Chapter 3: Analyzing Business Decision Processes

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I. Introduction

Let’s examine some generalizations about decision-making behavior and business decision processes that impact building and using Decision Support Systems. At a fundamental level, both managers and Decision Support Systems analysts need to acknowledge that decision-making is an important part of a manager's job and some other business professionals. 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. Decision Support System design should begin with an understanding of an existing decision process. This chapter emphasizes: understanding managerial decisions; evaluating decision-making context; the decision-making processes; what is "good" decision-making; and redesigning decision processes.

II. 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 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 information search problems and detours, delayed feedback of results, uncertainty, ambiguity and in some cases conflict during decision-making. In many situations, managers seem to engage in an informal causal analysis in an attempt to favorably influence decision outcomes.

Figure 3.1 Categories of Organizational Decisions

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).

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

> **Strategic Planning** - decision processes related to allocating resources, controlling organizational performance, establishing broad policies, evaluating investment or merger proposals.
>
> **Management Control** - decision processes associated with 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 by managers 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. We need to do more than support the "decision".

III.Decision-Making and Problem-Solving

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, semi-structured or ill-structured. 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 ill-structured or unstructured decision situations, objectives are hard to quantify and it is usually not possible to develop a model of the situation. Ill-structured situations require managers to use more creativity and subjective judgment to find a solution. Ill-structured situations can be supported by computerized systems, but the support focuses more on information presentation, summary and support analyses 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.

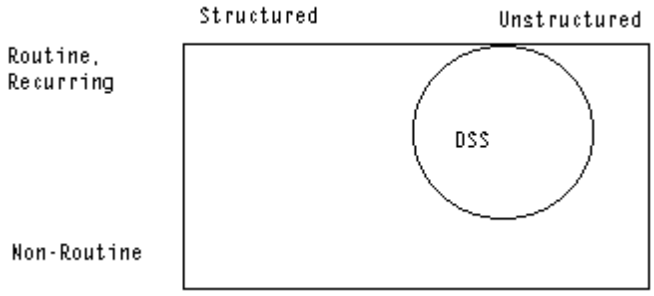


Figure 3.2 Matching Decision Support to Decision Situations

Decisions can be categorized as routine and recurring decisions or programmed decisions with set responses, and as non-routine or infrequent decisions that are usually less structured. Examples of routine decisions that can be automated and programmed include placing an order to replenish inventory, sending delinquency notices, or routing trains. Non-routine 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 non-routine. If a decision is "generic" and routine, valuable time and resources should not be expended each time the decision occurs as one would with a non-routine, non-recurring decision. Recurring decision situations should be analyzed and "programmed" as much as is possible and they should be supported when possible by technology. The potential rewards from improving routine, recurring decisions are 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 the situation does not require, expect, encourage or need analysis and intended rationality using a computer support system with models, databases and other sophisticated tools will be unnecessary and may be manipulated or distorted. Rather than dwell on when decision analysts should avoid suggesting DSS, it seems more important to help analysts identify "good situations" for building Decision Support 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.

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. Finally, in some situations many people need to be involved and consulted. Enterprise-wide and Group Decision Support Systems (GDSS) can help involve multiple stakeholders, especially those internal to the organization.

IV. 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 5 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 and 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-maker's 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 - their goals, experiences, capabilities, and commitment; 2) functional units – the technological characteristics, independence, interdependence, and conflict among units; and 3) organization factors - like goals and objectives, processes and procedures, and the nature of the product or service. The factors in the external environment that impact decisions include: customers, suppliers, competitors, socio-political issues, and technological issues. Some DSS help managers assess the above factors, but what is more important is to consider them when 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. Some people take credit for the good ideas of others; some managers accept little help, they 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 DSS 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.

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

People are influenced by how information is presented to them; we are also susceptible to social pressure; and we have a desire to avoid cognitive dissonance. This means that once a person has committed to a decision, then 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. According to Janis and Mann (1977), 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 as 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 DSS and may actually reduce the effectiveness of decision-making in an organization.

V. 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 3 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. Prior to implementation a major decision has is made and 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 can be supported by a variety of Decision Support Systems.

An Example

According to Hammer and Champy (1993, p. 36-39), IBM Credit Corporation, a wholly owned subsidiary of IBM, had a business decision 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 1 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 repot. 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 2 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 systems for a deal structurer who handled all of the steps! Difficult decisions could be referred to a small group of specialists. The new Decision Support System and process resulted in a 90-percent reduction in cycle time and an enormous improvement in productivity.

VI. A General Decision Process Model

A sequential, decision process model (see Figure 3.3) provides a broad view for understanding 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.

