

DECISION MAKING

Proven Methods for Better Decisions



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Preface

Decisions are continually made by everyone. They range from the elementary decision a child makes when he or she decides to take a hand off a hot stove, to the complex decisions made when negotiating a SALT agreement. The range of decisions is truly vast and complex.

The purpose of this book is to present a guide as to how decisions should be made and the factors which influence decisions and decision makers. The book presents both an analysis of decision makers, some of the things that make them the way they are, and some of the processes which have been developed in order to assist the decision maker to quantify potential solutions.

In this book, the background of elemental decision making is presented first; the literature then proceeds with discussions of the decision makers and the impact of the human relations field on decision making, concluding with various decision-making techniques. Decision techniques start with the simple selection from two alternatives and proceed to the multialternative decision process where each alternative has a number of factors influencing the final selection. As a decision becomes more complex, so does the process involved in making a selection; however, there has been a conscious effort to keep the mathematics to a minimum. This book was prepared for the manager, not for the mathematician. The goal of the author is to make this book a reference source for management decisions rather than a quantitative analysis textbook.

Paul E. Moody

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Introduction

DECISION LOOP

Often it has been asked whether organizations have any rules and regulations that relate to a process by which a manager can arrive at objectives, policies, and strategies. While there is no single set of rules for any of these functions, they all relate to decisions of different forms. Although a number of authors have tried to compile a concise list of rules to fit all cases, their attempts have been futile. However, a series of steps can be listed that relate to all decision-making circumstances. Figure 1 illustrates the closed-loop decision process.

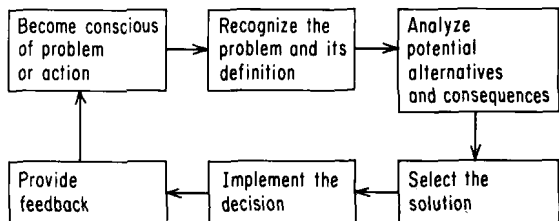


Figure 1 Decision-making loop.

The decision may be simplistic or complex, or it may relate to any of the other fields of management; however, all decisions can be guided by the basic closed-loop process.

IMPORTANCE OF THE DECISION

How are most decisions made? Are they made by guessing, by taking a poll, by voting, by following a hunch, by experience, or by a systematic approach to determine the best way to solve a particular problem? If this were a multiple-choice quiz, we would have to check the block that indicates all the above.

Given that a number of methods can be used to arrive at a decision, how can we determine which one to use at a particular time? Obviously, this problem relates to the importance of the decision. For example, in an average business day, a decision as to which letter to answer first may be inconsequential, and so it may be made on a first-in, first-out basis. However, a decision related either to the selection of an individual for a major management position or to a significant capital expenditure would require significant prior research. Are there any guidelines to help determine the importance of a decision? Research indicates that there are guidelines for almost everything. Do we need them? The answer depends on the particular situation. In this text we provide these guidelines in a "cookbook" fashion for those times when they are needed. Thus the time required to read long-winded presentations of information (with the facts cleverly concealed) can be saved; instead, you can refer to lists that can be referenced with a minimum of digging.

The decision maker not only must make correct decisions, but also must make them in a timely manner at minimum cost. The minor decisions may not warrant thorough analysis and research and even may be safely delegated to others. The importance of a decision is strongly related to the decision maker's position in the organization. For example, a decision that may be of minor importance to a top executive may be of major importance to the individual making the choice at a lower level.

To assess a decision's importance, five factors should be evaluated:

1. Size or Length of Commitment. If the decision entails the commitment of considerable capital or the expenditure of great effort by a number of people, then it is considered a major decision. Similarly, if the decision will have a long-term impact on the organization, such as relocating a plant to a new or foreign site or getting into or out of a particular segment of the market, the decision is considered major.

2. Flexibility of Plans. Some plans can be reversed easily, while others have a degree of finality about them. If a decision involves taking a course of action that cannot be reversed easily, then that decision assumes major significance. An example would be the selling of patent rights for an invention that a company is not using presently but may wish to use in the future; another example would be the sale of a piece of land that is not being used currently. The financial consideration may be minor at the time of sale, but the long-term impact on the company may be significant.

