Solving Problems Analytically and Creatively

**LEARNING OBJECTIVES**
- Utilize analytical problem-solving techniques
- Recognize personal conceptual blocks
- Enhance creativity by overcoming conceptual blocks
- Foster innovation among others

**SKILL ASSESSMENT**
Diagnostic Surveys for Creative Problem Solving
- Problem Solving, Creativity, and Innovation
- How Creative Are You? (Revised)
- Innovative Attitude Scale

**SKILL LEARNING**
Problem Solving, Creativity, and Innovation
- Conceptual Blocks
- Conceptual Blockbusting
- International Caveats
- Hints for Applying Problem-Solving Techniques
- Fostering Innovation
- Summary
- Behavioral Guidelines

**SKILL ANALYSIS**
Cases Involving Problem Solving
- Admiral Kimmel's Failure at Pearl Harbor
- Innovation and Apple

**SKILL PRACTICE**
Exercises for Applying Conceptual Blockbusting
- Individual Assignment—Analytical Problem Solving
- Team Assignment—Creative Problem Solving
- Moving Up in the Rankings
- Keith Dunn and McGuffey's Restaurant

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Activities for Solving Problems Creatively
- Suggested Assignments
- Application Plan and Evaluation
DIAGNOSTIC SURVEYS FOR CREATIVE PROBLEM SOLVING

PROBLEM SOLVING, CREATIVITY, AND INNOVATION

Step 1: Before you read the material in this chapter, respond to the following statements by writing a number from the rating scale that follows in the left-hand column (Pre-assessment). Your answers should reflect your attitudes and behavior as they are now, not as you would like them to be. Be honest. This instrument is designed to help you discover your level of competency in problem solving and creativity so you can tailor your learning to your specific needs. When you have completed the survey, use the scoring key in Appendix 1 to identify the skill areas discussed in this chapter that are most important for you to master.

Step 2: After you have completed the reading and the exercises in this chapter and, ideally, as many as you can of the Skill Application assignments at the end of this chapter, cover up your first set of answers. Then respond to the same statements again, this time in the right-hand column (Post-assessment). When you have completed the survey, use the scoring key in the Appendix to measure your progress. If your score remains low in specific skill areas, use the behavioral guidelines at the end of the Skill Learning section to guide your further practice.

Rating Scale

1 Strongly disagree
2 Disagree
3 Slightly disagree
4 Slightly agree
5 Agree
6 Strongly agree

Assessment

Pre- | Post-
--- | ---

When I encounter a routine problem:

1. I state clearly and explicitly what the problem is. I avoid trying to solve it until I have defined it.

2. I generate more than one alternative solution to the problem, instead of identifying only one obvious solution.

3. I keep in mind both long-term and short-term consequences as I evaluate various alternative solutions.

4. I gather as much information as I can about what the problem is before trying to solve it.

5. I keep steps in the problem-solving process distinct; that is, I define the problem before proposing alternative solutions, and I generate alternatives before selecting a single solution.
When faced with an ambiguous or difficult problem that does not have an easy solution:

6. I defined problems in multiple ways. I don’t limit myself to just one problem definition.

7. I am flexible in the way I approach the problem by trying out several different alternative methods rather than relying on the same approach every time.

8. I find underlying patterns among elements in the problem so that I can uncover underlying dimensions or principles that help me understand the problem.

9. I unfreeze my thinking by asking lots of questions about the nature of the problem before considering ways to solve it.

10. I think about the problem from both the left (logical) side of my brain and the right (intuitive) side of my brain.

11. To help me understand the problem and generate alternative solutions, I use analogies and metaphors that help me identify what else this problem is like.

12. I consider whether or not the exact opposite definition to my initial definition is also true.

13. I avoid selecting a solution until I have developed several possible alternatives.

14. I break down the problem into smaller components and analyze each one separately.

15. I have specific techniques that I use to help develop creative and innovative solutions to problems.

When trying to foster more creativity and innovation among those with whom I work:

16. I help arrange opportunities for individuals to work on their ideas outside the constraints of their normal job assignments.

17. I make sure there are divergent points of view represented or expressed in every complex problem-solving situation.

18. I make a few outrageous suggestions to stimulate people to find new ways of approaching problems.

19. I acquire information from individuals outside the problem-solving group who will be affected by the decision, mainly to determine their preferences and expectations.

20. I involve appropriate outsiders (e.g., customers or recognized experts) in problem-solving discussions.

21. I try to provide recognition not only for those who come up with creative ideas (the idea champions) but also for those who support others’ ideas (supporters) and who provide resources to implement them (orchestrators).

22. I encourage informed rule-breaking in pursuit of creative solutions.

**How Creative Are You? © (Revised)**

How creative are you? The following test helps you determine if you have the personality traits, attitudes, values, motivations, and interests that characterize creativity. It is based on several years’ study of attributes possessed by men and women in a variety of fields and occupations who think and act creatively.
For each statement, write in the appropriate letter:

A Agree
B Undecided or Don't Know
C Disagree

Be as frank as possible. Try not to second-guess how a creative person might respond. Turn to Appendix 1 to find the answer key and an interpretation of your scores.

1. I always work with a great deal of certainty that I am following the correct procedure for solving a particular problem.
2. It would be a waste of time for me to ask questions if I had no hope of obtaining answers.
3. I concentrate harder on whatever interests me than do most people.
4. I feel that a logical, step-by-step method is best for solving problems.
5. In groups, I occasionally voice opinions that seem to turn some people off.
6. I spend a great deal of time thinking about what others think of me.
7. It is more important for me to do what I believe to be right than to try to win the approval of others.
8. People who seem uncertain about things lose my respect.
9. More than other people, I need to have things interesting and exciting.
10. I know how to keep my inner impulses in check.
11. I am able to stick with difficult problems over extended periods of time.
12. On occasion, I get overly enthusiastic.
13. I often get my best ideas when doing nothing in particular.
14. I rely on intuitive hunches and the feeling of "rightness" or "wrongness" when moving toward the solution of a problem.
15. When problem solving, I work faster when analyzing the problem and slower when synthesizing the information I have gathered.
16. I sometimes get a kick out of breaking the rules and doing things I am not supposed to do.
17. I like hobbies that involve collecting things.
18. Daydreaming has provided the impetus for many of my more important projects.
19. I like people who are objective and rational.
20. If I had to choose from two occupations other than the one I now have, I would rather be a physician than an explorer.
21. I can get along more easily with people if they belong to about the same social and business class as myself.
22. I have a high degree of aesthetic sensitivity.
23. I am driven to achieve high status and power in life.
24. I like people who are sure of their conclusions.
25. Inspiration has nothing to do with the successful solution of problems.
26. When I am in an argument, my greatest pleasure would be for the person who disagrees with me to become a friend, even at the price of sacrificing my point of view.
27. I am much more interested in coming up with new ideas than in trying to sell them to others.
28. I would enjoy spending an entire day alone, just “chewing the mental cud.”
29. I tend to avoid situations in which I might feel inferior.
30. In evaluating information, the source is more important to me than the content.
31. I resent things being uncertain and unpredictable.
32. I like people who follow the rule “business before pleasure.”
33. Self-respect is much more important than the respect of others.
34. I feel that people who strive for perfection are unwise.
35. I prefer to work with others in a team effort rather than solo.
36. I like work in which I must influence others.
37. Many problems that I encounter in life cannot be resolved in terms of right or wrong solutions.
38. It is important for me to have a place for everything and everything in its place.
39. Writers who use strange and unusual words merely want to show off.
40. Below is a list of terms that describe people. Choose 10 words that best characterize you.

energetic    persuasive    observant
fashionable  self-confident persevering
original    cautious    habit-bound
resourceful egotistical independent
stern    predictable formal
informal    dedicated forward-looking
tactful
factual    open-minded
inghstic enthusiastic innovative
poised    acquisitive practical
alert    curious organized
dynamic    self-demanding polished
courageous    efficient helpful
INNOVATIVE ATTITUDE SCALE

Indicate the extent to which each of the following statements is true of either your actual behavior or your intentions at work; that is, describe the way you are or the way you intend to be on the job. Use the scale for your responses. To score the “Innovative Attitude Scale,” turn to Appendix 1 to find the answer key and an interpretation of your score.

Rating Scale

5  Almost always true
4  Often true
3  Not applicable
2  Seldom true
1  Almost never true

1. I openly discuss with my supervisor how to get ahead.
2. I try new ideas and approaches to problems.
3. I take things or situations apart to find out how they work.
4. I welcome uncertainty and unusual circumstances related to my tasks.
5. I negotiate my salary openly with my supervisor.
6. I can be counted on to find a new use for existing methods or equipment.
7. Among my colleagues and co-workers, I will be the first or nearly the first to try out a new idea or method.
8. I take the opportunity to translate communications from other departments for my work group.
9. I demonstrate originality.
10. I will work on a problem that has caused others great difficulty.
11. I provide critical input toward a new solution.
12. I provide written evaluations of proposed ideas.
13. I develop contacts with experts outside my firm.
14. I use personal contacts to maneuver into choice work assignments.
15. I make time to pursue my own pet ideas or projects.
16. I set aside resources for the pursuit of a risky project.
17. I tolerate people who depart from organizational routine.
18. I speak out in staff meetings.
19. I work in teams to try to solve complex problems.
20. If my co-workers are asked, they will say I am a wit.

CHAPTER 3
SOLVING PROBLEMS ANALYTICALLY AND CREATIVELY

SKILL LEARNING

Problem Solving, Creativity, and Innovation

Problem solving is a skill that is required of every person in almost every aspect of life. Seldom does an hour go by without an individual’s being faced with the need to solve some kind of problem. The manager’s job, in particular, is inherently a problem-solving job. If there were no problems in organizations, there would be no need for managers. Therefore, it is hard to conceive of an incompetent problem solver succeeding as a manager.

In this chapter, we offer specific guidelines and techniques for improving problem-solving skills. Two kinds of problem solving—analytical and creative—are addressed. Effective managers are able to solve problems both analytically and creatively, even through different skills are required for each type of problem. First, we discuss analytical problem solving—the kind that managers use many times each day. Then we turn to creative problem solving, a kind that occurs less frequently. Yet this creative problem-solving ability often separates career successes from career failures, heroes from goats, and achievers from derailed executives. It can also produce a dramatic impact on organizational effectiveness. A great deal of research has highlighted the positive relationship between creative problem solving and successful organizations (Sternberg, 1999). This chapter provides guidelines for how you can become a more effective problem solver, both analytical and creative, and concludes with a brief discussion of how managers can foster creative problem solving and innovation among the people with whom they work.

STEPS IN ANALYTICAL PROBLEM SOLVING

Most people, including managers, don’t particularly like problems. Problems are time-consuming, they create stress, and they never seem to go away. In fact, most people try to get rid of problems as soon as they can. Their natural tendency is to select the first reasonable solution that comes to mind (Koopman, Broekhuijsen, & Wierdema, 1998; March, 1994; March & Simon, 1958). Unfortunately, that first solution is often not the best one. In typical problem solving, most people implement a marginally acceptable or merely satisfactory solution instead of the optimal or ideal solution. In fact, many observers have attributed the extensive failures of Internet and dot-com firms—as well as more established companies—to the abandonment of correct problem-solving principles by managers. Shortcuts in analytical problem solving by managers and entrepreneurs, they argue, have had a major negative effect on company survival (Goll & Rasheed, 1997). Effective problem solving relies on a systematic and logical approach, and it involves at least four steps, which are explained next.

