Building a Business Case for Shared Geospatial Data and Services:

A Practitioner's Guide to Financial and Strategic Analysis for a Multi-participant Program

A Research Publication of the Geospatial Information & Technology Association's Research Division in Conjunction with the U.S. Federal Geographic Data Committee

The content and methodology of this document are based on the *Building a Business Case for Geospatial Information Technology* workbook published by GITA

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DISCLAIMER

This project was jointly funded by the Federal Geospatial Data Committee (FGDC) and the Geospatial Information Technology Association (GITA). These organizations assume no responsibility for the content of the research study reported in this publication or for the opinions or statements of fact expressed in the report. The mention of trade names for commercial products does not represent or imply the approval or endorsement of these organizations. This report is presented solely for informational purposes.

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FOREWORD

The Geospatial Information & Technology Association (GITA) is a nonprofit educational association serving the global geospatial community. GITA provides industry leadership by offering excellent geospatial educational and information exchange opportunities and promoting the use and development of geospatial information and technology to meet our members' evolving needs. This leadership is increasingly being delivered and recognized through our various research initiatives, demonstration projects, and relationships with other nonprofit organizations and state and federal agencies.

In order to effectively manage these efforts, GITA has established a Research Division. The Research Division is responsible for sponsoring applied research and demonstration projects to enable federal, state, and local government agencies, along with electric, energy, gas, pipeline, telecommunications, and water and wastewater organizations and other professionals, to meet their business needs through the use of geospatial information and technology. It seeks to work together with member organizations that voluntarily participate in order to support and benefit from the geospatially related research that the association sponsors. Close to 150 user organizations are members of GITA, and more than 130 geospatially-related consulting firms, solution providers and vendor companies are corporate members. The majority of our members are in the United States and Canada. However, members from our international affiliates are welcome to participate in research and demonstration projects.

This publication, *"Building a Business Case for Shared Geospatial Data and Services: A Practitioners Guide to Financial and Strategic Analysis for a Multi-participant Program,"* is a result of a project of the GITA Research Division in partnership with FGDC. It is hoped that its findings will be applied in United States' Federal agencies as well as in communities throughout North American and around the world. We intend that this report not only serves as a means of communicating the results of this important applied research, but also becomes a tool to enlist the further support of utilities, government agencies, and other types of organizations and individuals for additional needed work.

Robert M. Samborski
Executive Director, GITA
March 2007

ACKNOWLEDGMENTS

About the Geospatial Information and Technology Association

The Geospatial Information and Technology Association (GITA) is a non-profit association focused on providing education, information exchange, and applied research on the use and benefits of geospatial information and technology worldwide. Its membership includes federal, state, and local government agencies, utilities, infrastructure management organizations, and private sector companies.

About the Federal Geographic Data Committee

The Federal Geographic Data Committee (FGDC) is a 19 member interagency committee with representatives from the Executive Office of the President, Cabinet-level and independent agencies. The FGDC is developing the National Spatial Data Infrastructure (NSDI) in cooperation with organizations from both the public and private sectors. The NSDI encompasses policies, standards, and procedures for organizations to cooperatively produce and share geographic data.

Special Thanks

The project team of Nancy Lerner, Susan Ancel, Mary Ann Stewart and Dave DiSera deserve special thanks for their vision and tireless work which brought this workbook to fruition. We are indebted to the project advisory committee of Milo Robinson (Federal Geographic Data Committee), Tammy Griffin (Washington State Department of Transportation), Dave Dennis (City of Cleveland) and Pete Gomez (Xcel Energy), and Paula Rojas (GeoConnections Canada) for their input and guidance during the review of the workbook business case and return on investment workbook and template material.

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EXECUTIVE SUMMARY

Public sector organizations can improve efficiency and data quality by sharing their data, technology, and applications. Shared data and services make sophisticated technology affordable for a broad range of agencies. Multi-agency partnerships reduce redundant data maintenance activities. This increases productivity and improves information quality and consistency. For these reasons, data and technology partnerships have become very attractive to government agencies, especially in the area of land- and property-based services supported by Geospatial Information Technology (GIT).

GIT is a complicated investment. The initial costs can be high, and the tangible benefits can take several years to materialize. Elected and appointed officials do not have time to delve into the finer points of the technology before being asked to make an investment decision. They must weigh a GIT project against countless other opportunities and choose where and how their organization will spend its money. Their best tools for making these decisions are the net present value (financial bottom line) and strategic business case.

The financial bottom line of a GIT project depends on the presence and quality of the existing GIT infrastructure. GIT infrastructure includes base maps, technical support personnel, and base map maintenance applications as well as user access tools and data communications channels. These infrastructure elements are expensive and may be difficult for a single agency to cost-justify. If multiple agencies share the cost of this infrastructure, each of the participants is in a better position to develop business cases for new applications. When multiple government agencies serve the same geographic area, it is logical for these agencies to share their geographic information and to standardize and integrate their spatial data management processes. When these agencies use the same GIT software, the opportunities for cooperative application development multiply, and the business case for sharing GIS resources becomes even more persuasive.

When developing a business case for a GIT project that relies on shared data and services, it is important to understand exactly where each agency should draw the line in terms of the allocation of costs and benefits. The costs of a proposed system can be researched and allocated among partners, but the potential benefits are much harder to document. Many of the benefits of GIT partnerships accrue to the community as a whole and can be difficult to quantify on an agency-by-agency basis. Therefore, it is important for GIT partners to collaborate in the development of business cases related to their cooperative projects.

This workbook is the culmination of several years of ongoing research by the Geospatial Information & Technology Association (GITA). It presents a straightforward methodology for developing GIT benefit estimates, conducting financial analysis, and preparing a credible business case for a multi-participant GIT investment.

RESEARCH OBJECTIVES

The Geospatial Information Technology Association (GITA) and the Federal Geospatial Data Committee (FGDC) funded this study to develop and document a formal methodology for the preparation of business cases for shared data and services for GIT within and across multiple agencies. The research includes a literature search and the development of a workbook and digital templates to assist other organizations in building multi-agency business cases for shared data and services GIT projects. The workbook includes a case study from a project with multi-participant organizations. The case study provides a real-life example applying the workbook's methodology and templates.

This workbook builds on the seminars held at the GITA annual conference beginning in 2003, and the document "Building a Business Case for Geospatial Information Technology" published by GITA.

The key objectives of the study include the following:

1. Evaluate current related literature collected by the FGDC and GITA.

2. Further develop return on investment methodology as presented in the GITA seminars, enhancing and refining the techniques and documentation.

3. Develop a set of spreadsheet templates, examples, and directions that government agencies can use for financial analysis of their own projects.

4. Conduct site visits to perform individual case studies of the financial performance and strategic impact of a multi-participant geospatial project. Perform investment analysis on this project and thoroughly document the case study as an example for the workbook, including detailed spreadsheet analysis available for study. Describe the approach to allocating the costs and benefits of shared data and services among the GIT partners.

CONCLUSIONS

Large shared data and services geospatial projects, such as multi-agency efforts throughout a metropolitan area, have large costs and accompanying large benefits. In many cases, productivity benefits are dominant.

Mature geospatial implementations enable the return of substantial benefits from the development of new applications based on the existing technology at a low marginal cost.

Complex projects involving multiple agencies can provide substantial quantifiable and strategic benefits, but it may be difficult to collect thorough and consistent benefit data from all affected agencies.

RECOMMENDATIONS

GIT partners should jointly develop their business cases. Joint workshops will provide all participants with a common understanding of costs and benefits and a consistent approach to project definition and underlying assumptions. This research project demonstrated that collaborative business case workshops are more effective than independent development of financial assumptions and analysis.

It is essential for participants in GIT business case workshops to understand cost and benefit data requirements and the analysis process. Training sessions should be scheduled well in advance of the business case workshop so that participants know what types of information to bring to the group discussion.

Organizations can benefit from a clear understanding of the uses of financial analysis at all stages of a project. The case study demonstrates financial analysis through a wide range of project lifecycles: from making the business case in order to obtain project funding, to setting the stage for analysis of project performance, to full historical analysis once benefits have been realized. Further work in this area should address the appropriate use of financial analysis at the various stages of a project's life.

CHAPTER 1
INTRODUCTION

WHY READ THIS WORKBOOK?

This workbook will teach you how to develop a financial and strategic analysis of a shared data and services geospatial information technology (GIT) project. It explains each step in the process and provides detailed examples and a case study to illustrate the concepts. The accompanying CD provides templates that will help you build your own business case. The CD also includes a detailed instruction guide on how to use the templates and the completed versions of the templates for the case study for additional reference.

This workbook will also provide you with insights into how various government organizations are using GIT, and it will point you to additional reading material on this and related subjects.

WHY READ ABOUT GOVERNMENT AGENCIES OUTSIDE MY OWN SECTOR?

Multiple government organizations share and serve a particular geographic area, so GIT projects are fertile grounds for interagency collaboration. GIT collaboration within a community can improve all agencies' service levels while reducing the cost of data collection, data maintenance, and supporting technology. For this reason, it is valuable to become familiar with the full range of government GIT applications.

This workbook will help you identify potential partners, recognize cost distribution opportunities, and incorporate the benefits of collaboration and data sharing into your project design and business case.

WHO SHOULD USE THIS WORKBOOK?

This workbook is designed expressly for GIT practitioners and managers who are responsible for defining and prioritizing projects and for obtaining project funding.

Whether you are running a GIT program for a local government, state office, or federal agency, this workbook will provide you with the tools you need to make sound decisions and communicate effectively with others involved in the investment decision.

HOW TO USE THIS WORKBOOK AND THE ACCOMPANYING CD

To get the most out of this workbook, the authors recommend that you open the accompanying ***Case Study Financial Analysis*** files on the CD as you read through the case study. You can also refer to these files for examples as you read through the workbook sections on benefit and cost estimation and financial analysis.

After reading the workbook and reviewing the case study, you will be ready to build your own business case. Follow the instructions on the CD (also in the appendix of this workbook) to select the appropriate template file from the ***Business Case Templates and Instructions*** folder. The instructions will take you step-by-step through the preparation of the business case following the same process that is described in the workbook. Refer to the application examples in the workbook if you need help defining your project. Refer to the literature review if you want to read more about GIT investment analysis and related topics.

WHY BUILD A SHARED DATA AND SERVICES GIT BUSINESS CASE?

A multi-participant Geospatial Information Technology (GIT) project is a complicated investment. The initial costs can be high, and the tangible benefits can take several years to materialize. The technical intricacies can be overwhelming. Often elected and appointed officials do not have time to delve into the finer points of the technology before being asked to make an investment decision. Armed with only a basic understanding of GIT, they must weigh the project against countless other opportunities and choose where and how their organization will spend its money. Their best tools for making these decisions are bottom line cumulative costs and cumulative benefits for determining payback period, break-even point, and return on their investment.

For GIT project managers across all government sectors, this poses a tricky problem. The costs of a proposed multi-participant GIT program are not terribly difficult to research, but the potential benefits are much harder to document. Somehow, multiple organizations working together must identify these benefits and then predict their financial impact. This task is usually left to the GIT project managers or other staff members among these organizations who are promoting the investment. Because the early costs of the program are typically high, officials are understandably sensitive to the benefit estimates. They want to be sure the financial analysis is sound.

This workbook is a culmination of several years of ongoing research by GITA and the FGDC. It presents a rational methodology that is focused on ways for developing benefit estimates that should instill a sufficient level of management confidence for ultimately determining a credible business case and return on investment.

STRUCTURE OF THIS WORKBOOK

Each section of this workbook starts with a short paragraph describing the key concepts to be covered in that section. The focus of this workbook is to lead the practitioner through the process of building a successful business case to obtain project funding.

Multiple examples are provided throughout the workbook to help identify additional benefits to consider when implementing a shared data and services GIT project. These examples have been organized by business use areas that are referenced throughout the text. The definitions of each business use can be found at the end of Chapter 2.

The literature review is an additional valuable source of ideas to consider when developing your project scope and business case. It was developed by FGDC to specifically address issues with multi-agency financial analysis.

The case study represents a range of agencies within one state that could typically be found as participants in a multi-agency GIT project. This case study illustrates how the concepts presented in this workbook can be utilized when planning any multi-agency program.

CHAPTER 2
OVERVIEW OF SHARED DATA AND SERVICES GIT AND BUSINESS CASE STRUCTURE

KEY CHAPTER OBJECTIVES

This chapter presents an overview of shared GIT data and services, including its uses and benefits, followed by a discussion of the basic structure of a business case, including project definition, financial analysis, and strategic analysis.

Business uses of GIT are also defined in this chapter. These will be referenced throughout the workbook to provide further examples of tangible and intangible benefits that can be obtained in each of these areas. It is important to note that many GIT programs address multiple business uses.

SHARED DATA AND SERVICES OVERVIEW

Many government agencies have already entered into GIT partnerships, and many others are actively exploring opportunities to share data and services. GIT partnerships reduce the costs to all participants while improving the quality and consistency of spatial information. Cooperative arrangements are not new to local government - many agencies already share services and resources, thus benefiting from lower costs and economies of scale in the procurement of products and services. Traditionally, government agencies have opted for shared services in administrative business areas, such as payroll or telephone systems. More recently, however, there has been a shift towards sharing of advanced technology solutions, mostly in the area of web-based services, such as county-wide portals.

Shared services make the most economic sense where the cost of running essential services by a single entity verges on the unaffordable. This often applies to service areas that rely on complex computer applications for service delivery. This includes land- and property-based services supported by Geospatial Information Technology.