3. *Certainty of Goals and Premises.* If a company has a long-standing policy of acting in a certain situation in a particular way, then it is easy to make a decision that is consistent with past history. However, if an organization is very volatile and a historical pattern has not been established—or if the nature of the decision is such that actions are highly dependent on factors known to only higher-level personnel in the organization—then the decision assumes major importance. For example, it would be quite inappropriate for financial directors to declare the amount of dividends to be paid based solely on their own financial data. They may not be aware of a capital expenditure that the company's top management has been considering while waiting for adequate profit data to justify the investment.

4. *Quantifiability of Variables.* When the costs associated with a decision can be defined accurately, the decision takes on minor importance. For example, if the method by which a component is to be machined must be chosen and if the cost and time associated with the use of each method are known, then the analysis of relevant factors and the resulting decision are not very important. But if the decision is related to bidding on the design and manufacture of a complex item and if the cost and program relate to a broad estimate which is subject to errors, then the decision assumes much greater importance.

5. *Human Impact.* Where the human impact of a decision is great, its importance is great. This is particularly true when the decision involves many people. As an example, I once worked in an organization that had two major facilities approximately 100 miles apart. To consolidate operations, it was decided to move one particular function from one location to the other. This may have been a fine plan; however, it did not take into account the fact that approximately 250 employees would have to either move or commute 100 miles. When top management finally realized the impact of the plan in terms of unhappy people and the potential of many of the best people for finding other employment, the plan was scrapped.

TIME-COST RELATIONSHIP

How do we make these final decisions? How much data do we gather first? How much does the data cost? Why can some people not make decisions even after great anguish over the alternatives? These questions relate to the individual's background, or experience, and education.

Although there is little we can do to change our personalities or outlooks on life, and we only have hindsight in relation to our personal experiences, we can do a lot about future life and educational experiences. This text could be one step of an educational experience that will continue for the rest of our lives, for one primary difference between a "success" and an "almost success" relates to an individual's ability to make timely and good decisions, regardless of the complexity of the problem or the decision maker's experience with it.

Let's start by developing a definition of a decision. For the purposes of this text, a *decision* is an action that must be taken when there is no more time for gathering facts. The problem is how to decide when to stop gathering facts. The solution varies with each problem we attempt to solve, for gathering facts costs time and money.

Figure 2 graphically elucidates the cost of gathering facts versus the benefits derived. In Figure 2, the more time expended gathering facts,

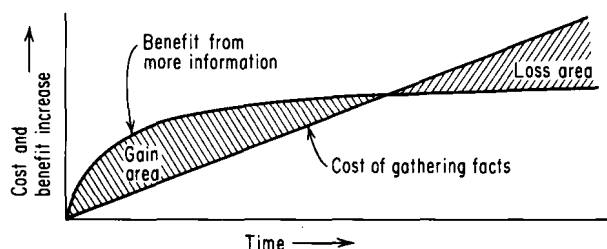


Figure 2 Cost-benefit time curves.

the greater the total related cost. Note that this loss may be felt in terms of not only money but also opportunity, effectiveness of action, reversibility of a decision, and so on. Also there is an immediate benefit from having additional data to help us make the decision. However, as time goes on, the marginal benefit decreases until finally we have waited too long. The cost associated with gathering facts has outweighed the benefit that they provide. In essence, we move from a position where we could gain by the accumulation of data to one in which we lose.

This type of chart varies radically for each decision; however, the principle remains unchanged. For example, the time required for a child to take her hand off a hot stove may be quite dramatic relative to the cost in terms of pain and the benefit in terms of the burn's severity. Conversely, a decision to sign or not sign a SALT agreement does not

have a similar short time frame, and much data gathering is required. But, even with a SALT agreement, too much delay may result in additional problems which could be more serious than we care to think about now.