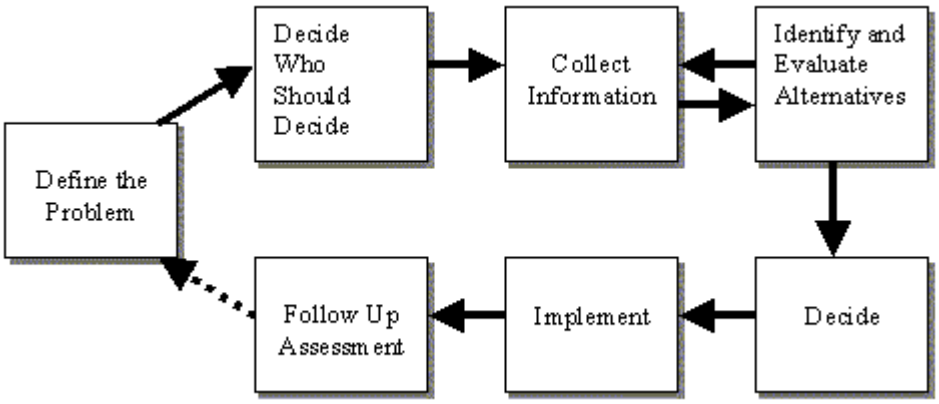


Figure 3.3 A General Decision Process Model

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, and 7. Follow-up Assessment.

Define the Problem

Many managers feel that a well-defined problem is much easier to solve and problem identification reduces the chances of having a good answer but to the wrong problem. When the wrong problem is defined it is impossible to making 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 problem exists when at least the following three conditions are met:

1. Managers have measured how well the company is doing using a standard.
2. There is a deviation from the standard, i.e. the company is not achieving our desired result. Managers identify problem symptoms.
3. A manager recognizes the deviation and wants to find a solution.

The above conditions are simple enough 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 which 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 (1971) 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 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 in 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 ideas. 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). Some GDSS have tools based on NGT, that is, silent idea generation, idea sharing, rating or ranking of alternatives (see Delbecq, Van de Ven and Gustafson, 1975). Using criteria can help 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 decision is delayed and postponed. 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 often characterize ineffective managers. 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 is the culmination of one process. The specific decision process may be 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. 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.

VII. "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 assure some wrong decisions, for example, bad weather, disease, changing economic conditions, false information received, bad luck and changes in laws and regulations.

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, 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 the rewards of successful implementations 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. Thus, in this view, we need to discover the decision maker's perception of the decision situation in order to increase the decision maker's effectiveness. This is fully as important as identifying the surface "facts" of the situation. It is often the case that the "facts" which initially appear important when working within a semistructured or unstructured decision situation are not the ones that, after they are explored by the decision maker, turn out to be the most influential in affecting decision outcome."

"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. The definition of efficiency used here is closely related to the term's use in physics and engineering: an output value divided by a value for the input resources used to obtain that output."

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, 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 experience and lack of knowledge and improper use of decision aids.

Tradition and 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 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 DSS and DSS can do little to reduce this impediment. Managers need to be conscious of the problem and overcome it as best they can.

Lack of Knowledge Impediment

For routine, recurring decisions knowledge and experience are very important. DSS and expert systems can capture some managerial knowledge and reduce the impediment of inexperience and lack of knowledge.

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 can actually hinder "good" and successful decision-making. DSS can provide a false sense of confidence that information is complete or that data is accurate. Completeness and accuracy are essential activities of the DSS analyst. These attributes of information are not guaranteed because the data is in a DSS. DSS need to be designed to positively impact decision behavior for an individual or for a group. In Decision Support Systems it is hard to support qualitative issues; managers are encouraged to place the most emphasis on numbers; also DSS usually neglect political issues; and DSS users may not explicitly consider their values and use their general knowledge and common sense.

Simon (1965) argued that we need to understand the thought process that computerized decision aids will support if we are to create effective support systems. Our understanding of decision 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.

VIII. 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. We do not need to focus only on grand efforts to reengineer corporations, what we do need is redesigned business decision processes that better use information technologies and Decision Support Systems.

Business Process Reengineering

In a now classic Harvard Business review article, Michael Hammer (1990) asserted 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 said 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.

A business process is a group of activities that create value for a customer. Let’s briefly examine the process of fulfilling a customer order. Order fulfillment is a process that consists of many 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. Some meta-decisions about product quality or employee performance are also made periodically. If we reengineer this process our goal is 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.

According to Hammer and others, business process reengineering typically creates an organization with a particular set of characteristics:

1. Processes are simple instead of complex.
2. People perform a broad ranges of tasks.
3. People become empowered, 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. People in the organization focus on pleasing the customer.