Shared data typically includes base maps (aerial photography, physical maps, parcels, and street centerlines). Shared applications typically include data maintenance (base map maintenance) tools and basic user access/viewing tools. Shared services may include application development, outsourced data maintenance, application administration, hardware, and user support. When multiple government agencies serve the same geographic area, it is logical for these agencies to share their geographic information and to standardize and integrate their spatial data management processes. When these agencies use the same GIT software, the opportunities for cooperative application development multiply, and the business case for sharing GIS resources becomes even more persuasive.

The first step towards a shared vision among multiple agencies, once the business case is developed and proven, could be consolidation and centralization of GIT support resources for basic administrative tasks. The next step could be a reduction in duplication of effort through sharing of maintenance processes such as managing the GIT program and base maps. Hardware could be centralized as the next step, with all GIT systems moved to a shared platform, thereby reducing maintenance effort and costs, and freeing up computer room and office space for some of the participating agencies. The final step could be the sharing of the actual GIT software and databases, achieved through consolidation of software licenses.

The program to deliver such a shared vision would need to be carefully planned and rolled out in stages, ensuring convergence of working procedures, policies, and software versions, and a major cleanup of data sets. However long and complicated the program, it needs to deliver real benefits at the end of each stage. Planning for these stages of benefits is part of the business case development process.

GIT OVERVIEW

The simplest definition of GIT is "an automated system for managing and analyzing information with a geographic, i.e. spatial, reference." More specifically, GIT is a collection of hardware, software, data and procedures functioning together to capture, manage, analyze, maintain, and display information that has a spatial reference to the real world. Information has a spatial reference if it can be tied to a map. Typically, over 80 percent of information necessary to support an agency's daily operations has a spatial reference.

GIT is not simply a computer system for making maps, although it can create maps as required. GIT is a sophisticated management, query, and analysis tool that allows users to identify and display the geospatial relationships among related features. There are many generic questions that a well-designed GIT and integrated database environment can answer, including:

- **Location — What is at a given location?** Data management is simplified when the user can quickly discover what exists at a particular location. The location can be described in many ways, including place name, Zip code, billing and street address, geographic coordinates, or by pointing to the feature on a computer screen. For example, by pointing to a street on the computer screen or entering an address, the location and characteristic of all assets, planned construction activities, property sales, main breaks, demographic data, etc., can be immediately identified.

- **Condition — Where is it?** This question is the reverse of the location question. Instead of identifying what exists at a given location, the user finds locations where certain conditions are satisfied. For example, state highway roadways that were constructed before 1960 that have had specific categories of road repair performed on them can be identified.

- **Trends — What has changed over time?** This question can involve either location or condition and seeks to find the difference over time. For example, a GIT analysis can show ground water contamination within an environmentally sensitive area where levels of contaminant and extent of intrusion have continued to increase over a certain percentage during a specified period of time.

- **Patterns — What spatial patterns exist?** These types of questions can be very sophisticated. For example, a GIT analysis can show the spatial distribution of new home building permits and correlate this information with locations of existing community services, including such things as schools, police and fire stations, and medical clinics. This information can help determine if additional services are required to support growing areas within the community.

- **Modeling — What if ...?** These types of questions are posed to predict the consequences of proposed changes. For example, the user can model a variety of emergency situations ranging from a contaminant spill to a terrorist attack and determine how the survivors can be safely moved out of harm's way.

GIT AS A CORE ENABLING TECHNOLOGY

Organizations that have implemented GIT programs are finding that it is a core technology that increasingly defines their information management strategy and practices. The primary reason is that, as previously noted, a majority of all data and information used by organizations is geographically referenced. Consequently, any technology that provides the capability to capture, organize, and make available the majority of an organization's data will be, by definition, a core technology.

As GIT capabilities increase, the applications that access the data expand and increase in complexity. As more geographically referenced information is made available to the participating organizations, the skills of the staff, the organizational structures, and the work practices across the organizations will evolve to reflect the necessary shared data and services.

Therefore, it is important that as government agencies work together to deploy a shared data and services GIT program, participants have a clear understanding of:

- What the technology will allow the organization to achieve (e.g., business value)

- What changes the technology will drive within each organization, and across organizations

- The most cost-effective way to implement and integrate this technology

- The time and resources necessary for implementation and operation of the program

Ultimately, the implementation of a shared data and services GIT program will assist an organization's ability to reduce operational costs and data redundancy, improve analysis processes, and increase the ability to access and integrate information. The result will offer better decision support and increased data-sharing and services within a technical framework that integrates data from the various systems across the various organizations.

BUSINESS USES OF GIT

Successful shared data and services GIT applications are designed to support specific business needs for a combination of participating organizations. It is the applications and organizational practices that enable shared data and services, rather than the mere presence of the technology, that provide the true benefits through the use of GIT.

The following is a list of common shared data and services of GIT:

- Data Access and Mapping (Accessing Data, Automated Mapping, and Data Maintenance)
- Emergency Management and Security (Emergency Preparedness and Response/Critical Infrastructure Protection
- Government Administration (Property Appraisal/Legislative (Voting) Districting/Tax Assessment)
- Quality of Life (Public Health and Safety/Community Services/Code Enforcement)
- Field Infrastructure Management (Management of Roads and Utilities/Capital Improvements/Maintenance)
- Facility Management (Management of Buildings and Property/Capital Improvements/Maintenance)
- Service Delivery (Citizen and Customer Service/Call Management/Outage Management/Dispatch)
- Customer Relationship Management (Usage or Consumption Analysis/New Service Planning/Customer Compliance)
- Engineering (Planning/Design/Construction/System Analysis/Network Modeling)
- Land Management (Development Review/Zoning/Permitting/Land Use Analysis)
- Regulatory Compliance (Permit Application/Monitoring Programs/Compliance Management)
- Environmental Management (Natural Resource Preservation/Watershed Protection/Weather Monitoring)

Specific examples are cited for each business use at the end of this chapter. These examples are typical GIT applications that agencies develop to support a shared data and services program. In this workbook, the term *application* refers to a business process supported by people, data, software, and hardware. In the Information Technology (IT) world, the term *application* is sometimes used to refer to a software product or a piece of custom code. However, software alone is typically too narrow an item to constitute a true GIT project or investment. The full costs of any shared data and services GIT program will include human and business process costs as well as technology costs, and the benefits of the investment can be realized only in the context of the business processes that the technology supports across multiple organizations.

It is important to note that unless the business requirements of the participating organizations are well understood, there is a risk of implementing a system that does not address all participants' needs, and this could jeopardize the GIT partnership. It is essential for all project participants to agree on the functional and technical requirements of all shared data and applications. The applications that are defined to support the various business needs of one or more organizations will need to be prioritized for funding and implementation purposes. Once prioritized, the specific multi-agency data, hardware and software, organizational, and training elements required to support that application can be further defined, and then developed or acquired.

TAKING A SHARED DATA AND SERVICES APPROACH TO IMPLEMENTING A GIT PROGRAM ACROSS MULTIPLE AGENCIES

The implementation of GIT can be a long-term undertaking. Working together, agencies can greatly improve the value of their GIT implementations by taking a shared data and services approach. This approach has proven very successful as a means to minimize program costs. It is not uncommon for a shared data and services GIT program to take three to five years to show payback. A shared data and services approach also enables multiple agencies to more effectively leverage existing datasets and operational capabilities. As a result, it can bring about major efficiencies and savings through increased operational performance.

In the absence of GIT partnerships, organizations often duplicate data that are already available and in use by other departments or agencies. Planning for enterprise architecture across multiple agencies will reveal these areas of redundancy and provide an opportunity to make business decisions regarding cross-organizational data acquisition and management. A shared data and services GIT program can enable an organization to keep pace with new mandates even when it faces a shrinking budget. In addition, sharing common data can build stronger inter-organizational cooperation and expanded use of common information across these groups.

It is important to emphasize that one of the most useful features of a GIT system is its ability to overlay different views of a location. Combinations are limited only by the kinds of questions asked and the kinds of geospatial data available to provide answers. This powerful ability to integrate different kinds of information about a location can lead to better-informed decisions about investments in services. GIT is an effective analytical and decision-making tool that enables its users to organize, compare, and analyze disparate types of information.

ROLE AND STRUCTURE OF A GIT BUSINESS CASE

Elected and appointed officials typically do not have time to delve into the finer points of technology before being asked to make GIT investment decisions. Armed with only a basic understanding of

GIT, they must weigh these projects against countless other opportunities and choose where and how their organizations will spend money. They are looking not for the technical merits of their investment options but rather for the business cases for each alternative. Ideally, the projects that have the most persuasive business cases are the ones that receive funding.

A business case consists of a project definition, financial analysis, and strategic analysis. It answers these essential questions:

- What is the nature and purpose of this investment?
- What is the financial impact of the investment? In other words:
    - What are the benefits, and when will we realize them?
    - What are the costs, and when will we incur them?
    - Do benefits exceed costs? By how much?
    - Will this project pay for itself? How quickly?
    - How confident are we in the assumptions behind our financial analysis? What happens if our assumptions are wrong?
- Does this investment further our business mission and goals? How?

PROJECT DEFINITION

The project definition explains the nature and purpose of the GIT investment. It summarizes the scope of activities around the application(s) to be developed. Often, it is as important to clarify what lies outside the scope as it is to explain what the scope includes. Following is an example of a project definition:

> *Project Name:* SWOMP – State-wide Open Mapping Program
>
> *Project Purpose:* Support the Governor's Efficient Government Reform Initiative through the development of a single statewide street centerline map and associated addressing standard for all parcels across the state. Discourage duplicate data management by cities and counties. Improve the quality and consistency of street address data used for emergency response and preparedness. Minimize emergency response teams' travel time through more efficient and effective dispatch.

Project Scope Summary:

- Implement a statewide Street Centerline and Addressing System to:

  - Map and maintain a standard street centerline for each road segment in the state, in coordination with local and county agencies.

  - Obtain and verify addresses on any parcel in the state, view the selection on-line, and print/plot the results. Use this data to improve local, state, and federal coordination.

The definition above is sufficiently concise for a busy decision-maker. It gives the project a name (SWOMP). It suggests a link to recognized goals and policies (the Governor's Efficient Government Reform Initiative). It also summarizes expected outcomes and clarifies the extent of the project (statewide street centerlines and parcels with associated addresses). The scope emphasizes the business use of the technology and avoids technical jargon.

Because shared data and services GIT projects involve multiple organizations, it is important to maintain clear project definitions within and across each participating organization. It is also important to identify project interrelationships with other programs.

For example, another state agency may be considering the installation of a new data communications line that would support several different GIT projects as well as a proposed program to provide office automation to a remote site. If the installation of the data communications line is lumped into the definition of one of the GIT projects, then that project's financial analysis will bear the full burden of the line's costs. This may be strategically advantageous if the GIT project has significant benefits and can independently justify the line. On the other hand, it may cause decision-makers to reject the GIT project as too costly. Either way, it is important to note the interrelationships in the business cases for all projects that benefit from the new data line.

In some cases, activities that support multiple projects are best treated as separate strategic initiatives. This type of project might be presented as a "cost of doing business" as opposed to a truly discretionary investment. Following is an example of this type of approach in an abbreviated business case:

> The new fiber-optic line along State Highway 46 will support four of the IT projects under consideration for the coming budget year. The combined financial benefit of these supported projects is $6.6 million, which far outweighs the $4.7 million price tag for the communication line. Even if we choose not to pursue any of the other proposed IT projects, the new data line will provide an important communications link for the State Highway 46 project. This high-speed line is essential for day-to-day business because the dial-up connection that we currently use is too slow even for basic Email and access to the Land Information System. The fiber line we are proposing has the lowest life cycle cost of all the technical alternatives considered.

FINANCIAL ANALYSIS

Financial analysis looks at cash flows related to an investment. Positive cash flows are *benefits* that may be realized as revenues or cost avoidance. Negative cash flows are *costs* and include one-time or capital costs to start the project as well as ongoing costs the project would introduce to the operating budget. There are six steps in preparing the financial analysis section of a business case:

1. Estimate tangible benefits (positive cash flows).
2. Estimate tangible costs (negative cash flows).
3. Schedule the cash flows.
4. Account for opportunity cost and inflation.
5. Calculate financial metrics such as net present value (NPV)and return on investment (ROI).
6. Consider the sensitivity of the financial analysis to the timeline and other assumptions underlying the cash flow estimates.

Chapters 3 and 4 provide detailed guidelines on estimating benefits and costs. Chapter 5 addresses the scheduling of cash flows, the time value of money (opportunity cost and inflation), the calculation of financial metrics, and financial sensitivity analysis.

STRATEGIC ANALYSIS

The strategic analysis addresses the relationship of the project to the mission and goals of the participating organizations. It presents costs and benefits that cannot be quantified and are therefore ignored by the financial analysis. Sometimes, a shared data and services project has such significant strategic value that it is worthwhile even if the financial analysis is not persuasive. For example, a city and county may choose to implement a common Internet-based GIT application that allows developers to obtain permits by completing applications on-line. The city and county may choose to make this investment even if the cost of the technology outweighs the financial benefit of a streamlined permit application process. Officials may place such a high strategic value on developer goodwill that they deem the program to be worth the expense.

Chapter 6 provides guidelines for preparing a strategic analysis.

BUSINESS USE APPLICATION EXAMPLES

The following table lists shared data and service related application examples for each of the 12 business use applications discussed in this workbook.