If excessive gathering of facts is a risk, then why do it? The answer is evident. We gather facts to limit uncertainties about the results of the course of action we choose. For every decision made, there are varying amounts of uncertainty. Our task is to reduce that uncertainty until we are reasonably certain of the results of different options without exceeding the crossover point of cost versus benefit. An example of the relationship between uncertainty and the cost of gathering data is illustrated in Figure 3.

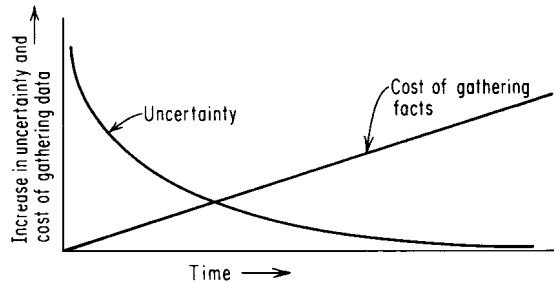


Figure 3 Cost-uncertainty time curves.

As previously illustrated, the cost of gathering data increases with time. However, as time passes and the amount of data gathered increases, uncertainty decreases. Note that uncertainty never reaches zero. So do we keep gathering facts until the uncertainty curve has flattened out? Not at all. By that time it is quite possible that we have passed our crossover point between cost and benefit and time has passed us by.

Now we are back to the beginning. How do we make effective decisions given that uncertainty will always be with us and that reducing this uncertainty entails a cost? The answer is to first analyze the problem and then evaluate its relative magnitude. For minor problems, off-the-cuff decisions may be completely proper. For decisions having major ramifications, the proper amount of data must be gathered to select the best course of action. Another way to look at the time versus uncertainty curve is to compare it with the curve of total cost of obtain-

ing data to reduce uncertainty versus actual cost savings derived from the additional data. See Figure 4.

The point is that normally the total cost can be reduced by the improved decisions made after data have been gathered. However, at a certain point the cost of gathering data does not marginally improve

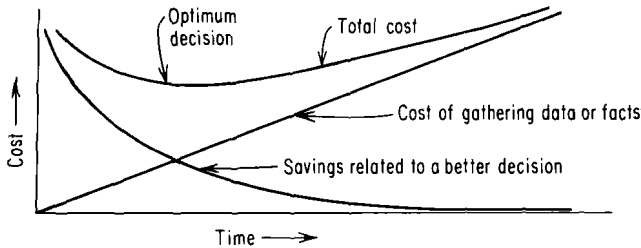


Figure 4 Optimum decision point curves.

the cost factor associated with an improved decision. On Figure 4 this point is called the *optimum decision* point. Delaying the decision any longer results in a total increased cost, which may be in terms of actual dollars, opportunity costs, or other factors.

ELEMENTS OF THE DECISION PROCESS

In *The Effective Executive*¹ Peter Drucker lists five elements of the decision process:

1. Clear realization that the problem is generic and can be solved only through a decision that establishes a rule
2. Definition of the specifications of the solution, or the *boundary conditions*
3. Derivation of a solution that is "right," that is, one that fully satisfies the specifications before attention is given to the concessions needed to make the decision acceptable
4. The building into the decision of the action to carry it out
5. The *feedback* that tests the validity and effectiveness of the decision against the actual course of events

¹Peter E. Drucker, *The Effective Executive*, New York, Harper & Row, Publishers, Incorporated, 1967.

Drucker goes on to explain that a decision is a judgment and, as such, is rarely a choice between right and wrong. At best, it is a choice between “almost right” and “almost wrong.”

Clearly, decisions involve compromise; but I cannot agree that a particular set of steps can be followed to arrive at “almost right” conclusions. The reason is that almost all decisions are unique in character, controlling conditions, and preferred resolution. The best that any text can offer a manager or decision maker is, first, enough data to induce that person to consider the situation as a decision point, to recognize that a number of studies and investigations have been conducted which may provide guidance in arriving at the optimal decision, and, second, a single, readable (not high-powered) method of analyzing alternatives.

