Problem Solving and Decision Making

Alessandro Anzalone, Ph.D.
Hillsborough Community College, Brandon Campus

Agenda

1. Problem Solving for Total Quality
2. Two Models for Solving and Preventing Problems
3. Problem-Solving and Decision-Making Tools
4. Decision Making for Total Quality
5. The Decision-Making Process
6. Objective Versus Subjective Decision Making
7. Scientific Decision Making and Problem Solving
8. Employee Involvement in Problem Solving and Decision Making
9. Role of Information in Decision Making
10. Using Management Information Systems
11. Creativity in Decision Making
12. References

"It is a capital mistake to theorize before you have all the evidence. It biases the judgment."

Sir Arthur Conan Doyle
(22 May 1859 – 7 July 1930)

Problem Solving for Total Quality

If you ask the typical manager to describe his or her biggest problem in today's workplace, the response will probably include one or more of the following:

- ✓ We spend all our time in meetings trying to resolve problems.
- ✓ We are constantly fighting problems, and that doesn't leave us time to do our real jobs, such as planning, leading, and so forth.
- ✓ As soon as we "put out one fire," another pops up
- ✓ We've got more problems than we can handle, and it bogs us down.

Problem Solving for Total Quality

In total quality jargon, a problem is solved only when its recurrence has become impossible or significantly less probable. That will always be the objective of total quality problem solving. Any problem that is merely fixed by restoring the situation to what it was before the problem was manifested will return again. That is why managers spend so much time with problem issues. The problems are not being solved—just put into a recycle loop. In those organizations that have adopted total quality, problems are solved once and for all. The same problems do not return time and time again. That means that there will be fewer problems tomorrow than there were today, fewer next month than this month, fewer next year than this year. Managers will have more time to manage, leaders to lead.

Problem Solving for Total Quality

When problem solutions lead to process or products or services improvement,

- ✓product or service quality improves,
- ✓costs decrease (through less waste and warranty action),
- ✓customer satisfaction improves,
- ✓competitiveness improves, and
- ✓the probability for success improves.

Two Models for Solving and Preventing Problems

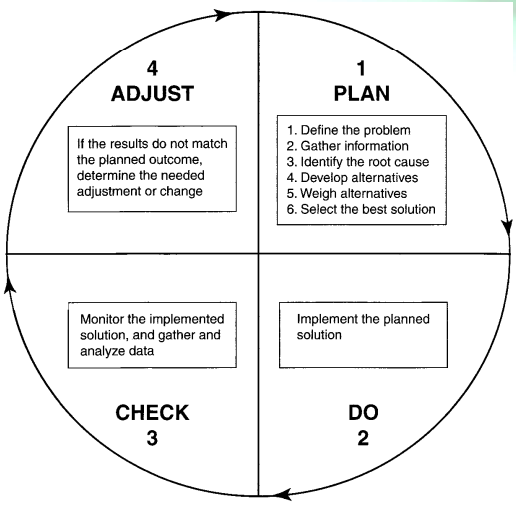
Even the best-managed organizations have problems. problem is any situation in which what exists does not match what is desired, or put another way, there is a discrepancy between the current state of affairs and the one desired. The greater the disparity between the two, the greater the problem. Problem solving in a total quality setting is not just "putting out fires" as they occur. Rather, it is one more way to make continual improvements in the workplace and its products or services. This section contains two models for solving problems in ways that simultaneously lead to workplace or product improvements: the PDCA cycle and Toyota's Practical Problem-Solving Process.

Two Models for Solving and Preventing Problems

The Plan—Do—Check—Adjust Cycle

This continual improvement model goes by several names. The Japanese call it the Deming Cycle after Dr. W. Edwards Deming, who introduced it to them. Deming himself referred to it as the Shewhart Cycle after its originator, Dr. Walter Shewhart. In the West, it is commonly called simply the PDCA cycle, standing for plan—do—check—act. In the book, the authors have taken the liberty to suggest that the letter A more correctly means adjust.