DATA ACCESS AND MAPPING **Automated Map Production, Data Maintenance, and Data Access**
▪ Data access and viewing tools (e.g., web portals to spatial data) ▪ Automated tools to create the graphical representation of digital spatial data (maps and atlases, which may be distributed electronically or as hard plots or books) ▪ Automated tools to facilitate a timely and standardized update process for digital maps and the nonspatial records associated with the map features ▪ Automated tools to capture field data and updates
EMERGENCY MANAGEMENT AND SECURITY **Emergency Preparedness and Response/Critical Infrastructure Protection**
▪ Applications that identify and quantify risks to public safety and/or critical infrastructure ▪ Applications that safeguard the public and/or assets that are essential to a community ▪ Applications that support community collaboration related to emergency preparedness and response
GOVERNMENT ADMINISTRATION **Property Appraisal/Legislative (Voting) Districting/Tax Assessment**
▪ Applications that support cadastral mapping and property appraisal ▪ Applications that support property tax assessment and revenue projections ▪ Applications that support sales tax assessment and revenue projections ▪ Applications that support the delineation of special districts related to public improvements that benefit particular properties and affect tax rates for those properties ▪ Applications that support the delineation of legislative (voting) districts and analyze demographic information related to these districts ▪ Applications that support the planning and management of public election activities

QUALITY OF LIFE Public Health and Safety/Community Services/Code Enforcement
▪ Applications that support crime pattern analysis and other public safety planning and management activities ▪ Applications that support epidemiological analysis and other public health planning and management activities ▪ Applications that support land use planning, public open space (park) acquisition and planning, and economic development and redevelopment ▪ Applications that support vector control (e.g., mosquito control) and animal control (e.g., vaccination programs and licensing, loose and dangerous animal programs) ▪ Applications that support code enforcement, including inspections and investigations of building code violations and other municipal, state, or federal code violations
FIELD INFRASTRUCTURE MANAGEMENT Management of Roads and Utilities/Capital Improvements/Maintenance
▪ Applications that support maintenance planning, scheduling, and work assignment (for preventive and predictive maintenance programs, planned repairs, and construction) ▪ Applications that support route development and optimization (for maintenance programs, meter reading, etc.) ▪ Applications that support field infrastructure performance and condition analysis and repair/replace decision making (capital project planning) ▪ Applications that support isolation of networked field infrastructure ▪ Applications that provide map-based access to detailed infrastructure drawings ▪ Field system analysis applications that predict the location and/or impact of point sources of pollution/contamination/illegal use ▪ Applications that support monitoring programs for tanks and other potential contamination sources ▪ Applications that support field infrastructure project coordination and/or joint planning of complex (multi-agency) work

FACILITY MANAGEMENT **Management of Buildings and Property/Capital Improvements/Maintenance**
▪ Applications that support maintenance planning and scheduling (preventive and predictive maintenance programs, repairs, and construction on facilities) ▪ Applications that support facility asset performance and condition analysis and property valuation ▪ Applications that provide map-based access to shop drawings, schematics, operations manuals, and/or training videos ▪ Field system analysis applications that predict point sources of pollution/contamination/illegal use that have affected or may affect production/treatment facilities
SERVICE DELIVERY **Citizen and Customer Service/Call Management/Outage Management/Dispatch**
▪ Applications that support call emergency management and dispatch functions ▪ Applications that support analysis of citizen complaints and trends ▪ Applications that support outage response coordination in order to minimize incident impact and expedite service restoration ▪ Applications that support Automatic Vehicle Location and route optimization
CITIZEN AND CUSTOMER RELATIONSHIP MANAGEMENT **New Service Planning/Compliance**
▪ Applications that identify and protect citizens and customers with special needs ▪ Applications that support citizen collaboration and communications ▪ Applications that track utility customer locations (service premises) and associated consumption/usage and work/complaint histories ▪ Applications that track monitored/regulated organizations and support associated monitoring programs (e.g., significant industrial users, storm water discharge monitoring)

ENGINEERING **Planning/Design/Construction/System Analysis/Network Modeling**
▪ Applications that project demographic trends, forecast future demand, and analyze capacity relative to demand projections (e.g., load/volume capacity analysis) ▪ Applications that support site/corridor analysis (evaluation of soil types, property values, natural and cultural resource protection, and other factors that affect infrastructure reliability and development costs) ▪ Applications that support site selection and right-of-way/easement acquisition ▪ Applications that support surface and subsurface models, including three-dimensional models and hydrological models ▪ Applications that support construction project management, including inspections and acceptance/commissioning ▪ Applications that support the development of engineering drawings, including design optimization and modeling (selection of design alternatives based on predefined criteria)
LAND MANAGEMENT **Development Review/Zoning/Permitting/Land Use Analysis**
▪ Applications that support regional (multi-agency) development coordination activities, including cooperative land use planning and zoning coordination ▪ Applications that track zoning and support zoning case management for development and redevelopment ▪ Applications that support the process of issuing building permits, business licenses, certificates of occupancy, and other regulatory instruments affecting development and redevelopment ▪ Applications that support the development review process, including plat and construction plan approval, redlining, and street name and address management
REGULATORY COMPLIANCE **Permit Application/Monitoring Programs/Compliance Management**
▪ Applications that support permit application processes (for construction or operations) ▪ Applications that support regulatory reporting

▪ Applications that support monitoring and work activities related to permit compliance (e.g., utility rights of way management, water sampling, leak detection, PCB management) ▪ Applications that display and/or analyze monitoring results and/or permit violations (e.g., overflow/incident mapping, noise modeling, pipeline pressure mapping)
ENVIRONMENTAL MANAGEMENT **Natural Resource Preservation/Watershed Protection/Weather Monitoring**
▪ Applications that identify and quantify risks to the environment/watershed and/or support associated operations planning, including time-lapse analysis ▪ Applications that monitor environmental/weather conditions and/or support associated operational decisions ▪ Applications that support environmental monitoring programs

CHAPTER 3
GIT BENEFITS

KEY CHAPTER OBJECTIVES

This chapter will provide an overview of the types of benefits that organizations can expect when implementing a shared data and services GIT program. It will define methodologies for quantifying the tangible benefits to help build a positive business case and includes discussion about dealing with the uncertainty of benefit assumptions. The chapter ends with a list of tangible benefits typical of the 12 business use areas presented in Chapter 2.

TANGIBLE AND INTANGIBLE BENEFITS

A tangible benefit can be quantified as a dollar value. This dollar value is associated with future revenue or cost savings. A cost savings (or avoided cost) is a cost that will occur if a proposed investment is not pursued). Revenue benefits may arise from a growth in demand (more customers or more per capita consumption for an existing product or service), introduction of a new service, or an increase in percentage of receivables recognized and collected (e.g., more accurate permit tracking, more effective data collection and maintenance). Avoided costs include all types of reductions in operating costs such as payroll costs, material and equipment costs, and data and technology license fees. Avoided costs may also include one-time items such as fines or judgments.

Not all benefits are quantifiable. Sometimes, it is impossible to estimate the dollar value of a particular project outcome. These intangible benefits belong in the strategic analysis section of a business case (see Chapter 6). Intangible benefits associated with GIT projects include customer/citizen goodwill, employee morale, quality of life, environmental health, and community growth. Although intangible benefits do not affect the financial analysis, they can be equally important or even more important than the tangible benefits. For example, the ability to stay in business is a strategic benefit that can make a business case compelling in the absence of any tangible benefits.

Both tangible and intangible benefits are a direct result of the GIT applications under consideration. For this reason, it is essential to clearly define the GIT business applications in the project definition (see Chapters 1 and 2).

CAPTURING PRODUCTIVITY BENEFITS

Productivity increases are an important GIT benefit. Higher productivity means that people can accomplish more work in a given amount of time. An organization can realize the benefits of higher productivity three different ways:

- **Revenue Increase**: Higher productivity enables an organization to increase the output of a product or service. If there is a market (demand) for these additional products or services, then the organization can anticipate an increase in revenue. This type of productivity benefit is typical for physical improvements but is not common for GIT projects, so it will not be explored further in this workbook.

- **Labor Cost Avoidance:** Higher productivity will enable an organization to maintain current output or service levels while cutting staff positions. The result is elimination (or avoidance) of the associated labor costs, including salaries, fringe, and the costs of related office space, equipment, and support services. The potential is significantly increased within a shared data and services GIT program. Labor cost avoidance is a common GIT benefit and is always appropriate to include in a financial analysis.

- **Value of New Services or Service Levels:** If one or more organizations do not intend to cut staff positions, then higher productivity translates into new services or a higher level of service. These services have value; if they did not, the organization would direct staff to do something else. Some organizations are willing to quantify the value of these new services. In other words, without taking any money out of their budgets, they recognize tangible benefits because they are doing more worthwhile things (or are providing a higher level or quality of service). However, not all governmental agencies are comfortable quantifying productivity gains that are realized as new services. They prefer to quantify only those benefits that appear as budget reductions. This is particularly true of organizations that are over-staffed or are experiencing a decline in their responsibilities. In these situations, the new services or higher service levels should be addressed in the strategic analysis (see Chapter 6).

Set the Parameters

Before calculating productivity gains, it is essential to set the parameters for quantifying productivity. These parameters include:

- Whether the organization is willing to quantify new services or higher service levels for purposes of financial analysis.

- A salary multiplier that reflects fringe costs such as payroll taxes and insurance premiums. Fringe multipliers are usually in the range of 15% to 80% of actual salary. A burdened hourly rate is an hourly wage augmented by the fringe multiplier. For example, the burdened hourly rate for a wage of $20/hour and a 30% fringe multiplier is ($20/hour X 1.3) = $26/hour.

- Average attrition rates (the number of positions employees vacate each year). Employees vacate positions when they move to different positions, retire, or otherwise leave the organization.

Finance and human relations departments typically provide these parameters. They may differ across agencies. The fringe multiplier and attrition rate may differ across job classifications.

Identify Affected Staff Positions

Accurate benefit estimation requires a detailed accounting of the staff positions affected by the proposed applications. If a relatively small number of positions (e.g., fewer than a dozen) are affected, the cost of each specific position can be calculated. Otherwise, positions should be grouped into categories with similar job titles, roles, and salaries.

Estimate Annual Labor Hour Savings

Labor hour savings are a function of the proposed GIT application(s). Each savings estimate should be tied to a specific cause and should be stated as an annual figure. For example:

- Eliminate annual map book binding process (three clerks @ 40 hours per clerk each year) for a total labor savings of 120 hours per year for Records Clerks

- Reduce time needed to retrieve record drawings by 15 minutes per retrieval. Field crews retrieve record drawings approximately 10,000 times per year. Total savings in Years 1 through 3: 10,000 X 0.25 = 2,500 field crews hours per year. After acquisition that is slated for Year 4, retrievals are expected to grow to 12,000 times per year. Savings for Year 4 and beyond: 12,000 X 0.25 = 3,000 field crew hours per year.

As a quality control measure, it is a good idea to compare the estimated labor hour savings for a job category to the total number of labor hours available from that category. For example, if only one individual holds a particular position, it is impossible for that position's total hourly savings to exceed the total number of hours one person can work in a single year (unless more positions are to be added to the category, in which case the anticipated staffing growth should be clearly noted in the financial analysis).

By documenting the specific causes for each type of labor savings, project managers can quickly respond to inquiries about benefit predictions. In essence, they can demonstrate what the GIT project will do, how it will affect people, and, ultimately, what that means in terms of dollars saved.

Translate Labor Hour Savings into Dollar Amounts

Labor hour savings are translated into dollars by multiplying the total saved hours by the burdened hourly rate (i.e., salary plus fringe benefits) for the affected staff position or category.

If the agency intends to eliminate positions, then the hourly savings should be truncated down to the nearest whole number of positions eliminated (or new positions avoided). The hours that reflect a full time position will depend on the nature of the position. Although most full-time staff positions provide roughly 2,000 labor hours per year, care should be taken to understand the true (productive) annual work hours of a particular staff position or category before determining how many hours must be saved before a position can be eliminated or avoided. In all likelihood, somewhere between 10% and 25% of an employee's time is spent on overhead activities such as vacation, sick leave, end-of-shift clean-up, and administrative meetings. This means that a reduction of between 1,500 and 1,900 hours of core workload should be sufficient to eliminate a budgeted full time position. On the other hand, if employees in a particular job category are working a lot of overtime, a reduction in hours of workload may not be enough to justify the elimination of a budgeted position; rather, this may provide a benefit in the form of overtime cost avoidance.

If an organization intends to account for productivity recognized as new services or higher service levels, then any number of labor hours can be used in the calculation of the benefit dollars.

The annual productivity benefit of a particular GIT project is the sum of the annual dollar benefits for each affected staff position. This can be expressed as follows:

$$\textbf{ANNUAL PRODUCTIVITY BENEFIT} = (C_1 \times S_1) + (C_2 \times S_2) + \ldots + (C_p \times S_p)$$

Where:

- **P** = a particular staff position or category
- **C** = the burdened hourly cost of the staff position (salary plus fringe benefits)
- **S** = the annual impact of the application on the staff position in terms of hours saved for positions in the category

Figure 3.1 illustrates how this productivity benefit equation can be organized in a spreadsheet. The first table in the spreadsheet should show each job category (label P) along with its average hourly rate and the burdened rate (label C). The second table should list each application associated with the proposed GIT project and the labor hours saved in each job category (label S). The annual productivity benefit equation can then be entered into a productivity value column (label B) and totaled for all applications.