DECISION INGREDIENTS

The art—not science—of decision making is based on five basic ingredients.

1. Facts. In this text we discuss some methods of obtaining facts. Facts are gathered for both sides of the question, pro and con, in order to define the boundaries of the problem. However, if facts cannot be obtained, the decision must be based on the available data, which fall into the category of general information.

2. Knowledge. If the decision maker has knowledge of either the circumstances surrounding the problem or a similar situation, then this knowledge can be used in selecting a favorable course of action. In the absence of personal knowledge, we are forced to seek advice from those who are informed. Thus there has been a tremendous increase in the consulting business. In the 1920s and 1930s, a manager was expected to be familiar with all aspects of the business. However, this expectation has declined in recent years as business has grown more complex and individuals have specialized in areas in which a general manager could not be expected to possess technical knowledge, owing to the years of training needed. Obtaining consulting services is even more important when more than one speciality is involved in the analysis of multiple aspects of a complex problem.

3. Experience. When an individual solves a problem in a particular way and the results are either poor or good, that experience provides him or her with data to use in solving the next similar problem. If an accept-

able solution is found, most likely it will be repeated each time a similar problem arises. If we lack experience, then we have to experiment, but only when the results of a bad experiment do not have disastrous consequences. Major problems, though, cannot be solved by experiment.

4. Analysis. A great deal of the following text is devoted to methods of analyzing problems. These methods should supplement, but not replace, the other ingredients. However, in the absence of a method to mathematically analyze a problem, perhaps we can study it by other than mathematical means; if that fails, we must rely on intuition. Some people scoff at intuition. But if the other ingredients of decision making do not point to a direction to take, then intuition may be the only choice left.

5. Judgment. Judgment is needed to combine the facts, knowledge, experience, and analysis to select the proper course of action. There is no substitute for good judgment.

DECISION CHARACTERISTICS

There are five characteristics of decisions. The first two are quite similar to the factors used to evaluate a decision's importance.

1. Futurity. This characteristic involves the extent to which commitment entailed by the decision will affect the future. A decision that has a long-term influence can be considered a high-level decision, whereas a short-term decision can be made at a much lower level.

2. Reversibility. This factor relates to the speed with which a decision can be reversed and the difficulty involved in making that reversal. If reversibility is difficult, a high-level decision is indicated; but if reversibility is easy, a low-level decision is needed.

3. Impact. This characteristic relates to the extent to which other areas or activities are affected. If the impact is extensive, then a high-level decision is indicated; a singular impact relates to a low-level decision.

4. Quality. This factor relates to labor relations, ethical values, legal considerations, basic principles of conduct, company image, and so on. If many of these factors are involved, a high-level decision is needed; if only a few factors are relevant, a low-level decision is indicated.

5. Periodicity. This element relates to whether the decision is made frequently or rarely. A rare decision is a high-level decision, whereas a frequently made decision is a low-level decision.

DECISION PROBLEMS

The next topic to discuss is the 10 greatest problem areas associated with decision making. It may not be the best form to start a text with a series of lists. However, the purpose here is not to present data that should be taken as gospel, but rather to emphasize that many aspects must be considered in decision making and no one view represents the entire picture.

1. *Misdirection.* This is a case of wrong question, right answer. As an example, suppose you were looking for a top scientist to lead a group of highly trained technical personnel in search of a major breakthrough in some scientific field. You may find and hire the top scientist, only to have him or her lead the program into complete chaos and disorganized research projects. Perhaps you did not need a top scientist at all; what you needed may have been an individual with a scientific background and a record of success in getting technical people to work together to accomplish a joint objective.

2. *Sampling.* This problem involves the difficulty of securing a sample that is both adequate and representative. This is a constant problem in marketing, for an entire field of expertise has been developed to obtain sample sizes from a portion of the population which reflect what can be expected from the entire population. Although statistical analysis offers all sorts of probability curves and analytical data, there is the ever-present danger that the sample taken may not represent the facts. The most famous example of the danger of sampling is the major automobile manufacturer that took samples to determine exactly what the U.S. public wanted in an automobile. The difficulty arose because what people claimed they wanted was quite different from what they actually wanted. The result was the Edsel.