The Plan—Do—Check—Adjust Cycle

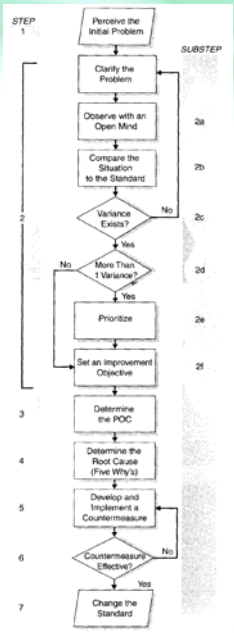


Two Models for Solving and Preventing Problems

General Procedure for Problem Solving: The Toyota Model

Whether you are reacting to an existent problem that has just come up or working to prevent future problems, it will be helpful to follow a procedure that defines the methodology of problem solving and establishes an order of execution of the critical steps. The following flowchart of the problem-solving process employed by one of the great manufacturers. Toyota's "Practical Problem-Solving Process" is said to have seven main steps, although the number of steps may depend on one's definition of "step." Note that step 2, for example, is broken into several subprocesses. Regardless of how the process steps are counted, the excellent Toyota process is appropriate for almost all situations, including both latent and existent problem categories.

Two Models for Solving and Preventing Problems



Two Models for Solving and Preventing Problems

1. Perceive the initial problem. At this point, symptoms may be clear, but the problem may not be well defined.
2. Clarify the problem. It is critical for problem solvers to fully grasp the situation before proceeding. From this analysis, the problem is defined.
   a. Observe the situation with an open mind.
   b. Compare the actual situation to the standard (procedure, work instruction, flowchart, specifications, etc.).
   c. Determine if variance exists. If not, then try again at step 2.
   d. Determine if multiple variances exist.
   e. If multiple variances exist, prioritize by severity. (See the discussion of FMEA in Chapter 15.)
   f. Set an improvement objective. This is a description of the desired state to be achieved by the problem's solution.
3. Determine the actual point of cause (POC), using these questions:
   a. Where do we observe the problem geographically, and where in the process or product function?
   b. Where is the cause geographically, and where in the process or product function?

   Questions lead upstream toward the root cause, which will be the target for improvement.
4. Determine the root cause. Use the Five-Why analysis:
   a. Ask why the observed variance exists.
   b. Ask why the answer to that question is as stated.
   c. Repeat the "why" question at each succeeding level until the root cause is determined. (*Note:* It is permissible to go beyond five why's.)
   d. Use other total quality tools (e.g., cause-and-effect diagrams, Pareto analysis) as appropriate.
5. Develop and implement a countermeasure (solution to the problem). If multiple solutions are possible, select the one that is most advantageous, being careful to avoid introduction of any new problems.
6. Evaluate the countermeasure's effectiveness in solving the problem.
   a. Evaluate by analysis before the solution is implemented, and observe and monitor after implementation.
   b. Achieve consensus that the implemented countermeasure is valid and effective.
7. Change the standard. The original standard must be changed to reflect the countermeasure.

Figure 16–3
Overview of the Toyota Practical Problem-Solving Process

Problem-Solving and Decision-Making Tools

The models presented in the previous section can help organizations determine better solutions and make better decisions, provided that they are based on facts. Decisions and solutions based on information that is inaccurate or tainted by personal opinions, exaggeration, or personal agendas are not likely to be optimal, regardless of the problem-solving model used. The information collection step can be made more effective through the use of the total quality tools discussed in the previous chapter.

In today's competitive environment, organizational decisions and problem responses can no longer be made the way we have been making them for the last 100 years. Today's business decisions and problem solutions cannot be made without sufficient knowledge of all the relevant factors, which often means that the collective knowledge of the organization must be tapped. At the least, we must be smart in our decision making and problem solving, or we may find ourselves on the path to ruin.

Decision Making for Total Quality

All people make decisions. Some are minor. (What should I wear to work today? What should I have for breakfast?) Some are major. (Should I accept a job offer in another city? Should I buy a new house?) Regardless of the nature of the decision, decision making can be defined as follows:

Decision making is the process of selecting one course of action from among two or more alternatives

Decision Making for Total Quality

Decision making is a critical task in a total quality setting. Decisions play the same role in an organization that fuel plays in an automobile engine: they keep it running. The work of an organization cannot proceed until decisions are made.