Field Division

P

Job Title/Class	Work Coord.	Dispatcher	Field Tech
Avg. Hourly Rate:	$25	$10	$15
+ 20% Fringe	$30	$12	$18

C

B

Applications:	Total Annual Labor Hours Saved:			Productivity Value:
PWM	100	200	1000	$23,400
OWM	200	0	2000	$42,000
				$65,400

S

Figure 3.1 Sample spreadsheet to calculate productivity benefit

Productivity Benefits and Job Security Fears

Any time a GIT business case cites a reduction in staff positions, there is a risk that employees will react negatively, particularly if they feel that their own jobs are in jeopardy. If an organization is badly overstaffed, this situation may be acceptable. However, a loss of job security (even if it is only a perception on the part of employees) can become a significant morale problem with undesirable consequences for the GIT project, from one or more of the participating agencies. One way to alleviate this problem is to focus only on future positions that can be avoided. This may be sufficient to address this issue.

Another option is to tie position cuts to attrition by stating specifically that positions cuts will be limited to vacant positions. Under this approach, the number of positions saved per year must be compared to the total number of vacancies in each category. If there are not enough vacancies to “cover” the savings, then the attrition rate should be used to adjust the timing of the labor cost avoidance benefit. For example, if a project’s productivity estimate is 11,000 hours of labor savings for desk clerks, and if the organization assumes that each clerk works 2,000 hours per year, then:

11,000 hours saved / 2000 hours per position = 5.5 positions

This truncates down to five full-time positions.

Now, assume that only two clerk positions are vacant at the time the business case is prepared and that the attrition rate for this category is two positions per year. If the productivity benefit is assumed to begin at the start of Year 2, the organization can plan to eliminate four positions in Year 2 by freezing the two current vacancies and also freezing the two positions that are expected to be vacated for Year 2. It can then plan to eliminate the fifth position at the start of Year 3 (when attrition is expected to create two additional vacancies). Figure 3.2 illustrates this approach.

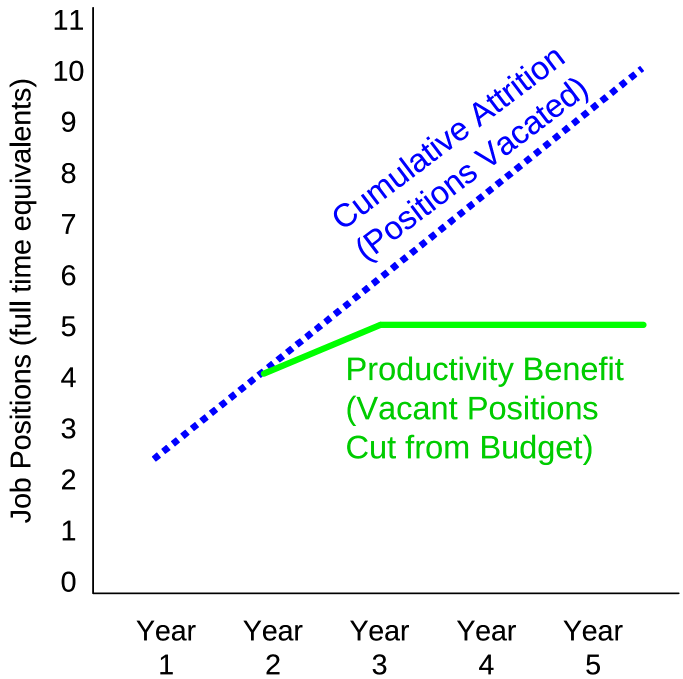

Figure 3.2 Timing of productivity benefit for cutting five positions contingent upon attrition

CALCULATING OTHER TANGIBLE BENEFITS

Shared data and services GIT projects may provide other tangible benefits such as preventing regulatory fines and penalties, increasing fee collection, or reducing legal liability or workers' compensation costs. As with productivity gains, it is important to describe and quantify each of these benefits individually. This provides a complete record of its benefit estimation process.

Like productivity gains, some of these miscellaneous benefits are permanent. In other words, once an organization begins realizing the benefit, it continues to realize it every year thereafter. However, certain miscellaneous benefits are periodic or one-time events. For example, a local government may be able to avoid the consulting costs associated with a comprehensive plan that is prepared every three years. A State Department of Transportation may be able to conduct its own preliminary environmental study for a new roadway program. For these types of benefits, it is important to identify the years in which they will occur and the dollar values that will be realized in each of those years. This is done as part of the cash flow scheduling for the financial analysis (see Chapter 5).

INTERNAL AND EXTERNAL BENEFITS

The only benefits that should be quantified for the financial analysis section of a business case are those that accrue directly to the organization funding the investment. External benefits may be readily quantifiable, but they do not factor into the funding agency's return on investment. If the external benefits are of strategic value to the funding agency, they belong in the strategic analysis section of the business case (see Chapter 6).

For example, consider a regional base map development project funded by a council of governments. If the project will raise the productivity of Council personnel, the value of the labor hours saved should be part of the financial analysis of the project. However, the financial analysis should not include productivity or data quality benefits that may accrue to the Census Bureau, state agencies, local governments, or private businesses that take advantage of the data.

When a single agency funds a project, the distinction between internal and external benefits is very clear. When agencies share data and services developed through cooperative projects, the distinction between internal and external benefits depends on the granularity of the business case. If the business case is prepared from the perspective of a single agency that is participating in the cooperative project, it should include only those tangible benefits (and costs) that will be realized by the subject participant. If the business case is prepared from the perspective of the cooperative, it should include the benefits (and costs) realized by all participants. Multi-participant initiatives often require both types of business cases. The broader business case helps the cooperative decide whether a joint investment is worthwhile. The individual business cases help participants decide whether the cost allocation is equitable and whether continued participation in the cooperative is warranted.

ESTIMATING BENEFITS ARISING FROM SHARED DATA AND SERVICES

When preparing business cases for investments in multi-participant GIT projects, it is essential to identify which agency will realize each benefit. It is also essential to clarify whether the business case reflects the perspective of the entire partnership or the perspective of a single participant. This information allows analysts to organize the benefit data into the financial and strategic sections of the business case as needed. Ordinarily, there is no need to quantify the benefits described in the strategic analysis.

Occasionally, however, the external benefits of a GIT project are significant enough that they warrant quantification within the strategic analysis section. Consider again the example of the regional base map developed by a Council of Governments. If this regional base map allows dozens of local agencies to reduce the number of GIT specialists on their payrolls, the dollar value of these external benefits may outweigh all the other benefits captured in the use case. In this instance, the strategic analysis should include quantified benefit projections. If all the external agencies are supported by the same taxpayers that support the Council of Governments, then the strategic analysis may include financial projections from the perspective of the taxpayer.

When estimating benefits (or costs) for a multi-participant project, care should be taken to ensure that all participants use the same assumptions about project schedule, application scope, and participant responsibilities. The most effective way to coordinate the project business cases is for all partner agencies to collaborate on standard project definitions, schedules, and estimated cash flows.

DEALING WITH UNCERTAINTY

Benefits estimates are almost never certainties. They are based on assumptions which may or may not prove true. One way to deal with uncertainty is to examine the sensitivity of the financial analysis to different variables, including the value and timing of specific benefits (see Chapter 5). Sensitivity analysis is a good approach for dealing with uncertainties in productivity benefit estimates.

Another method of dealing with uncertainty is to reduce benefit estimates by the probability of their occurrence. This approach is appropriate for miscellaneous, event-driven estimates such as cost savings from avoiding fines or fees. If the event that would trigger the fine or fee is only 70% likely to occur, then the dollar value of the benefit can be reduced to 70% of the anticipated fee or fine amount:

$$\text{Adjusted Benefit} = B \times P$$

Where:
B = the dollar amount of the benefit
P = probability that the benefit will be realized

EXAMPLES OF TANGIBLE BENEFITS FOR GIT BUSINESS USES

Following are some examples of tangible benefits associated with different shared data and services GIT business uses. (See Chapter 6 for examples of intangible benefits.) These examples are not comprehensive and are intended only as a starting point for developing a GIT business case.

DATA ACCESS AND MAPPING Data Access, Automated Map Production, and Data Maintenance
▪ Reduce map production and distribution costs ▪ Reduce map editing costs (internal productivity) ▪ Avoid cost of liability for failure to provide information to multiple agencies ▪ Eliminate costs of research/reconciliation of inconsistent data ▪ Reduce the cost of research and decision-making by expediting/facilitating access to critical information
EMERGENCY MANAGEMENT AND SECURITY Emergency Preparedness and Response/Critical Infrastructure Protection
▪ Reduce repair and service interruption costs associated with emergencies ▪ Reduce the cost of preparing insurance claims ▪ Maximize and expedite claim recovery ▪ Reduce cost of maintaining/staffing emergency operations centers and avoid/reduce other emergency preparedness costs through consolidation of roles/activities in the region
GOVERNMENT ADMINISTRATION Property Appraisal / Legislative (Voting) Districting/Tax Assessment
▪ Increase tax revenues by identifying properties that are not on the tax rolls ▪ Increase rate-based revenues by identifying undocumented users ▪ Increase productivity of appraisal staff ▪ Increase productivity of election planning/management staff
QUALITY OF LIFE Public Health and Safety/Community Services/Code Enforcement

- Raise property values by improving community livability
- Secure/retain grant funding for community services programs
- Increase tax revenues by attracting new business
- Improve staff productivity by reducing travel time and numbers of trips
- Reduce field infrastructure repair costs through more effective management of wild animal populations (e.g., armadillos, moles) that damage infrastructure
- Reduce insurance rates

FIELD INFRASTRUCTURE MANAGEMENT
Management of Roads and Utilities/Capital Improvements/Maintenance

- Improve field crew productivity by reducing travel time
- Reduce operations and maintenance costs by avoiding breakdowns and optimizing programmed activities (better planning and scheduling of proactive work, equipment take-downs, and routine repairs)
- Reduce cost of repair by expediting access to asset and maintenance information (faster repairs)
- Reduce cost of inventory by streamlining requirements for on-hand stock (supporting more just-in-time procurement)
- Reduce capital costs by extending asset life
- Reduce cost of capital project planning (better asset performance and condition information)
- Reduce cost of line locate program by eliminating trips to locations that do not have assets
- Reduce cost of special projects/repairs by sharing common costs with other agencies working in the area

FACILITY MANAGEMENT **Management of Plants, Buildings, and Property/Capital Improvements/Maintenance**
▪ Reduce operations and maintenance costs by avoiding breakdowns and optimizing programmed activities (better planning and scheduling of proactive work, equipment take-downs, and routine repairs) ▪ Reduce cost of repair by expediting access to asset and maintenance information (faster repairs) ▪ Reduce cost of inventory by streamlining requirements for on-hand stock (supporting more just-in-time procurement) ▪ Reduce capital costs by extending asset life ▪ Reduce operating costs by improving source quality (e.g., influent, power)
SERVICE DELIVERY **Citizen and Customer Service/Call Management/Outage Management/Dispatch**
▪ Reduce fees, fines, or damage mitigation costs associated with inadequate response times ▪ Improve productivity of field crews through reduced travel time and reduction/elimination of duplicate work orders ▪ Increase rate-based revenues by minimizing the length of service interruptions ▪ Reduce cost of call management by reducing transfers and expediting call processing (internal productivity benefit and/or avoidance of new call-taker positions)

CITIZEN AND CUSTOMER RELATIONSHIP MANAGEMENT
New Service Planning/Customer Compliance

- Reduce fees, fines, or damage mitigation costs associated with interrupting service to special needs customers
- Reduce operating costs through more effective use of interruptible programs
- Reduce wastewater treatment costs by improving influent quality and/or reducing illegal discharge to the sewer system
- Reduce storm water system maintenance costs by reducing illegal discharges/dumping
- Increase revenues by expanding opportunities to sell/provide additional services and better targeting the new service offerings and marketing

ENGINEERING
Planning/Design/Construction/System Analysis/Network Modeling

- Reduce the cost of preliminary design by reducing/eliminating the need for *ad hoc* aerial photography and mapping across multiple agencies
- Reduce the cost of preliminary design by expediting/automating the production of alternative designs
- Reduce the cost of design by expediting access to relevant data
- Reduce the cost of construction and/or land acquisition through design optimization and better site/corridor selection
- Reduce the cost of construction through more efficient inspections and construction management/coordination
- Reduce the cost of construction through community project coordination
- Reduce cost of debt through more accurate long term revenue forecasts
- Reduce or delay capital costs through more thorough examination of alternatives (better models)

LAND MANAGEMENT Development Review/Zoning/Permitting/Land Use Analysis
▪ Reduce the cost of internal development review, permitting and/or inspections ▪ Reduce the cost of joint development review (better regional communication – reduce lag time and additional reviews; productivity) ▪ Avoid costs associated with duplicate or otherwise undesirable street names or addresses (e.g., avoid dispatch to wrong location and/or confusion of field personnel – affects productivity and also costs associated with liability for incorrect/delayed dispatch) ▪ Increase business license revenues (more accurate permit and license data) ▪ Increase tax revenues by expediting activities that raise property values
REGULATORY COMPLIANCE Permit Application/Monitoring Programs/Compliance Management
▪ Reduce the cost of assembling permit application/renewal documentation ▪ Avoid or minimize fines by preventing violations ▪ Reduce report development and submittal costs (productivity benefits of automated reporting) ▪ Reduce cost of sampling/monitoring by optimizing routes and sample point selection
ENVIRONMENTAL MANAGEMENT Natural Resource Preservation/Watershed Protection/Weather Monitoring
▪ Avoid or minimize fines or restoration costs associated with environmental damage ▪ Reduce production/treatment costs by anticipating uncontrollable conditions (e.g., weather) that affect operations ▪ Reduce production/treatment costs by controlling land use and management (e.g., agricultural techniques, waste disposal methods, pesticide/herbicide use) that affect operations ▪ Reduce reactive maintenance costs by assembling resources in advance of uncontrollable conditions (e.g., weather) that affect demand and/or operations

CHAPTER 4
GIT COSTS

KEY CHAPTER OBJECTIVES

This chapter will review the typical costs that should be considered when building the business case for a shared data and services GIT investment. The types of costs that one or more agencies will face include the one-time start up costs and the ongoing costs once the project has been completed. Both of these types of costs should be included to provide a complete picture of the value of the investment. The chapter also includes sections on dealing with shared costs and sunk costs. Examples of typical GIT costs are presented at the end of the chapter.

