Chapter 3

Analyzing Business Decision Processes

INTRODUCTION

Let's examine some generalizations about decision-making behavior and business decision processes that affect building and using Decision Support Systems (DSS). At a fundamental level, both managers and DSS analysts need to acknowledge that decision making is the most important part of a manager's job. Managers take actions on behalf of an organization and stakeholders. They allocate resources and negotiate agreements. They monitor performance and correct deviations from plans. Managers are evaluated on their ability to make effective decisions. The effectiveness of business decisions is evaluated by many stakeholders, but especially by managers in the managerial hierarchy and by stockholders.

Most of us would agree with the above generalizations, but we need to refine our understanding of business decision making to build successful DSS. Let's begin by asking: What steps do managers follow in making a specific decision? When does a decision process begin and end? How do we identify who is involved in making a specific decision? Managers who want to improve their decisions need to be sensitive to the answers to these questions. DSS designers also need to ask and answer these questions. DSS design should begin with an understanding of an existing decision process. This chapter examines managerial decisions; evaluates decision-making context and decision-making processes; discusses what is "good" decision making; and examines redesigning decision processes.

MANAGERIAL DECISIONS

Managers do not make all of their decisions as part of a deliberate, coherent, and continuous decision-making process (cf., Mintzberg, 1973). Instead, brevity, variety, and fragmented activities characterize the manager's typical workday.

Also, despite its importance, managers do much more than make decisions. They also serve in roles as a figurehead, leader, entrepreneur, negotiator, and liaison to stakeholders.

For managers, decision making is a dynamic process. It is complex and at times ambiguous. Decision makers encounter problems when searching for information, and they must work with delayed feedback of results, uncertainty, ambiguity, and, in some cases, conflict during decision making (cf., Janis and Mann, 1977). In many situations, managers seem to engage in an informal causal analysis in an attempt to favorably influence decision outcomes.

The scope of organizational and managerial decision making is very broad. Decisions are made by individuals at all levels in an organization and by a wide variety of groups in an organization. Robert Anthony (1965) classified decisions in four categories associated with organization levels (see Figure 3.1).

Figure 3.1 Categories of Organizational Decisions

Analysts need to determine if a proposed DSS is intended for use in:

Strategic Planning — decisions related to allocating resources; capital budgeting; controlling organizational performance; developing annual and long-range plans; establishing broad policies; evaluating investment or merger proposals.

Management Control — decisions related to acquisition and use of resources by operating units; buyer and supplier behavior; introduction of new products; R&D project expenditures.

Operational Control — decisions related to the effectiveness of organizational actions; monitoring product/service quality; assessing product/service needs.

Operational Performance — day-to-day decisions made in functional units to implement strategic decisions; functional tactics; and operational activities.

Both managers and DSS analysts need to analyze decision support needs and distinguish among them in terms of who participates, the type of decision, and other factors discussed in later sections. From an analyst's perspective a "decision" is the result of a choice point in an ongoing process of evaluating alternatives to select one or some combination of alternatives that will attain a desired end. DSS often do much more than support a specific "decision".

Decision making and problem solving are intertwined concepts. The type of problem or decision situation has an impact on the type of approach that should

be taken to resolve the problem. Problems may be structured, semistructured or unstructured. According to Simon (1965), structured problems can be described in numbers, or can be specified in terms of numerical objectives. In structured problems, specific computational techniques may be available to find an optimal solution. In unstructured decision situations, objectives are hard to quantify and identify, and it is usually not possible to develop a model of the situation. Unstructured situations require managers to use more creativity and subjective judgment to find a solution. Unstructured situations can be supported by computerized systems, but the support focuses more on information presentation, summary, and support analyses and collaboration rather than on finding an optimal solution. The system must be a "support system" that promotes high quality subjective judgment and creativity. Figure 3.2 shows what decision situations are suitable for computerized decision support.