Managers should be prepared to have their decisions evaluated and even criticized after the fact. Although it may seem unfair to conduct a retrospective critique of decisions that were made during the "heat of battle," having one's decisions evaluated is part of accountability, and it can be an effective way to improve a manager's decision-making skills.

Decision Making for Total Quality

Evaluating Decisions

There are two ways to evaluate decisions. The first is to examine the results. In every case when a decision must be made, there is a corresponding result. That result should advance an organization toward the accomplishment of its goals. To the extent that it does, the decision is usually considered a good decision. Managers have traditionally had their decisions evaluated based on results. However, this is not the only way that decisions should be evaluated. Regardless of results, it is wise also to evaluate the process used in making a decision. Positive results can cause a manager to overlook the fact that a faulty process was used, and in the long run, a faulty process will lead to negative results more frequently than to positive ones.

The Decision-Making Process

Decision making is a process. For the purpose of this course, the decision-making process is defined as follows:

The decision-making process is a logically sequenced series of activities through which decisions are made.

Numerous decision-making models exist. Although they appear to have major differences, all involve the various steps shown in the following figure.

The Decision-Making Process

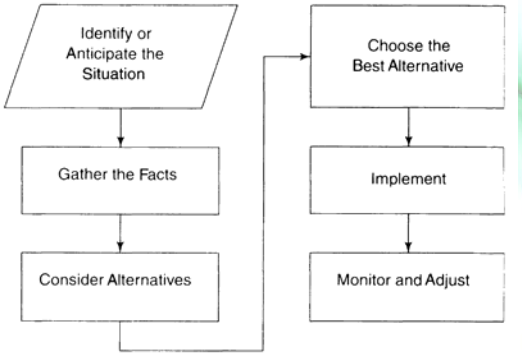


Figure 16–4
Decision-Making Model

Objective Versus Subjective Decision Making

All approaches to decision making fail into one of two categories: objective or subjective. Although the approach used by managers in a total quality setting may have characteristics of both, the goal is to minimize subjectivity and maximize objectivity. The approach most likely to result in a quality decision is the objective approach.

Objective Decision Making

The objective approach is logical and orderly. It proceeds in a step-by-step manner and assumes that managers have the time to systematically pursue all steps in the decision-making process. It also assumes that complete and accurate information is available and that managers are free to select what they feel is the best alternative.

Objective Versus Subjective Decision Making

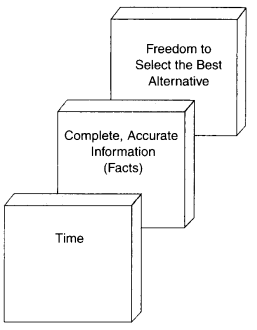


Figure 16–5
Factors That Contribute to Objective Decision Making

Objective Versus Subjective Decision Making

Subjective Decision Making

Whereas objective decision making is based on logic and complete, accurate information subjective decision making is based on intuition, experience, and incomplete information. This approach assumes decision makers will be under pressure, short on time, and operating with only limited information. The goal of subjective decision making is to make the best decision possible under the circumstances. In using this approach, the danger always exists that managers might make quick, knee-jerk decisions based on no information and no input from other sources. The subjective approach does not give managers license to make sloppy decisions. If time is short, they should use the little time available to list and evaluate alternatives. If information is incomplete, they should use as much information as is available *Subjective decision making is an anathema in the total quality context, and it should be avoided whenever possible.*

Scientific Decision Making and Problem Solving

Peter R. Scholtes explains the rationale for scientific decision making:

"The core of quality improvement methods is summed up in two words: *scientific approach*. Though this may sound complicated, a scientific approach is really just a systematic way for individuals and teams to learn about processes. It means agreeing to make decisions based on date rather than hunches, to look for root causes of problems rather than react to superficial symptoms to seek permanent solutions rather than rely on quick fixes. A scientific approach can, but does not always, involve using sophisticated statistics, formulas, and experiments. These tools enable us to go beyond Band-Aid methods that merely cover up problems to find permanent, upstream improvements ."