START-UP AND OPERATING COSTS

Investment costs fall into two categories:

- **One-time (start-up) costs.** These costs may be capitalized (i.e., recorded as assets and then depreciated to spread the expense over the life of the investment). However, capitalization is an accounting convention and does not factor into the financial analysis. Whether a cost is capitalized or expensed immediately, it should still be considered as a negative cash flow in the year it is incurred. Sometimes, the ability to capitalize costs or fund projects out of capital budgets is deemed desirable and can serve to differentiate project alternatives. In these cases, the ability to capitalize should be addressed in the strategic analysis. Examples of one-time GIT project costs include:
    - New hardware
    - New software
    - Data acquisition or conversion
    - Start-up services
- **Ongoing costs.** These are typically funded out of operating budgets (i.e., expensed in the year incurred). Examples of GIT operating costs include:
    - New hires
    - Salary adjustments
    - Hardware maintenance fees
    - Software maintenance fees
    - Training
    - Support services

- Data license fees

SUNK COSTS

Financial analyses of proposed projects deal strictly with future cash flows. Costs that have already been incurred are considered sunk costs and should never be included in the financial analysis of a future investment. It may seem counter-intuitive to ignore a significant previous expense such as a large data conversion investment for GIT. However, historical costs are facts that cannot be changed by future project decisions. No matter how much money has been spent in the past, the value of a future investment depends only on future benefits and costs. When a large sunk cost is an issue with decision makers, this issue can be addressed in the strategic analysis. For example, a section of the strategic analysis might state:

> Over the past ten years, we have invested $9.5 Million in the development of a land base and digital county-based street centerline maps and the acquisition of GIT hardware and software. The SWOMP project will leverage this important investment and provide real, demonstrable benefits for the organization and the state or community as a whole.

This $8 million historical investment is not included in the SWOMP project cost estimates because the money has already been spent.

SHARED COSTS

Costs, like benefits, may be internal or external to the funding agency. For example, if a federal agency upgrades its GIT software, the agency should include the entire cost of new software and upgrade services in its financial analysis. However, if the upgrade will require a group of state agencies to modify their existing GIT applications and interfaces, these state agency costs are external to the federal agency's financial analysis. In the latter example, the strategic analysis might include a discussion of the external costs.

When multiple agencies share data or services, the costs of the associated GIT projects are divided among the participants, often in accordance with the requirements of the interlocal agreement or memorandum of understanding that established the GIT partnership. When developing business cases for multi-participant GIT projects, it is important to itemize each cost and note which participant will bear that cost. The business analyst can then determine which cash flows to include in the financial analysis and which to address in the strategic analysis.

INTERNAL LABOR COSTS

Internal staff time can be a significant GIT project cost. Internal labor costs can include:

- **New positions created as part of the project.** This may include system or database administrators and technical support personnel.

- **Salary increases related to the project.** This may include raises needed to retain drafting technicians who become proficient in GIT.

- **Cost of time for existing positions diverted to build, support, or use the proposed application(s).** These costs can be politically sensitive in organizations that utilize program budgets, particularly if the diverted time reflects a large percentage of existing employees' hours. If a project's business case indicates that an existing GIT Technician position will be diverted full time for two years for project development, this may raise two concerns: (1) the position may not be justifiable in the budget if the GIT investment is rejected or delayed, and (2) even if the project is funded, the position is not justified after Year two. For organizations that rely on program-based budgets, the internal labor cost estimation process may be fraught with the same types of job security issues as the process for estimating productivity-related position cuts. One option for dealing with this issue is to recast the internal labor cost as a reduced productivity benefit. In other words, instead of listing the internal labor costs with the other negative cash flows, the dollar amount can be subtracted from the benefit associated with work force productivity gains. This generalizes the project's impact on labor spending. It may mitigate job security fears associated with productivity benefit estimates and internal development cost estimates, and it has no net effect on the determination of a project's financial viability (see Chapter 5).

The hourly cost of internal labor should be the burdened rate (hourly wage plus fringe benefits). Figure 4.1 is a GIT project cost estimate that includes internal labor costs.

One-time Costs:	**Ongoing Costs:**
• GIT programming contract — $125,000 • Five satellite imagery software licenses — $25,000 • Satellite imagery system support contract — $50,000 • Project manager time — Hourly wage: $30 Burdened rate = $30 *1.2 = $36 Estimate labor @ 100 hours 100 hrs. @ $36/hr. = $3,600	• Additional annual software maintenance — $5,000 SWOMP user support by GIT help desk — Average help desk employee hourly wage: $25 Burdened rate = $25 *1.2 = $30 Estimate support needs @ 200 hours per year 200 hrs/yr @ $30/hr = $6,000

Figure 4.1 Example of GIT project cost estimate

In Figure 4.1, there are two internal labor costs: a one-time cost of $3,600 associated with the project manager's time, and an ongoing cost of $6,000 per year in GIT help desk staff time. These costs can be recast as reduced productivity benefits using the following equation:

REDUCED ANNUAL PRODUCTIVITY BENEFIT =SAP-[AIL+(OIL÷PP)]

Where:

- **SAP** = sum of all applications' annual productivity benefits
- **AIL** = annual internal labor cost (to be recast)
- **OIL** = one-time internal labor cost (to be annualized over project life and recast)
- **PP** = planning period (project life) (See Chapter 5 for details)

Figure 4.2 shows how this equation is applied to the internal labor costs from Figure 4.1. First, the applications' annual productivity benefits are added together (SAP label). Then, the ongoing internal labor cost for the help desk is subtracted from the annual benefit (AIL label). The one-time project management cost (OIL label) is divided over the project life (PP label) for an annual benefit of reduction of $3,600 / 10 years = $360 per year. The end result is an annual productivity benefit estimate of $59,040 instead of the original estimate of $65,400.

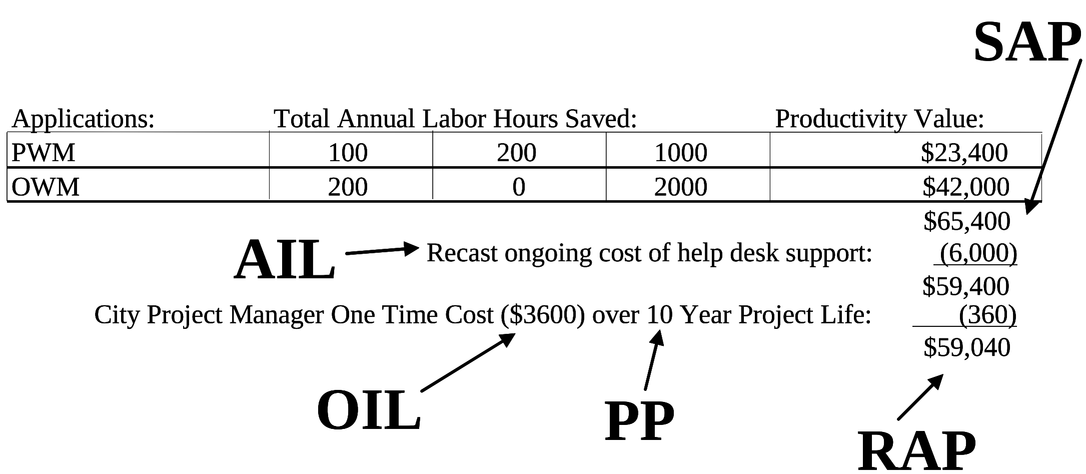

Figure 4.2 Internal labor costs recast as reduced annual productivity benefit

EXAMPLES OF TYPICAL GIT COSTS

Following are some examples of one-time and ongoing costs typical for GIT investments. These examples are not comprehensive and are intended only as a starting point for developing a shared data and services GIT business case.

Capital/One Time Costs
▪ Project planning and business analysis/systems analysis ▪ Legal and financial review ▪ Technical staff development and training ▪ Application and interface design ▪ Data acquisition ▪ Data conversion and reconciliation ▪ Network enhancements ▪ Office space, furnishings, phones, and other general equipment for new staff positions ▪ New hardware to support the application ▪ New software to support the application ▪ Application development (programming) ▪ Interface development (programming) ▪ User training ▪ Introductory publicity and communication

Operating/On-going Costs – Personnel Costs
▪ Salaries and fringe benefits for new staff (for execution of the supported business processes, technical support, ongoing workflow or systems analysis, and/or data maintenance) ▪ Ongoing training and conference attendance for new staff positions ▪ Allocations related to new staff positions (e.g., telephone services, office automation software maintenance fees, personal computer upgrades, administrative overhead allocations) ▪ Increases to salary and fringe for existing staff (to reflect new duties and associated salary adjustments) ▪ Additional ongoing training and conference attendance for existing staff positions
Operating/On-going Costs – Technology Costs
▪ Hardware maintenance contracts and/or periodic upgrades ▪ Software license maintenance fees and/or periodic upgrades ▪ Hardware and software lease costs ▪ Application service provider (ASP) fees (if applicable) ▪ Internet service provider fees ▪ Shared resource cost allocations ▪ Additional communication fees (e.g., wireless charges, leased lines) ▪ Contracts for application support and enhancements, including periodic workflow and performance analysis
Operating / On-going Costs – Data Costs
▪ Data license fees ▪ Contracts for offsite data storage ▪ Contracts for data maintenance/updates

Operating / On-going Costs – Technology Costs
▪ Office supplies to support a shared data and services GIT program ▪ Building maintenance (or maintenance/overhead allocations) for new office space

CHAPTER 5
FINANCIAL ANALYSIS

KEY CHAPTER OBJECTIVES

This Chapter explains the different financial analysis metrics, such as return on investment, internal rate of return, breakeven point and payback period, and addresses when it is appropriate to use each metric to compare investments. Techniques for defining cash flows and the opportunity cost impacts as part of the analysis will be explained, as well as how to account for inflation in your analysis. Finally, the chapter will close with a discussion on sensitivity analysis and how to include this in your overall shared data and service GIT project justification.

WHAT IS FINANCIAL ANALYSIS?

Financial analysis looks at cash flows related to an investment. Positive cash flows are *benefits* that may be realized as revenues or cost avoidance. Chapter 3 provides guidelines and examples for estimating GIT project benefits. Negative cash flows are *costs* and include one-time or capital costs to start the project as well as ongoing costs the project would introduce to the operating budget. Chapter 4 provides guidelines and examples for estimating GIT project costs.

The CD that accompanies this workbook contains financial analysis templates and examples of completed templates for the case study. Readers may find it useful to review the case study financial analysis files as they work through this chapter. These are Microsoft® Excel files. Basic familiarity with Microsoft® Excel workbook navigation is all that is required to follow along in the case study files.

PROJECT LIFE AND CASH FLOW SCHEDULE

A cash flow schedule shows costs and benefits for every year of a project's life. For purposes of financial analysis, a finite life (or planning period) is needed. A project life may be anywhere from several years to several decades in length. Determining factors include:

- Business nature of the applications (i.e., How long will the processes be relevant, and how many agencies will benefit from it?)

- Speed of technology change (i.e., When will newer technology replace these applications?)

- Significance of future cash flows (i.e., At what point do future cash flows cease to have a significant impact on the financial analysis?) The planning period should be long enough to include all one-time costs and benefits and at least one instance of each periodic cost and benefit.

- Magnitude of data acquisition. Data sets, if properly maintained, are long-lived assets, so it is appropriate to use 10-year or longer planning periods for projects with substantial data acquisition components. On the other hand, hardware and software are relatively short-lived assets. A five-year planning period is appropriate for projects that are predominantly technology development efforts.

The finance departments of the representative agencies may provide guidelines for planning periods for different types of projects. The cash flow schedule should reflect the years in which specific costs and benefits occur (regardless of accounting methods used to book these flows as revenues and expenses).

Figure 5.1 shows how activities related to costs and benefits can be mapped to a project timeline. Accurate scheduling of costs and benefits requires a solid understanding of the project implementation schedule. Benefits typically do not occur until after the implementation is completed. Costs may occur at various stages of the implementation, and some costs may continue annually after the implementation is complete.

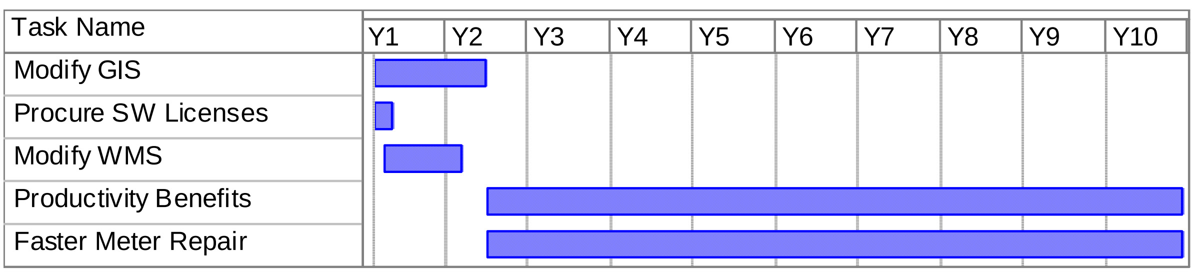

Figure 5.1 High level timeline for costs and benefits

Figure 5.2 shows how a spreadsheet can be used to translate a high level project timeline into a detailed schedule of cash flows. Costs are shown as negative flows while benefits are shown as positive flows. Spreadsheet equations are used to total the costs and benefits for each year of the project life. Spreadsheet equations can also calculate cumulative values by adding the total cost or benefit for the current year to the cumulative value for the previous year.