Defining the Problem

The most widely accepted model of analytical problem solving is summarized in Table 1. This method is well known and widely utilized in firms, and it lies at the heart of the quality improvement movement. It is widely asserted that to improve quality as individuals and as organizations, an essential step is to learn and apply this analytical method of problem solving (see Ichikawa, 1986; Juran, 1988; Riley, 1998). Many large organizations (e.g., Ford Motor Company, General Electric, Dana) spend millions of dollars to teach their managers this type of problem solving as part of their quality improvement process. Variations on this four-step approach have been implemented in various firms (e.g., Ford uses an eight-step approach), but all the steps are merely derivations of the standard model we discuss here.

The first step is to define a problem. This involves diagnosing a situation so that the focus is on the real problem, not just its symptoms. For example, suppose you must deal with an employee who consistently fails to get work done on time. Slow work might be the problem, or it might be only a symptom of another underlying problem such as bad health, low morale, lack of training, or inadequate rewards. Defining the problem, therefore, requires a wide search for information. The more information that is acquired, the more likely it is that the problem will be defined accurately. As Charles Kettering put it, “It ain’t the things you don’t know that’ll get you in trouble, but the things you know for sure that ain’t so.”

Following are some attributes of good problem definition:
Table 1  A Table of Problem Solving

<table>
<thead>
<tr>
<th>STEP</th>
<th>CHARACTERISTICS</th>
</tr>
</thead>
</table>
| 1. Define the problem. | • Differentiate fact from opinion.  
| | • Specify underlying causes.  
| | • Tap everyone involved for information.  
| | • State the problem explicitly.  
| | • Identify what standard is violated.  
| | • Determine whose problem it is.  
| | • Avoid stating the problem as a disguised solution. |
| 2. Generate alternative solutions. | • Postpone evaluating alternatives.  
| | • Be sure all involved individuals generate alternatives.  
| | • Specify alternatives that are consistent with goals.  
| | • Specify both short-term and long-term alternatives.  
| | • Build on others’ ideas.  
| | • Specify alternatives that solve the problem. |
| 3. Evaluate and select an alternative. | • Evaluate relative to an optimal standard.  
| | • Evaluate systematically.  
| | • Evaluate relative to goals.  
| | • Evaluate main effects and side effects.  
| | • State the selected alternative explicitly. |
| 4. Implement and follow up on the solution. | • Implement at the proper time and in the right sequence.  
| | • Provide opportunities for feedback.  
| | • Engender acceptance of those who are affected.  
| | • Establish an ongoing monitoring system.  
| | • Evaluate based on problem solution. |

1. Factual information is differentiated from opinion or speculation. Objective data are separated from perceptions and suppositions.
2. All individuals involved are tapped as information sources. Broad participation is encouraged.
3. The problem is stated explicitly. This often helps point out ambiguities in the definition.
4. The problem definition clearly identifies what standard or expectation has been violated. Problems, by their very nature, involve the violation of some standard or expectation.
5. The problem definition must address the question “Whose problem is this?” No problems are completely independent of people.
6. The definition is not simply a disguised solution. Saying “The problem is that we need to motivate slow employees” is inappropriate because the problem is stated as a solution.

Managers often propose a solution before an adequate definition of a problem has been given. This may lead to solving the “wrong” problem. The definition step in problem solving, therefore, is extremely important.

Generating Alternatives
The second step is to generate alternative solutions. This requires postponing the selection of any one solution until several alternatives have been proposed. Much
research on problem solving (e.g., March 1999) supports the prescription that the quality of solutions can be significantly enhanced by considering multiple alternatives. Judgment and evaluation, therefore, must be postponed so the first acceptable solution suggested is not the one immediately selected. The problem with evaluating and selecting an alternative too early is that we may rule out some good ideas by just not getting around to thinking about them. We hit on an idea that sounds good and we go with it, thereby never even thinking of alternatives that may be better in the long run.

Many alternative solutions should be produced before any of them are evaluated. A common problem in managerial decision making is that alternatives are evaluated as they are proposed, so the first acceptable (although frequently not optimal) one is chosen. Some attributes of good alternative generation follow:

1. The evaluation of each proposed alternative is postponed. All alternatives should be proposed before evaluation is allowed.
2. Alternatives are proposed by all individuals involved in the problem. Broad participation in proposing alternatives improves solution quality and group acceptance.
3. Alternative solutions are consistent with organizational goals or policies. Subversion and criticism are detrimental to both the organization and the alternative generation process.
4. Alternatives take into consideration both short-term and long-term consequences.
5. Alternatives build on one another. Bad ideas may become good ones if they are combined with or modified by other ideas.
6. Alternatives solve the problem that has been defined. Another problem may also be important, but it should be ignored if it does not directly affect the problem being considered.

**Evaluating Alternatives**

The third problem-solving step is to evaluate and select an alternative. This step involves careful weighing of the advantages and disadvantages of the proposed alternatives before making a final selection. In selecting the best alternative, skilled problem solvers make sure that alternatives are judged in terms of the extent to which they will solve the problem without causing other unanticipated problems; the extent to which all individuals involved will accept the alternative; the extent to which implementation of the alternative is likely; and the extent to which the alternative fits within organizational constraints (e.g., is consistent with policies, norms, and budget limitations). Care is taken not to short-circuit these considerations by choosing the most conspicuous alternative without considering others. The classic description of the difficulty with problem solving, made almost 50 years ago, still remains as a core principle in problem solving (March & Simon, 1958):

*Most human decision making, whether individual or organizational, is concerned with the discovery and selection of satisfactory alternatives; only in exceptional cases is it concerned with the discovery and selection of optimal alternatives. To optimize requires processes several orders of magnitude more complex than those required to satisfy. An example is the difference between searching a haystack to find the sharpest needle in it and searching the haystack to find a needle sharp enough to sew with.*

Given the natural tendency to select the first satisfactory solution proposed, this step deserves particular attention in problem solving. Some attributes of good evaluation are:

1. Alternatives are evaluated relative to an optimal, rather than a satisfactory standard.
2. Evaluation of alternatives occurs systematically so each alternative is given due consideration. Short-circuiting evaluation inhibits selection of optimal alternatives.
3. Alternatives are evaluated in terms of the goals of the organization and the individuals involved. Organizational goals should be met, but individual preferences should also be considered.
4. Alternatives are evaluated in terms of their probable effects. Both side effects and direct effects on the problem are considered.
5. The alternative ultimately selected is stated explicitly. This can help uncover latent ambiguities.

**Implementing the Solution**

The final step is to implement and follow up on the solution. A surprising amount of the time, people faced with a problem will try to jump to step 4 before having
gone through steps 1 through 3. That is, they react to a problem by trying to implement a solution before they have defined it, analyzed it, or generated and evaluated alternative solutions. It is important to remember, therefore, that “to get rid of the problem” by solving it will most likely not be successful without the first three steps in the model.

Implementing any problem solution requires sensitivity to possible resistance from those who will be affected by it. Almost any change engenders some resistance. Therefore, the best problem solvers are careful to select a strategy that maximizes the probability that the solution will be accepted and fully implemented. This may involve ordering that the solution be implemented by others, “selling” the solution to others, or involving others in the implementation. Several authors (e.g., Dutton & Ashford, 1993; Miller, Hickson, & Wilson, 1996; Vroom & Yetton, 1976) have provided guidelines for managers to determine which of these implementation behaviors is most appropriate under which circumstances. Generally speaking, participation by others in the implementation of a solution will increase its acceptance and decrease resistance (Black & Gregersen, 1997).

Effective implementation is usually most effective when it is accomplished in small steps or increments. Weick (1984) introduced the idea of “small wins” in which solutions to problems are implemented little by little. The idea is to implement a part of the solution that is easy to accomplish, then publicize it. Follow that up by implementing another part of the solution that is easy to accomplish, and publicize it again. Continue implementing incrementally to achieve small wins. This strategy decreases resistance (small changes are usually not worth fighting over), creates support as others observe progress (a bandwagon effect occurs), and reduces costs (failure is not career-ending, and large allocations of resources are not required before success is assured). It also helps ensure persistence and perseverance in implementation. Calvin Coolidge’s well-known quotation is apropos:

Nothing in the world can take the place of perseverance. Talent will not; nothing is more common than unsuccessful people with talent. Genius will not; unrewarded genius is almost a proverb. Education will not; the world is full of educated derelicts. Persistence and determination alone are omnipotent.

Of course, any implementation requires follow-up to prevent negative side effects and ensure solution of the problem. Follow-up not only helps ensure effective implementation, but it also serves a feedback function by providing information that can be used to improve future problem solving.

Some attributes of effective implementation and follow-up are:

1. Implementation occurs at the right time and in the proper sequence. It does not ignore constraining factors, and it does not come before steps 1, 2, and 3 in the problem-solving process.
2. Implementation occurs using a “small-wins” strategy in order to discourage resistance and engender support.
3. The implementation process includes opportunities for feedback. How well the solution works is communicated, and recurring information exchange occurs.
4. Participation by individuals affected by the problem solution is facilitated in order to create support and commitment.
5. An ongoing monitoring system is set up for the implemented solution. Long-term as well as short-term effects are assessed.
6. Evaluation of success is based on problem solution, not on side benefits. Although the solution may provide some positive outcomes, it is unsuccessful unless it solves the problem being considered.

LIMITATIONS OF THE ANALYTICAL PROBLEM-SOLVING MODEL

Most experienced problem solvers are familiar with the preceding steps in analytical problem solving, which are based on empirical research results and sound rationale (March, 1994; Miller, Hickson & Wilson, 1996; Mitroff, 1998; Zeitz, 1999). Unfortunately, managers do not always practice these steps. The demands of their jobs often pressure managers into circumventing some steps, and problem solving suffers as a result. When these four steps (defining the problem, generating alternatives, evaluating alternatives, and implementing the solution) are followed, however, effective problem solving is markedly enhanced.

Simply learning about and practicing these four steps does not guarantee that an individual will effectively solve all types of problems. These problem-solving steps are most effective mainly when the problems faced are straightforward, when alternatives are readily
most people have trouble solving problems creatively. The trouble is that problems, a new way of thinking may be required, multiple answers, analytic rules, or thinking boundaries. Experience in a job often leads to “proper” ways of doing things, specialized knowledge, and rigid expectation of appropriate actions. Individuals lose the ability to experiment, improvise, or take mental detours. They have developed certain conceptual blocks in their problem-solving activities of which they are not even aware. These blocks inhibit them from solving certain problems effectively. The blocks are largely personal, as opposed to interpersonal or organizational, so skill development is required to overcome them.

Conceptual blocks are mental obstacles that constrain the way problems are defined and limit the number of alternative solutions thought to be relevant (Adams, 2001). Every individual has conceptual blocks, but some people have more numerous and more intense ones. These blocks are largely unrecognized or unconscious, so the only way individuals can be made aware of them is to be confronted with problems that are unsolvable because of them. Conceptual blocks result largely from the thinking processes that problem solvers use when facing problems. Everyone develops some conceptual blocks over time. In fact, we need some of them to cope with everyday life. Here’s why.