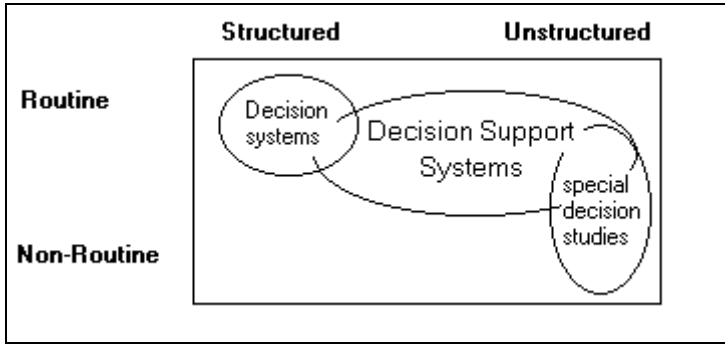

Figure 3.2 Matching Decision Support to Decision Situations

Managers encounter three types of decisions: selection from a list of alternatives, including yes/no decisions; evaluation of alternatives using criteria and decision rules; and design and construction of a custom solution. DSS can potentially support all three of these choice situations. Each decision situation can also be categorized as routine and recurring decisions or as nonroutine or infrequent. Examples of routine decisions that can be automated and programmed with a decision system include placing an order to replenish inventory, sending delinquency notices, or routing packages. Nonroutine decisions that can benefit from decision support include deciding on a new supplier for a part, disciplining an employee who is constantly late for work, or creating a budget.

Managers should not treat routine decisions as if they were nonroutine. If a decision is "generic" and routine, valuable time and resources should not be expended each time the decision occurs as would be required with a nonroutine, nonrecurring decision. Routine decision situations should be analyzed and "programmed" as much as is possible and they should be supported in most situations by technology. The potential rewards from improving routine, recurring decisions are usually very large.

What situations are less likely to benefit from computerized decision aids and decision support? One situation that comes rapidly to mind is one of limited consequence, e.g. low return, and few positive or negative consequences, such as assigning parking spaces. Another is a situation where political factors outweigh or gain ascendancy over facts and analysis. In general, computerized decision aids support rational decision behavior that uses analytical decision processes. Where a decision situation does not require, expect, encourage, or need analysis and intended rationality, using any computer support system will be unnecessary and may lead to manipulation or distortion of outcomes. Rather than dwell on when DSS analysts should avoid suggesting DSS, it seems more important to help analysts identify "good situations" for building such systems.

Computerized decision support should be considered when managers are in decision situations characterized by one or more of the following factors: complexity, uncertainty, multiple groups with a stake in the decision outcome (multiple stakeholders), a large amount of information (especially company data), and/or rapid change in information. Complex decision situations with many variables, complex causal relationships, and an available historical database can sometimes be modeled. These are complex situations, and models can simplify such decision situations, aid in understanding them, and help test alternatives. Computerized models, especially visual models, can be very useful in these situations. The model is a representation of the actual situation, and analyses performed using the model can help the decision maker(s) anticipate consequences of alternatives. Sometimes, a software model can actually recommend optimal choices to a decision maker. In many cases, knowing what DSS tools are available is an important factor in choosing appropriate situations to support. General characteristics like complexity and uncertainty may provide cues to appropriate situations but an understanding of the technologies and their limitations is equally important.

In some unstructured, nonroutine situations, models are sometimes constructed and DSS may be used as part of a special decision study by a decision support analyst. These situations do not justify a large investment in creating a user interface so that managers can directly interact with models or data. Some other names for special decision studies include a quantitative analysis, a simulation study, and a management analysis. DSS analysts and managers need to recognize that every situation that could benefit from using a database or a quantitative model is not a candidate for building a DSS.

Data-driven DSS seem most appropriate where managers need frequent access to conduct ad hoc analyses of large data sets. Model-driven DSS are appropriate in recurring decision situations that are semistructured and where a quantitative model or models can inform or support analyses and choices. Knowledge-driven DSS are appropriate where a narrow domain of expertise can be defined, where one or more experts can be identified, or where knowledge can be codified to help a less expert decision maker. A document-driven DSS should be built when a very large set of documents has been, is or will be created that needs to be filtered, sorted, searched, and analyzed. A communications-driven DSS is most appropriate where two or more people need to be involved in an ad hoc or ongoing decision process, who either cannot meet

or find it costly to meet, but want to use technology tools to communicate, collaborate, evaluate, and support decision analysis or evaluation.

Finally, risk and uncertainty characterize many decision situations. Managers in these situations need to assess risks, and in some cases, they need to assess the financial consequences of acting in an uncertain or risky situation. Computerized tools can help elicit and apply risk information in a decision situation. Computerized support systems can also help deal with large amounts of information and rapidly changing information.

DECISION-MAKING CONTEXT

Understanding the context of managerial decision making is important in building DSS. The decision-making context defines both the potential for and the limits to decision support. We need to consider the whole decision cycle and process and all of the varied decision activities of managers and their staff.