Year	1	2	3	4	5	6	7	8	9	10
GIS Contract	($100,000)	($25,000)								
Software	($25,000)									
WMS Contract	($25,000)	($25,000)								
Annual Costs	**($150,000)**	**($50,000)**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
Cumulative Costs	**($150,000)**	**($200,000)**	**($200,000)**	**($200,000)**	**($200,000)**	**($200,000)**	**($200,000)**	**($200,000)**	**($200,000)**	**($200,000)**
Productivity		$29,520	$59,040	$59,040	$59,040	$59,040	$59,040	$59,040	$59,040	$59,040
Faster Repair		$10,000	$20,000	$20,000	$20,000	$20,000	$20,000	$20,000	$20,000	$20,000
Annual Benefits	**$0**	**$39,520**	**$79,040**	**$79,040**	**$79,040**	**$79,040**	**$79,040**	**$79,040**	**$79,040**	**$79,040**
Cumulative Benefits	**$0**	**$39,520**	**$118,560**	**$197,600**	**$276,640**	**$355,680**	**$434,720**	**$513,760**	**$592,800**	**$671,840**

Figure 5.2 Cash flow schedule

TIME VALUE OF MONEY (OPPORTUNITY COSTS)

The timing of benefits and costs has an impact on their current value. A $100 bill in hand today is more valuable than a $100 bill that will not be in hand until next year. This is because money in hand today can be invested during the year to return a greater amount at year's end. If an organization has to wait a full year realize a benefit of $100, there is an *opportunity cost* associated with this delay. The opportunity cost can be quantified as the return that might have been earned if the $100 had been in hand and invested at the start of the year. (In the same way, if an organization can delay a $100 cost for a year, the negative value of that cash flow is mitigated by the fact that the money can be invested for a year prior to being spent.)

Opportunity Costs for Future Investments

The essential concepts in addressing the time value of money for future investments are: future values, present values, and the discount rate.

- A *future value* is the actual cash flow that will be realized at the time shown. GIT cost and benefit estimates are typically expressed as future values.

- The *present value* of a future cost or benefit is the value today of experiencing that cost or benefit at the projected time in the future. Present values allow a realistic comparison of cash flows that occur in different periods. The future values of GIT costs and benefits should be converted into present values prior to calculating the financial metrics (return on investment, net present value, etc.).

- The *discount rate* is a multiplier that converts future values to present values. This multiplier reflects the annual rate of return available from an alternative investment. This may be a secure alternative such as government bonds, or it may be an average or published rate of return for investments of a similar nature or risk level. Most finance departments provide guidelines for discount rates to be used within their organizations. The discount rate is sometimes called a cutoff rate, hurdle rate, required rate of return, or opportunity cost of capital.

The following equation shows how a simple (or *nominal*) discount rate converts a future cash flow to its present value.

$$\mathbf{PV = FV_n \div (1 + DR)^{n-1}}$$

Where:

PV	=	Present value of the cash flow
FV_n	=	Future value estimated for year n
DR	=	Discount Rate
n	**=**	The year of the future cash flow (e.g., n = 1 for current period cash flows, n = 2 for next year's cash flows)

Figure 5.3 shows how a spreadsheet can be used to convert a cash flow schedule into present values. The spreadsheet first expresses annual costs and benefits as future values. It then applies the above equation to convert these cash flows to present values. As with the undiscounted schedule, the cumulative values are calculated by adding the present value of the current year's cash flow to the previous year's cumulative value.

Discount Rate = 5%										
Year	1	2	3	4	5	6	7	8	9	10
Annual Costs	($150,000)	($50,000)	$0	$0	$0	$0	$0	$0	$0	$0
PV Annual Costs	($150,000)	($47,619)	$0	$0	$0	$0	$0	$0	$0	$0
Cumulative Costs	($150,000)	($197,619)	($197,619)	($197,619)	($197,619)	($197,619)	($197,619)	($197,619)	($197,619)	($197,619)
Annual Benefits	$0	$39,520	$79,040	$79,040	$79,040	$79,040	$79,040	$79,040	$79,040	$79,040
PV Annual Benefits	$0	$37,638	$71,692	$68,278	$65,026	$61,930	$58,981	$56,172	$53,497	$50,950
Cumulative Benefits	$0	$37,638	$109,330	$177,607	$242,634	$304,564	$363,545	$419,717	$473,214	$524,164

Present Value of Annual Benefit in Year 3:

$$= FV \div (1 + DR)^{n-1}$$
$$= 79{,}040 \div (1 + 0.05)^{3-1}$$
$$= 71{,}692$$

Present Value of Cumulative Benefits in Year 3:

= PV Year 3 Benefits + PV Year 2 Cumulative Benefits
= 71,692 + 37,638
= 109,330

Figure 5.3 Using a spreadsheet to convert a cash flow schedule to present values

Opportunity Costs and Historical Analyses

The time value of money is also relevant in historical analyses (reviews of past investments). Discount rates are used to convert actual historical cash flows into adjusted values for a single year in the same way that they are used to convert a future investment's cash flows into present values The essential concepts in addressing the time value of money in past investments are: actual historical cash flows, adjusted values, and basis for stating adjusted values.

- An *actual historical cash flow* is a cost or benefit expressed in the dollars actually spent (or realized) in the year the cost or benefit occurred.

- The *adjusted value* of a historical cash flow translates the dollars into the value they held in a particular year, typically the year of project inception. These values are expressed with a reference to the subject year. For example: $2.3 Million (in 2001 dollars).

Adjusted values allow a realistic comparison of cash flows that occur in different periods. Actual historical cash flows should be adjusted into values for a single year prior to calculating the financial metrics (return on investment, net present value, etc.).

- The adjusted values in a historical analysis are stated as dollars for a particular year. The selected year is the *basis for stating the adjusted values*, and any year can be used as long as all cash flows are converted to the values they hold in that year. Although any year can serve as the basis for the adjusted values, it is valuable to use the year of project inception. This enables analysts to compare actual financial performance to the business case (projections) prepared at the beginning of the project. In other words, if analysts prepared a business case prior to launching a project, they would have discounted all projected cash flows to present values (i.e., values at the year of project inception). By using this same year as the basis for stating adjusted values in a historical analysis, an analyst can safely compare the cash flows (and resulting financial metrics) from both business cases.

DEALING WITH INFLATION

Inflation occurs when money loses purchasing power over time. *Purchasing power* is the amount of real goods or services that can be acquired for a given sum of money. When the inflation rate is high or the investment life span is longer than a couple of years, inflation can have a significant impact on the purchasing power of future cash flows.

When estimating the future values of costs and benefits for long projects, it is important to consider inflation and to document whether or not it is included in the estimates. Inflation should be treated consistently throughout the analysis. In other words, it should be included in all cash flow estimates or in none of them. If internal labor estimates reflect cost of living increases each year, then estimates of new or avoided data license fees should likewise reflect annual price increases anticipated from the vendor. If future values of cost and benefit estimates do not include an inflation factor, then this fact should be stated in the analysis.

However, if the future values reflect inflation, then the nominal discount rate must be adjusted to reflect the reduction in purchasing power over time. This reduces the impact of the discount rate on the future cash flows because it reduces the true value (purchasing power) of the return that could be earned if the cash were otherwise invested. A *real discount rate* (as opposed to a simple or nominal discount rate) is a multiplier that is adjusted to reflect inflation. The assumed inflation rate should be clearly documented. Most Finance Departments will provide guidelines for inflation assumptions and real discount rates.

The following equation shows how to use a real discount rate (the nominal discount rate reduced by the inflation rate) to convert future cash flows that reflect inflation.

$$PV = FV_n \,[\,(1 + IR) \div (1 + DR)\,]^{n-1}$$

Where:

PV	=	Present value of the cash flow
FVn	=	Future value estimated for year n
IR	=	Assumed annual inflation rate
DR	=	Annual nominal discount rate
n	=	The year of the future cash flow (e.g., n = 1 for current period cash flows, n = 2 for next year's cash flows**)**

Figure 5.4 shows how a spreadsheet can convert future cash flows that reflect inflation. Compare Figure 5.4 to Figure 5.3. The present values in Figure 5.4 (with the inflation accounting) are higher than those in Figure 5.3 because inflation has reduced the opportunity cost of money.

Discount Rate = 5%										
Inflation Rate = 2%										
Year	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Annual Costs	**($150,000)**	**($50,000)**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
PV Annual Costs	**($150,000)**	**($48,571)**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
Cumulative Costs	**($150,000)**	**($198,571)**	**($198,571)**	**($198,571)**	**($198,571)**	**($198,571)**	**($198,571)**	**($198,571)**	**($198,571)**	**($198,571)**
Annual Benefits	**$0**	**$39,520**	**$79,040**	**$79,040**	**$79,040**	**$79,040**	**$79,040**	**$79,040**	**$79,040**	**$79,040**
PV Annual Benefits	**$0**	**$38,391**	**$74,588**	**$72,457**	**$70,387**	**$68,376**	**$66,422**	**$64,524**	**$62,681**	**$60,890**
Cumulative Benefits	**$0**	**$38,391**	**$112,979**	**$185,436**	**$255,822**	**$324,198**	**$390,620**	**$455,144**	**$517,825**	**$578,715**

Present Value of Annual Benefit in Year 3:

$$= FV * [(1 + IR) \div (1 + DR)]^{n-1}$$
$$= 79{,}040 * [(1 + 0.02) \div (1 + 0.05)]^{3-1}$$
$$= 74{,}588$$

Figure 5.4 Using a spreadsheet to calculate present values for a cash flow schedule that reflects inflation

Note: The example in Figure 5.3 shows future cash flows that "level off" to constant values toward the end of the project. Often, this is an indication that the future values ignore inflation, in which case a simple or nominal discount rate should be used rather than the real discount rate illustrated in Figure 5.4. Before factoring inflation into a present value conversion process, it is important to verify that the future cash flows actually reflect inflation.

COMMON FINANCIAL METRICS

Once the cash flow schedule is converted to reflect present values, standard metrics can be used to express the financial value of the project. Five common financial metrics are net present value, return on investment, internal rate of return, breakeven point, and payback period.

Net Present Value (NPV)

NPV is the sum of the present values of all cash flows (i.e., benefits net of costs). The equation for calculating NPV is as follows:

$$\mathbf{NPV = \sum PV}$$

Where:

$\sum PV$ = sum of present values of future cash flows

This is the best overall measure of financial value because a higher NPV always indicates a better financial investment. A positive NPV indicates that a project is financially viable. When deciding between mutually exclusive projects or rationing project funding, NPV will indicate which projects have the greatest financial value.

Refer to Figure 5.4 (the cash flow schedule converted to present values with the real discount rate). The present value of cumulative costs in this example is ($198,571), and the present value of cumulative benefits is $578,715. Adding these cumulative costs and benefits produces an NPV of ($198,571) + $578,715 = $380,143. This indicates the project is financially viable and is a better investment that alternative projects with NPVs less than $380,143 (assuming the strategic values of the projects are equivalent).

Return on Investment (ROI)

ROI is the ratio of NPV to the absolute present value of all costs. (Note: The absolute value of the costs is expressed as a positive rather than a negative number). A positive ROI indicates that a project is financially viable.

Refer to Figure 5.4 and the discussion of NPV above. The present value of cumulative costs in this example is ($198,571), and the NPV is $380,143. ROI is figured as NPV divided by the absolute value of the cumulative costs: $380,143 ÷ $198,571 = 190%. This indicates the project is financially viable. ROI may be annualized (expressed as an annual rate of return). Financial calculators and spreadsheets have functions that provide this value. It can also be approximated by dividing the ROI by the number of years in the project life (in this example, the 10 year planning period). The annualized rate of return for this is example is approximated as 190% ÷ 10 years = 19% per year.

ROI is not the same thing as a benefit/cost ratio. ROI is a ratio of *net* benefits (NPV) to costs. Benefit/cost ratios divide cumulative benefits by cumulative costs. These ratios should use present values. They can be calculated for each year of a project's life and are useful for calculating breakeven point.

Despite its popularity, ROI is an inappropriate metric for comparing mutually exclusive investments. There are two reasons for this:

- First, projects with a high NPV can have a relatively low ROI while projects with a low NPV can have a deceptively high ROI. For example, assume there are two mutually exclusive investments. One is worth $100,000 (NPV) with an ROI of 12% and the other is worth $80,000 (NPV) with an ROI of 14%. If only one investment can be pursued and the projects have equivalent risk and strategic value, then the best option is to pursue the first one. The $100,000 NPV is worth more than the $80,000 NPV regardless of the ROI percentages.

- Second, ROI is sensitive to subjective assumptions about the nature of costs and benefits. A particular GIT project may create some new costs or workload while simultaneously streamlining other tasks and reducing other costs. It is up to an analyst's subjective judgment whether to consolidate or itemize workload and cost impacts. Analysts who consolidate impacts will typically produce higher ROI figures than analysts who itemize. This is because ROI depends on a denominator that is a reflection of total investment costs. As discussed in Chapter 4, it may be appropriate to treat certain types of costs as reductions in benefits. This reduces the "cost denominator" of the ROI ratio and thus increases the resulting ROI.