At every moment, each of us is bombarded with far more information than we can possibly absorb. For example, you are probably not conscious right now of the temperature of the room, the color of your skin, the level of illumination overhead, or how your toes feel in your shoes. All of this information is available to you and is being processed by your brain, but you have tuned out some things and focused on others. Over time, you must develop the habit of mentally filtering out some of the information to which you are exposed; otherwise, information overload would drive you crazy. These filtering habits eventually become conceptual blocks. Though you are not conscious of them, they inhibit you from registering some kinds of information and, therefore, from solving certain kinds of problems.

Paradoxically, the more formal education individuals have, and the more experience they have in a job, the less able they are to solve problems in creative ways. It has been estimated that most adults over 40 display less than 2 percent of the creative problem-solving ability of a child under 5 years old. That’s because formal education often prescribes “right” answers, analytic rules, or thinking boundaries. Experience in a job often leads to “proper” ways of doing things, specialized knowledge, and rigid expectation of appropriate actions. Individuals lose the ability to experiment, improvise, or take mental detours. Consider the following example:

*If you place in a bottle half a dozen bees and the same number of flies, and lay the bottle down horizontally, with its base to the win-*
### Table 2  Some Constraints on the Analytical Problem-Solving Model

<table>
<thead>
<tr>
<th>STEP</th>
<th>CONSTRAINTS</th>
</tr>
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<tbody>
<tr>
<td>1. Define the problem.</td>
<td>• There is seldom consensus as to the definition of the problem.&lt;br&gt;• There is often uncertainty as to whose definition will be accepted.&lt;br&gt;• Problems are usually defined in terms of the solutions already possessed.&lt;br&gt;• Symptoms get confused with the real problem.&lt;br&gt;• Confusing information inhibits problem identification.</td>
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<tr>
<td>2. Generate alternative solutions.</td>
<td>• Solution alternatives are usually evaluated one at a time as they are proposed.&lt;br&gt;• Few of the possible alternatives are usually known.&lt;br&gt;• The first acceptable solution is usually accepted.&lt;br&gt;• Alternatives are based on what was successful in the past.</td>
</tr>
<tr>
<td>3. Evaluate and select an alternative.</td>
<td>• Limited information about each alternative is usually available.&lt;br&gt;• Search for information occurs close to home—in easily accessible places.&lt;br&gt;• The type of information available is constrained by factors such as primacy versus recency, extremity versus centrality, expected versus surprising, and correlation versus causation.&lt;br&gt;• Gathering information on each alternative is costly.&lt;br&gt;• Preferences of which is the best alternative are not always known.&lt;br&gt;• Satisfactory solutions, not optimal ones, are usually accepted.&lt;br&gt;• Solutions are often selected by oversight or default.&lt;br&gt;• Solutions often are implemented before the problem is defined.</td>
</tr>
<tr>
<td>4. Implement and follow up on the solution.</td>
<td>• Acceptance by others of the solution is not always forthcoming.&lt;br&gt;• Resistance to change is a universal phenomenon.&lt;br&gt;• It is not always clear what part of the solution should be monitored or measured in follow-up.&lt;br&gt;• Political and organizational processes must be managed in any implementation effort.&lt;br&gt;• It may take a long time to implement a solution.</td>
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dow, you will find that the bees will persist, until they die of exhaustion or hunger, in their endeavor to discover an issue through the glass; while the flies, in less than two minutes, will all have sallied forth through the neck on the opposite side. ... It is [the bees'] love of light, it is their very intelligence, that is their undoing in this experiment. They evidently imagine that the issue from every prison must be there when the light shines clearest; and they act in accordance, and persist in too logical an action. To them glass is a supernatural mystery they never have met in nature; they have had no experience of this suddenly impenetrable atmosphere; and the greater their intelligence, the more inadmissible, more incomprehensible, will the strange obstacle appear. Whereas the feather-brained flies, careless of logic as of the enigma of crystal, disregarding the call of the light, flutter wildly, hither and thither, meeting here the good fortune that often waits on the simple, who find salvation where the wiser will perish, necessarily end by discovering the friendly opening that restores their liberty to them.
This illustration identifies a paradox inherent in learning to solve problems creatively. On the one hand, more education and experience may inhibit creative problem solving and reinforce conceptual blocks. Like the bees in the story, individuals may not find solutions because the problem requires less “educated,” more “playful” approaches. On the other hand, as several researchers have found, training directed toward improving thinking significantly enhances creative problem-solving abilities and managerial effectiveness (Albert & Runco, 1999; Mumford et al., 1997; Nickerson, 1999; Smith, 1998).

For example, research has found that training in thinking increased the number of good ideas produced in problem solving by more than 125 percent (Scope, 1999). Creativity in art, music composition, problem finding, problem construction, and idea generation have been found to improve substantially when training in creative problem solving and thinking skills is received (de Bono, 1987, 1993; Fine, Ward, & Smith, 1992; Getzels & Csikszentmihalyi, 1976; Nickerson, 1999; Starko, 2001). Moreover, substantial data also exist that such training can enhance the profitability and efficiency of organizations (Williams & Yang, 1999). Many organizations such as IBM, General Electric (GE), and AT&T now send their executives to creativity workshops in order to improve their creative-thinking abilities. Creative problem-solving experts are currently hot property on the consulting circuit, and about a million copies of books on creativity are sold each year in North America. Several well-known products have been produced as a direct result of this kind of training; for example, the National Aeronautics and Space Administration’s (NASA’s) Velcro snaps, GE’s self-diagnostic dishwashers, Mead’s carbonless copy paper, and Kodak’s Trimprint film.

Resolving this paradox is not just a matter of more exposure to information or education. Rather, one must master the process of thinking about certain problems in a creative way. As Csikszentmihalyi (1997: 11) observed:

\[
\text{Each of us is born with two contradictory sets of instructions: a conservative tendency, made up of instincts for self-preservation, self-aggrandizement, and saving energy, and an expansive tendency made up of instincts for exploring, for enjoying novelty and risk—the curiosity that leads to creativity belongs to this set. We need both of these programs. But whereas the first tendency requires little encouragement or support from the outside to motivate behavior, the second can will if it is not cultivated. If too few opportunities for curiosity are available, if too many obstacles are placed in the way of risk and exploration, the motivation to engage in creative behavior is easily extinguished.}
\]

In the next section, we focus on problems that require creative rather than analytical solutions. These are problems for which no acceptable alternative seems to be available, all reasonable solutions seem to be blocked, or no obvious best answer is accessible. This situation may exist because conceptual blocks inhibit the implementation of analytical problem solving. Our focus, therefore, will be on tools and techniques that help overcome conceptual blocks and unlock problem-solving creativity.

Two examples help illustrate the kinds of problems that require creative problem-solving skills. They also illustrate several conceptual blocks that inhibit problem solving and several techniques and tools you can use to overcome such blocks.

\section*{Percy Spencer’s Magnetron}

During World War II, the British developed one of the best-kept military secrets of the war, a special radar detector based on a device called the magnetron. This radar was credited with turning the tide of battle in the war between Britain and Germany and helping the British withstand Hitler’s Blitzkrieg. In 1940, Raytheon was one of several U.S. firms invited to produce magnetrons for the war effort.

The workings of magnetrons were not well understood, even by sophisticated physicists. Even among the firms that made magnetrons, few understood what made them work. A magnetron was tested, in those early days, by holding a neon tube next to it. If the neon tube got bright enough, the magnetron tube passed the test. In the process of conducting the test, the hands of the scientist holding the neon tube got warm. It was this phenomenon that led to a major creative breakthrough that eventually transformed lifestyles throughout the world.

At the end of the war, the market for radar essentially dried up, and most firms stopped producing magnetrons. At Raytheon, however, a scientist named Percy Spencer had been fooling around with magnetrons, trying to think of alternative uses for the devices. He was convinced that magnetrons could be used to cook food by using the heat produced in the neon tube. But Raytheon was in the defense business. Next to its two prize products—the Hawk and Sparrow missiles—cooking devices seemed odd and out of place. Percy
Spencer was convinced that Raytheon should continue to produce magnetrons, even though production costs were prohibitively high. But Raytheon had lost money on the devices, and now there was no available market for them. The consumer product Spencer had in mind did not fit within the bounds of Raytheon’s business.

As it turned out, Percy Spencer’s solution to Raytheon’s problem produced the microwave oven and a revolution in cooking methods throughout the world. Later, we will analyze several problem-solving techniques illustrated by Spencer’s creative triumph.

**Spence Silver’s Glue**

A second example of creative problem solving began with Spence Silver’s assignment to work on a temporary project team within the 3M company. The team was searching for new adhesives, so Silver obtained some material from AMD, Inc., which had potential for a new polymer-based adhesive. He described one of his experiments in this way: “In the course of this exploration, I tried an experiment with one of the monomers in which I wanted to see what would happen if I put a lot of it into the reaction mixture. Before, we had used amounts that would correspond to conventional wisdom” (Nayak & Ketteringham, 1986). The result was a substance that failed all the conventional 3M tests for adhesives. It didn’t stick. It preferred its own molecules to the molecules of any other substance. It was more cohesive than adhesive. It sort of “hung around without making a commitment.” It was a “now-it-works, now-it-doesn’t” kind of glue.

For five years, Silver went from department to department within the company trying to find someone interested in using his newly found substance in a product. Silver had found a solution; he just couldn’t find a problem to solve with it. Predictably, 3M showed little interest. The company’s mission was to make adhesives that adhered ever more tightly. The ultimate adhesive was one that formed an unbreakable bond, not one that formed a temporary bond.

After four years the task force was disbanded, and team members were assigned to other projects. But Silver was still convinced that his substance was good for something. He just didn’t know what. As it turned out, Silver’s solution has become the prototype for innovation in American firms, and it has spawned a half-billion dollars in annual revenues for 3M—in a unique product called Post-It Notes.

These two examples are positive illustrations of how solving a problem in a unique way can lead to phenomenal business success. Creative problem solving can have remarkable effects on individuals’ careers and on business success. To understand how to solve problems creatively, however, we must first consider the blocks that inhibit creativity.

**Conceptual Blocks**

Table 3 summarizes four types of conceptual blocks that inhibit creative problem solving. Each is discussed and illustrated below with problems or exercises. We encourage you to complete the exercises and solve the problems as you read the chapter, because doing so

<table>
<thead>
<tr>
<th>Table 3</th>
<th>Conceptual Blocks That Inhibit Creative Problem Solving</th>
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<tr>
<td>1. Constancy</td>
<td>Defined a problem in only one way without considering alternative views</td>
</tr>
<tr>
<td>• Vertical thinking</td>
<td>Not using more than one language to define and assess the problem</td>
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<tr>
<td>• One thinking language</td>
<td>Present problems are seen only as variations of past problems</td>
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<td>2. Commitment</td>
<td>Failing to perceive commonalities among elements that initially appear to be different</td>
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<td>• Stereotyping based on past experience</td>
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<td>• Ignoring commonalities</td>
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<td>3. Compression</td>
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will help you become aware of your own conceptual blocks. Later, we shall discuss in more detail how you can overcome those blocks.

