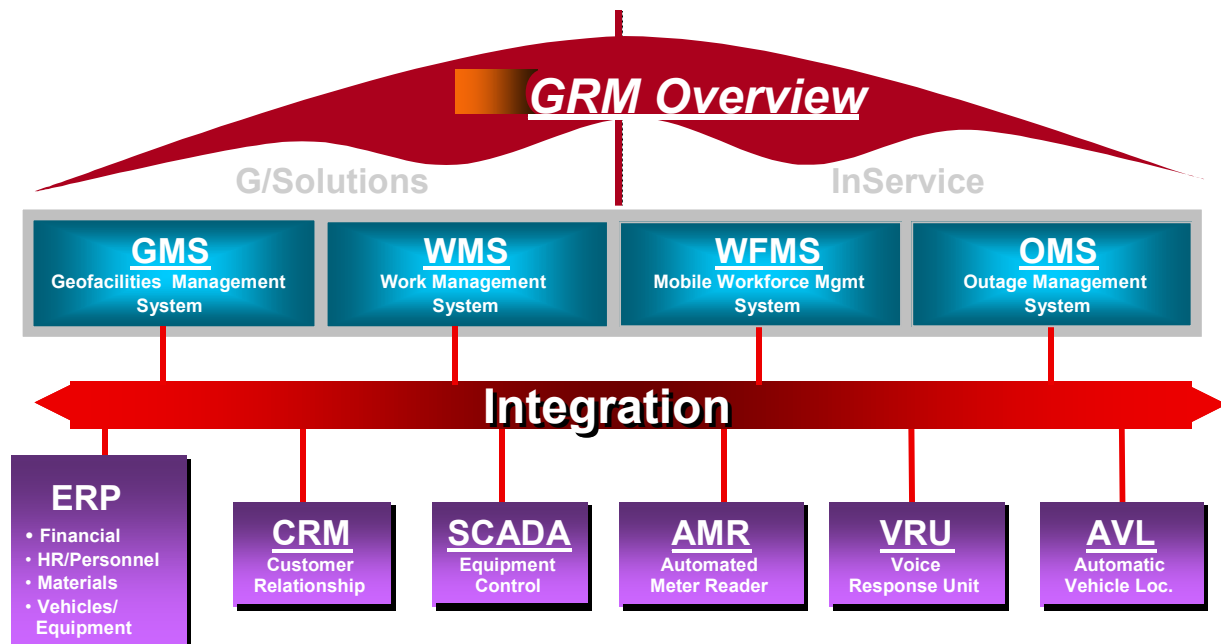
Understanding how best to justify Information Technology (IT) investments versus other capital projects has historically been a difficult process within the industry. To add to the confusion, Y2K, the California energy crisis, the Enron scandal, 9/11, the war in Iraq, the economic downturn, the 2003 August Blackout and security issues have distracted executive attention resulting in a slowdown in IT investment over the past several years. Additionally, cost over-runs, lengthy delays, and other variables have also made it difficult to justify new IT investments. The consequence in many cases has been a “piece meal” approach to the IT infrastructure resulting from too little long-range planning as to how systems will operate in an integrated manner across the enterprise and too little consideration of what characteristics the new technology must have in order to maximize the investment. A common pitfall is the inclination to start integration without first considering process integration issues. Another is force fitting antiquated technology that doesn’t have the inherent capability to share geofacilities data with mainstream corporate applications. Justification based on the cost-savings and customer satisfaction that automation provides is obvious; the ability to differentiate between competing technologies is the necessary exercise that will ultimately maximize or “strand” your automation investment.

Integration of the major IT systems has recently become the focus of attention among the technology providers and consultants to the industry. The process started with Enterprise Resource Planning (ERP) and spread to Customer Information Systems (CIS) and Geospatial Resource Management

(GRM) – an environment in which it is possible to optimize end-to-end processes and enterprisewide system integration related to engineering and operational workflows ultimately improving customer service delivery.

WHAT IS GRM?