These 10 consequences of Business Process Reengineering are desirable results and many of them can be realized by more modest efforts to redesign business decision processes. Many of characteristics are attitudes that managers need to develop, rather than new processes or structures.

Redesigning Business Decision Processes

Managers can be logical and intentionally rational in their decision-making and yet make the wrong decision. The following tips for redesigning decision processes and developing a new DSS should help insure that the decision-maker who uses a Decision Support System will benefit from using it.

Begin by defining the business decision process. Determine if a DSS can help gather and organize information systematically. Decision-makers must understand how the information in a proposed DSS is defined and organized. 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 time pressure and low time pressure situations. A DSS should help managers analyze information thoroughly, help get other people involved, and help explore available options. The process analysis should look for these opportunities.

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 the 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. A DSS should help a manager deal with ambiguity. The worst decision-makers suffer from analysis paralysis. DSS should help a manager conduct appropriate analyses, but it should not promote excessive analysis.

Some DSS should incorporate soft data and encourage managers to engage in qualitative data collection. Decision-makers need to concentrate on what others are saying, ask questions, provide feedback, avoid stereotypes, and try to build a consensus from the input they receive. A DSS should enhance a decision-maker's confidence. Confident decision-makers successfully deal 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 reinforce a manager's values. 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.

A DSS should encourage creativity. All solutions are not clearly identified in decision situations. DSS should not impose too much structure in situations that are unstructured or ambiguous.

To develop an effective Decision Support System of any type, managers and analysts must focus on the interface between the decision-maker and the computer. A new DSS will impact the business process, related decision-making 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". For example, program commands may be efficient but not responsive to user needs.

IX. Conclusions and Commentary

Making "good" decisions is **NOT** an easy task for individual managers or for groups of managers. Decision Support Systems can aid in routine and non-routine 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 of us 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 Decision Support Systems can improve the frequency of successful decisions in an organization. This outcome is possible, but stressing providing more information to decision makers is the wrong approach.

Decision makers will benefit from better, more timely 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 action 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 DSS should reduce the negative consequences of human

information processing limitations. These positive results arise from a sophisticated understanding of decision-making concepts and behavior. We need to use our knowledge of managerial decision-making when we design DSS.

X. Audit Questions

1. What decision or decision process led managers to consider developing or improving a DSS?
2. Has the firm examined relevant business processes from a customer service and information technology perspective?
3. What are the most important decisions made by managers in the company?

Questions for Review

1. What is meant by terms like decision process, decision problem and decision situation?
2. What are 5 elements of a decision situation?
3. What are the steps in the General Decision Process Model?
4. Do managers differ in the way they make decisions? If so, are the differences important in designing DSS?

Questions for Discussion

1. Can decision-making be improved? How do we know a computerized decision aid is needed?
2. Why do DSS analysts need to understand decision behavior? Should DSS analysts actually study specific decision behaviors in the organizations where they work?
3. How do DSS analysts reconcile competing models or decision frameworks? Can DSS analysts bias decision-making by overly structuring and rationalizing decision-making?
4. Can all managerial decisions benefit from computerized decision support?
5. Who makes decisions in organizations? Are decisions made by a single individual or by groups?

Decision Process Flowcharting Exercise

Develop a process flowchart for the IBM Credit Corporation business decision process that evaluated customer's requests for financing. See the flowcharting symbols explanation.

Internet Exercise

Conduct a search using Excite for articles on Business Process Reengineering and Process Redesign. Visit www.brint.com and conduct a search at that site. What Web sites have articles on these topics?