**CONSTANCY**

Constancy, in the present context, means that an individual becomes wedded to one way of looking at a problem or to using one approach to define, describe, or solve it. It is easy to see why constancy is common in problem solving. Being constant, or consistent, is a highly valued attribute for most of us. We like to appear at least moderately consistent in our approach to life, and constancy is often associated with maturity, honesty, and even intelligence. We judge lack of constancy as untrustworthy, peculiar, or airheaded. Prominent psychologists theorize, in fact, that a need for constancy is the primary motivator of human behavior (Festinger, 1957; Heider, 1946; Newcomb, 1954). Many psychological studies have shown that once individuals take a stand or employ a particular approach to a problem, they are highly likely to pursue that same course without deviation in the future (see Cialdini, 2001, for multiple examples).

However, constancy can inhibit the solution of some kinds of problems. Consistency sometimes drives out creativity. Two illustrations of the constancy block are vertical thinking and using only one thinking language.

**Vertical Thinking**

The term *vertical thinking* was coined by Edward de Bono (1968, 2000). It refers to defining a problem in a single way and then pursuing that definition without deviation until a solution is reached. No alternative definitions are considered. All information gathered and all alternatives generated are consistent with the original definition. De Bono contrasted lateral thinking to vertical thinking in the following ways: vertical thinking focuses on continuity, lateral thinking focuses on discontinuity; vertical thinking chooses, lateral thinking changes; vertical thinking is concerned with stability, lateral thinking is concerned with instability; vertical thinking searches for what is right, lateral thinking searches for what is different; vertical thinking is analytical, lateral thinking is provocative; vertical thinking is concerned with where an idea came from, lateral thinking is concerned with where the idea is going; vertical thinking moves in the most likely directions, lateral thinking moves in the least likely directions; vertical thinking discovers the idea.

In a search for oil, for example, vertical thinkers determine a spot for the hole and drill the hole deeper and deeper until they strike oil. Lateral thinkers generate alternative ways of viewing a problem and produce multiple definitions. Instead of drilling one hole deeper and deeper, lateral thinkers drill a number of holes in different places in search of oil. The vertical-thinking conceptual block arises from not being able to view the problem from multiple perspectives—to drill several holes—or to think laterally as well as vertically in problem solving. Problem definition is restricted.

There are plenty of examples of creative solutions that occurred because an individual refused to get stuck with a single problem definition. Alexander Graham Bell was trying to devise a hearing aid when he shifted definitions and invented the telephone. Harland Sanders was trying to sell his recipe to restaurants when he shifted definitions and developed his Kentucky Fried Chicken business. Karl Jansky was studying telephone static when he shifted definitions, discovered radio waves from the Milky Way galaxy, and developed the science of radio astronomy.

In the development of the microwave industry described earlier, Percy Spencer shifted the definition of the problem from “How can we save our military radar business at the end of the war?” to “What other applications can be made for the magnetron?” Other problem definitions followed, such as: “How can we make magnetrons cheaper?” “How can we mass-produce magnetrons?” “How can we convince someone besides the military to buy magnetrons?” “How can we enter a consumer products market?” “How can we make microwave ovens practical and safe?” And so on. Each new problem definition led to new ways of thinking about the problem, new alternative approaches, and, eventually, to a new microwave oven industry.

Spence Silver at 3M is another example of someone who changed problem definitions. He began with “How can I get an adhesive that has a stronger bond?” but switched to “How can I find an application for an adhesive that doesn’t stick firmly?” Eventually, other problem definitions followed: “How can we get this new glue to stick to one surface but not another (e.g., to notepaper but not normal paper)?” “How can we replace staples, thumbtacks, and paper clips in the workplace?” “How can we manufacture and package a product that uses nonadhesive glue?” “How can we get anyone to pay $1.00 a pad for scratch paper?” And so on.

Shifting definitions is not easy, of course, because it is not natural. It requires individuals to deflect their tendency toward constancy. Later, we will discuss
some hints and tools that can help overcome the constancy block while avoiding the negative consequences of inconsistency.

A Single-Thinking Language

A second manifestation of the constancy block is the use of only one thinking language. Most people think in words—that is, they think about a problem and its solution in terms of verbal language. Analytical problem solving reinforces this approach. Some writers, in fact, have argued that thinking cannot even occur without words (Feldman, 1999; Vygotsky, 1962). Other thought languages are available, however, such as nonverbal or symbolic languages (e.g., mathematics), sensory imagery (e.g., smelling or tactile sensation), feelings and emotions (e.g., happiness, fear, or anger), and visual imagery (e.g., mental pictures). The more languages available to problem solvers, the better and more creative will be their solutions. As Koestler (1964: 177) puts it, “[V]erbal language can become a screen which stands between the thinker and reality. This is the reason that true creativity often starts where [verbal] language ends.”

Percy Spencer at Raytheon is a prime example of a visual thinker:

One day, while Spencer was lunching with Dr. Ivan Getting and several other Raytheon scientists, a mathematical question arose. Several men, in a familiar reflex, pulled out their slide rules, but before any could complete the equation, Spencer gave the answer. Dr. Getting was astonished. “How did you do that?” he asked. “The root,” said Spencer shortly. “I learned cube roots and squares by using blocks as a boy. Since then, all I have to do is visualize them placed together.” (Scott, 1974: 287)

The microwave oven depended on Spencer’s command of multiple-thinking languages. Furthermore, the new oven would never have gotten off the ground without a critical incident that illustrates the power of visual thinking. By 1965, Raytheon was just about to give up on any consumer application of the magnetron when a meeting was held with George Foerstner, president of the recently acquired Amana Refrigeration Company. In the meeting, costs, applications, manufacturing obstacles, and so on were discussed. Foerstner galvanized the entire microwave oven effort with the following statement, as reported by a Raytheon vice president:

George says, “It’s no problem. It’s about the same size as an air conditioner. It weighs about the same. It should sell for the same. So we’ll price it at $499.” Now you think that’s silly, but you stop and think about it. Here’s a man who really didn’t understand the technologies. But there is about the same amount of copper involved, the same amount of steel as an air conditioner. And these are basic raw materials. It didn’t make a lot of difference how you fit them together to make them work. They’re both boxes; they’re both made out of sheet metal; and they both require some sort of trim. (Nayak & Ketteringham, 1986: 181).

In several short sentences, Foerstner had taken one of the most complicated military secrets of World War II and translated it into something no more complex than a room air conditioner. He had painted a picture of an application that no one else had been able to capture by describing a magnetron visually, as a familiar object, not as a set of calculations, formulas, or blueprints.

A similar occurrence in the Post-It Note chronology also led to a breakthrough. Spence Silver had been trying for years to get someone in 3M to adopt his unsticky glue. Art Fry, another scientist with 3M, had heard Silver’s presentations before. One day while singing in North Presbyterian Church in St. Paul, Minnesota, Fry was fumbling around with the slips of paper that marked the various hymns in his book. Suddenly, a visual image popped into his mind:

I thought, “Gee, if I had a little adhesive on these bookmarks, that would be just the ticket.” So I decided to check into that idea the next week at work. What I had in mind was Silver’s adhesive. . . . I knew I had a much bigger discovery than that. I also now realized that the primary application for Silver’s adhesive was not to put it on a fixed surface like bulletin boards. That was a secondary application. The primary application concerned paper to paper. I realized that immediately.” (Nayak & Ketteringham, 1986: 63–64).

Years of verbal descriptions had not led to any applications for Silver’s glue. Tactile thinking (handling the glue) also had not produced many ideas. However, thinking about the product in visual terms, as applied to what Fry initially called “a better bookmark,” led to the breakthrough that was needed.
This emphasis on using alternative thinking languages, especially visual thinking, is now becoming the new frontier in scientific research (McKim, 1997). With the advent of the digital revolution, scientists are increasingly working with pictures and simulated images rather than with numerical data. “Scientists who are using the new computer graphics say that by viewing images instead of numbers, a fundamental change in the way researchers think and work is occurring. People have a lot easier time getting an intuition from pictures than they do from numbers and tables or formulas. In most physics experiments, the answer used to be a number or a string of numbers. In the last few years the answer has increasingly become a picture” (Markoff, 1988: D3).

To illustrate the differences among thinking languages, consider the following two simple problems:

1. Assume that the numbers in Figure 1 are on a scoreboard. Shade in six segments of the numbers and place a mathematical sign in the circle to create a correct calculation.

2. Figure 2 shows seven matchsticks. By moving only one matchstick, make the figure into a true equality (i.e., the value on one side equals the value on the other side). Before looking up the answers in the Appendix, try defining the problems differently by using different thinking languages. How many answers can you find?

COMMITMENT

Commitment can also serve as a conceptual block to creative problem solving. Once individuals become committed to a particular point of view, definition, or solution, it is likely that they will follow through on that commitment. Cialdini (2001) reported a study in which investigators asked Californians to put a large, poorly lettered sign on their front lawns saying DRIVE CAREFULLY. Only 17 percent agreed to do so. However, after signing a petition favoring “keeping California beautiful,” the people were again asked to put the DRIVE CAREFULLY sign on their lawns, and 76 percent agree to do so. Once they had committed to being active and involved citizens (i.e., to keeping California beautiful), it was consistent for these people to agree to the large unsightly sign as visible evidence of their commitment. Most people have the same inclination toward being consistent and maintaining commitments.

A host of other studies have demonstrated the same phenomenon, even though commitment can sometimes lead to dysfunctional or foolish decisions, rigidly defended. Two forms of commitment that produce conceptual blocks are stereotyping based on past experiences and ignoring commonalities.
Stereotyping Based on Past Experiences

March (1999) pointed out that a major obstacle to innovative problem solving is that individuals tend to define present problems in terms of problems they have faced in the past. Current problems are usually seen as variations on some past situation, so the alternatives proposed to solve the current problem are ones that have proven successful in the past. Both problem definitions and proposed solutions are therefore restricted by past experience. This restriction is referred to as perceptual stereotyping (Adams, 2001); that is, certain preconceptions formed on the basis of past experience determine how an individual defines a situation.

When individuals receive an initial cue regarding the definition of a problem, all subsequent problems are frequently framed in terms of the initial cue. Of course, this is not all bad, because perceptual stereotyping helps organize problems on the basis of a limited amount of data, and the need to consciously analyze every problem encountered is eliminated. However, perceptual stereotyping prevents individuals from viewing a problem in novel ways.

The creation of microwave ovens and Post-It Notes provides examples of overcoming stereotyping based on past experiences. Scott (1974) described the first meeting of John D. Cockcroft, technical leader of the British radar system that invented magnetrons, and Percy Spencer of Raytheon:

Cockcroft liked Spencer at once. He showed him the magnetron, and the American regarded it thoughtfully. He asked questions—very intelligent ones—about how it was produced, and the Britisher answered at length. Later Spencer wrote, “The technique of making these tubes, as described to us, was awkward and impractical.” Awkward and impractical! Nobody else dared draw such a judgment about a product of undoubted scientific brilliance, produced and displayed by the leaders of British science.

Despite his admiration for Cockcroft and the magnificent magnetron, Spencer refused to abandon his curious and inquisitive stance. Rather than adopting the position of other scientists and assuming that since the British invented it and were using it, they surely knew how to produce a magnetron, Spencer broke out of the stereotypes and pushed for improvements.

Similarly, Spence Silver at 3M described his invention in terms of breaking stereotypes based on past experience.