Geospatial Resource Management (GRM) provides advanced integrated solutions to improve the efficiency and lower the costs of operating a service delivery network. GRM serves as an “umbrella” for several interrelated systems: GIS, Work Management, Mobile Workforce Management, and Outage Management. These systems share common threads via the geofacilities model, location information, and the work required to supply reliable service. Geospatial technology is the medium for binding these systems into an effective whole. Previously isolated locked-in-paper facilities information is made available across the enterprise through Web and mobile computing technology, where rapid analysis and smart management decisions drive optimized processes.



Intergraph’s commitment to GRM is based on our customers’ achievement of noticeable benefits and dramatic timesavings. Quantifiable results – with returns on investment occurring as quickly as within two to three years – have come through the reduction of redundant processes, more efficient capture, design, and analysis of network asset information, and more efficient management of resources involved in service delivery.

This report provides a discussion of considerations that are key to maximizing the ROI of integrated GRM projects within the utilities and communications industries. The considerations involve not only the varying levels of GRM implementation with their increasing promise of enhanced ROI, but also considerations of technology characteristics that can maximize the benefits achieved by GRM investments. While conditions vary from company to company, the proposed approach is intended to provide a starting point for evaluating the potential return of GRM solutions as part of the overall IT infrastructure.

THE BUSINESS PERSPECTIVE

The following diagram describes the balanced business perspectives that concern senior executives:

- How Shareholders view the organization
- Customers Perspective
- Internal Business Objectives
- Opportunities for continuous improvement

How do We look to Shareholders?

Financial Picture	
Goals	Measures
Survive	•Cash Flow
Succeed	•Revenue Growth •Operating Income
Prosper	•Market Share •ROE
Projects	•ROI, Payback Period •On-Time, On-Budget

How do Customers See Us?

Customer View	
Goals	Measures
Services \$	• Rate Base, % Increase
Service Reliability	• SAIDI, SAIFI, CAIDI, CAIFI • # Customer Complaints
Customer Response	• Response Time • Adequate Info.
Service Quality	• % Repeat Service Calls

What must We Excel at?

Internal Business	
Goals	Measures
Safety	•Days without Accidents •Safety Awareness
IT Architecture	•Integrated, Scalable
Systems to support Mgmt.	•Timely Info.-Decisions •Reliable Information
Systems to support Optns.	•Administration •Technical •Field Operations

Improvement to create Value?

Innovation & Learning	
Goals	Measures
Flexibility for Change/Grow	• Best of Breed Application Integration
Process Improvements	• # New Initiatives Implemented
Technology Improvements	• System Upgrades • Paper Reduction • FTE Reduction
Reduce Risk	• Improved Data Integrity

Integrated enterprise IT systems provide the information for capturing and tracking the measurements against established goals. While the goals and measures may vary from organization to organization, establishing a set of goals and measures similar to those in the diagram and being able to track progress over time is a continuous objective of management.

Evaluating the potential of new IT systems will generally be gauged by how well the system integrates into the corporate IT environment and contributes to the measures of the overall goals of the organization. The GRM environment, while representative of information used in the daily workflows of engineering and operations, must also collect and deliver data to the entire enterprise.

Strategic Benefits of GRM Related to Employee Satisfaction

Numerous strategic benefits may be realized by implementation of GRM initiatives. Traditionally, computer applications were built to displace people. However, these applications are instead *empowering people*. GRM can be shown to improve the work environment for employees by improving access to information. Utility employees have reported during project interviews that

difficulties encountered trying to identify and access accurate information is a major cause of inefficiency. Direct improvements to information accessibility and accuracy improve the work environment, the morale and the effectiveness of employees.

The following benefits to the user community result from using a GRM to collect, store, manage, analyze and present facility data. All provide improvements in work process efficiency.

- All users have access to a common database of information.
- The quality of data is the same for all. More than one person can have access to the same data simultaneously.
- Users can quickly create custom maps and reports, and have flexibility in selecting the data they want to view, analyze or present.
- Maps and reports are more consistent and easier to read. Deteriorating maps are eliminated.