The importance of managerial decision making and the types of decisions made vary at different levels in the managerial hierarchy. At the lowest level, supervisors assign tasks, monitor and control operations, and make a variety of short-term decisions. At the managerial control level, decisions are more complex and more information is used to make decisions. At the strategic or senior management level, managerial decisions focus on issues of corporate performance, macro allocations of resources, major personnel choices, and strategic directions on products and markets.

All of the managers in an organization are drawing conclusions from information and making choices from identified alternatives. Some managerial decisions need computerized support more than others. Some decision activities are also easier to support than are others.

Alexis and Wilson (1967) discuss five major elements of a decision situation: goals, relevant alternatives, process of ranking alternatives, decision environment, and decision makers. DSS analysts should first examine the goals to be achieved in the situation, who sets the goals, and when and how are they revised. In some situations, analysts can examine relevant alternatives and how they are identified. An alternative is relevant if it is feasible, can be implemented, and solves an existing problem. Decision situations usually have a process of ranking alternatives from most to least desirable. This process may be subjective or objective. Analysts should determine how alternatives are currently ordered. DSS analysts should especially examine the decision environment and the decision makers in evaluating the advisability of computerizing a decision process. Both the decision environment and the decision makers are important in understanding the decision-making context.

Decision Environment

Various aspects of the decision makers' environment can affect the final decision. Robert Duncan (1974) characterized the decision environment as consisting of two categories—internal and external. The factors in the internal environment that influence decisions include: 1) people, and their goals,

experiences, capabilities, and commitment; 2) functional units, including the technological characteristics, independence, interdependence, and conflict among units; and 3) organization factors, including goals and objectives, processes and procedures, and the nature of the product or service. The factors in the external environment that affect decisions include customers, suppliers, competitors, sociopolitical issues, and technological issues. Some DSS help managers assess the above factors, but it is more important to consider them when designing and building a DSS.

Decision Makers

Sometimes we can identify a single individual who is responsible for making a specific decision, but this is not always the situation. What is often more important is determining the scope of the decision (scope refers to who and what the decision will affect). Scope often determines what level of management should be responsible for making the decision. In general, the broader the scope of the decision, the higher the level of management involvement in the decision-making process. Analysts need to identify and evaluate the individual or group who will actually make the choice. Not all decision makers are alike. Some people are weak decision makers who want others to make decisions for them. Others take credit for the good ideas of their colleagues or subordinates. Still other managers accept little help, isolate themselves, and are extremely self-reliant. Finally, some managers make a decision based on how it will make them look, rather than on facts or values.

Pritsker and Sigal (1983) characterize decision makers with respect to how they would use a decision support system if one were available. A *hands-off* DSS user reads reports but doesn't directly use the DSS. A *requester* decision maker has an intermediary, like a decision support analyst, use a DSS. The requester frames the questions, interprets the results, and then makes the decisions. The third type of decision maker is a *hands-on* DSS user. The hands-on user has direct on-line access to the DSS. Finally, a *renaissance* decision maker is a hands-on user, feels comfortable talking about database systems and modeling, can use intermediaries when appropriate, and can build his or her own models and small DSS. The target audiences for DSS are hands-on and renaissance decision makers.

Managers, including hands-on and renaissance decision makers, have a number of limitations that can be compensated for by using information technology. For example, they sometimes use simplistic strategies to search for information. Managers request excessive information or fail to organize and use the information they request.

In general, people are influenced by how information is presented to them; managers, like most people, are also susceptible to social pressure, and they have a desire to avoid cognitive dissonance (Janis and Mann, 1977). This means that once a person has committed to a decision, there is less concern about objectivity. People bias new information to support the already made decision. Sadly, some managers routinely make decisions first and then look for information to support or "bolster" their decision. Comparing and evaluating

alternatives is sometimes more haphazard than orderly. Risk preferences are usually not discussed explicitly in decision making. Some managers are generally overconfident or have an illusion of control in situations governed primarily by chance. Also, comparing and evaluating alternatives for many managers is a combination of judgments, political bargaining, and limited analysis.

Managers have cognitive limitations; they receive incomplete and imperfect information, and they experience time and cost constraints in decision situations. Decision makers also often find themselves confronted by too much information, time pressure, and distractions. Janis and Mann (1977) note that when the degree of complexity of an issue exceeds the limits of a person's cognitive abilities, there is a marked decrease in the adequacy of human information processing that is a direct effect of information overload and ensuing fatigue. Decisions may also be affected adversely by personal concerns and agendas. Computerized decision aids can help overcome some of these factors that constrain and limit the overall quality of organizational decision making. DSS can also be used in negative ways to develop rationalizations and bolster previously made decisions. This type of use of a DSS will negate any benefits of computerized decision support and may actually reduce the effectiveness of decision making in an organization.