Scientific Decision Making and Problem Solving

Complexity and the Scientific Approach
In the language of scientific decision making, complexity means nonproductive, unnecessary work that results when organizations try to improve their processes without first developing a systematic plan. Several different types of complexity exist, including the following: errors and defects, breakdowns and delays, inefficiency, and variation. The Pareto principle should be kept in mind when attempting to apply the scientific approach.

Errors and Defects
Errors cause defects and defects reduce competitiveness. When a defect occurs, one of two things must happen: the part or product must be scrapped altogether, or extra work must be done to correct the defect. Waste or extra work that results from errors and defects adds cost to the product without adding value.

Scientific Decision Making and Problem Solving

Breakdowns and Delays
Equipment breakdowns delay work, causing production personnel either to work overtime or to work faster to catch up. Overtime adds cost to the product without adding value. When this happens, the organization's competitors gain an unearned competitive advantage. When attempts are made to run a process faster than its optimum rate, an increase in errors is inevitable.

Inefficiency
inefficiency means using more resources (time, material, movement, or something else) than necessary to accomplish a task. Inefficiency often occurs because organizations fall into the habit of doing things the way they have always been done without ever asking why.

Scientific Decision Making and Problem Solving

Variation

In a total quality setting, consistency and predictability are important. When a process runs consistently, efforts can begin to improve it by reducing process variations, of which there are two kinds:

- ✓ Common-cause variation is the result of the sum of numerous small sources of natural variation that are always part of the process.
- ✓ Special-cause variation is the result of factors that are not part of the process and that occur only in special circumstances, as when a shipment of faulty raw material is used or a new, untrained operator is involved.

Scientific Decision Making and Problem Solving

Commenting on variation, Scholtes says:

"If you react to common-cause variation as if it were due to special causes, you will only make matters worse and increase variation, defects, and mistakes. If you fail to notice the appearance of a special cause, you will miss an opportunity to search out and eliminate a source of problems."

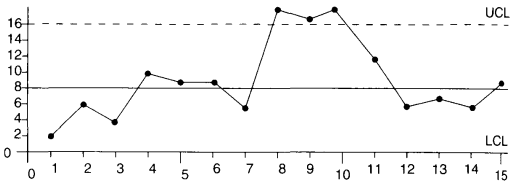


Figure 16–6
Control Chart

Employee Involvement in Problem Solving and Decision Making

Previously we showed how employee involvement and empowerment can improve decision making and problem solving. Employees are more likely to show ownership in a decision or solution they had a part in reaching. Correspondingly, they are more likely to support a decision or solution for which they feel ownership. There are many advantages to be gained from involving employees in decision making and problem solving. There are also factors that, if not understood and properly handled, can lead to problems.

Employee Involvement in Problem Solving and Decision Making

Advantages of Employee Involvement

Involving employees in decision making and problem solving can have a number of advantages. It can result in a more accurate picture of what the problem really is and a more comprehensive list of potential solution and decision alternatives. It can help managers do a better job of evaluating alternatives and selecting the best one to implement.

Perhaps the most important advantages are gained after the decision is made. Employees who participate in the decision-making or problem-solving process are more likely to understand and accept the decision or solution and have a personal stake in making sure the alternative selected succeeds.

Employee Involvement in Problem Solving and Decision Making

Potential Problems with Employee Involvement

Involving employees in decision making and problem solving can lead to problems. The major potential problem is that it takes time, and managers do not always have time. Other potential difficulties are that it takes employees away from their jobs and that it can result in conflict among team members. Next to time, the most significant potential problem is that employee involvement can lead to democratic compromises that do not necessarily represent the best decision. In addition, disharmony can result when a decision maker rejects the advice of the group.