Cost Containment Benefits of GRM

Some of the opportunities associated with GRM and its comprehensive enterprisewide integration are realized as tangible operational savings. Operational savings are delivered through improved efficiencies that result in *direct overhead reductions*.

Investment in a new system can offset the costs of a current system by reducing ongoing maintenance costs, system development costs, and administrative costs. Cost containment is achieved through the ability to implement system enhancements for new technologies without the extensive application customization required for less flexible, proprietary systems.

Applications that support maintenance and change management of the pipes and wires networks have traditionally consisted of in-house development and semi- to highly-customized vendor software. These applications have either not been integrated or were only loosely integrated necessitating a large IT support staff, and often, a larger operations staff due to related inefficiencies. One utility dramatically reduced the staff needed to support previous internally developed applications by implementing a commercial off-the-shelf (COTS) GIS and Work Management solution and tightly integrating it with a COTS-based mobile workforce management solution. In this case, the IT and operations staffs were reduced 20 percent and 25 percent, respectively.

To accomplish these savings, GRM IT investment today should take into account commercial best-of-breed applications in the core application areas of energy delivery, i.e., GIS, work management, mobile workforce management, and outage management. Industry consultants note that commercial application implementation and integration are being sought to replace custom legacy systems. The reason is cost savings over time. For example, the software vendor provides application support/maintenance, which is typically 15 – 20 percent of software licensing costs (20 percent x \$1,000,000 averaging licensing cost = \$200,000 annually). In-house legacy systems typically require one to three full-time support persons in a production environment – two people x (\$85/hour average burdened rate) x (2000 hours/year) = \$340,000/year. This represents about a 40 percent savings in ongoing IT administration/ maintenance costs.*

* Montgomery Research, Frank Hoss, IBM (http://www.utilitiesproject.com/documents.asp?grID=233&d_ID=885)

Best-of-class COTS applications offer the best practices of utilities or communications companies — providing benefits that would usually not be available through applications that are customized and maintained in-house. Although some companies think their custom software offers a competitive advantage and that COTS software levels the competitive playing field, a stronger case can be made that how a company *uses data* provides the real competitive advantage.

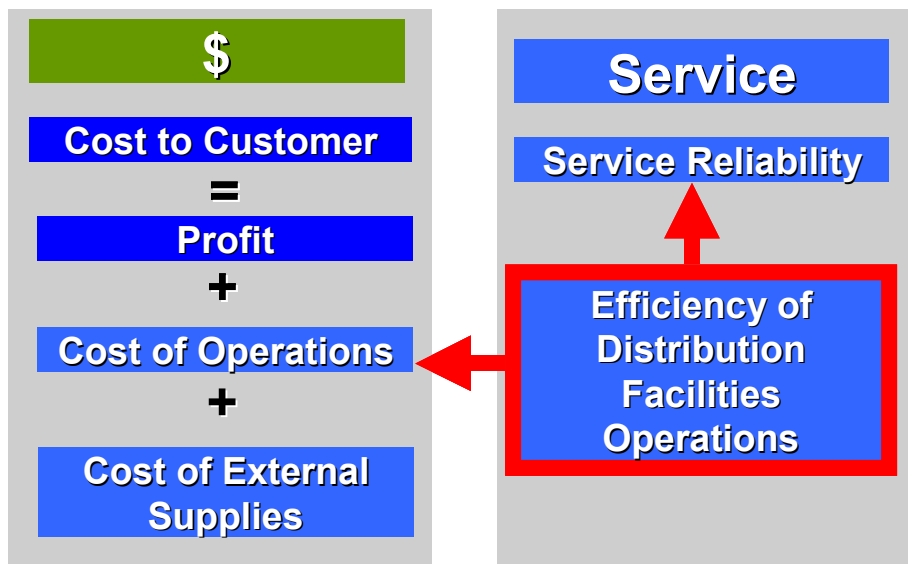
Operational savings are also delivered through efficiencies achieved via network utilization enhancements that reduce capital investment requirements. The results are less tangible but real and can have a direct impact on a company's success. For example, improvements in quality of service and response times to customer requests are tangible benefits more difficult to measure.