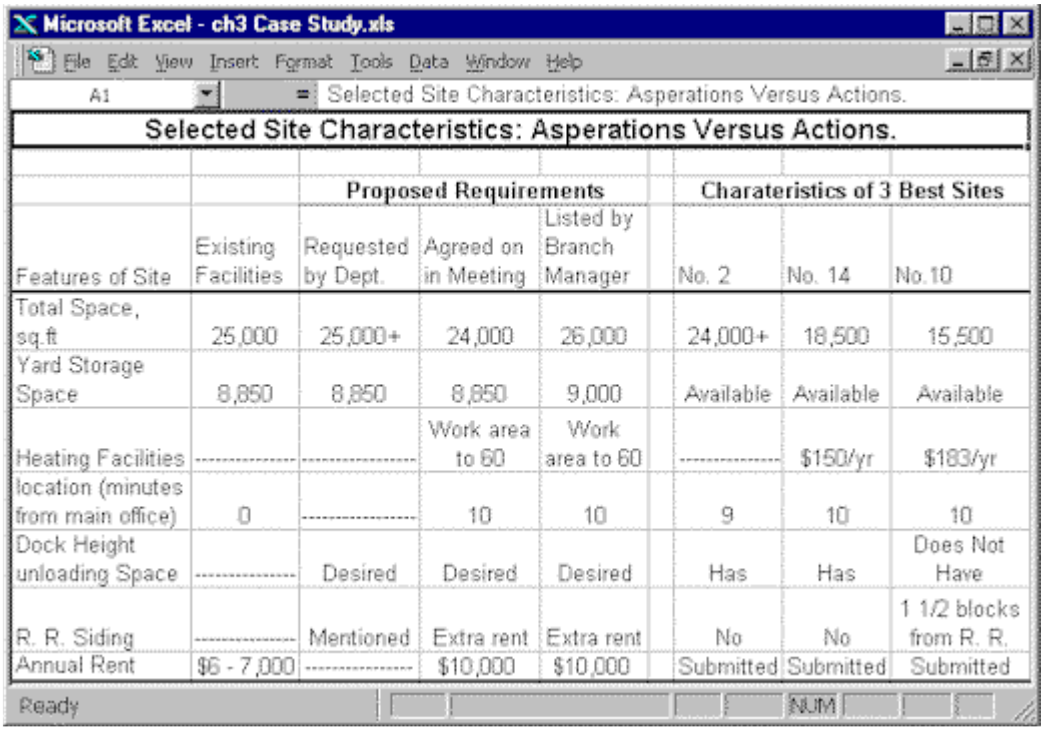
XI. Case Study - Home Specialties

A medium-sized construction firm wanted to find new work space and storage space for its Home Specialties Department. Home Specialties had a unique and somewhat insecure position in the firm. Other departments rarely shared its customers. It used union labor like other departments of the firm, but unlike most of its competitors; therefore, its labor costs were too high to enable it to bid successfully on many projects. High labor costs and changes in style and technology in the construction industry were causing the department's market to shrink. Top management expected sales of the department to decline. Top managers outside the Home Specialties Department had negative feelings toward the department for two reasons: 1) the head of the department was a senior manager in the firm and his earnings under a profit-sharing contract were higher than the earnings of almost all other department heads; and 2) other departments were also expanding, and some of them were anxious to take over space that was being used by Home Specialties.

For at least two years, managers had faced the problem of deciding the long-run importance of Home Specialties operations and of providing plant facilities to accommodate expanded operations had been an issue for at least two years. Management had long been aware of the need for some kind of action. However, there was no consensus about what the critical problem was or about what alternative would be satisfactory. The President, who believed centralized operations was most efficient, initially viewed the problem as one of finding a way to expand facilities at or near the current site. The Head of the Home Specialties Department wanted to move the department to a new location, where it would not be in conflict with the operations of the other units. Some members of general management thought that the department should be dropped from the firm in order to release working capital for units that had a brighter future. The President and the Branch Manager had talked of maintaining the department, but of limiting it to the size that fit the existing site. Managers had talked about reducing the share of profits going to the department personal, and forcing the Head of the department to take a cut in salary. Some years earlier, a few managers had almost forced the department manager out of the firm.

The President's show of interest when a local plot of land became available, coupled with continuing pressure from department management to investigate possible new sites, resulted in a decision to concentrate on a search for a new site. A study of the feasibility of moving the department may have seemed timely, too, because of the President's independent decision to renegotiate profit-sharing contracts with department management. Since the department manager and his assistant wanted to move, a decision to support their search for a new location might have been regarded as an inducement to them to accept a cut in earnings. In addition, the move might make it easier to curtail department operations or to ease the department out of the firm.

Requirements for the new site were set forth in a conference attended by the branch manager, the Department Head for Home Specialties, his assistant, and a specialist in estimating costs of building alterations. The pressures on current facilities, at least, were not expected to increase over the next year or two. In defining the requirements for a new site, the executives in the department were trying to find something that would be equivalent to what they already had. The assistant head of the Home Specialties Department initiated most suggestions for the site requirements. He worked from a memorandum he had prepared earlier. The Branch Manager drafted the final set of requirements after the meeting. The essential specifications are included in Table 3.1.



Selected Site Characteristics: Asperations Versus Actions.