Figure 5.5 shows three different analysts' interpretations of a proposed investment in an engineering research tool. Each analyst uses the same underlying assumptions, but they make different decisions about the itemization and presentation of costs and benefits. Each interpretation is valid and defensible. The decisions have no impact on NPV, which is the same in each analysis. However, the subjective differences in presentation yield very different ROI projections. The third analysis has an ROI that is more than 50% higher than that produced in the first analysis. These examples illustrate the significant weakness of ROI as a tool for comparing investment alternatives. They also demonstrate the power of NPV, which is a much better comparative tool because it is immune to analysts' subjective decisions about the presentation of costs and benefits.

Analysis 1: **Itemize Everything**	**Analysis 2:** **Consolidate Engineering Impact**	**Analysis 3:** **Consolidate Engineering and Service Contract Impacts**
<u>Assumptions</u> Project Life – 5 Years Inflation Rate – 2.5% Cost of Capital – 5% Fringe Rate – 50% Labor costs reflect inflation rate	<u>Assumptions</u> Project Life – 5 Years Inflation Rate – 2.5% Cost of Capital – 5% Fringe Rate – 50% Labor costs reflect inflation rate	<u>Assumptions</u> Project Life – 5 Years Inflation Rate – 2.5% Cost of Capital – 5% Fringe Rate – 50% Labor costs reflect inflation rate
<u>Current (and Burdened) Rates</u> Programmers – $30 ($45) Administrator – $40 ($60) Analysts – $35 ($52.50)	<u>Current (and Burdened) Rates</u> Programmers – $30 ($45) Administrator – $40 ($60) Analysts – $35 ($52.50)	<u>Current (and Burdened) Rates</u> Programmers – $30 ($45) Administrator – $40 ($60) Analysts – $35 ($52.50)

Analysis 1: Itemize Everything	**Analysis 2: Consolidate Engineering Impact**	**Analysis 3: Consolidate Engineering and Service Contract Impacts**
<u>One-time Costs (all Year 1)</u> New Software: $50,000 Programmer Time: 500 hours Administrator Time: 40 hours Analysts Time: 80 hours	<u>One-time Costs (all Year 1)</u> New Software: $50,000 Programmer Time: 500 hours Administrator Time: 40 hours	<u>One-time Costs (all Year 1)</u> New Software: $50,000 Programmer Time: 500 hours Administrator Time: 40 hours
<u>Annual Costs</u> Administrator Labor: 8 hours Software Maintenance: $10,000	<u>Annual Costs</u> Administrator Labor: 8 hours Software Maintenance: $10,000	<u>Annual Costs</u> Administrator Labor: 8 hours
<u>Annual Benefits</u> Faster Research for Analysts: Year 1 – 200 hours Year 2 – 400 hours Year 3 – 400 hours Year 4 – 400 hours Year 5 – 400 hours Avoid Research Contract: Year 2 – $15,000 Year 3 – $15,500 Year 4 – $16,000 Year 5 – $16,500	<u>Annual Benefits</u> Faster Research for Analysts: Year 1 – 120 hours Year 2 – 400 hours Year 3 – 400 hours Year 4 – 400 hours Year 5 – 400 hours Avoid Research Contract: Year 2 – $15,000 Year 3 – $15,500 Year 4 – $16,000 Year 5 – $16,500	<u>Annual Benefits</u> Faster Research for Analysts: Year 1 – 120 hours Year 2 – 400 hours Year 3 – 400 hours Year 4 – 400 hours Year 5 – 400 hours Reduce Contract Fees: Year 2 – $5,000 Year 3 – $5,500 Year 4 – $6,000 Year 5 – $6,500
Cumulative Cash Flows <u>(Present Values)</u> Costs – $118,698 Benefits – $153,907	Cumulative Cash Flows <u>(Present Values)</u> Costs – $114,498 Benefits – $149,707	Cumulative Cash Flows <u>(Present Values)</u> Costs – $76,823 Benefits – $112,032
NPV: $35,209 ROI: 5.93% (Annualized)	NPV: $35,209 ROI: 6.15% (Annualized)	NPV: $35,209 ROI: 9.17% (Annualized)

Figure 5.5 Subjective decisions about treatment of costs and benefits yield different ROI projections for the same investment, yet NPV remains unaffected

Internal Rate of Return (IRR)

The internal rate of return (IRR) is the discount rate that would produce an NPV of zero (i.e., the discount rate at which the cumulative present value of benefits equals the cumulative present value of costs). If the IRR exceeds the minimum rate of return that an organization requires for a project, it can be deemed a good investment. However, IRR is an inappropriate metric for comparing investment options because a high NPV project can have an IRR that is lower than an alternative project with a smaller NPV.

Spreadsheet software and financial calculators are typically used to calculate IRR for a stream of cash flows. Without these tools, solving for IRR requires trial and error estimates of NPV at different discount rates (similar to solving for square roots). If the first discount rate produces a positive NPV, try again and again with higher rates until NPV is negative. A graph of NPVs (or present values of costs and benefits) at different discount rates can help zero in on the IRR. See Figure 5.6.

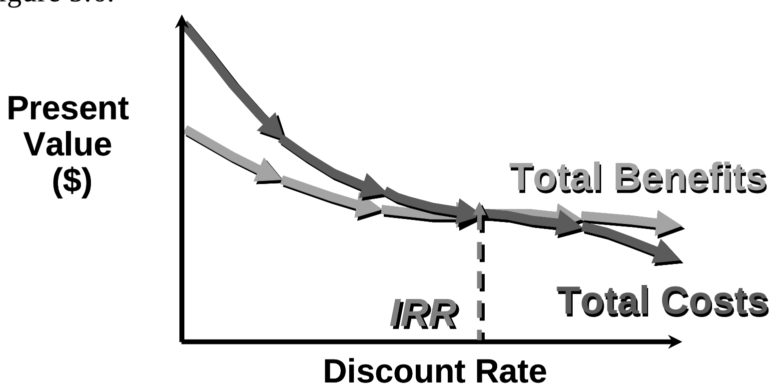

Figure 5.6 Estimating IRR by plotting cumulative present values at different discount rates

Breakeven Point

Breakeven point is the year in which cumulative benefits equal cumulative costs. Financially viable projects will break even at some point in the future. Although this metric is politically relevant, it is not a meaningful financial differentiator and should not be used to compare the financial impact of alternative projects. For example, assume there are two mutually exclusive investments. One is worth $100,000 (NPV) and will break even in Year 4, and the other is worth $80,000 (NPV) and will break even in Year 3. If only one investment can be pursued and both projects have the same risk and strategic value, then the best option is to pursue the first one. Expressed as a present value, $100,000 is always worth more than $80,000 regardless of the timing of the cash flows.

To calculate the breakeven point, look for the year in which cumulative benefits exceed cumulative costs. This can be achieved in a spreadsheet by setting up a “benefit/cost ratio” row that divides cumulative benefits by cumulative costs. Breakeven occurs in the year where the ratio exceeds 1. (The same thing can be accomplished with a “Net Benefits” row that subtracts cumulative costs from cumulative benefits. In this case, look for the year in which the net benefits exceed 0.) Present values should be used in the calculation of the benefit ratios or net benefits.

Payback Period

The payback period is the length of time between the initial investment (project start) and the breakeven point, typically expressed in months or years. Like the breakeven point, this metric is politically relevant, but it is not a meaningful financial differentiator and should not be used to compare the financial impact of alternative projects.

Figure 5.7 illustrates the calculation of the breakeven point and payback period. Breakeven occurs at the point where the cost and benefit lines intersect. If these lines intersect more than once (due to periodic cost spikes such as those associated with hardware and software replacement), the breakeven point is the final intersection.

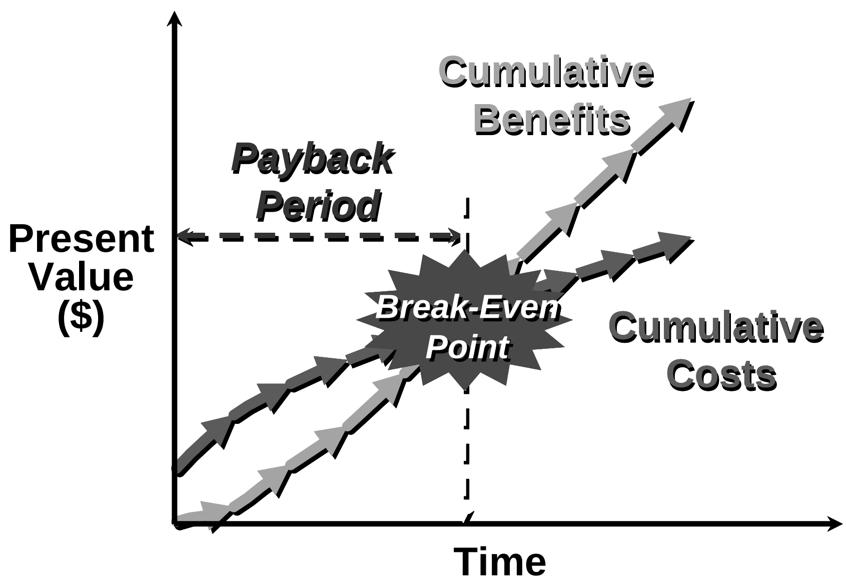

Figure 5.7 The breakeven point occurs when cumulative benefits begin to exceed cumulative costs. The payback period is the span between the outset of the project and the breakeven point.

IMPACT OF RECASTING INTERNAL LABOR COSTS

It may be politically expedient to recast internal labor costs as a reduced productivity benefit (see Chapter 3). This process has no impact on NPV because it trades a negative cash flow for a proportionately reduced positive cash flow, and the sum of all cash flows is unchanged. The process will also not effect the determination of project viability using ROI or breakeven point because this determination is really a reflection of NPV (i.e., ROI will always be greater than zero and a project will eventually break even if NPV is positive). However, the recasting process has the effect of reducing stated project costs, which leads to a higher ROI. As illustrated in Figure 5.5, the distinction between a cost and a negative benefit is open to interpretation. As a result, the denominator in an ROI ratio is subjective. This is the reason NPV is the preferred tool for comparing investment options.

SENSITIVITY ANALYSIS

Financial analysis relies on estimates and assumptions. If actual costs and benefits differ from the estimates, the results of the investment will differ from those predicted by the analysis. If NPV is extremely sensitive to an uncertain cash flow estimate with a wide range of possible actual values, then the investment may be riskier than an alternative for which there is a narrower range of possible values or less sensitivity to any particular estimate. When two investment alternatives have the same NPV, the option with the lower risk is typically viewed as the better investment (although some organizations may prefer riskier options that have a strong possibility of achieving a higher NPV). Sensitivity analysis illustrates the risk inherent in a financial analysis and allows officials to factor their risk tolerance into the decision-making process.

Sensitivity analysis begins with thorough documentation of all benefit and cost estimates and the assumptions underlying these estimates (see Chapters 3 and 4). Each of these estimates and assumptions are *variables* in the investment decision. In addition to the cash flow estimates, important investment variables include the cash flow schedule, the events that affect that cash flow schedule, and the opportunity cost of capital (discount rate). Sensitivity analysis looks at how these variables affect NPV. This is accomplished by calculating several "versions" of NPV using different values for one or more selected variables while holding all other variables at their original levels.

For numeric variables (cash flow estimates, discount rates), the sensitivity analysis typically includes the "minimum" and "maximum" NPV (the NPV for the minimum and maximum values of the variable under consideration). The sensitivity analysis also may indicate the value of the variable that produces an NPV of zero. If this "breakeven" level of the variable is significantly higher than the potential minimum value of the variable or is otherwise likely to occur, the investment may be deemed a risky one. Alternatively, if the worst-case scenarios for the significant variables still produce a positive NPV, then the investment may be deemed a low-risk option.

For nonnumeric variables (such as events that influence cash flows or timing), the sensitivity analysis shows NPV for alternative assumptions and then states the confidence level in the original assumption. If confidence in the original assumption is low and alternative assumptions produce a negative NPV, the investment may be deemed a risky one. Low risk investments are characterized by high confidence levels in all variables and positive NPVs even for worst-case scenarios of alternative assumptions. Following is an example of sensitivity analysis for a nonnumeric variable. Refer to the previous figures and examples for background.

This financial analysis assumes training will happen in Year 2. It is possible that emergency management training might be delayed as long as Year 4 (the termination of the current union contract). If this happens, benefits will not begin until Year 5, and the NPV will drop roughly 50% to $194,708. Annualized ROI will drop from 19% to 10%. It is highly unlikely that training will be delayed beyond the end of Year 2 because influential union officials have expressed their support. Even under the worst case scenario for this variable, the investment is still cost-justifiable.

Figure 5.8 shows how to use a spreadsheet to calculate alternative financial metrics for the different assumptions in the sensitivity analysis example above. This can be compared to the original analysis shown in Figure 5.3, where the benefits are shown to occur partially through Year 2 of the project.

Year	1	2	3	4	5	6	7	8	9	10
Annual Costs	($150,000)	($50,000)	$0	$0	$0	$0	$0	$0	$0	$0
PV Annual Costs	($150,000)	($48,571)	$0	$0	$0	$0	$0	$0	$0	$0
Cumulative Costs	($150,000)	($198,571)	($198,571)	($198,571)	($198,571)	($198,571)	($198,571)	($198,571)	($198,571)	($198,571)
Annual Benefits	$0	$0	$0	$0	$79,040	$79,040	$79,040	$79,040	$79,040	$79,040
PV Annual Benefits	$0	$0	$0	$0	$70,387	$68,376	$66,422	$64,524	$62,681	$60,890
Cumulative Benefits	$0	$0	$0	$0	$70,387	$138,762	$205,184	$269,709	$332,389	$393,279
									NPV ($393,279-$198,571):	$194,708
									ROI ($194/708 / $198,571):	98%
									Annualized (98% / 10 years):	10%

Figure 5.8 Calculation of NPV and ROI with training delayed until Year 4

CHAPTER 6
STRATEGIC ANALYSIS AND THE BUSINESS CASE

KEY CHAPTER OBJECTIVES

This chapter discusses how to present the strategic value and make the business case for the proposed shared data and services GIT program. This includes how best to present the intangible benefits that are not captured in the financial analyses and how to present any project interrelationships, and benefits that extend beyond organization. A recommended format for an Executive Summary of the project is also provided. Examples of strategic (intangible) benefits for each of the 12 business use areas are also provided at the end of the chapter.