DECISION-MAKING PROCESSES

How do individuals and groups make decisions? What steps should be completed? A sequential model of decision making can help analyze how decisions are being made and how they should be made (cf., Mintzberg, Raisinghani, and Theoret, 1976).

Simon (1965) identifies three stages in a sequential decision-making process: 1) intelligence—finding occasions for making a decision; 2) design—finding, inventing, developing, and analyzing alternative courses of action; and 3) choice—selecting a course of action. A fourth stage, called implementation, is also often discussed, even though Simon considers implementation as a separate decision process of intelligence, design, and choice. A major decision is made prior to implementation; implementation then involves many supporting actions and, hence, choices. Managing these stages and how they interact can be a major challenge in complex, rapidly changing, and ambiguous or uncertain decision situations. Each of the above stages is part of a business decision process, and each stage can be supported by a variety of DSS. Let's begin discussing how to identify decision-making processes by briefly reviewing the concept of a system and then reviewing some specific examples.

What Is a System?

The term "system" is used in many technology-related concepts including DSS and Transaction Processing System (TPS)—both are computing or information systems. Managers and MIS specialists use the concept of a system frequently and yet it is hard for most of us to define and understand the concept.

A system is an interrelated set of components including people, activities, technology, and procedures that are designed or intended to achieve a predefined purpose. A system receives input from its environment, and the various subsystems or components of the system interact to produce outputs. Systems are defined in terms of their components. System components are surrounded by an imaginary boundary that separates a specific system from its environment. A system designer identifies both inputs from the environment as well as the outputs from the system. Systems also have feedback mechanisms to provide a means of controlling the operation of the system. Feedback is an output from a system that later reenters the system as an input.

Let's examine a simple conceptual specification of a decision process and a system. The initial input into the process and system is a bank customer requesting a loan. The customer makes a request to a bank officer. The bank officer collects information from the customer and enters that information into a computerized form. A loan approval model is built into a computerized decision aid. Some people identify the computerized model as the actual decision support system. The banker uses the result from the computerized loan approval model to finalize the decision to approve or deny the loan. In some cases the loan information will need to be shared with a loan committee, possibly using a group support system. The actual decision is then communicated to the customer either face-to-face or by a formal letter that may be generated by a computerized decision aid. Feedback comes from the customer.

This decision process, and the overall conceptual system, may include various DSS. The bank's TPS would be updated when the loan was made and the funds distributed. The loan is the primary business transaction. Evaluating the loan report is the purpose of the decision process. DSS can support evaluating loan requests, or a DSS can help analyze lending activity at the bank or predict lending activity and interest rates.

In a DSS, the primary focus is often on the computerized components of the system. This is a narrow perspective for defining the components of a system; it is often helpful to define the DSS boundary to include a broader decision process that may involve people performing noncomputerized tasks as well as more routine data gathering tasks. The users of the computerized tools are also part of the broader system. Finally, note that the actual communication or transmission of decisions may not occur using computerized systems. This step in a decision process needs to be considered in the design of the DSS, and it should be included within the boundary of the system.

One needs to define and understand DSS on both a conceptual level and a concrete, technical level. Both managers and DSS analysts need to understand what they are trying to accomplish. The specific purpose of a proposed DSS and its components needs to be defined early in the design and development process.

IBM Credit Corporation Example

According to Hammer and Champy (1993, pp. 36–39), IBM Credit Corporation, a wholly owned subsidiary of IBM, had a business process that

evaluated customer's requests for financing that included the following five steps:

Step 1. A salesperson called in a request for financing, which was recorded on paper by one of 14 clerical staff members "sitting around a conference room table in Old Greenwich, Connecticut." This step initiated the process.

Step 2. Someone physically walked the paper request to the credit department, where a specialist entered the request into a computer and checked the credit status of the customer. The result was written on the credit report. Then, the paper-based credit report was delivered to the business practices department.

Step 3. The business practices department used a different computer system to modify a standard loan agreement according to any special requests made by the customer. The document was attached to the original request and delivered to the pricer.

Step 4. The pricer keyed all the information into a PC spreadsheet and determined the appropriate interest rate. This figure was written onto the other forms and delivered to the clerical group.

Step 5. The clerical group converted all paper documents into a quote letter and delivered it to the sales representative using FedEx.

The entire process took six days on average, although it sometimes took as long as two weeks. Some people would say a model-driven DSS is needed to support Step 4, but the entire process can be redesigned and automated. What would you do? Can you redesign the process and then recommend appropriate DSS for each step? Would a communications-driven DSS help?