The key to the Post-It adhesive was doing the experiment. If I had sat down and factored it out beforehand, and thought about it, I wouldn’t have done the experiment. If I had really seriously cracked the books and gone through the literature, I would have stopped. The literature was full of examples that said you can’t do this. (Nayak & Ketteringham, 1986: 57)

This is not to say that one should avoid learning from past experience or that failing to learn the mistakes of history does not doom us to repeat them. Rather, it is to say that commitment to a course of action based on past experience can sometimes inhibit viewing problems in new ways, and can even prevent us from solving some problems at all. Consider the following problem as an example.

There are four volumes of Shakespeare on the shelf (see Figure 3). The pages of each volume are exactly two inches thick. The covers are each one-sixth of an inch thick. A bookworm started eating at page 1 of Volume I and ate straight through to the last page of Volume IV. What distance did the worm cover?

Solving this problem is relatively simple, but it requires that you overcome a stereotyping block to get the correct answer. (See Appendix 1 for the answer.)

Ignoring Commonalities

A second manifestation of the commitment block is failure to identify similarities among seemingly disparate pieces of data. This is among the most commonly identified blocks to creativity. It means that a person becomes committed to a particular point of view, to the fact that elements are different, and, consequently, becomes unable to make connections, identify themes, or perceive commonalities.

The ability to find one definition or solution for two seemingly dissimilar problems is a characteristic of creative individuals (see Sternberg, 1999). The inability to do this can overload a problem solver by requiring that every problem encountered be solved individually. The discovery of penicillin by Sir Alexander Fleming resulted from his seeing a common theme among seemingly unrelated events. Fleming was working with some cultures of staphylococci that had accidentally become contaminated. The contamination, a growth of fungi, and isolated clusters of dead
staphylococci led Fleming to see a relationship no one else had ever seen previously and thus to discover a wonder drug. The famous chemist Friedrich Kekule saw a relationship between his dream of a snake swallowing its own tail and the chemical structure of organic compounds. This creative insight led him to the discovery that organic compounds such as benzene have closed rings rather than open structures (Koestler, 1964).

For Percy Spencer at Raytheon, seeing a connection between the heat of a neon tube and the heat required to cook food was the creative connection that led to his breakthrough in the microwave industry. One of Spencer’s colleagues recalled: “In the process of testing a bulb [with a magnetron], your hands got hot. I don’t know when Percy really came up with the thought of microwave ovens, but he knew at that time—and that was 1942. He [remarked] frequently that this would be a good device for cooking food.” Another colleague described Spencer this way: “The way Percy Spencer’s mind worked is an interesting thing. He had a mind that allowed him to hold an extraordinary array of associations on phenomena and relate them to one another” (Nayak & Ketteringham, 1986: 184, 205). Similarly, the connection Art Fry made between a glue that wouldn’t stick tightly and marking hymns in a choir book was the final breakthrough that led to the development of the revolutionary Post-It Note business.

To test your own ability to see commonalities, answer the following three questions: (1) What are some common terms that apply to both water and finance? (2) In Figure 4, using the code letters for the smaller ships as a guide, what is the name of the larger ship? (3) What does the single piece of wood look like that will pass through each hole in the block in Figure 5 but that will perfectly fill each hole as it passes through? (Answers are in Appendix 1.)

**COMPRESSION**

Conceptual blocks also occur as a result of compression of ideas. Looking too narrowly at a problem, screening out too much relevant data, and making assumptions that inhibit problem solution are common examples. Two especially cogent examples of compression are artificially constraining problems and not distinguishing figure from ground.

**Artificial Constraints**

Sometimes people place boundaries around problems, or constrain their approach to them, in such a way that the problems become impossible to solve. Such constraints arise from hidden assumptions people make about problems they encounter. People assume that some problem definitions or alternative solutions are
Figure 4  Name That Ship!


Figure 5  A Block Problem

off limits, so they ignore them. For an illustration of this conceptual block, look at Figure 6. Without lifting your pencil from the paper, draw four straight lines that pass through all nine dots. Complete the task before reading further.

By thinking of the figure as more constrained than it actually is, the problem becomes impossible to solve. Try to break out of your own limiting assumptions on the problem. (One four-line answer is presented in Appendix 1.) Now that you have been cued, can you do the same task with only three lines? Work on this problem for a minute.

If you are successful, now try to do the task with only one line. Can you determine how to put a single straight line through all nine dots without lifting your pencil from the paper? (No paintbrushes allowed!) Both the three-line solution and some one-line solutions are in Appendix 1.

Artificially constraining problems means that the problem definition and the possible alternatives are limited more than the problem necessitates. Creative problem solving requires that individuals become adept at recognizing their hidden assumptions and expanding the alternatives they consider.

**Separating Figure from Ground**

Another illustration of the compression block is the reverse of artificial constraints. It is the ability to constrain problems sufficiently so that they can be solved. Problems almost never come clearly specified, so problem solvers must determine what the real problem is. They must filter out inaccurate, misleading, or irrelevant information in order to define the problem correctly and generate appropriate alternative solutions. The inability to separate the important from the unimportant, and to compress problems appropriately, serves as a conceptual block because it exaggerates the complexity of a problem and inhibits a simple definition.

How well do you filter out irrelevant information? Consider Figure 7. For each pair, find the pattern on the left that is embedded in the more complex pattern on the right. On the complex pattern, outline the embedded pattern. Now try to find at least two figures in each pattern. (See Appendix 1 for a solution.)

Try one more. What is the word written in Figure 8?

This compression block—separating figure from ground and artificially constraining problems—played an important role in the microwave oven and Post-It Note breakthroughs. George Foerstner’s contribution to the development and manufacture of the microwave oven was to compress the problem, that is, to separate out all the irrelevant complexity that constrained others. Whereas the magnetron was a device so compli-
cated that few people understood it, Foerstner focused on its basic raw materials, its size, and its functionality. By comparing it to an air conditioner, he eliminated much of the complexity and mystery, and, as described by two analysts, “He had seen what all the researchers had failed to see, and they knew he was right” (Nayak & Ketteringham, 1986: 181).

Spence Silver had to add complexity, to overcome compression, in order to find an application for his product. Because the glue had failed every traditional 3M test for adhesives, it was categorized as a useless configuration of chemicals. The potential for the product was artificially constrained by traditional assumptions about adhesives—more stickiness, stronger bonding is best—until Art Fry visualized some unconventional applications: a better bookmark, a bulletin board, scratch paper, and, paradoxically, a replacement for 3M’s main product, tape.

COMPLACENCY

Some conceptual blocks occur not because of poor thinking habits or inappropriate assumptions but because of fear, ignorance, insecurity, or just plain mental laziness. Two especially prevalent examples of the complacency block are a lack of questioning and a bias against thinking.

Noninquisitiveness

Sometimes the inability to solve problems results from an unwillingness to ask questions, obtain information, or search for data. Individuals may think they will appear naïve or ignorant if they question something or attempt to redefine a problem. Asking questions puts them at risk of exposing their ignorance. It also may be threatening to others because it implies that what they
accept may not be correct. This may create resistance, conflict, or even ridicule by others.

Creative problem solving is inherently risky, therefore, because it potentially involves interpersonal conflict. It is risky also because it is fraught with mistakes. As Linus Pauling, the Nobel laureate, said, “If you want to have a good idea, have a lot of them, because most of them will be bad ones.” Years of nonsupportive socialization, however, block the adventuresome and inquisitive stance in most people. Most of us are not rewarded for bad ideas. To illustrate, answer the following questions for yourself:

1. When would it be easier to learn a new language, when you were 5 years old or now? Why?
2. How many times in the last month have you tried something for which the probability of success was less than 50 percent?
3. When was the last time you asked three “why” questions in a row?

To illustrate the extent of our lack of inquisitiveness, how many of the following commonly experienced questions can you answer?

- Why are people immune to their own body odor?
- Why are there 21 guns in a 21-gun salute?
- What happens to the tread that wears off tires?
- Why doesn’t sugar spoil or get moldy?
- Why doesn’t a two-by-four measure two inches by four inches?
- Why doesn’t postage stamp glue have flavoring?
- Why is a telephone keypad arranged differently from that of a calculator?
- Why do hot dogs come 10 in a package while buns come 8 in a package?
- How do military cadets find their caps after throwing them in the air at football games and graduation?
- Why is Jack the nickname for John?
- How do they print the M&M on M&M candies?

Most of us adopt a habit of being a bit complacent in asking such questions, let alone finding out the answers. We often stop being inquisitive as we get older because we learn that it is good to be intelligent, and being intelligent is interpreted as already knowing the answers, instead of asking good questions. Consequently, we learn less well at 35 than at 5, take fewer risks, avoid asking why, and function in the world without trying to understand it. Creative problem solvers, however, are frequently engaged in inquisitive and experimental behavior. Spence Silver at 3M described his attitude about the complacency block this way:

> People like myself get excited about looking for new properties in materials. I find that very satisfying, to perturb the structure slightly and just see what happens. I have a hard time talking people into doing that—people who are more highly trained. It’s been my experience that people are reluctant just to try, to experiment—just to see what will happen. (Nayak & Ketteringham, 1986: 58)

### Bias Against Thinking

A second manifestation of the complacency block is in an inclination to avoid doing cognitive work. This block, like most of the others, is partly a cultural bias as well as a personal one. For example, assume that you passed by your subordinate’s office one day and noticed him leaning back in his chair, staring out the window. A half-hour later, as you passed by again, he had his feet up on the desk, still staring out the window. And 20 minutes later, you noticed that his demeanor hadn’t changed much. What would be your conclusion? Most of us would assume that the fellow was not doing any work. We would assume that unless we saw action, he wasn’t being productive.

> When was the last time you heard someone say, “I’m sorry. I can’t go to the ball game (or concert, dance, party, or movie) because I have to think”? Or, “I’ll do the dishes tonight. I know you need to catch up on your thinking”? That these statements sound outlandish illustrates the bias most people develop toward action rather than thought, or against putting their feet up, rocking back in their chair, looking off into space, and engaging in solitary cognitive activity. This does not mean daydreaming or fantasizing, but thinking.

> There is a particular conceptual block in Western cultures against the kind of thinking that uses the right hemisphere of the brain. **Left-hemisphere thinking**, for most people, is concerned with logical, analytical, linear, or sequential tasks. Thinking using the left
hemisphere is apt to be organized, planned, and precise. Language and mathematics are left-hemisphere activities. **Right-hemisphere thinking** is concerned with intuition, synthesis, playfulness, and qualitative judgment. It tends to be more spontaneous, imaginative, and emotional than left-hemisphere thinking. The emphasis in most formal education is toward left-hemisphere thought development even more in Eastern cultures than in Western cultures. Problem solving on the basis of reason, logic, and utility is generally rewarded, while problem solving based on sentiment, intuition, or pleasure is frequently considered tenuous and inferior.

A number of researchers have found that the most creative problem solvers are *ambidextrous* in their thinking. That is, they use both left- and right-hemisphere thinking and easily switch from one to the other (Hermann, 1981; Hudspith, 1985; Martin-dale, 1999). Creative ideas arise most frequently in the right hemisphere but must be processed and interpreted by the left, so creative problem solvers use both hemispheres equally well.

Try the exercise in Table 4. It illustrates this ambidextrous principle. There are two lists of words. Take about two minutes to memorize the first list. Then, on a piece of paper, write down as many words as you can remember. Now take about two minutes and memorize the words in the second list. Repeat the process of writing down as many words as you can remember.

