Chapter 12

Evaluating Decision Support Systems Projects

We must choose wisely among Decision Support Systems projects.

Introduction

Information Technologies support a more global society and many companies now compete in markets all over the world. To compete effectively companies must integrate transaction processing and decision support systems. New systems are needed to support managers working in this new market environment. Telecommunications, shared databases, groupware, Data-Driven and Model-Driven DSS must be integrated and coordinated. Many barriers including language, differing regulations and technology issues must be overcome to make global transaction processing and decision support integration a reality. Integration in a company will not likely occur as part of one large-scale project, rather it will occur more incrementally through the implementation of many smaller projects.

Most observers agree new technologies have created many opportunities to implement innovative Decision Support Systems. This is the good news. The bad news is that many projects will not meet expectations and some will be spectacular failures. To increase the success rate, we need to carefully evaluate proposed DSS projects.

Many managers and MIS professionals are involved in evaluating proposed DSS projects. The technical managers who need to focus on evaluating DSS projects include the Chief Information Officer, corporate IT professionals, database administrators, and network administrators. The business managers who evaluate innovative DSS projects include senior managers, strategic planners, business development managers, competitive intelligence analysts, and market researchers.

When we evaluate projects, we must be skeptical and we must ask questions. We need to understand and use evaluation tools and techniques. Also, for a DSS project, it is very important to examine the technological risk. But, we may also need to consider cross-cultural and international issues when evaluating DSS projects.

Common evaluation questions include: What is the return on investment for a proposed DSS project? What is the payback period? What is the opportunity cost? What are the anticipated benefits? What can we do with a new system that we cannot do with our current information systems? Do our competitors have a data warehouse or OLAP or an EIS? Managers should ask these questions about a proposed or in process DSS project, but it may be difficult to provide satisfactory answers to them. Almost everyone agrees that evaluating and justifying a Decision Support Systems project can be difficult and challenging.

This chapter focuses on the process of evaluating proposed Decision Support Systems projects, especially Web-Based projects; evaluation tools; evaluation criteria; international DSS issues, ethics and privacy issues, and conclusions about evaluating DSS projects.

DSS Project Evaluation Process

Managers evaluate many types of projects, but technology projects are usually the most difficult to evaluate. Evaluating DSS projects is especially difficult and it must be an on-going process for large-scale projects. Evaluation activities should be commensurate or **proportionate** to the **scope**, **complexity**, and **cost** of a proposed DSS project. Project sponsors and project managers must decide what amount and type of evaluation is appropriate and necessary in their company's Information Technology management environment.

A discussion of the process of evaluating DSS projects generates many questions. For example, when should DSS projects be evaluated? Should we examine in-house capabilities when we evaluate DSS projects? When does vendor evaluation occur? Once we have a project team, what is their role in DSS project evaluation? Who should do the evaluation? Is a feasibility analysis always needed? How many go-no go opportunities do managers have? Most managers can add to this list. I will try to offer suggestions about some of the most commonly asked questions.

Figure 12.1 portrays the evaluation process as a multi-stage cycle of development and evaluation. The scale of the project and the development approach determines what activities will actually occur and in what sequence. Evaluation should be performed periodically from the initial idea stage to the final post-implementation project evaluation. A DSS project can be revised or even canceled at any stage. The resources that have been expended on the project are "sunk" costs. One should not continue a bad project because of the money and resources that have already been spent on it. Managers need to know when to stop spending money and divert funds to more feasible projects. Managers also need to know when despite setbacks it is desirable to continue an important project.