Utility and Communication organizations are service organizations to their customers. Their customers are particularly interested in two criteria:

- Cost of services
- Service reliability

GRM investment is maximized for customer satisfaction when it facilitates data sharing between Outage Management, Mobile Workforce Management and GIS. For a Utility or Communication organization, the efficiency of operating their distribution facilities is the major controllable factor that affects the cost of supply and the reliability of service to their customers. Showing how the GRM systems contribute to improving the efficiency of facilities operations is a major step in the overall justification process.

Customer's View



Any system should be able to contribute to monitoring activities that interface with customers, such as response times for service calls and providing customers with real time information in the field through Mobile Workforce Management Systems. Reducing the cycle time to resolve issues with customers, greatly improves customer satisfaction. In contrast, repeat visits required to solve

problems encountered in the field involve many more company personnel, increase costs, and significantly reduce customer satisfaction.

An Outage Management System (OMS) will provide many of the standard industry statistics that utility organizations must regularly report to regulatory agencies. By closely monitoring SAIDI, SAIFI, CAIDI, and CAIFI statistics, management will be able to determine if improvements in service levels to customers are being made. Customer Information Systems monitor customer calls and complaints that provide parameters on which customer service improvements are being made.

Factoring in the Web

Recognizing how much the Internet has enhanced communication, any IT investment needs to involve integrated Web-based solutions with the potential for business-to-business and business-to-customer service features. Because today's utilities and communications companies often support more than a million customers over service territories encompassing hundreds of thousands of square miles, exploiting the power of the Internet can be a significant convenience for them.

Utilities typically contract 50 percent or more of their work to third parties. Third parties can be given access to work schedules via a Web interface, which provides the utility with better control over contracted activities. These examples clearly point to the need for modular integration in work scheduling as well as other processes.

Increasing ROI Associated with GRM Investment

As I have stated in previous industry association presentations, my experience with clients has proven that ROI increases significantly as the GRM environment encompasses more applications and users as indicated below:

- Traditional AM/FM has been shown to return a dollar for every dollar spent
- Add automated design to the above for a 2:1 return
- When enterprise access for decision support is achieved, the return jumps to approximately 4:1
- When GRM expands to make network operations more efficient, the benefits become exponential

Add to this comprehensive GRM, the right enabling technology and the benefits are maximized. The following represents one communications operator's effort to align current technology with GRM objectives.

Example: Asia Pacific Telecom Aligns GRM Objectives with Technology Capabilities

In 2004, one of our communications clients moved from an exclusive-provider license to deliver telecommunications services to a competitive market. This means that the network had to prepare to supply wholesale services to competitive retail companies as well as the company's own retail operations. This change is profound as it significantly raises the importance of: effective network asset management, planned network development, and asset valuation.

In recognition of this, the telecom initiated some major structural changes in its management of the network. Planning, Design, Project Implementation, and Research and Development for the Core,

Access and Broadband parts of the network were integrated into a single unit. The aim is to provide the following:

- Effective coordination of all aspects of network development
- Integration of all network information into a single unified database
- Visibility to retailers of connections and services currently available and due to come on-line
- Visibility to the Customer Services Counter of the network lifecycle states, such as the proposed developments
- Standardization of the IT delivery environment on Citrix and Windows 2000

The requirement was to reduce the range of legacy operating systems and hardware systems; to improve systems support, systems maintenance and ultimately systems availability. The benefits achieved by this activity are measured at three points.

- Unifying the operating systems reduces the complexity of the installation and ultimately the services of fewer specialists.
- Standardizing hardware reduces overall investment in equipment, and reduces the cost of subsequent upgrades.
- Reducing the complexity of the operating system and hardware environments returns the benefit of increased up time.