3. *Bias.* This factor is the degree to which prejudice affects the answers. Although bias may be found in the decision maker, in a major decision the decision maker may well depend on information from a source having an unidentified bias. One example comes from my own experience when I applied for a position in a research laboratory at a particular salary. I was hired at the salary I requested; however, not until years later did I learn that one of my coworkers had recommended that I be offered a much lower starting salary. When I asked why, he stated that he thought I would turn it down, and he was not in favor of hiring any competition for himself. Fortunately for me, the man who made the final decision saw through this bias.

4. Ubiquitous Average. Averages bury extremes, and these extremes may be very important. For example, assume you are considering going into a business which has a 10 to 50 percent profit on various items with an average return of 20 percent. You discover that you can expect your accounts receivable to be paid anywhere from 30 days to a year, with an average account being paid in 60 days. From the straight mathematics of the business, based on averages, it may appear to be a good investment. However, once into it, you may find that your low-profit items are paid promptly whereas collecting on high-profit items takes considerable time. This could force you to borrow capital to stay in business. The cost of the borrowing could change what appeared to be a good deal, based on averages, to a bad deal, based on reality.

5. Selectivity. This factor involves rejecting unfavorable results or choosing a method that is certain to yield favorable answers. The most common example of selectivity is a politician commenting on the results of primary elections. A candidate can lose 10 out of 12 districts in a primary and appear quite sincere when noting that the two trend-setter districts are indications that a groundswell of support is developing. Another example of obtaining a selective answer is the circulation of a marketing sampler that asks questions such as, Would you prefer to feed your children the higher-priced, yet nourishing breakfast food brand X or the lower-priced brand Y which has no nutritional value?

6. Interpretation. There is the danger in using facts and arriving at a distortion of their meaning. The most common problem associated with interpretation is simply the lack of technical background to understand what the facts mean. For example, the difference between a statistical and an actual sample could be expressed via the *mean*, the *median*, or the *mode*. If you were not familiar with the terms, you might think they all meant the same thing. In reality, they imply different things, and you may be considerably more interested in one than in the other, depending on the problem being evaluated.

7. Jumped-at Conclusion. You build it, walk into it, and spring it all by yourself. No one sets the trap for you. This is a simple trap to fall into, especially if you already favor a particular solution and the first bit of data substantiates your "gut feeling." Take the college professor who was correcting final examinations and happened to correct the class clown's paper first. The paper received a grade of 40 percent, so the professor immediately marked the class clown's report card with an F. What does the professor do after discovering that the 40 percent is the

top grade for the class? Or there is the much more famous example of the embarrassed New York newspaper that ran a headline, following a Presidential election, that Dewey defeated Truman.

8. *Meaningless Difference.* A lot can be done to avoid this problem by practical experience. Suppose a company decides to invest considerable capital resources in buying an expensive computer system in which the staff has a considerable degree of capability and excellent technical background. In a field that changes as rapidly as the computer field, the technological edge of today may be completely meaningless tomorrow. So the option of renting computer services should be seriously considered before any large capital investment is made.

9. *Connotation.* This problem relates to an emotional content or implication that is added to an explicit literal meaning. Connotations can easily mislead the decision maker who is not aware of and watching out for them on a continuous basis. This emotional connection is used every day in advertising media. Take, for example, the names of models of automobiles. They imply romance, intrigue, speed, adventure, and so on. The story comes to mind of the boy who offered his little brother one *great big nickel* in exchange for two little dimes.

10. *Status.* In a business environment there is a barrier between a supervisor and a subordinate which limits communication in either direction. There is the fear of disapproval, on the one hand, and the fear of loss of prestige, on the other. This barrier can be low or high; however, the decision maker must recognize that it is always there and will have considerable impact on the data transmitted. In literally hundreds of conversations with both supervisors and subordinates, I cannot remember one in which one of us said, "Well, here is the data; however, it may be completely wrong."