		Proposed Requirements			Charateristics of 3 Best Sites		
Features of Site	Existing Facilities	Requested by Dept.	Agreed on in Meeting	Listed by Branch Manager	No. 2	No. 14	No.10
Total Space, sq.ft	25,000	25,000+	24,000	26,000	24,000+	18,500	15,500
Yard Storage Space	8,850	8,850	8,850	9,000	Available	Available	Available
Heating Facilities	----------	----------	Work area to 60	Work area to 60	----------	$150/yr	$183/yr
location (minutes from main office)	0	----------	10	10	9	10	10
Dock Height unloading Space	----------	Desired	Desired	Desired	Has	Has	Does Not Have
R. R. Siding	----------	Mentioned	Extra rent	Extra rent	No	No	1 1/2 blocks from R. R.
Annual Rent	$6 - 7,000	----------	$10,000	$10,000	Submitted	Submitted	Submitted

Table 3.1. Site Characteristics Spreadsheet Analysis.

The conference was notable for the absence of real debates about or explicit consideration of the relative importance of different kinds of requirements. The discussion was oriented toward making sure that the new site would offer the same facilities as the old one. The most intensive discussion for several requirements centered on reaching an agreement as to what facilities the department had at its current location. The question of flexibility of various requirements was hardly raised, although it was unreasonable to expect to find a site that corresponded to all of the committee's specifications.

XII. Case Study (cont) - Home Specialties Intensive Search

An intensive search for sites followed the conference and lasted for four months. The evaluation of each site about which information was received was a three-phase process. First, the branch manager or another member of the central management group looked at

the initial information that was available from the advertisements, phone calls, or cursory visits to the site to decide whether the site was worth further inspection. At least 18 sites were rejected at this stage because they all failed to meet one of a small set of requirements. The most important considerations at this stage were: (1) whether the site could be rented (the company did not want to purchase), (2) whether the site was located near the company's existing facilities (something within 10 minutes' driving distance was preferred), and (3) whether the site was approximately the right size (sites with 15,000 to 25,000 square feet were preferred). One or more of these three factors caused the rejection of eleven of the eighteen sites in this early phase. Of the remaining seven, one was rejected because of problems of access, one because of an unsatisfactory layout, and five for unknown reasons.

The second phase consisted of a more detailed evaluation of the site potential. Four sites were given detailed consideration. Members of the Home Specialties Department staff estimated the expenditures required to make the necessary heating, lighting, and ventilation installations. One of the four sites was rejected after the detailed inspection because the branch manager found it liable to frequent flood damage and because the company would have had to buy other leases on the property.

There were, then, three sites that management thought good enough to prepare bids on. Site number 2, the first one for which a bid was prepared, had an area about the same as the specifications called for; but site number 14 and site number 10 were both smaller than the specifications required. Site number 10 was at the distance limits set by management and site number 14 was beyond the distance limits set by management. Management expected to get by on site number 2 with a bid of $10,000 to $15,000 for 24,000 square feet of space; the bid on site number 14 was $12,000 for 18,500 square feet. On site number 10, the third one for which a bid was prepared, management considered offering $17,500 for 15,500 square feet of space, excluding yard space which had to be obtained separately.

The bids on sites number 2 and number 14 were turned down by the agents for the properties, but the bid on site number 10 was never submitted. The President refused to approve the bid because he thought it offered too much money for too little space. The search for a new site for the Home Specialties Department apparently ended with the President's refusal to approve the bid for site number 10.

This case is based on Cyert, Dill and March (1958).

Questions for Discussion

1. Would a Model-Driven or Data-Driven DSS have helped in making this decision? Would this company have benefited from a Group DSS?
2. What type of decision situation is described? Routine? Structured? Unique? Political? Strategic?
3. What was the decision process? Can you diagram the process?
4. Was a formal search conducted to identify alternatives?
5. What is the decision-making context for this situation? Describe this situation in terms of its elements.

XIII. An Executive's Perspective on Automating Decision Processes from 1967

I am influenced by personal experience, even in this still unautomated world, of the power of the measurable to drawf the nonmeasurable. I recall times when I have criticized some forecast or estimate for omitting some variable which must obviously be relevant to the result and have been answered--"We couldn't include that; we couldn't put a value on it." And if I objected--"But by omitting it, you have valued it at zero; and you know that is the only value it cannot have." The answer given in the sad, patient voice which the professional keeps for the amateur--would be--"No; we haven't valued it; we have only omitted it." And then, triumphantly--"look, one of the footnotes says so."

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).

Questions for discussion:

1. Are Vickers's fears warranted?
2. In what organizations, at what levels, and for what problems are his concerns possibly well founded?
3. What can be done to avoid the problems Vickers anticipates?

Thanks to Karl E. Weick whose paper in the Harvard Business School Research Colloquium "The Information Systems Research Challenge" in 1984 brought this quote from Vickers to my attention.

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