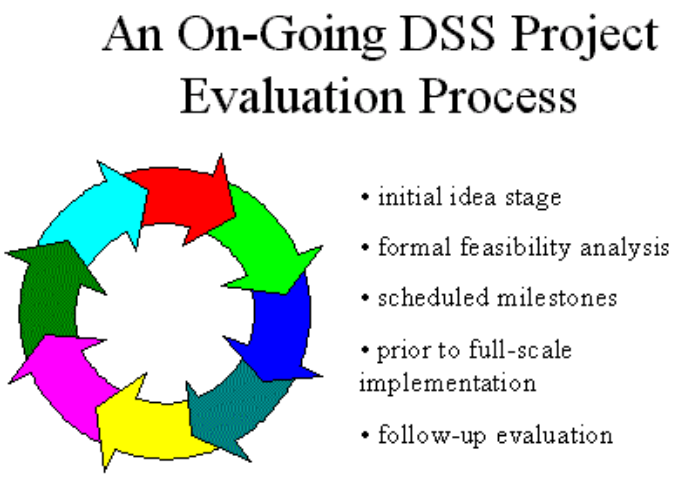


Figure 12.1 – On-Going DSS Project Evaluation Process

First, there are several possible times and ways to evaluate a DSS project. At different times in the development of a DSS, a different type of evaluation may be needed. An initial DSS idea often needs nurturing. So at the initial idea stage we probably want a positive, developmental evaluation. At some point in the design stage for a DSS project a feasibility study needs to be completed. Even small-scale end user built DSS projects need to be evaluated. Often a feasibility study actually improves the understanding of a proposed Decision Support System. The extent of the feasibility study should be a function of the scope of a proposed DSS and the type of proposed DSS. A feasibility study for a Web-Based, Data-Driven DSS should be much more extensive than a study for a small-scale Model-Driven DSS on a single personal computer. What should be included in a data warehouse feasibility analysis?

Managers should conduct some type of evaluation of a large-scale DSS project at each step in the Systems Development Life Cycle (SDLC) or after each major change in a prototype. Prior to implementation an enterprise-wide or inter-organizational DSS must be carefully evaluated. Managers should not hesitate to delay implementation if problems are encountered. A DSS project will fail dramatically if problems are encountered doing the initial roll-out for the DSS. A DSS is usually best introduced in stages. The initial user group is critical to the overall long-term success of the project. After implementation, DSS should be regularly reviewed and evaluated. Technologies and user needs change and a process should be in place to insure that an obsolete DSS is not hurting decision-making rather than enhancing it.

We should always examine in-house capabilities when we evaluate DSS projects. In general, DSS projects should be implemented by in-house Information Systems staff. We want to enhance expertise with DSS tools among company employees and in general DSS applications should be treated as key business capabilities.

DSS are built using software development tools and so vendor evaluation will be part of many innovative and large-scale DSS. When does vendor evaluation occur? Usually vendors are selected once a feasibility analysis is completed. Vendor capabilities and software should be considered in a feasibility study.

Once we have a project team, what is their role in DSS project evaluation? Who should do the evaluation? Is a feasibility analysis always needed? How many go-no go opportunities do I have? The DSS project team has the major role in evaluating DSS projects. The team should do the feasibility study and managers need to recognize that a major DSS project should be evaluated regularly. A feasibility study is needed, but it may be very limited in the topics addressed (see Chapter 4). Canceling a project is always difficult, but managers can avoid this by actively managing DSS projects and by critically evaluating the feasibility of proposed projects.

Large-scale DSS projects can be expensive. A data warehouse project can cost $1 million to $2 million and take 1 to 3 years to complete. Business benefits can however be extensive. An IDC study of 62 firms found an average 3-year ROI of 401% and the payback period can be very short.

Large-scale DSS can become a key strategic weapon for a company. Project evaluation helps increase the chance of success and cost effective implementation. Recall our goal is to provide managers with the right information, in the right format, at the right time and at the right cost. Let's now examine some tools that can help evaluate DSS projects.

Evaluation Tools and Techniques

For many years, business professors have been discussing the issues surrounding financial evaluation of capital expenditure projects. The argument continues. Typical evaluation tools recommended are Return on Investment (ROI), Net Present Value (NPV), and discounted cash flow. These tools are closely tied to the capital budgeting process and they are intended to provide a rational allocation of capital. This is a laudable goal.

Because managers are asked to spend funds on a Decision Support Systems project, anticipated results and benefits should be quantified so that the requested expenditure can be evaluated in comparable units. But for a DSS project it is difficult to quantify the results and benefits. DSS analysts are basically making estimates and guesses. A financial analysis is especially difficult because the costs are uncertain and many of the benefits are qualitative and intangible.

A number of alternative tools are available for evaluating data warehouse projects. Incremental value analysis is an evaluation of “soft” benefits such as improving staff productivity, improving the speed of strategic actions, enhancing a company's competitive advantage, or improving access to data. Another alternative, the scoring approach, considers intangible benefits and other considerations that are not considered credible by analysts who only focus on financial criteria. A third alternative, the qualitative benefits scenario approach attempts to estimate what decision-making will be like when a proposed DSS is in place and hence speculate on how the company will benefit. All of these qualitative approaches have pluses and minuses, but each can be improved by understanding the upside and downside of a DSS project. Table 12.1 lists 6 different evaluation tools and techniques.

Evaluation Tools and Techniques
Cost-Benefit Analysis
Cost-Effectiveness Analysis
Incremental Value Analysis
Qualitative Benefits Scenario Approach
Research and Development Options Approach
Scoring Approach

Table 12.1 – Summary of Evaluation Tools and Techniques

When choosing an evaluation method, you need to consider many questions, including: Which tools work best? What technique should I use for this specific DSS project? Should I use different techniques for Data-Driven DSS than Model-Driven DSS projects? Does the scope of the project (amount of dollars to be spent) influence the technique I should use? The next few paragraphs provide more details on the evaluation tools and assist in answering these questions.