Support the increased Asset Valuation requirements

Asset data for Core, Access and Broadband had to be incorporated into a single data model to complete the asset database. The GIS needed to hold details about these assets in an open and accessible format so that simple productivity tools like MS-Access and Crystal Reports could easily access and summarize the information. In fact, it was seen as essential that the company could access this information independently of the GIS itself – asset data should be readily available to departments other than GIS.

Support the integrated Network planning and design requirements

All three planning teams are required to enter their network designs (using the lifecycle states model) into the same integrated database. Each team should be able to interact with, and respond to the proposals of the others. Furthermore, the planning teams should be able to further collaborate by using the same marketing and data and analyses, while setting their respective planning goals.

Ensure GIS data accessibility

The key business factor here is that because all three network planning areas use the same database, retailers and consumers need to be able to see what's *in place*, what's *planned*, and what connections are *coming on-line* soon. With this information, the company can get consumers connected at the earliest opportunity.

With GIS data stored in an accessible and open format, interfacing to other systems is possible at a data level. This is an enabling step in terms of achieving a data interface between the GIS and the customer billing system (ICMS). This interface brings very significant benefits to in that it positively identifies what cable pairs are available or in use in any area.

Flexibility and future expansion

Interfacing data collected and organized in the GIS with that of other systems is a requirement. Therefore, to be cost effective and supportable, the GIS must hold its data in an accessible format.

For example, at one time, the customer billing system (ICMS) and the asset recording system (GIS) were completely independent. Information was double entered into each system and consequently information in the two systems differed by the timing of its entry. Consequently, business operations were poorly served, as there could be many available connections that were not leveraged in a timely manner. Additionally, there would be some connections used but not billed.

Marketing analysis – using the data to expand

The company realized that the planning of proposed network extensions needed to be driven by marketing analyses. This placed new requirements on the GIS. It had to be capable of thematic mapping, and spatial analyses beyond network traces. In particular, ‘point in polygon’ summations and proximity analyses are required to fulfill this requirement.

Flexible licensing – mix of client and concurrent user licenses

The company changed its technology from a ‘processor per desk’ policy to a thin client solution (Citrix) and received these benefits:

- Reduced equipment costs
- Reduced down time
- Simplified support
- Reduced software license costs
- The ability to deliver all IT solutions to any network location

Previously the GIS could only be used on the workstations for which it was purchased. The company needed to be able to deliver GIS functionality to any connection on the network. This is particularly important when an engineer is working at a remote site.

Use Commercial Off-The-Shelf (COTS) software

The telecom recognized that using proprietary systems and modified software packages introduces unique versions of software, which inevitably leads to increased support costs. Where appropriate package solutions (COTS solutions) are available, they should be used.

Consequently, an upgraded GIS system must be a COTS solution that complies with corporate IT standards. In addition, the system must not be customized beyond its standard capabilities. Configuration within available system parameters is permitted, but customization to modify source code that introduces unique variations is not permitted.

Flexibility for future expansion

In addition to storing data in an open and accessible format, the telecom recognized the implications of a scalable architecture, which ensures that performance is not be impaired as the network grows. This greatly simplifies any future planned developments and interfaces with other systems.

SUMMARY

Companies have different reasons for embracing an integrated GRM environment, however, one electric company's stated predicament catalogues the most common issues that drive GRM investment:

“Within our company are a large number of disparate, non-integrated systems with inefficient interfaces. This results in extra costs, lack of flexibility, and an inability to respond to business needs. There is no unifying topology or architecture governing the applications, the data, or the technical infrastructure. There is high potential for confusion and misunderstanding of asset information. “(From Integral)

The justification for GRM is becoming more apparent, however, the right choice of GRM enabling technology can further maximize and future-proof your GRM investment by providing:

- COTS applications and integration of best-of-class applications
- Open data formats – let nothing come between you and your data but an SQL statement. Don't let your GIS hold your data hostage!
- Platform that is flexible and scalable to adapt to a fast-changing business conditions
- Integrated Web-based solutions with the potential for business-to-business and business-to-customer service features.