To redesign the process, two senior managers at IBM Credit took a financing request and walked it themselves through all five steps, asking personnel at each step "to put aside whatever they were doing" and process the request as they normally would. They learned the actual work took 90 minutes. The problem was in the structure of the process and the lack of integrated computer support. IBM Credit developed a new computerized system for a deal structurer who handled all of the steps. In the redesigned process, one person, termed a "deal structurer," completes all of the above steps. A simple DSS helps find information, evaluate the request, and prepare the quote. Difficult decisions could be referred to a small group of specialists. The new DSS and process resulted in a 90 percent reduction in cycle time and an enormous improvement in productivity. Turnaround on credit approvals was cut from seven days to approximately 4 hours. One could look at this example as reengineering a transaction processing system, but that view neglects the importance of the decision making activities embedded in the business process.

A General Decision Process Model

A sequential, decision process model (see Figure 3.3) provides a broad view for understanding the above decision processes. Decision making is more than deciding. Each of the steps in the decision process is important; each step can cause errors and each can potentially be supported by some type of computerized decision aid.

The next few paragraphs review the seven steps in a general decision process model: 1. Define the problem. 2. Decide who should decide. 3. Collect information. 4. Identify and evaluate alternatives. 5. Decide. 6. Implement. 7. Follow-up Assessment.

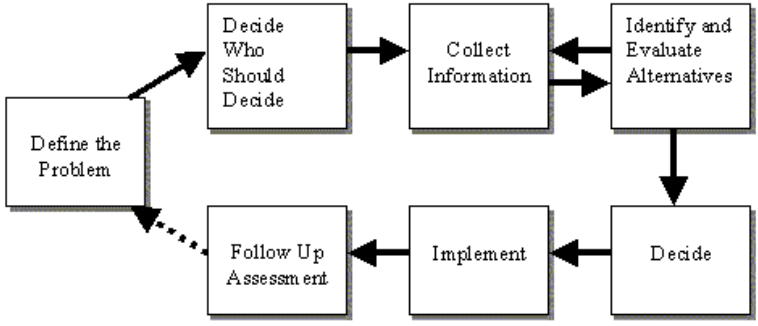

Figure 3.3 A General Decision Process Model

Define the Problem

Many managers feel that a well-defined problem is much easier to solve and that problem definition reduces the chances of having a good answer to the wrong problem. When the wrong problem is defined, it is impossible to make a successful decision. Optimists see problems as opportunities. Pessimists see too many problems. How a problem is "framed" and defined influences how it is solved and the type of decision support, if any, that is used. So what is a problem? A narrow definition of a problem requires that at least the following three conditions be met to label a discrepancy as a problem: First, using a standard, managers have measured how well the company is doing. Second, there is a deviation from a standard, i.e. the company is not achieving the desired result. Third, a manager recognizes the deviation and wants to find a solution.

The above conditions are simple enough to list, but recognizing problems can be difficult. The complexity of today's organizations makes it hard in many cases to identify "real" problems and causes and to get beyond problem symptoms. A number of tools and actions can assist in problem identification, including a good information system, well thought-out standards, and clear and regular communication with key people in an organization. An annual plan that summarizes progress and establishes specific plans for the next year, awareness of new developments in technology, and regular contact and interaction with managers in other organizations also helps managers in identifying decision problems.

Decide Who Should Decide

In decision situations, an individual makes some decisions with available information. An individual manager makes other decisions after consulting with colleagues to gather information and opinions. Finally, some decisions should be

made by groups using a participative decision-making process. Vroom and Yetton (1973) developed a decision tree to help managers decide who should decide in a given decision situation. Their criteria for choosing an autocratic, consultative, or group decision process included: need for acceptance of the decision; adequacy of available information; subordinate acceptance of organizational goals; and likelihood of conflict among subordinates about a preferred solution.

Collect Information

Once a problem is defined, one can proceed to determine the factors that affect the problem and the information needed about viable alternatives. Without information, decision making is by hunch and intuition. On the other hand, too much time can be spent gathering data. Formal search and data gathering has a cost in terms of both money and time. The additional costs of data collection need to be weighed against the benefits of additional data. MIS and DSS can provide information for decision making, but a cost is incurred in development and use of the system.