Most people remember more words from the first list than from the second. This is because the first list contains words that relate to visual perceptions. They connect with right-brain activity as well as left-brain activity. People can draw mental pictures or fantasize about them. The same is true for creative ideas. The more both sides of the brain are used, the more creative the ideas.

**REVIEW OF CONCEPTUAL BLOCKS**

So far, we have suggested that certain conceptual blocks prevent individuals from solving problems creatively. These blocks, summarized earlier in Table 3, narrow the scope of problem definition, limit the consideration of alternative solutions, and constrain the selection of an optimal solution. Unfortunately, many of these conceptual blocks are unconscious, and it is only by being confronted with problems that are unsolvable because of conceptual blocks that individuals become aware that they exist. We have attempted to make you aware of your own conceptual blocks by asking you to solve problems that require you to overcome these mental barriers. These conceptual blocks are not all bad, of course; not all problems should be addressed by creative problem solving. But research has shown that individuals who have developed creative problem-solving skills are far more effective with complex problems that require a search for alternative solutions than others who are conceptually blocked (Basadur, 1979; Collins & Amabile, 1999; Sternberg, 1999; Williams & Yang, 1999).

In the next section, we provide some techniques and tools that help overcome these blocks and improve creative problem-solving skills.

**Conceptual Blockbusting**

Conceptual blocks cannot be overcome all at once because most blocks are a product of years of habit-forming thought processes. Overcoming them requires practice in thinking in different ways over a long period of time. You will not become a skilled creative problem solver just by reading this chapter. By becoming aware of your conceptual blocks and practicing the following techniques, however, research has demonstrated that you can enhance your creative problem-solving skills.

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**Table 4** Exercise to Test Ambidextrous Thinking

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<thead>
<tr>
<th>List 1</th>
<th>List 2</th>
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<tr>
<td>sunset</td>
<td>decline</td>
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<td>perfume</td>
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<td>brick</td>
<td>ambiguous</td>
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<td>monkey</td>
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<td>castle</td>
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<td>radar</td>
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<td>blister</td>
<td>quantity</td>
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<td>chessboard</td>
<td>survey</td>
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</table>

STAGES IN CREATIVE THOUGHT

A first step in overcoming conceptual blocks is recognizing that creative problem solving is a skill that can be developed. Being a creative problem solver is not an inherent ability that some people naturally have and others do not have. Jacob Rainbow, an employee of the U.S. Patent Office who has more than 200 patents by himself, described the creative process as follows:

So you need three things to be an original thinker. First, you have to have a tremendous amount of information—a big data base if you like to be fancy. . . . Then you have to be willing to pull the ideas, because you’re interested. Now, some people could do it, but they don’t bother. They’re interested in doing something else. . . . It’s fun to come up with an idea, and if nobody wants it, I don’t give a damn. It’s just fun to come up with something strange and different. . . . And then you must have the ability to get rid of the trash which you think of. You cannot only think of good ideas. . . . And by the way, if you’re not well-trained, but you’ve got good ideas, and you don’t know if they’re good or bad, then you send them to the Bureau of Standards, National Institute of Standards, where I work, and we evaluate them. And we throw them out. (Csikszentmihalyi, 1997: 48)

Researchers generally agree that creative problem solving involves four stages: preparation, incubation, illumination, and verification (see Albert & Runco, 1999; Nickerson, 1999; Poincare, 1982; Ribot, 1906; Wallas, 1926). The preparation stage includes gathering data, defining the problem, generating alternatives, and consciously examining all available information. The primary difference between skillful creative problem solving and analytical problem solving is in how this first step is approached. Creative problem solvers are more flexible and fluent in data gathering, problem definition, alternative generation, and examination of options. In fact, it is in this stage that training in creative problem solving can significantly improve effectiveness because the other three steps are not amenable to conscious mental work. (Adams, 2001; Ward, Smith, & Fine, 1999). The following discussion, therefore, is limited primarily to improving functioning in this first stage. The incubation stage involves mostly unconscious mental activity in which the mind combines unrelated thoughts in pursuit of a solution. Conscious effort is not involved. Illumination, the third stage, occurs when an insight is recognized and a creative solution is articulated. Verification is the final stage, which involves evaluating the creative solution relative to some standard of acceptability.

In the preparation stage, two types of techniques are available for improving creative problem-solving abilities. One technique helps individuals think about and define problems more creatively; the other helps individuals gather information and generate more alternative solutions to problems.

One major difference between effective, creative problem solvers and other people is that creative problem solvers are less constrained. They allow themselves to be more flexible in the definitions they impose on problems and the number of solutions they identify. They develop a large repertoire of approaches to problem solving. In short, they engage in what Csikszentmihalyi (1997) described as “playfulness and childishness.” They try more things and worry less about their false starts or failures. As Interaction Associates (1971: 15) explained:

Flexibility in thinking is critical to good problem solving. A problem solver should be able to conceptually dance around the problem like a good boxer, jabbing and poking, without getting caught in one place or “fixated.” At any given moment, a good problem solver should be able to apply a large number of strategies (for generating alternative definitions and solutions). Moreover, a good problem solver is a person who has developed, through his understanding of strategies and experiences in problem solving, a sense of appropriateness of what is likely to be the most useful strategy at any particular time.

As a perusal through any bookstore will show, the number of books suggesting ways to enhance creative problem solving is enormous. We now present a few tools and hints that we have found to be especially effective and relatively simple for business executives and students to apply. Although some of them may seem game-like or playful, a sober pedagogical rationale underlies all of them. They help to un-freeze you from your normal skeptical, analytical approach to problems and increase your playfulness. They relate to (1) defining problems and (2) generating alternative solutions.
METHODS FOR IMPROVING PROBLEM DEFINITION

Problem definition is probably the most critical step in creative problem solving. Once a problem is defined, solving it is often relatively simple. However, as explained in Table 2, individuals tend to define problems in terms with which they are familiar. Even well-trained scientists suffer from this problem: “Good scientists study the most important problems they think they can solve” (Medawar, 1967). When a problem is faced that is strange or does not appear to have an easily identified solution, the problem either remains undefined or is redefined in terms of something familiar. Unfortunately, new problems may not be the same as old problems, so relying on past definitions may impede the process of solving current problems, or lead to solving the wrong problem. Applying techniques for creative problem definition can help individuals see problems in alternative ways so their definitions are less narrowly constrained. Three such techniques for improving and expanding the definition process are discussed below.

Make the Strange Familiar and the Familiar Strange

One well-known, well-tested technique for improving creative problem solving is called synectics (Gordon, 1961; Roukes, 1988). The goal of synectics is to help you put something you don’t know in terms of something you do know, then reverse the process back again. The point is, by analyzing what you know and applying it to what you don’t know, you can develop new insights and perspectives. The process of synectics relies on the use of analogies and metaphors, and it works this way.

First, you form a definition of a problem (make the strange familiar). Then, you try to transform that definition so it is out of focus, distorted, or changed in some way (make the familiar strange). Use synectics—analogy and metaphors—to create this distortion. Postpone the original definition of the problem while you examine the analogy or the metaphor. Then, impose that same analysis on the original problem to see what new insights you can uncover.

Suppose you have defined a problem as low morale among members of your team. You may form an analogy or metaphor by answering questions such as the following about the problem:

- What does this remind me of?
- What does this make me feel like?
- What is this similar to?
- What isn’t this similar to?

Your answers might be: “This problem reminds me of trying to turn a rusty bolt,” “It makes me feel like I do when visiting a hospital ward,” “This is similar to the loser’s locker room after a basketball game,” “This isn’t like a well-tuned automobile,” and so on. Metaphors and analogies should connect what you are less sure about (the original problem) to what you are more sure about (the metaphor). By analyzing the metaphor or analogy, you may identify attributes of the problem that were not evident before. New insights can occur.

Many creative solutions have been generated by such a technique. For example, William Harvey was the first to apply the “pump” analogy to the heart, which led to the discovery of the body’s circulatory system. Niels Bohr compared the atom to the solar system and supplanted Rutherford’s prevailing “raisin pudding” model of matter’s building blocks. Consultant Roger von Oech (1986) helped turn around a struggling computer company by applying a restaurant analogy to the company’s operations. The real problems emerged when the restaurant, rather than the company, was analyzed. Major contributions in the field of organizational behavior have occurred by applying analogies to other types of organization, such as machines, cybernetic or open systems, force fields, clans, and so on. Probably the most effective analogies (called parables) were used by Jesus of Nazareth to teach principles that otherwise were difficult for individuals to grasp (e.g., the prodigal son, the good Samaritan, a shepherd and his flock).

Some hints to keep in mind when constructing analogies are:

- Include action or motion in the analogy (e.g., driving a car, cooking a meal, attending a funeral).
- Include things that can be visualized or pictured in the analogy (e.g., circuses, football games, crowded shopping malls).
- Pick familiar events or situations (e.g., families, kissing, bedtime).
- Try to relate things that are not obviously similar (e.g., saying an organization is like a big crowd is not nearly as rich a simile as saying that an organization is like a psychic prison or a poker game).
Four types of analogies are recommended as part of synectics: **personal analogies**, in which individuals try to identify themselves as the problem (“If I were the problem, how would I feel, what would I like, what could satisfy me?”); **direct analogies**, in which individuals apply facts, technology, and common experience to the problem (e.g., Brunel solved the problem of underwater construction by watching a shipworm tunneling into a tube); **symbolic analogies**, in which symbols or images are imposed on the problem (e.g., modeling the problem mathematically or diagramming the process flow); and **fantasy analogies**, in which individuals ask the question “In my wildest dreams, how would I wish the problem to be resolved?” (e.g., “I wish all employees would work with no supervision.”).

**Elaborate on the Definition**

There are a variety of ways to enlarge, alter, or replace a problem definition once it has been specified. One way is to force yourself to generate at least two alternative hypotheses for every problem definition; that is, specify at least two plausible definitions of the problem in addition to the one originally accepted. Think in plural rather than singular terms. Instead of asking, “What is the problem?” “What is the meaning of this?” “What will be the result?”, ask instead questions such as: “What are the problems?” “What are the meanings of this?” “What will be the results?”

As an example, look at Figure 9. Select the figure that is different from all the others.

A majority of people select B first. If you did, you’re right. It is the only figure that has all straight lines. On the other hand, quite a few people pick A. If you are one of them, you’re also right. It is the only figure with a continuous line and no points of discontinuity. Alternatively, C can also be right, with the rationale that it is the only figure with two straight and two curved lines. Similarly, D is the only one with one curved and one straight line, and E is the only figure that is nonsymmetrical or partial. The point is, there can often be more than one problem definition, more than one right answer, and more than one perspective from which to view a problem.

Another way to elaborate definitions is to use a question checklist. This is a series of questions designed to help individuals think of alternatives to their accepted definitions. Several creative managers have shared with us some of their most fruitful questions, such as:

- Is there anything else?
- Is the reverse true?
- Is this a symptom of a more general problem?
- Who sees it differently?

Nickerson (1999) reported an oft-used acronym—**SCAMPER**—designed to bring to mind questions having to do with **Substitution**, **Combination**, **Adaptation**, **Modification** (Magnification/Minimization), **Puting to other uses**, **Elimination**, and **Rearrangement**.