SUMMARY

In this chapter we introduced the concept of the decision loop. Then we discussed how the importance of a decision relates to the speed with which we proceed through this loop. We also discussed factors that differentiate between an important and a routine decision.

Next we reviewed the cost of gathering data and the increase in benefits derived from this additional information. As more and more data is collected, the risk of uncertainty decreases. However, at a certain

point the cost of gathering data does not increase the effectiveness of the final decision, and any further delay would pass the optimum decision point and increase total costs.

We talked about decision process elements as outlined by a prominent expert in the field. We supplemented this with a list of decision ingredients and characteristics. Finally, we listed 10 problems associated with the decision process that should be recognized and avoided.

Decision Makers

RISK AND COMMITMENT

One of the interesting theories related to decision makers is that an individual's preference to the assumption of risk is inversely proportional to the size of the commitment involved in a decision. This concept is illustrated graphically in Figure 5. In this figure the average individual is not very concerned about making a high-risk decision when the com-

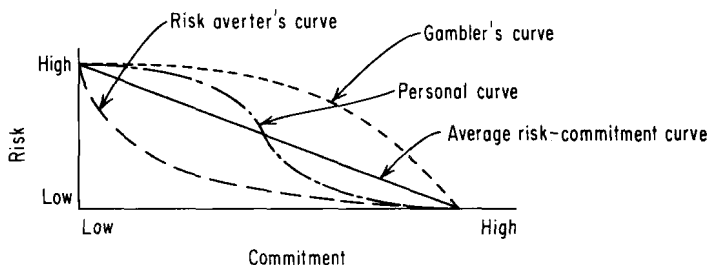


Figure 5 Risk-commitment curve.

mitment is relatively low. The curve also indicates that the average individual does not become involved in a high-commitment endeavor unless the risk is relatively low. An example is the purchase of a lottery ticket, which has a very high risk (in that most likely it will not win); yet the investment is low. But very few people would buy a home without first inspecting it, to make sure they were getting sufficient value for the high investment involved.

However, very few of us fit into what may be considered the average curve. Figure 5 indicates that some people may be willing to make a much greater commitment at higher risk than the average individual. This is indicated by the gambler's curve. Other people are much more timid than the average individual and make a significant commitment

only when the risk has been reduced considerably. This type is represented by the risk averter's curve.

To assess an individual's preference within the total number of possibilities, we must understand the individual's background and position within the organization. For example, a higher-level manager may be accustomed to taking larger risks than a lower-level manager. Another factor is the possible impact of the decision on the company or on the personal fortune of the decision maker. One person may be more conservative with a company's funds while another may be more conservative with her or his own fortune. We cannot say that one is right and the other wrong, because the circumstances of each case are unique. Nonetheless, for a particular type of business, it would be wise to watch both the successful and unsuccessful managers and try to categorize their management styles with regard to risk versus commitment; then, of course, emulate the successful manager.

The last curve shown in Figure 5 is the personal curve, which represents the majority of us, in that we all tend to accept a high risk as long as the commitment is low. However, once the commitment increases to such a point that we feel threatened by that high a commitment, we wish to reduce the risk as much as possible. The trick of finding the best risk-commitment curve is to select one in which you are not such a risk averter that you miss opportunities, but you are not such a gambler that your actions become dangerously risky relative to your ratio of right to wrong decisions.

SCIENTIFIC DECISION MAKERS

If decisions are made at all levels of an organization, who can be called the decision makers? The answer is that everyone working in a business environment is a decision maker. Will this continue? Some say "Yes," others "No."

In the early days of the industrial revolution, the owner or manager of a business ruled with an iron fist. A decision made by the boss always was right. No questions—no problems. However, as the working class became more educated, they realized that the boss was just another person, whose decisions could be good or not so good, like anyone else's. As management realized that business was becoming more complex, they hired experts to advise them in the fields of law, government, finance, engineering, marketing, computers, manufacturing, unions, and so on. The list is endless for a very diverse company. Where does it