Identify and Evaluate Alternatives

The most creative part of decision making is the identification of alternatives and the determination of which ones should receive serious consideration and analysis. Brainstorming to generate ideas is useful in many situations. A long list of ideas with many poor ideas and one or two good ones is more useful than a short list of old ideas. A large quantity of ideas is more likely to lead to some high quality ideas than focusing on one or a few readily available ones. Early in the brainstorming process, the objective is quantity of ideas. How good, unique, or impractical an idea may be is of very little concern in brainstorming. A commonly used group brainstorming and idea evaluation tool is the Nominal Group Technique (NGT). NGT emphasizes silent idea generation, idea sharing, and rating or ranking of alternatives (see Delbecq, Van de Ven and Gustafson, 1975). Some GDSS have tools based on NGT. Also using explicit decision criteria can help one evaluate alternatives.

Decide

To make a decision is to commit to a course of action or inaction. In some situations, a decision *must* be made—it is required or demanded by circumstances, customers, or stockholders. Decisions are then sometimes made with less information than one would like and with some feasible alternatives not evaluated or even considered. DSS are not usually as helpful in these "crisis" decision situations. In other situations, there is more time for collecting information and evaluating alternatives.

In decision situations with ample time to collect information and evaluate alternatives, the decision is not forced and the result may be a more thoughtful decision or in a worst case a delayed and postponed decision. Indecision is a failure to take action when it should be taken. "I need more information" is a common reason cited by people for not deciding. Indecision or decisions made with great anguish is often a characteristic of an ineffective manager. DSS can potentially reduce procrastination and indecision by helping structure the

decision situation and gather information. DSS can also help weight and structure decision criteria on "soft" criteria, like company impact or reaction of competitors.

Implement

A decision or choice among alternatives is the culmination of one specific decision process. The decision process may have been long and convoluted or rapid and simple. But for any problem and set of alternatives, made with or without a decision aid, once a decision is made, something usually happens. What happens is implementation of the "decision". Decisions often trigger actions and information technology can focus and direct those actions and complete a broader process of action and change. DSS can help communicate decisions, monitor plans and actions, and track performance.

Follow-up and Assessment

Measuring and evaluating the consequences of a decision that has been implemented calls for the decision maker to accept responsibility for the decision. During follow-up, new problems may or may not be discovered. In some cases, minor adjustments and corrective actions are necessary. Because situations do not remain the same for very long, managers are often dealing with problems that grew out of the solutions chosen to previous problems. So the decision loop or cycle is complete—definition of a problem leading to assessment of the decision that was implemented leads to consciousness of new problems. DSS can help in monitoring, follow-up, and assessment.

"GOOD" DECISION MAKING

Good decisions are the ones that resolve the problem identified. Not all decisions will have this intended outcome. No manager always makes the right decision. Factors that are unforeseeable, or over which the decision maker has no control, ensure that some wrong decisions will be made.

Defining Success

According to Trull (1966), the success of a decision is a function of its quality and of how it is implemented. Decision quality is judged by a decision's compatibility with existing constraints, its timeliness, and its incorporation of the optimal amount of information. A successful implementation of a decision results when managers avoid conflict of interest, make sure the decision is understood by those who must carry it out, and perceive that the rewards of successful implementation are worth the risks of implementing the decision. Decision success is a measure of whether objectives sought when making a decision have been partially or completely attained.

The distinction between effectiveness of decision making and efficiency in decision making helps DSS analysts understand the impact of DSS on decision behavior. Keen and Scott Morton (1978) present the following explanations of these important concepts: "Effectiveness in decision making requires us to address the process of identifying what should be done. Effective decision

making requires consideration of the criteria influencing the decision. … Efficiency in decision making addresses the means for performing a given defined task in order to achieve outputs as well as possible, relative to some predefined performance criteria."

Increasing efficiency typically takes the form of minimizing time, cost, or effort to complete an activity. Effectiveness focuses on what activities should occur. A focus on effectiveness requires decision makers to adapt and learn and to make a responsive adjustment to changes in the environment for and within which they make decisions (after Bennett 1983, p. 2).

Impediments

There are some known impediments to "good" decisions over which a manager does have some control. Some examples include tradition and bias, lack of knowledge, and improper use of decision aids.

Tradition and Status Quo Bias Impediment

"We have always done it that way." The finality and implied end of discussion suggested by this statement means that tradition is at work. Approaching alternatives with prejudice means that an otherwise good alternative is not given serious consideration because of bias. Tradition and status quo bias reflect fear of change and fear of failure. Comfort with the known and confidence in what has worked before are understandable. But when tradition and bias prevent brainstorming for new ideas, consideration of off-the-wall ideas, making mistakes, and experimenting with new ideas, they are impediments to good decision making. This impediment can hinder the implementation of a novel DSS, and a computerized DSS can do little to reduce this impediment. Managers need to be conscious of this problem and work to overcome it with others who perceive a need for change.