Nevertheless, if care is taken, managers can gain all of the advantages, while avoiding the potential disadvantages associated with employee involvement in decision making or problem solving. Several techniques are available to help increase the effectiveness of group involvement. Prominent among these are brainstorming, the nominal group technique (NGT), and the use of teams.

Role of Information in Decision Making

Information is a critical element in decision making. although having accurate, up-to-date, comprehensive information does not guarantee a good decision, lacking such information can guarantee a bad one. The old saying that "knowledge is power" applies in decision making— particularly in a competitive situation. To make decisions that will help their organizations be competitive, managers need timely, accurate information.

Information can be defined as data that are relevant to the decision-making process that have been converted into a useable format.

Data that are relevant to decision making are those that might have an impact on the decision. Communication is a process that requires a sender, a medium, and a receiver. In this process, information is what is provided by the sender, transmitted by the medium, and received by the receiver. For the purpose of this chapter, decision makers are receivers of information who base decisions at least in part on what they receive.

Role of Information in Decision Making

Data Versus Information

Data for one person may be information for another. The difference lies in the needs of the individual. Managers' needs are dictated by the types of decisions they make. For example, a computer printout listing speed and feed rates for a company's machine tools would contain valuable information for the production manager; the same printout would be just data to the warehouse manager. In deciding on the type of information they need, decision makers should ask themselves these questions:

- ✓ What are my responsibilities?
- ✓ What are my organizational goals?
- ✓ What types of decisions do I have to make relative to these responsibilities and goals?

Role of Information in Decision Making

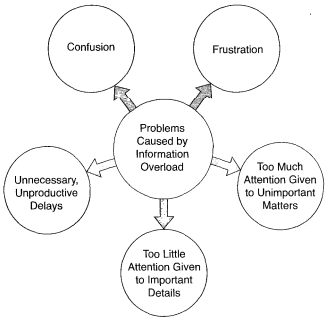
Value of Information

Information is a useful commodity. s such, it has value. Its value is determined by the needs of the people who will use it and the extent to which the information will help them meet their needs. Information also has a cost. Because it must be collected, stored, processed, continually updated, and presented in a useable format when needed, information can be expensive. This fact requires managers to weigh the value of information against its cost when deciding what information they need to make decisions. It makes no sense to spend $100 on information to help make a $10 decision.

Role of Information in Decision Making

Amount of Information

An old saying holds that a manager can't have too much information. This is no longer true, With advances in information technologies, not only can managers have too much information, but also they frequently do. This phenomenon has come to be known as information overload, the condition that exists when people receive more information than they can process in a timely manner. The phrase "in a timely manner" means in time to be useful in decision making.



Using Management Information Systems

A management information system (MIS) is a system used to collect, store, process, and present information used by managers in decision making.

In the modern workplace, a management information system is typically a computer-based system. A management information system has three major components; hardware, software, and people. Hardware consists of the computer (be it a mainframe, mini-, or microcomputer), all of the peripheral devices for interaction with the computer, and output devices such as printers and display screens.

Using Management Information Systems

Software is the component that allows the computer to perform specific operations and process data. It consists primarily of computer programs but also includes the database, files, and manuals that explain operating procedures. Systems software controls the basic operation of the system. Y-lpplications software controls the processing of data for specific computer applications (word processing, databases, computer-assisted planning, spreadsheets, etc.).

A database is a broad collection of data from which specific information can be drawn. For example, a company might have a personnel database in which many different items of information about its employees are stored. From this database can be drawn a variety of different reports—such as printouts of all employees in order of employment date, by job classification, or by ZIP code. Data are kept in electronic files stored under specific groupings or file names.

Using Management Information Systems

The most important component is the people component. It consists of the people who manage, operate, maintain, and use the system. Managers who depend on a management information system for part of the information needed to make decisions are users.

Creativity in Decision Making

The pressures of a competitive marketplace are making it increasingly important for organizations to be *flexible, innovative, and creative* in decision making. To survive in an unsure. rapidly changing marketplace, organizations must be able to adjust rapidly and change directions quickly. To do so requires creativity at all levels of the organization.