As an exercise, take a minute now to think of a problem you are currently experiencing. Write it down so it is formally defined. Now manipulate that definition by answering the four questions in the checklist. If you can’t think of a problem, try the exercise with this one. Select one of the three words. “I am not as attractive/intelligent/creative as I would like to be.”

**Reverse the Definition**

A third tool for improving and expanding problem definition is to reverse the definition of the problem. That is, turn the problem upside down, inside out, or back to front. Reverse the way in which you think of the problem. For example, consider the following problem:
A tradition in Sandusky, Ohio, for as long as anyone could remember was the Fourth of July Parade. It was one of the largest and most popular events on the city’s annual calendar. Now, in 1988, the city mayor was hit with some startling and potentially disastrous news. The State of Ohio was mandating that liability insurance be carried on every attraction—floats, bands, majorettes—that participated in the parade. To protect against the possibility of injury or accident of any parade participant, each had to be covered by liability insurance.

The trouble, of course, was that taking out a liability insurance policy for all parade participants would require far more expense than the city could afford. The amount of insurance required for that large a number of participants and equipment made it impossible for the city to carry the cost. On the one hand, the mayor hated to cancel an important tradition that everyone in town looked forward to. On the other hand, to hold the event would break the city budget. If you were a consultant to the mayor, what would you suggest?

Commonly suggested alternatives in this problem include the following:

1. Try to negotiate with an insurance company for a lower rate. (However, the risk is merely being transferred to the insurance company.)
2. Hold fund-raising events to generate enough money to purchase the insurance policy, or find a wealthy donor to sponsor the parade. (However, this may deflect potential donations away from, or may compete with, other community service agencies such as United Way, Red Cross, or local churches that also sponsor fund-raisers and require donations.)
3. Charge a “participation fee” to parade participants to cover the insurance expense. (However, this would likely eliminate most high school, middle school, and elementary school bands and floats. It would also reduce the amount of money float builders and sponsoring organizations could spend on the actual float. Such a requirement would likely be a parade killer.)
4. Charge a fee to spectators of the parade. (However, this would require restricted access to the parade, an administrative structure to coordinate fee collection and ticketing, and the destruction of the sense of community participation that characterized this traditional event.)

Each of these suggestions is good, but each maintains a single definition of the problem. Each assumes that the solution to the problem is associated with solving the financial problem associated with the liability insurance requirement. Each suggestion, therefore, brings with it some danger of damaging the traditional nature of the parade or eliminating it altogether. If the problem is reversed, other answers normally not considered become evident; that is, the need for liability insurance at all could be addressed.

Here is an excerpt from a newspaper report of how the problem was addressed:

Sandusky, Ohio (AP) The Fourth of July parade here wasn’t canceled, but it was immobilized by liability insurance worries. The band marched in place to the beat of a drum, and a country fair queen waved to her subjects from a float moored to the curb.

The Reverse Community Parade began at 10:00 A.M. Friday along Washington Row at the north end of the city and stayed there until dusk. “Very honestly, it was the issue of liability,” said Gene Kleindienst, superintendent of city schools and one of the celebration’s organizers. “By not having a mobile parade, we significantly reduced the issue of liability,” he said.

The immobile parade included about 20 floats and displays made by community groups. Games, displays, and food booths were in an adjacent park. Parade chairman Judee Hill said some folks didn’t understand. “Someone asked me if she was too late for the parade, and she had a hard time understanding the parade is here all day,” she said.

Those who weren’t puzzled seemed to appreciate the parade for its stationary qualities. “I like this. I can see more,” said 67-year-old William A. Sibley. “I’m 80 percent blind. Now I know there’s something there,” he said pointing to a float.

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majorettes passing out on the street,” she commented.

Baton twirler Tammy Ross said her performance was better standing still. “You can throw better. You don’t have to worry about dropping it as much,” she explained.

Mr. Kleindienst said community responses were favorable. “I think we’ve started a new tradition,” he said.

By reversing the definition, Sandusky not only eliminated the problem without damaging the tradition and without shifting the risk to insurance companies or other community groups; it added a new dimension that allowed at least some people to enjoy the event more than ever.

This reversal is similar to what Rothenberg (1979, 1991) referred to as Janusian thinking. Janus was the Roman god with two faces that looked in opposite directions. Janusian thinking means thinking contradictory thoughts at the same time; that is, conceiving two opposing ideas to be true concurrently. Rothenberg claimed, after studying 54 highly creative artists and scientists (e.g., Nobel Prize winners), that most major scientific breakthroughs and artistic masterpieces are products of Janusian thinking. Creative people who actively formulate antithetical ideas and then resolve them produce the most valuable contributions to the scientific and artistic worlds. Quantum leaps in knowledge often occur.

An example is Einstein’s account (1919: 1) of having “the happiest thought of my life.” He developed the concept that “for an observer in free fall from the roof of a house, there exists, during his fall, no gravitational field . . . in his immediate vicinity. If the observer releases any objects, they will remain, relative to him, in a state of rest. The [falling] observer is therefore justified in considering his state as one of rest.” Einstein concluded, in other words, that two seemingly contradictory states could be present simultaneously: motion and rest. This realization led to the development of his revolutionary general theory of relativity.

In another study of creative potential, Rothenberg and Hausman (2000) found that when individuals were presented with a stimulus word and asked to respond with the word that first came to mind, highly creative students, Nobel scientists, and prize-winning artists responded with antonyms significantly more often than did individuals with average creativity. Rothenberg argued, based on these results, that creative people think in terms of opposites more often than do other people (also see research by Blasko & Mokwa, 1986).

For our purposes, the whole point is to reverse or contradict the currently accepted definition in order to expand the number of perspectives considered. For instance, a problem might be that morale is too high instead of (or in addition to) too low in our team (we may need more discipline), or maybe employees need less motivation instead of more motivation to increase productivity. Opposites and backward looks often enhance creativity.

These three techniques for improving creative problem definition are summarized in Table 5. Their purpose is not to help you generate alternative definitions just for the sake of alternatives but to broaden your perspectives, to help you overcome conceptual blocks, and to produce more elegant (i.e., high-quality and parsimonious) solutions.

### WAYS TO GENERATE MORE ALTERNATIVES

Because a common tendency is to define problems in terms of available solutions (i.e., the problem is defined as a solution already possessed or the first acceptable alternative; e.g., March, 1999; & March & Simon, 1958), most of us consider a minimal number and a narrow range of alternatives in problem solving. Most experts agree, however, that the primary characteristics of effective creative problem solvers are their fluency and their flexibility of thought (Sternberg, 1999). Fluency refers to the number of ideas or concepts produced in a given length of time. Flexibility refers to the diversity of ideas or concepts generated. While most problem solvers consider a few homogeneous alternatives, creative problem solvers consider many heterogeneous alternatives.

The following techniques are designed to help you improve your ability to generate a large number and a wide variety of alternatives when faced with problems. They are summarized in Table 6.

### Table 5 Techniques for Improving Problem Definition

<table>
<thead>
<tr>
<th>Technique</th>
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<tbody>
<tr>
<td>1. Make the strange familiar and the familiar strange.</td>
</tr>
<tr>
<td>2. Elaborate on the definition.</td>
</tr>
<tr>
<td>3. Reverse the definition.</td>
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</table>

### LEARNING

WAYS TO GENERATE MORE ALTERNATIVES

Because a common tendency is to define problems in terms of available solutions (i.e., the problem is defined as a solution already possessed or the first acceptable alternative; e.g., March, 1999; & March & Simon, 1958), most of us consider a minimal number and a narrow range of alternatives in problem solving. Most experts agree, however, that the primary characteristics of effective creative problem solvers are their fluency and their flexibility of thought (Sternberg, 1999). Fluency refers to the number of ideas or concepts produced in a given length of time. Flexibility refers to the diversity of ideas or concepts generated. While most problem solvers consider a few homogeneous alternatives, creative problem solvers consider many heterogeneous alternatives.

The following techniques are designed to help you improve your ability to generate a large number and a wide variety of alternatives when faced with problems. They are summarized in Table 6.
Defer Judgment

Probably the most common method of generating alternatives is the technique of brainstorming developed by Osborn (1993). This tool is powerful because most people make quick judgments about each piece of information or each alternative solution they encounter. Brainstorming is designed to help people generate alternatives for problem solving without prematurely evaluating, and hence discarding, them. Four main rules govern brainstorming:

1. No evaluation of any kind is permitted as alternatives are being generated. Individual energy is spent on generating ideas, not on defending them.
2. The wildest and most divergent ideas are encouraged. It is easier to tighten alternatives than to loosen them up.
3. The quantity of ideas takes precedence over the quality. Emphasizing quality engenders judgment and evaluation.
4. Participants should build on or modify the ideas of others. Poor ideas that are added to or altered often become good ideas.

The idea of brainstorming is to use it in a group setting so individuals can stimulate ideas in one another. Recent research has found, however, that brainstorming in a group may be less efficient than alternative forms of brainstorming (due to free riders, unwitting evaluations, production blocking, etc.). One widely used alternative brainstorming technique is to have individual group members generate ideas on their own then submit them to the group for exploration and evaluation (Fine, Ward, & Smith, 1992). Alternatively, electronic brainstorming in which individuals use chat rooms or their own computer to generate ideas has shown positive results as well (Siau, 1995). What is clear from the research is that generating alternatives using a group in the process produces more and better ideas than can be produced alone.

One caution about brainstorming should be noted, however. Often, after a rush of alternatives is produced at the outset of a brainstorming session, the quantity of ideas rapidly subsides. But to stop there is an ineffective use of brainstorming. When easily identifiable solutions have been exhausted, that’s when the truly creative alternatives are often produced in brainstorming groups. So keep working!

The best way to get a feel for the power of brainstorming groups is to participate in one. Try the following exercise based on an actual problem faced by a group of students and university professors. Spend at least 10 minutes in a small group, brainstorming ideas.

A request has been made for a faculty member to design an executive education program for midlevel managers at a major automobile company. It is to focus on enhancing creativity and innovation among managers. The trouble is, the top human resource executive indicates that he does not want to approach the subject with brain teasers or games. Instead, he wants other approaches that will help these managers become more creative personally and more effective at fostering innovation among others.

What ideas can you come up with for teaching this subject of creative problem solving to midlevel managers in an organization? How could you help them learn to be more creative? Generate as many ideas as you can following the rules of brainstorming. After at least 10 minutes, assess the fluency and flexibility of the ideas generated.

Expand Current Alternatives

Sometimes, brainstorming in a group is not possible or is too costly in terms of the number of people involved and hours required. Managers facing a fast-paced, twenty-first-century environment may find brainstorming to be too inefficient. Moreover, people sometimes need an external stimulus or blockbuster to help them generate new ideas. One useful and readily available technique for expanding alternatives is subdivision, or dividing a problem into smaller parts. This is a well-used and proven technique for enlarging the alternative set.

March and Simon (1958: 193) suggested that subdivision improves problem solving by increasing the speed with which alternatives can be generated and selected:

The mode of subdivision has an influence on the extent to which planning can proceed...
simultaneously on the several aspects of the problem. The more detailed the factorization of the problem, the more simultaneous activity is possible, hence, the greater the speed of problem solving.