Lack of Knowledge Impediment

Having the right information at the right time is important in many decision situations. It is also important that managers understand the information they receive. In nonroutine decision situations an absence of information and knowledge can be a major impediment to effective decision making. In more routine and recurring decision situations this problem can be overcome. A wide variety of DSS can be built to overcome that impediment. DSS can provide information and knowledge and facilitate understanding in many decision situations.

Improper Use of Decision Aids Impediment

It is discouraging to realize that some of the decision aids and DSS that have been created and implemented in organizations actually hindered "good" and successful decision making. DSS can provide a false sense of confidence that information is complete or that data is accurate. To avoid this problem, it is important that DSS analysts conduct an assessment of situations that results in complete and accurate information. These attributes of information are not guaranteed because the data is in a DSS or because a model is used. DSS need to

be designed to positively impact decision behavior for an individual or for a group. Also in Decision Support Systems it is hard to support qualitative issues; so managers are rewarded for placing the greatest emphasis on numbers and quantified attributes. DSS usually neglect political issues, and DSS users may not explicitly consider their personal values and use their general knowledge and common sense while using a DSS. For all these reasons, DSS can be an impediment to good decision making in some situations.

To reduce the likelihood of these problems and to create effective DSS, Herbert Simon (1965) argued that we need to understand the thought process that computerized decision aids will support. Our understanding of decision behavior and thought processes remains incomplete and we need to be especially cautious in assessing when and how a DSS will be used prior to its design and implementation.

REDESIGNING DECISION PROCESSES

Hammer and Champy (1993) defined business process reengineering as the fundamental rethinking and redesign of business processes to achieve dramatic improvements in critical, contemporary measures of performance, such as cost, quality, service, and speed. In some situations reengineering has succeeded, but many failures have also occurred. Managers do not need to focus only on grand efforts to reengineer corporations; what is often needed is redesigned business decision processes that better use information technologies and DSS.

Business Process Reengineering

In a now classic *Harvard Business Review* article, Michael Hammer (1990) asserted that companies rarely achieve radical performance improvements when they invest in information technology. Most companies use computers to speed up, not break away from, business processes and rules that are decades, if not centuries, out of date. Hammer argued the power of computers can be released by "reengineering" work. Managers can use computers and DSS to achieve the important business goals of increasing speed, quality, and flexibility, while lowering business costs. Redesigned decision processes and new DSS can help achieve all of these goals.

In general, a business process is a group of activities, including decision activities, which create value for a customer. Let's briefly examine the process of fulfilling a customer order. Order fulfillment is a process that consists primarily of transaction processing activities, from order entry, picking products from inventory, dealing with back orders, shipping products, and dealing with returns. A number of decisions are made during the process, but they are primarily routine and recurring. What is often ignored are the control decisions about product quality or employee performance that are also made periodically with data from the order fulfillment process. If one reengineers this business process, the goal is most likely a dramatic improvement in results. Hammer argues that dramatic improvement means a quantum leap in performance, a tenfold increase in productivity, or an 80 percent reduction in cycle time. These

may be overly ambitious and impossible goals in the context of the order fulfillment process. Rather than accepting the status quo, improving the control decisions with a new DSS may actually be a more practical means of improving process performance, productivity or reducing cycle time.

Business process reengineering (BPR) has other consequences. According to Hammer and others, BPR typically creates an organization with a particular set of characteristics:

1. Processes are simple instead of complex.
2. People perform a broad range of tasks.
3. People become empowered to make decisions, rather than controlled.
4. The emphasis is a team and not an individual.
5. Organizational structure shifts to a flat structure.
6. Key figures are professionals, rather than managers.
7. The new focus is on the end-to-end business process.
8. The basis for performance measurement shifts from activity to result.
9. Managers serve as coaches, facilitators, and decision makers for exceptions.
10. A single point of contact is created for interacting with customers.

These consequences of business process reengineering are often desirable results, and many of them can be realized by more modest efforts to redesign business decision processes. Many of the above characteristics are attitudes, rather than new processes or structures that managers need to develop. Redesigning rather than reengineering Business Decision Processes is a viable alternative and DSS can be part of either strategy for improving work processes.

Redesigning Business Decision Processes

Managers can be logical and even intentionally rational in their decision making and yet still make the wrong decision. Also, there are not always, even after the fact, objectively "right" decisions. The following tips for redesigning decision processes and developing a new DSS should help insure that the decision maker who uses a DSS will benefit from using it.