INTERPRETING A BUSINESS CASE

Rigorous financial analysis of proposed GIT investments is rare and analysis of actual financial performance is rarer still. This is even more unusual for shared data and services GIT projects. Given the importance and size of these investments, the lack of rigorous business case analysis is unfortunate, and it provides the impetus for this workbook.

The purpose of a rigorous business case is to prepare decision-makers across multiple agencies to evaluate a proposed shared data and services GIT investment. While cost projections are relatively easy to assemble and must be accurate enough to support budgeting, the benefit estimates in a business case are often much harder to quantify and much more sensitive to the business case's underlying assumptions. When reviewing a business case for a proposed future investment, it is important to keep in mind the uncertainties associated with the benefit estimates. The point of a business case is not to guarantee a particular stream of benefits but rather to provide a reasonable indication of the prudence and relative value of a potential investment.

It is also useful to evaluate actual historical cash flows for a project. These analyses teach analysts to fine-tune their estimating skills, and this improves the reliability of future business cases. The purpose of preparing a historical business case is to learn lessons that can be applied to the evaluation of related future projects. Some organizations regularly conduct post implementation reviews of their capital projects and the use of the concepts and templates presented in this workbook will provide the necessary backup to allow an effective review.

It is important that the business case include a discussion of the strategic value of the investment in addition to the financial metrics discussed in previous chapters.

WHAT IS STRATEGIC ANALYSIS?

The strategic analysis section of a business case provides the context for interpreting the financial analysis. It explains how an investment furthers an organization's mission and goals, and it presents intangible (non-quantifiable) benefits. The strategic analysis also addresses project interrelationships. This is particularly important for GIT projects that involve data capture since the data may support a wide range of future endeavors.

Strategic analysis is an essential part of the business case for an investment, and is typically presented in a narrative form prior to presenting the financial metrics calculated through the templates.

STRATEGIC BENEFITS AS INTANGIBLES

The strategic analysis section of a business case is the place to define intangible benefits. These are the benefits that are not readily quantifiable. General examples of strategic benefits include higher employee morale and/or safety, more public goodwill, or an increased certainty of business continuity among agencies.   These can also be presented as consequences to the organization should the project not proceed.

PROJECT INTERRELATIONSHIPS

If the project under consideration will lay the groundwork for future projects, the strategic analysis describes these project relationships and the types of benefits that can be expected once the groundwork is in place.

For example, if a "foundation-type" GIT project provides a spatial inventory of linear infrastructure such as a transportation network, this will lay the groundwork for future linear asset management and security planning projects. The direct, tangible benefits of the first project may be limited to shared data access and data maintenance. However, the strategic benefits of the project include the ability to launch a linear asset management program that will likely reduce asset life cycle costs. It will provide a foundation for a linear asset security assessment and critical infrastructure protection plan among multiple agencies, which will improve public safety and increase the likelihood of business continuity in the event of a natural or man-made disaster.

Project interrelationships are particularly important for GIT investments among multiple agencies that are not justifiable from a purely financial perspective. If these projects are worthwhile, it is typically because they support future projects that will have a beneficial financial impact. It is important to communicate this potential clearly in the business case.

EXTERNAL BENEFITS

The benefits of a shared data and services GIT project must extend beyond the boundaries of the agencies that are funding it. If the funding agencies will be sharing data with other organizations or the general public, each of the data users will benefit. These benefits may even be quantifiable, but they will not find their way into the financial analysis if they do not accrue to the funding agency. The strategic analysis is the place to describe these external benefits.

For example, if a county agency is building a GIT capital project coordination application and making it available to other city and county agencies and utilities so that the community can identify project coordination opportunities, there will be many external benefits. Each of the participating agencies can anticipate a reduction in capital project costs. The agencies that maintain the streets and highways can anticipate an increase in useful pavement life through a reduction in excavations. Community businesses will benefit from a reduction in business interruption through better project coordination. All community residents can anticipate an improved quality of life due to a reduction in the number of disruptive excavations. Some of these benefits are quantifiable for the benefiting agencies. Others are purely intangible. All of them belong in the discussion of the strategic value of the proposed GIT project.

COOPERATIVE SHARED DATA AND SERVICE GIT PROJECTS

When the external benefits of a GIT project are significant, there is often an opportunity for collaboration with outside agencies beyond those participating. For example, a regional planning agency interested in building a capital project coordination application may find willing partners in area local governments, other utilities, and large landholders such as universities, hospital districts, or military bases.

Shared data and service projects present an interesting challenge to business case development. Each participant must persuade its governing board or council that the project itself is beneficial and that the allocation of costs is equitable. This requires an analysis of the project as a whole followed by an analysis of each participant's costs and benefits.

The financial analysis for an organization's contribution to a shared data and services GIT project should include only those costs and benefits that accrue directly to the participant. The strategic analysis is the place to describe the entire project, all costs and the method for distributing them among participants, and all benefits, including the benefits that accrue to external agencies and the community as a whole.

COMPLETING THE BUSINESS CASE

The complete shared data and services GIT business case includes the following elements:

- **Project Definition** (see Chapter 2).

- **Financial Analysis.** This is usually a summary of key financial metrics and highlights of the sensitivity analysis. Detailed assumptions, calculations, and the complete sensitivity analysis are typically placed in an appendix. (See Chapter 5.)

- **Strategic Analysis.** This includes the discussion of strategic benefits, external benefits, and project interrelationships. In the case of collaborative projects, this is the place to describe the full project, the cost-sharing methodology, and the benefits to other participants and the community as a whole.

- **Recommended Course of Action.** If a business case is persuasive, it should conclude with a recommendation to make the investment among the participating agencies. If the business case is not persuasive, it may end with a recommendation to table the project concept for future consideration. Falling technology costs, the steady growth of commercially available spatial data, and regulatory changes can make a huge difference in the costs and benefits of a GIT project. Participating agencies may wish to revisit tabled business cases as part of an annual strategic planning process to determine whether circumstances have changed sufficiently to warrant an updated analysis.

A business case may be extremely brief or may be hundreds of pages long. Larger investments often require more detailed (longer) business cases. If a business case is more than a few pages long, it should include a brief executive summary.

CHAPTER 7
RESEARCH FINDINGS AND RECOMMENDATIONS

KEY CHAPTER OBJECTIVES

This chapter summarizes the research findings that are included in the appendices of the workbook. This includes the Literature Review and Case Study Findings. Recommendations regarding application of the research and further research directions are provided in this section.

LITERATURE REVIEW FINDINGS

The multi-agency literature review shows a variety of approaches for describing project benefits and presents a strong case for the importance of quantifying and communicating shared data and services GIT project benefits. However, methodology for quantifying the cost savings of these benefits has not been generally well developed nor does there appear to be a common set of standards. It has been more the case that benefits are described qualitatively and as strategic benefits. In cases where benefits metrics have been developed, these may not have been translated into cost savings needed for a complete financial analysis of a project. There does not appear to be a flexible methodology or toolset suitable to adaptation to the diverse range of benefits found in multi-agency GIT projects.

Additionally, the components of multi-agency projects have typically not been analyzed in detail to study how their parts fit together to make a business case for the project as a whole, or for the complete life cycle of the project. There have been efforts to study a portion of the issues of multi-agency business cases, such as an analysis of 15 states' approaches to working with funding sources for GIS projects, but there has been no comprehensive toolset for bringing all of these components into a financial analysis of an entire project. Existing tools do not appear suitable for multi-agency project management tasks during, for example, the stages of a complex project implementation.

Further, methodology has not been developed for strategic analysis of multi-agency projects, taking into account the diverse needs, goals and constraints of the participating agencies. These issues may have been described as a subset of an analysis, but there has been no methodology developed to assist in analysis of the business case for the project as a whole with the various participating agency component parts. The literature review shows no significant efforts toward integrating strategic analysis and traditional financial analysis for evaluation of multi-agency projects, although it points out the need for such a methodology as cases are described.

CASE STUDY FINDINGS

The following case study demonstrates the robustness and effectiveness of the developed ROI toolset in meeting the needs of a broad range of GIS programs. The organizations represented by this project include a combination of local, regional, state and federal organizations. The toolset has benefited greatly from exposure to this wide range of circumstances in that it has grown to accommodate the requirements of each participating agency. The WA-Trans case study includes separate financial analyses from a wide variety of agencies that will share data and services. These separate analyses are then consolidated to provide an overall project financial analysis (from the perspective of a state taxpayer rather than the perspective of a single agency).

WA-Trans Washington Statewide Transportation Framework

Organizations served include the Washington State Department of Transportation (WSDOT), which is funding the bulk of the project, as well as a number of other agencies that will share the transportation data. Participating organizations include: Puget Sound Regional Council, multiple county governments, Sound Transit, County Road Administration Board (CRAB), a U.S. Bureau of Census Regional Office, Washington Department of Natural Resources, and Washington Department of Fish and Wildlife. Nineteen different organizations contributed to the case study.

The state DOT's mission is to keep people and business moving by operating and improving the state's transportation systems. WA-Trans will support this mission by providing a seamless, statewide transportation location-based data set that includes the best information available about roads, railroads, airports, ferry terminals and routes, port facilities, and non-motorized transportation routes such as bike paths and horse trails. The data will be used to improve transportation planning, analysis and design capabilities not only for the state DOT but also for local and regional organizations across the state. Better transportation planning will ultimately lead to better transportation infrastructure and more effective utilization of existing resources.

In order to integrate data from local, state, federal and tribal governments, the scope of the WA-Trans project includes:

- Completing the development of the statewide spatial database and related data standards;
- Implementing supporting applications that provide access to the spatial database and support integration of disparate data sets; and
- Developing interagency agreements in support of data sharing to formalize collaborative data collection and maintenance.

The strategic analysis addresses the relationship of the project to the organization's mission and goals. It presents costs and benefits that cannot be quantified and are therefore ignored by the financial analysis. Sometimes, a project has such significant strategic value that it is worthwhile even if the financial analysis is not persuasive. Examples for this case study could fall in the areas of emergency management and response, cross-governmental communication, and public communication. Additionally, WA-Trans is identified as a part of the state enterprise architecture as a strategic data resource.

From the sole perspective of Department of Transportation, the financial return on this investment appears small (NPV just over $255,000 and ROI below 1%). But when the financial impact on all participating agencies is considered, the project shows a very healthy return (NPV of over $17 million and ROI of over 10%). The WA-Trans project furthers the mission of WSDOT and is projected to be a financially sound investment for taxpayers.

CONCLUSIONS

Each phase of this project has brought a distinct perspective to this broad study of return on investment methodology.

The literature review found that qualitative information on geospatial investments at government agencies is more common than quantitative analysis. This is not surprising, as intangible benefits are particularly important for agencies that typically have public service as a primary function. There have been some attempts to establish valuation of service provided to the public but there has been no development of corresponding systematic methodology. The literature showed no consistent methodology for use in financial analysis of multi-agency projects. Similarly, there has been no unified approach to strategic analysis for the combined effects of multiple agencies participating in a GIT project.

The case study provides insight into issues of actual implementation of the developed return on investment methodology as well as some findings about geospatial implementations at agencies. Large shared data and services GIT projects across a community have large costs and accompanying large benefits. In many cases, productivity benefits are dominant. Mature GIT implementations enable the return of substantial benefits from the development of new applications based on the existing technology at marginal additional cost. Complex projects involving multiple agencies can provide substantial quantifiable and strategic benefits, but it may be time consuming to collect thorough and consistent benefit data from all affected agencies.

RECOMMENDATIONS FOR USING THESE TOOLS AND FOR FUTURE RESEARCH

This shared data and services GIT return on investment project has resulted in many new ideas for implementation of the methodology in a variety of governmental organizations. In performing the case study, the GITA ROI Team has adapted the methodology to make it more useful to the needs of the case study organizations as well as potential future users of this resource. Our recommendations focus on opportunities for further improving the usefulness of the tools developed by this project.

To better educate individuals on the use of these tools, it would be very worthwhile to take a workshop approach for the initial working with the templates. This project has demonstrated that the workshop approach is more productive than the more typical iterative procedure, in which one person develops drafts of templates, and circulates them for review and comment.

In organizing workshops for education in ROI methodology and collection of data for a case study, it is extremely important that participants be given a briefing on data requirements prior to conducting the workshop. If individual participants are able to bring supporting metrics to the workshop, they will receive a better understanding of the process of determining ROI for their projects. The financial analysis will thus benefit from the availability of the best possible metrics.

Agencies can benefit from a clear understanding of the uses of financial analysis at all stages of a project's life. Further work in this area should address the appropriate use of financial analysis at the various stages of a project's life: from making the business case in order to obtain project funding, to setting the stage for analysis of project performance, to full historical analysis once full benefits have been realized.

Finally, one area of improvement would be to perform a more in-depth review of each of the 12 application areas and create more specific templates, or validated benchmarks, that a agency should consider when considering an application in that particular area.   A second area of improvement would be the compilation of sample legal agreements for sharing GIT data and services. GITA will be assessing these opportunities in the future based on demand from industry.