Cost-Benefit Analysis

The primary benefit of DSS should be improved decisions. This intangible benefit presumes that managers will change their decision processes and actually use a data warehouse. In a recent Sentry Market survey, 30% of respondents identified "access to data" as the biggest benefit of a data warehouse. Other important benefits of DSS include: improved data accuracy; better control of data; better data consistency; decentralization of data; cost savings; and less reliance on legacy systems. Few managers think that DSS will result in cost savings.

Typical measures in Cost-Benefit Analysis (CBA) are ROI, NPV, and discounted cash flow. Cost-Benefit Analysis is grounded in finance and accounting and closely tied to the budget process. This analysis addresses the allocation of capital. CBA provides the appearance of accuracy and precision. CBA is useful for evaluating cost-savings projects and automation of current processes. CBA is difficult to use for decision-support, infrastructure, and strategic projects. For example, cost models for data warehouses are not available. Benefits are tough to measure. Benefits are not quantifiable or easily converted to dollars.

Examples of DSS cost factors include direct hardware and software costs, project personnel costs, support services (vendors or consultants), process change costs (people, material), and incremental infrastructure costs. Examples of DSS benefit factors include improved access to data, improved accuracy and consistency of data used in decision making, faster access to decision support, and cost savings from process improvements.

We can identify both tangible and intangible costs and benefits. We call a cost or benefit tangible if we can quantify the consequences. Intangible costs and benefits are difficult and sometimes impossible to quantify. Intangible results need to be

considered in an evaluation, but too many intangibles limit the validity of the cost-benefit analysis.

Cost-Benefit Analysis is a systematic, quantitative method for assessing the life cycle costs and benefits of competing alternatives. It involves explicitly stating assumptions, disregarding sunk costs and prior results, estimating direct and indirect costs and benefits, discounting costs and benefits, and performing sensitivity analysis. Discounting involves calculating how much a dollar of costs or benefits is worth today, even though it will be realized in the future. Discounting calculates the time value of money.

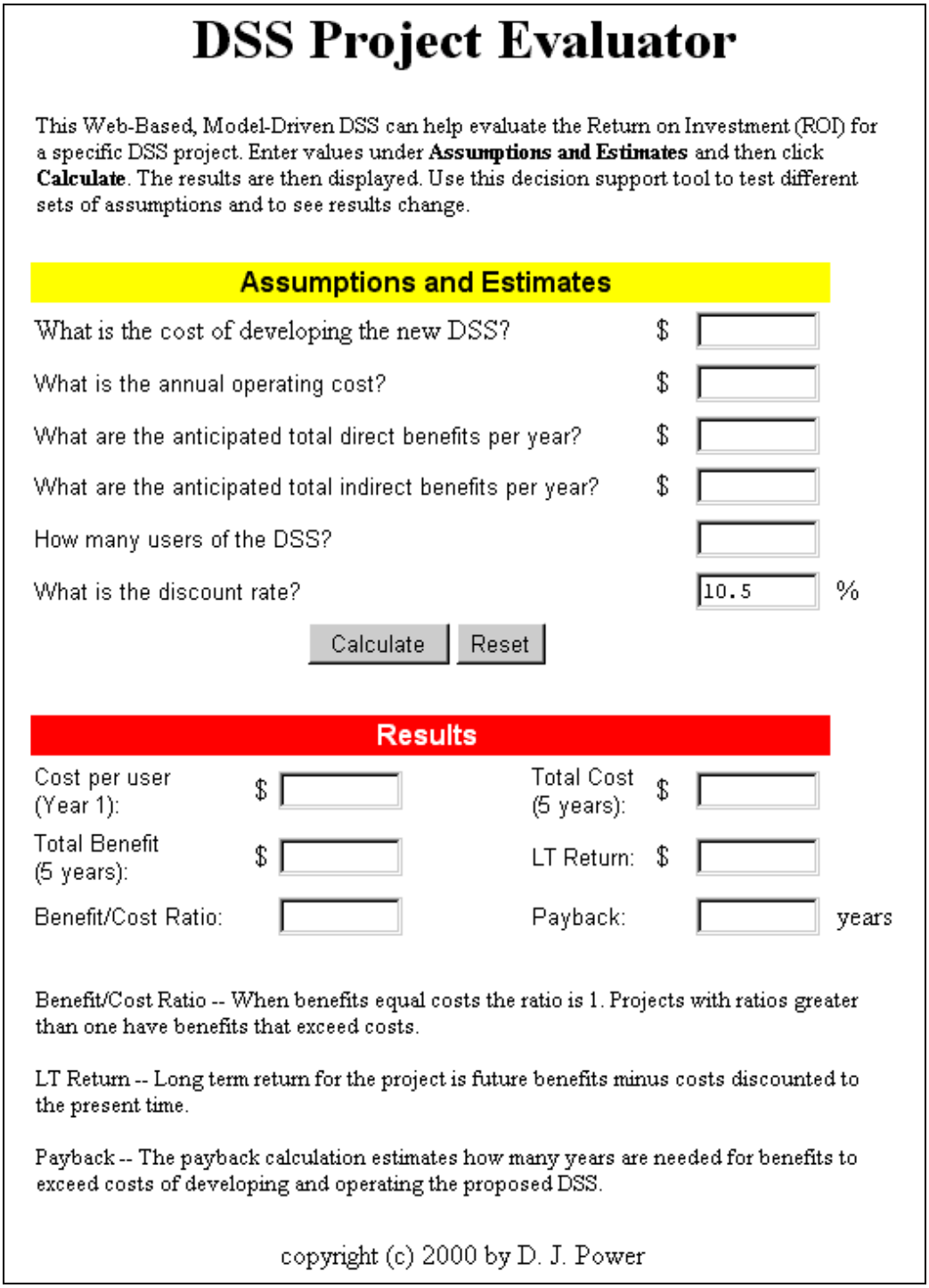
We can perform a cost-benefit analysis by following steps:

1. Define alternatives to the proposed project
2. Collect Cost and Benefit Data
3. Document assumptions
4. Estimate Costs and Benefits (direct, indirect, tangible, intangible)
5. Establish Measurement criteria (especially for benefits)
6. Evaluate all alternatives using NPV, Benefit/Cost Ratio or Payback

The DSS Project Evaluator Decision Aid (Figure 12.2), available at URL http://DSSResources.COM/decisionaids/cbanalysis.html may be useful in determining whether or not to implement a DSS. The program uses the annual operating cost, development cost, benefits, the number of users, and the discount rate to determine the long-term return, payback, benefit/cost ratio, and several other values important to consider when developing a DSS. The cost per user ratio is useful for determining how expensive the DSS is per person using the DSS. The benefit/cost ratio can be used to determine whether the total discounted benefits of the project are greater than the total discounted costs. Discounted means that they are adjusted for a fixed rate of inflation, the discount rate. If it is less than one, the total benefits are less than the total costs. The payback tells how many years it will take until overall benefits exceed overall costs. The LT (Long Term) Return is the overall value of the DSS, excluding costs to develop the DSS.

Cost-Effectiveness Analysis

A cost-effectiveness analysis is a simplified cost-benefit analysis where one assumes that all of the alternatives have either the same benefits or the same costs. The analysis is simplified because only benefits or costs need to be calculated, not both. In this analysis, the best alternative is the one with the greatest benefits or the lowest cost. This type of analysis is sometimes more feasible when costs or benefits are hard to measure or would be expensive to measure.



DSS Project Evaluator

This Web-Based, Model-Driven DSS can help evaluate the Return on Investment (ROI) for a specific DSS project. Enter values under **Assumptions and Estimates** and then click **Calculate**. The results are then displayed. Use this decision support tool to test different sets of assumptions and to see results change.

Assumptions and Estimates

What is the cost of developing the new DSS?	$	
What is the annual operating cost?	$	
What are the anticipated total direct benefits per year?	$	
What are the anticipated total indirect benefits per year?	$	
How many users of the DSS?		
What is the discount rate?		10.5 %

Calculate Reset

Results

Cost per user (Year 1):	$		Total Cost (5 years):	$	
Total Benefit (5 years):	$		LT Return:	$	
Benefit/Cost Ratio:			Payback:		years

Benefit/Cost Ratio -- When benefits equal costs the ratio is 1. Projects with ratios greater than one have benefits that exceed costs.

LT Return -- Long term return for the project is future benefits minus costs discounted to the present time.

Payback -- The payback calculation estimates how many years are needed for benefits to exceed costs of developing and operating the proposed DSS.

Figure 12.2 – DSS Project Evaluator Decision Aid

Incremental Value Analysis

Peter Keen (1981) proposed a tool that is appropriate with rapid prototyping. This tool examines alternatives, stimulates new ideas, and asks, "what if?". The process is based on value, rather than emphasizing costs. The incremental value analysis process involves five steps:

1. Establish the operational list of benefits that the DSS must achieve to be acceptable.

2. Establish the maximum cost that one is willing to pay to achieve the benefits.

3. Build and assess prototype Version 0

4. Establish cost and determine benefit threshold for Version 1

5. Build Version 1; monitor benefits and costs and evolve to Version N

The main advantages of the value analysis approach are that it is simple and easy to understand. The method attempts to reduce risk by requiring prototyping. Prototyping or staging can be difficult for a data warehouse project. If a corporate data model has been developed then a part of that model can be developed as a data mart. The method evaluates the DSS as an R&D effort rather than as a capital investment.