Creativity Defined
Like leadership, creativity has many definitions, and viewpoints vary about whether creative people are born or made. In modern organizations, creativity can be viewed as an approach to problem solving and decision making that is imaginative, original, and innovative. Developing such perspectives requires that decision makers have knowledge and experience regarding the issue in question.

Creativity in Decision Making

Creative Process
according to H. Von Oech, the creative process proceeds in four stages: preparation, incubation, insight, and verification. What takes place in each of these stages is summarized as follows:
Preparation involves learning, gaining experience, and collecting or storing information in a given area. Creative decision making requires that the people involved be prepared.
Incubation involves giving ideas time to develop, change, grow, and solidify. Ideas incubate while decision makers get away from the issue in question and give the mind time to sort things out. Incubation is often a function of the subconscious mind.
Insight follows incubation. It is the point in time when a potential solution falls in place and becomes clear to decision makers. This point is sometimes seen as a moment of inspiration. However, inspiration rarely occurs without having been preceded by perspiration. preparation, and incubation.
Verification involves reviewing the decision to determine whether it will actually work. t this point, traditional processes such as feasibility studies and cost—benefit analyses are used.

Creativity in Decision Making

Factors that Inhibit Creativity

A number of factors can inhibit creativity. Some of the more prominent of these follow:

- ✓ Looking for just one right answer. Seldom is there just one right solution to a problem.
- ✓ Focusing too intently on being logical. Creative solutions sometimes defy logic and conventional wisdom.
- ✓ Avoiding ambiguity. ambiguity is a normal part of the creative process. This is why the incubation step is so important.
- ✓ Avoiding risk. When organizations don't seem to be able to find a solution to a problem. it often means decision makers are unwilling to give an idea a chance.
- ✓ Forgetting how to play. Adults sometimes become so serious they forget how to play. Playful activity can stimulate creative ideas.
- ✓ Fearing rejection or looking foolish. Nobody likes to look foolish or feel rejection. This fear can cause people to hold back what might be creative solutions.
- ✓ Saying "I'm not creative." People who decide they are uncreative will be. Any person can think creatively and can learn to be even more creative.

Creativity in Decision Making

Helping People Think Creatively

In the age of high technology and global competition, creativity in decision making and problem solving is critical. Although it is true that some people are naturally more creative than others, it is also true that any person can learn to think creatively. In the modern workplace, the more people who think creatively, the better. Darrel W. Ray and Barbara L. Wiley recommend the following strategies for helping employees think creatively:

Idea vending. This is a facilitation strategy. It involves reviewing literature in the field in question and compiling files of ideas contained in the literature. Periodically, circulate these ideas among employees as a way to get people thinking. This will facilitate the development of new ideas by the employees. Such an approach is sometimes called stirring the pot.

Creativity in Decision Making

Helping People Think Creatively

Listening. One of the factors that causes good ideas to fall by the wayside is poor listening. Managers who are perpetually too hurried to listen to employees' ideas do not promote creative thinking. On the contrary, such managers stifle creativity. In addition to listening to the ideas, good and bad, of employees, managers should listen to the problems employees discuss in the workplace. Each problem is grist for the creativity mill.

Idea attribution. manager can promote creative thinking by subtly feeding pieces of ideas to employees and encouraging them to develop the idea fully. When an employee develops a creative idea, he or she gets full attribution and recognition for the idea. Time may be required before this strategy pays off, but with patience and persistence it can help employees become creative thinkers.

Creativity in Decision Making

Helping People Think Creatively

How does a football team that is no better than its opponent beat that opponent? Often the key is more creative game planning, play calling, and defense. This phenomenon also occurs in the workplace every day. *The organization that wins the competition in the marketplace is often the one that is the most creative in decision making and problem solving.*

References

Quality Management for Organizational Excellence: Introduction to Total Quality, 6th Edition, David Goetsch and Stanley Davis, copyright 2010, Pearson, ISBN: 978-0-13-501967-2.

Problem Solving and Decision Making

Alessandro Anzalone, Ph.D.
Hillsborough Community College, Brandon Campus