Begin by clearly defining the business process. Determine if a DSS can help gather, organize, analyze, and/or retrieve information as part of the business process.

Use DSS to manage time pressure in a business process. The greater the time pressure to make a decision, the worse a manager's decision is likely to be. Therefore, a DSS should help a manager obtain enough information to make a high-quality decision in both high and low time pressure situations. A DSS should help managers analyze information thoroughly, help get other people involved, and help explore available options. A business process analysis should look for these opportunities.

Have the DSS manage the steps in a decision process when possible. A DSS should help decision makers and groups act to make timely decisions and to communicate them. In general, if managers delay making a decision past some vague critical point, a decision may lose some or all of its effectiveness. If possible, a DSS should provide information to help assess the urgency of a

decision situation. Managers need to consider factors such as competitors' actions, how long the opportunity will last, how reversible the decision is, and the amount of risk involved. A DSS should help a manager deal with ambiguity. A DSS should help a manager conduct appropriate analyses, but it should not promote excessive analysis.

A DSS should enhance a decision maker's confidence. Confident decision makers deal more effectively with opportunities and risks. Managers need to use their decision-making skills to make the right decision and then use persuasion skills to sell the decision. A DSS should not be designed to help managers rationalize decisions, but rather to make more intentionally rational decisions. Analyzing goals and values is an important part of decision making, and DSS should not diminish the importance of values and the importance of assuming responsibility for the decisions that are made.

DSS should encourage creativity. Solutions are not clearly identified in all decision situations. DSS should not impose too much structure in situations that are unstructured or ambiguous. DSS can support creation of custom solutions.

To develop an effective DSS of any type, managers and analysts must focus on the interface between the decision maker and the computer. A new DSS will have an impact on the business process, related decision processes, and the behavior of the decision makers. The actual impact is primarily a function of the DSS user interface. DSS can only increase efficiency and effectiveness of decision making if the user interface is accepted and responsive to user needs. The interface must be responsive, rather than efficient, because what will help managers most may not be the "most efficient." A DSS must first be used in order to have any positive results.

CONCLUSIONS AND COMMENTARY

Making "good" decisions is *not* an easy task for individual managers or for groups of managers. DSS can aid in routine and nonroutine decision making but DSS do not make decision making any easier or less important. People do have significant limitations that hinder their success as decision makers. Despite those limitations, many managers make and have made successful decisions of major significance and importance without using a DSS. So, the issue in evaluating the need for a DSS must be whether DSS can improve the frequency of successful decisions in an organization. This outcome is possible, but at a cost, and simply providing more information for decision makers is the wrong approach. The trade-offs in evaluating proposed DSS are evaluated in more detail in Chapter 12.

Decision makers can benefit from better, timelier information that is presented in a relevant, unbiased way. Understandable analyses and graphical displays are generally better than complex displays and long, complex tables of numbers. Poor or excessive information presentation in a DSS may result in information overload or biased decision making. Both types of negative results will result in bad decisions or inaction when a decision is needed.

DSS analysts need to be cautious in their DSS design activities, and they need to avoid reinforcing the limitations of decision makers in a DSS design.

DSS should enhance the process of decision making and reduce the negative consequences of human information processing limitations. These positive results arise from a sophisticated understanding of decision-making concepts and behavior. DSS analysts need to use their knowledge of managerial decision making when designing and evaluating DSS.

Some managers have very real concerns about developing computerized decision support that must be addressed. For example, George Vickers, a manager turned sociologist, wrote in 1967, "I fear the alluring possibilities of automating decision processes, first, because the decisions which lend themselves to be so treated are decisions about the best means to reach given ends, where the criteria by which means are judged best are given, like the ' ends,' at the outset. I believe that no important decisions are of this type and that those which appear to be so usually conceal more important questions which ought to be dealt with first. I fear that automation will further bury these essential issues. Intractable problems are usually solved by being re-stated; their ' facts' are found to be irrelevant. Vast, vested interests resist such re-statements; and I fear that automation will make these vaster still. Most of all, I fear the possibilities of automated decision making, because I believe that the criteria which determine decisions are only evolved by the process of decision itself and that this process, so tedious and necessarily half-conscious, will be further jeopardized by the appearance of the new technique and the new mystique, with its panache of certainty" (Vickers, 1967, pp. 144–145). Vickers's concerns remain relevant today and his "fears" should be a cautionary cry to managers and to DSS analysts.