Qualitative Benefits Scenario Approach

Paul Schoemaker (1995), in "Scenario Planning: A Tool for Strategic Thinking.", discusses a related qualitative tool for evaluating information systems projects. This analysis tool helps executives in imagining possible futures. Scenario planning is not "day dreaming", but rather, a rigorous process for assessing and preparing for the future. The steps include

1. Identifying basic trends and uncertainties
2. Constructing scenario themes
3. Conducting quantitative research
4. Developing decision scenarios
5. Envisioning the DSS Project implemented
6. Describing the use of the proposed DSS
7. Discussing benefits that result from the new Decision Support System
8. Checking the scenario for consistency and plausibility
9. Discussing risks and uncertainties
10. Estimating the upper and lower bounds on costs and development schedule

A quantitative analysis is part of the scenario approach, but the decision does not narrowly focus on a Cost-Benefit Analysis.

Research and Development Options Approach

In an article, "Uncovering the Hidden Value in High Risk Investments". David Sharp (1991) proposes a more complex "options" approach.

Options are valuable; they provide the ability to take advantage of certain opportunities at a later time. In real estate terminology, an option is a right purchased for a fee to buy or sell property within a specified time and at a specified price. The value of an option may actually increase with uncertainty and project duration. Options analysis should consider expenditures for both incremental DSS development and maintaining flexibility to build a future DSS. The Research and Development Options Approach has 3 steps:

1. Identify the options embedded in a given investment. What do we do now incrementally to create future DSS opportunities?

2. Evaluate the environment and circumstances in which each might be exercised. Under what circumstances may we want to invest more in the proposed DSS?

3. Evaluate whether the total value of the options outweighs any shortfall in cash flow value from the expenditures; "How much would we be willing to pay now for this future flexibility and opportunity?"

This approach can be difficult to explain to managers and MIS staff. The key issue is expanding DSS opportunities.

Scoring Approach

Parker, Trainor and Benson (1989) describe a method for evaluating Information Systems projects that they called information economics and that can be considered more generally as a decision analysis scoring approach or model. A multi-factor evaluator program is available at dssresources.com/decisionaids/mfevaluator.html. This evaluation method separates the business and technical justification. It considers intangible benefits and other considerations that are not considered credible by analysts who only focus on financial criteria. This approach uses the firm's business and Information Systems strategic plans as part of an Information Systems project evaluation. The process involves weighting factors to reflect how well the project satisfies a given factor. Points are assigned to each impact criterion. The scores are summarized; projects are ranked.

The steps are to select a rating system to make numerical comparisons. Have multiple raters evaluate each alternative on benefit and cost factors. Weight the benefit and cost factors in terms of importance. Finally, calculate a weighted score for each alternative.

Business Justification of economic impact involves assessing strategic alignment, competitive advantage, management information support, competitive response to the

project, and strategic or organizational risk. Technical viability involves examining the strategic systems architecture, technical uncertainty, and system infrastructure risk.

DSS Project Evaluation Criteria and Risk Factors

One can categorize DSS project evaluation issues into 4 general areas: Economic, Operational, Schedule, and Technical. In a DSS project evaluation, these general criteria need to be considered. Let's examine the 4 criteria in more detail.

Based on Whitten, Bentley and Barlow (1994), we can define four evaluation "tests":

Economic Test – a measure of the cost-effectiveness of a project or solution. This is often called a cost-benefit analysis. This test was discussed extensively in the prior section.

Operational Test – a measure of how well the solution of problems or a specific solution will work in the organization. It is also a measure of how people feel about the Decision Support System proposal.

Schedule Test – a measure of the reasonableness of the project timetable.

Technical Test – a measure of the practicality of a specific technical solution and the availability of technical resources and expertise. In some DSS proposals technical issues are the major risk concern.

Which of the criteria should be the focus at various project evaluation stages? The initial evaluation should focus on the project need and the anticipated benefits. The focus should be on the operational test. As the project evaluation continues more feasibility issues need to be evaluated and the benefits need to be assessed more carefully to insure that project advocates are not inflating benefits and minimizing problems. The economic test may be revisited a number of times, but it should be a major part of a feasibility analysis.

As noted in Chapter 2, DSS projects have various levels of risk associated with them. When DSS projects have ambiguous objectives and low structure, the projects have higher levels of risk because the costs and scope of work of the project are hard to define. The schedule and technical tests are very important for high risk projects. Also, because the objectives of the project are ambiguous, it can be difficult to assess the return on the investment. When returns are hard to assess more qualitative economic analyses are used. DSS projects with a higher degree of structure and more clearly defined objectives generally are lower risk. More detailed planning is possible for projects with specific objectives. The size or scope of a DSS project in terms of the number of users served and the size of databases developed also impacts the risk of the assessed projects. Small DSS projects in terms of scope or dollar expenditures tend to be of lower risk than large projects. Finally, the sophistication of the technology and the experience of the developers using the technology influence the overall project risk. The ultimate decision to invest in a DSS project

should not be based solely on project risk. As noted in the discussion of gaining competitive advantage with innovative DSS projects, the project that is most likely to result in a competitive advantage is sometimes the riskiest project.

In general, evaluation activities and the application of the economic, operational, schedule and technical tests should be proportionate to the scope, complexity, and cost of a proposed DSS project. In narrow scope DSS projects that are highly structured, the amount of analysis and evaluation will often be limited, but as the project scope increases and the amount of structure is reduced for DSS projects, project risk increases and hence more frequent and more elaborate evaluation is needed. For large scope, low structure DSS projects, multiple detailed evaluations are probably needed and justified. Figure 12.3 summarizes the relationship between project scope and structure and project risk.

	Narrow Scope	**Large Scope**
Low Structure	Moderate Risk	High Risk
High Structure	Lowest risk	Moderate Risk

Figure 12.3 – Project Risk Factors

In all evaluations, one needs to consider the down stream affects of short-term decisions that have been based solely upon short-horizon cost savings. DSS may reduce some costs, but that is not usually the motivating factor for a new system. No DSS project decision should be made in isolation. Even small projects can sometimes have million dollar impacts. It is important to broadly examine DSS project impacts. Once a DSS project is completed managers need to follow-up and periodically evaluate what is working well with the system and why and what problems are being encountered.

International and Cultural Issues

As companies expand into the global marketplace Decision Support Systems must support communities of users from different nations. There are many issues and obstacles that need to be evaluated in considering such projects. Some of the obstacles to using technology to support decision-making in global corporations include: accounting and currency issues, different regulations and import/export restrictions, lack of spontaneous or informal communication among individuals when using Communications-Driven DSS, the impersonality of electronic communications, cultural differences including languages and different work-hours, a multiplicity of technology standards, the possible lack of a telecommunications infrastructure, different interpretations of screen displays, and time zone differences. It may be difficult to build trust and commitment among individuals using only electronic communications. Let's look at some of these issues in more detail.

Accounting and Currency Issues

Accounting and other business practices differ from country to country. This makes getting accurate financial reports difficult. Also, currency conversion and fluctuations are another source of challenge in designing some DSS.

Culture

The purpose of a Decision Support System is to inform decision-makers, and ignoring cultural issues may create mis-information or mis-interpretation. For example, not all cultures have the same assumptions about group decision-making and hence the use of a Group DSS. In some cultures, the norm is that all should have an equal voice in decision-making. Some cultures encourage an open and collaborative problem-solving atmosphere. Some cultural norms support detailed meeting notes and a very structured decision-making process. We need to ask if the project team has considered cultural issues.

Impersonality of Electronic Communication

In a global corporation, much of the communication will be electronic. There will be fewer "real" face-to-face meetings and probably not many face-to-face meetings using Interactive Video. Instead bulletin boards will likely proliferate. This change may isolate managers in different parts of a company. To keep from getting "out of touch", managers will need to work harder to communicate feelings and develop trust relationships. Communications-Driven DSS should probably include pictures of participants and background materials.

Lack of Spontaneous or Informal Communication

When using a Communications-Driven DSS in a global corporation, much of the information sharing will probably involve e-mail, bulleting boards and other non-real time methods of communication. Also, most of the communication will be written, and not face-to-face. This behavioral change means that there will be less spontaneous and informal communication in the company. This possibility needs to be anticipated.

Language

English is the unofficial language of business and technology. The problem with accepting this conclusion about language usage when constructing DSS is that it may create a communication barrier between managers. Some countries, such as China, require that a certain percent of business documents be written in the native language. France requires that all public documents in France be written in French. Should a Decision Support System be available in multiple languages? If so, what is the cost?

Regulations and Import/Export Restrictions

Some laws and regulations insist that a certain percentage of data collected in a country must be processed there. Also, some countries have data import/export restrictions. This makes it harder to aggregate all data assembled throughout the world. These restrictions can have a major impact on the design of Data-Driven DSS.

Screen Displays

Culture impacts evaluations of DSS layout and design. Language can cause confusion in screen displays. Also, colors and icons may have different emotional and political meanings in different countries.

Telecommunications Infrastructure

Telecommunications access, reliability, and standards differ from country to country. In many countries, the government owns or controls the communication industry and it may be difficult to install communication lines. Also, costs are a factor. Costs for telecommunications in Europe may be 10 to 12 times more than in the U.S. Some possible solutions to this are the Virtual Private Network and satellite systems. Technological infrastructure in different countries varies and constrains DSS implementation.

Time Zone Differences

There are many different time zones throughout the world. This makes it harder for companies to have real-time meetings and to have standard working hours for its employees.

One possible solution to many of these problems is what has been called IS/IT Internationalization. Internationalization is the process of planning and implementing IS/IT products and services so that they can easily be adapted to specific local languages and cultures. The internationalization process is sometimes called translation or localization enablement. Localizing a Decision Support System can include: allowing space in user interfaces for translation of text into languages that require more characters; developing DSS with products like Web editors or authoring tools that can support international character sets (Unicode); creating graphic images so that text labels can be translated inexpensively; and using examples in help systems and software documentation that have global meaning. At a minimum these issues must be addressed in the evaluation of a proposed DSS that will have a global reach.

Ethics and Privacy Issues

Projects can fail for many reasons. A systematic evaluation process and the appropriate use of evaluation tools and a systematic examination of evaluation issues can reduce project failures. One set of issues that can create problems are easy to minimize or overlook. These issues relate to the ethics of using a specific Decision Support System or privacy issues raised by using specific data in a Decision Support System. Both managers and MIS professionals need to be sensitive to ethics and privacy issues.

One might think that a Decision Support System is ethically neutral and that project proposals shouldn't raise any moral or value issues. This view ignores the important role that principles and values play in making decisions. When Model-Driven or Knowledge-Driven DSS are constructed, developers make assumptions that can have ethical impacts on choices. Also, some decisions are considered so

value-laden that many people would be uncomfortable with developing a Decision Support System to assist a decision-maker. One cannot specify all of the ethical issues that might be relevant to a specific DSS proposal, but once a proposal reaches the feasibility stage, the project sponsor needs to specifically address the ethical issues associated with the project.

Privacy concerns are also easy to ignore during the evaluation of a Decision Support System proposal. In many societies, people expect that certain personal and behavioral information about them will be kept private. This information belongs to the person and doesn't belong to a company, the public, or the government. Managers need to insure that data used in Decision Support Systems doesn't infringe on the privacy rights of individuals. The exact extent of privacy rights for employees, customers, and other data providers is not always clearly defined. In general, unless there is a clearly compelling reason to risk violating an individual's privacy, the "fence" to protect privacy of data should be higher and larger than minimum requirements.

Conclusions

The World-Wide Web has created a major opportunity to deliver more quantitative and qualitative information to decision-makers. To exploit these opportunities and successfully implement innovative DSS managers need to redesign business processes, integrate the technologies and associated information into decision-making processes, evaluate costs and benefits, and manage new types of business relationships. DSS projects must be evaluated in this broad context of corporate "readiness".

Learning enough to understand and evaluate an innovative DSS project is expensive. Managers and IS/IT staff need to do more than read a book. IS/IT staff should actually work with development tools prior to beginning a development project. The MIS unit may want to hire a consultant; staff should attend seminars and talk to vendors. The process of learning about innovative DSS opportunities will be time consuming and costly. Companies may need to spend a few hundred thousand dollars on a prototype or a departmental data mart and that is a significant investment. In firms with multi-million dollar IS/IT budgets, DSS prototype and data mart projects are needed and they should be viewed as "a learning experience". General managers need to spend enough money on DSS projects so that IS/IT managers and business managers can learn about the different types of DSS and can evaluate the costs and benefits.

In general, a detailed qualitative analysis of a proposed DSS at its initiation stage is the most that managers can reasonably expect. Although in some situations, financial analysis tools can be useful, in evaluating a major DSS project their use provides only the appearance of accuracy and precision. When making a DSS project decision, managers should generally ask, "What are the expected results and benefits?" rather than "What is the anticipated Return on Investment (ROI)?" Managers should examine the Return on Investment from a DSS project and they should examine the possible results from the project.

Justifying DSS projects with ROI and NPV is possible, but such an analysis does not accurately reflect the value of most Decision Support Systems. Costs and benefits of DSS ripple to other parts of the organization. In many ways the real benefits are created by changes in the organization, more than by the Decision Support System itself. Managers should not demand a positive ROI from Decision Support System projects, but they **must** demand positive results. Today, investigating innovative Decision Support System projects is a business necessity. Building DSS is an investment in improving the performance of a company and such projects are excellent employee and corporate development experiences.

Audit Questions

1. Does your company create budgets for DSS and IS/IT projects?
2. Are managers involved in evaluating proposed DSS projects?
3. Does your company have operations in more than one country?
4. Are cultural and International issues considered in evaluating DSS projects?
5. Is an evaluation checklist used?

Questions for Review

1. What are five tools or methods to evaluate DSS?
2. What is involved in a Cost/Benefit Analysis?
3. What are the International/Cultural issues that impact DSS?
4. What evaluation method attempts to reduce risk by requiring prototyping?
5. What evaluation tool and approach attempts to estimate what decision-making will be like when a proposed DSS is in place and hence speculate on how the company will benefit?
6. What do we call the resources that have already been expended on a project?
7. When benefits equal costs the Benefit/Cost ratio is equal to what number?
8. What do we call the calculation of how much a dollar of costs or benefits is worth today, even though it will be realized in the future?
9. Evaluating DSS projects should involve evaluation activities that are proportionate to what three factors?

Questions for Further Discussion

1. What type of DSS project should be evaluated most critically?
2. How do Decision Support Systems impact authority and potentially national sovereignty?
3. How important is it to examine the technological risk associated with a project?
4. How is the risk of an individual DSS project related to the risk of all current IS/IT projects? Should we try to balance risks?
5. What problems does one face in trying to justify DSS investments?
6. What are obstacles to using technology to create DSS for global corporations and globally distributed DSS?

Case Example - Metropolis International Airport

Metropolis International Airport is expanding. Two major airlines have selected Metropolis as a new major hub or base of operations. A new terminal is nearing completion. With the expected increase in traffic, the airport's director authorized development of a new Gate Management Decision Support System.

Scene: Frank Demillio, Project Manger in charge of the Gate Management Scheduling DSS project, is meeting with Airport Operations Manager Benjamin Pierce to discuss progress. The systems analysis and design phases of the project have been completed, and Frank is seeking approval to implement the system. Let's join the meeting in progress.

Frank: As you can see, we've designed a system that can fulfill all your stated requirements, including those specified after the initial project charter. Furthermore, the new system will include a Microsoft Windows user interface. All of your staff are familiar with Windows-based PC tools.

Ben: So you moved the entire application to the PC?

Frank: No, just the user interface and basic input data validation. Your database and business data processing will still be done on the host computer. But to your staff, the entire application will look and feel like a PC application.

[*Brief silence*.]

Are there any questions?

Ben: I'm quite impressed. The system design is everything you promised, and then some. But let's get to the bottom line, Frank. How much is this going to cost me? It seems more ambitious than the original estimates.

Frank: To implement the system, we estimate that it will cost $45,000. And the system will cost $4,500 per year for maintenance and enhancement.

Ben: And how much have we spent up to this point?

Frank: About $12,000 for requirements analysis and system design. We've also done some prototypes, if you care to see them.

Ben: Not right now. I'm just the sponsor. I trust the users' feedback on such matters. Let's see, according to my notes, the original estimate was $39,500, including analysis and design. The new estimate is $45,000 + 12,000—about $57,000! That's quite an increase.

Frank: Agreed. But your people increased the requirements as the project progressed. Also, we feel the Windows-based design will result in a faster learning curve and lower maintenance costs. Also, the $12,000 for analysis and design can't be recovered, so we shouldn't consider it in our decision on whether to proceed.

Ben: I agree that the project shouldn't be continued or canceled based solely on the money spent so far. However, I disagree that the money is irrelevant. If the project is continued, I should think that the new system would eventually pay for itself. How long until all costs are recovered.

Frank: You should start receiving benefits immediately after implementation.

Ben: But how many years or months will pass before the lifetime benefits exceed the lifetime costs?

[*Brief silence*.]

Look, I can probably allocate the funds you need to complete the system. But I also have managers asking for other things. Why should I give the money to you and not to them?

Frank: I don't understand, Ben. You and your staff commissioned this project. The proposed system will meet your needs.

Ben: Frank, you're a marvelous computer professional, but you don't always understand the economics of business and information.

Discussion Questions

1. Why is Ben Pierce hesitant about implementing the new DSS?

2. What doesn't Frank Demillo understand about the "economics of business and information"?

3. Is Frank Demillo's vision of the project flawed?

4. What is your assessment of the DSS project?

Based on a minicase in Whitten, Jeffrey L., L. D. Bentley, and V.M. Barlow. Systems Analysis and Design Methods (3rd ed.), Burr Ridge, IL: Irwin, 1994, p. 811.

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