To see how subdivision helps develop more alternatives and speeds the process of problem solving, consider the problem, common in the creativity literature, of listing alternative uses for a familiar object. For example, in one minute, how many uses can you list for a Ping Pong ball?

The more uses you identify, the greater is your fluency in thinking. The more variety in your list, the greater is your flexibility in thinking. You may have included the following in your list: bob for a fishing line, Christmas ornament, toy for a cat, gearshift knob, model for a molecular structure, wind gauge when hung from a string, head for a finger puppet, miniature basketball. Your list will be much longer.

Now that you have produced your list, apply the technique of subdivision by identifying the specific characteristics of a Ping Pong ball, that is, dividing it into its component attributes. For example, weight, color, texture, shape, porosity, strength, hardness, chemical properties, and conduction potential are all attributes of Ping Pong balls that help expand the uses you might think of. By dividing an object mentally into more specific attributes, you can arrive at many more alternative uses (e.g., reflector, holder when cut in half, bug bed, ball for lottery drawing, etc.).

One exercise we have used with students and executives to illustrate this technique is to have them write down as many of their managerial strengths as they can think of. Most people list 10 or 12 attributes relatively easily. Then we analyze the various dimensions of the manager’s role, the activities in which managers engage, the challenges that most managers face from inside and outside the organization, and so on. We then ask these same people to write down another list of their strengths as managers. The list is almost always twice as long or more. By identifying the subcomponents of any problem, far more alternatives can be generated than by considering the problem as a whole.

One final illustration: Assume that someone stole one-fourth of the cake shown in Figure 10. Four hungry athletes want equal pieces of what’s left. Divide the cake into exactly four pieces equal in size, shape, and area. Try to do it in a minute or less. The problem is easy if you use subdivision. It is more difficult if you don’t. One of the answers to the problem is in Appendix 1.

**Figure 10 A Slice of Cake**


**Combine Unrelated Attributes**

A third technique focuses on helping problem solvers expand alternatives by forcing the integration of seemingly unrelated elements. Research into creative problem solving has shown that an ability to see common relationships among disparate factors is a major factor differentiating creative from noncreative individuals (Feldman, 1999). Two ways to do this are through morphological synthesis (Koberg & Bagnall, 2003) and the relational algorithm (Crovitz, 1970). (For literature reviews, see Fine, Ward, & Smith, 1992; and Starko, 2001.)

With morphological synthesis, a four-step procedure is involved. First, the problem is written down. Second, attributes of the problem are listed. Third, alternatives to each attribute are listed. Fourth, different alternatives from the attributes list are combined.

To illustrate this procedure, suppose you are faced with the problem of an operator who takes an extended lunch break almost every day despite your reminders to be on time. Think of alternative ways to solve this problem. The first solution that comes to mind for most people is to sit down and have a talk with (or threaten) the operator. If that doesn’t work, most of us would just fire or transfer the person. However, look at what other alternatives can be generated by using morphological synthesis (see Table 7).

You can see how many more alternatives come to mind when you force together attributes that aren’t obviously connected. The matrix of attributes can create a very long list of possible solutions. In more complicated problems—for example, how to improve quality, how to better serve customers, how to improve the reward system—the potential number of alternatives is even greater, and, hence, more creativity is required to analyze them.

The second technique for combining unrelated attributes in problem solving, the relational algorithm, involves applying connecting words that force a relationship between two elements in a problem. For
Table 7  Morphological Synthesis

Step 1. Problem statement: The operator takes extended lunch breaks every day with friends in the cafeteria.

Step 2. Major attributes of the problem:

<table>
<thead>
<tr>
<th>AMOUNT OF TIME</th>
<th>START TIME</th>
<th>PLACE</th>
<th>WITH WHOM</th>
<th>FREQUENCY</th>
</tr>
</thead>
<tbody>
<tr>
<td>More than 1 hour</td>
<td>12 noon</td>
<td>Cafeteria</td>
<td>Friends</td>
<td>Daily</td>
</tr>
</tbody>
</table>

Step 3. Alternative attributes:

<table>
<thead>
<tr>
<th>AMOUNT OF TIME</th>
<th>START TIME</th>
<th>PLACE</th>
<th>WITH WHOM</th>
<th>FREQUENCY</th>
</tr>
</thead>
<tbody>
<tr>
<td>30 minutes</td>
<td>11:00</td>
<td>Office</td>
<td>Co-workers</td>
<td>Weekly</td>
</tr>
<tr>
<td>90 minutes</td>
<td>11:30</td>
<td>Conference room</td>
<td>Boss</td>
<td>Twice a week</td>
</tr>
<tr>
<td>45 minutes</td>
<td>12:30</td>
<td>Restaurant</td>
<td>Management team</td>
<td>Alternate days</td>
</tr>
</tbody>
</table>

Step 4. Combining attributes:
1. A 30-minute lunch beginning at 12:30 in the conference room with the boss once a week.
2. A 90-minute lunch beginning at 11:30 in the conference room with co-workers twice a week.
3. A 45-minute lunch beginning at 11:00 in the cafeteria with the management team every other day.
4. A 30-minute lunch beginning at 12:00 alone in the office on alternate days.

Example, the following is a list of some relational words:

- about
- against
- after
- across
- among
- at
- before
- between
- by
- from
- for
- if
- though
- through
- till
- under
- whenever
- whenever
- of
- on
- where
- while
- with

To illustrate the use of this technique, suppose you are faced with the following problem: Our customers are dissatisfied with our service. The two major elements in this problem are customers and service. They are connected by the phrase are dissatisfied with. With the relational algorithm technique, the relational words in the problem statement are removed and replaced with other relational words to see if new ideas for alternative solutions can be identified. Consider the following connections in which new relational words are used:

- Customers among service (e.g., customers interact with service personnel)
- Customers as service (e.g., customers deliver service to other customers)
- Customers and service (e.g., customers and service personnel work collaboratively together)
- Customers for service (e.g., customer focus groups can help improve service)
- Service near customers (e.g., change the location of the service to be nearer customers)
- Service before customers (e.g., prepare personalized service before the customer arrives)
- Service through customers (e.g., use customers to provide additional service)
- Service when customers (e.g., provide timely service when customers want it)

By connecting the two elements of the problem in different ways, new possibilities for problem solution can be formulated.

International Caveats

The perspective taken in this chapter has a clear bias toward Western culture. It focuses on analytical and creative problem solving as methods for addressing specific issues. Enhancing creativity has a specific
purpose, and that is to solve certain kinds of problems better. Creativity in Eastern cultures, on the other hand, is often defined differently. Creativity is focused less on creating solutions than on uncovering enlightenment, one’s true self, or the achievement of wholeness or self-actualization (Chu, 1970; Kuo, 1996). It is aimed at getting in touch with the unconscious (Maduro, 1976). In both the East and the West, however, creativity is viewed positively. Gods of creativity are worshipped in West African cultures (Olokun) and among Hindus (Vishvakarma), for example (Ben-Amos, 1986; Wonder & Blake, 1992), and creativity is often viewed in mystical or religious terms rather than managerial or practical terms.

In fostering creative problem solving in international settings or with individuals from different countries, Hampden-Turner and Trompenaars’ (1996, 1998, 2000) model is useful for understanding the caveats that must be kept in mind. Countries differ, for example, in their orientation toward internal control (Canada, United States, United Kingdom) versus external control (Japan, China, Czech Republic). In internal cultures, the environment is assumed to be changeable, so creativity focuses on attacking problems directly. In external cultures, because individuals assume less control of the environment, creativity focuses less on problem resolution and more on achieving insight or oneness with nature. Changing the environment is not the usual objective.

Similarly, cultures emphasizing a specific orientation (Sweden, Denmark, United Kingdom, France) are more likely to challenge the status quo and seek new ways to address problems than cultures emphasizing a diffuse culture (China, Nigeria, India, Singapore) in which loyalty, wholeness, and long-term relationships are more likely to inhibit individual creative effort. This is similar to the differences that are likely in countries emphasizing universalism (Korea, Venezuela, China, India) as opposed to particularism (Switzerland, United States, Sweden, United Kingdom, Germany). Cultures emphasizing universalism tend to focus on generalizable outcomes and consistent rules or procedures. Particularistic cultures are more inclined to search for unique aberrations from the norm, thus having more of a tendency toward creative solution finding. Managers encouraging conceptual blockbusting and creative problem solving, in other words, will find some individuals more inclined toward the rule-oriented procedures of analytical problem solving and less inclined toward the playfulness and experimentation associated with creative problem solving than others.

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**Hints for Applying Problem-Solving Techniques**

Not every problem is amenable to these techniques and tools for conceptual blockbusting, of course, nor is every individual equally inclined or skilled. Our intent in presenting these six suggestions is to help you expand the number of options available to you for defining problems and generating additional alternatives. They are most useful with problems that are not straightforward, are complex or ambiguous, or are imprecise in their definition. All of us have enormous creative potential, but the stresses and pressures of daily life, coupled with the inertia of conceptual habits, tend to submerge that potential. These hints are ways to help unlock it again.

Reading about techniques or having a desire to be creative is not, by itself, enough to make you a skillful creative problem solver, of course. Although research has confirmed the effectiveness of these techniques for improving creative problem solving, they depend on application and practice as well as an environment that is conducive to creativity. Here are six practical hints that will help facilitate your own ability to apply these techniques effectively and improve your creative problem-solving ability.

- **Give yourself some relaxation time.** The more intense your work, the more your need for complete breaks. Break out of your routine sometimes. This frees up your mind and gives room for new thoughts.
- **Find a place (physical space) where you can think.** It should be a place where interruptions are eliminated, at least for a time. Reserve your best time for thinking.
- **Talk to other people about ideas.** Isolation produces far fewer ideas than does conversation. Make a list of people who stimulate you to think. Spend some time with them.
- **Ask other people for their suggestions about your problems.** Find out what others think about them. Don’t be embarrassed to share your problems, but don’t become dependent on others to solve them for you.
- **Read a lot.** Read at least one thing regularly that is outside your field of expertise. Keep track of new thoughts from your reading.
- **Protect yourself from idea killers.** Don’t spend time with “black holes”—that is, peo-
### Fostering Innovation

Unlocking your own creative potential is not enough, of course, to make you a successful manager. A major challenge is to help unlock it in other people as well. Fostering innovation and creativity among those with whom you work is at least as great a challenge as increasing your own creativity. In this last section of the chapter, we briefly discuss some principles that will help you better accomplish the task of fostering innovation.

### MANAGEMENT PRINCIPLES

Neither Percy Spencer nor Spence Silver could have succeeded in their creative ideas had there not been a managerial support system present that fostered creative problem solving and the pursuit of innovation. In each case, certain characteristics were present in their organizations, fostered by managers around them, that made their innovations possible. In this section, we will not discuss the macro-organizational issues associated with

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**Figure 11 A Model of Analytical and Creative Problem Solving**

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<th>Problem Assessment</th>
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<td>Yes</td>
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**Constraints**

- Definitional problems
- Solution-generation problems
- Evaluation and selection problems
- Implementation and follow-up problems

**Conceptual Blocks**

- Constancy
- Commitment
- Compression
- Complacency

**Rational Problem Solving**

1. Define the problem.
2. Generate alternative solutions.
3. Evaluate and select alternatives.
4. Implement and follow up on the solution.

**Creative Problem Solving**

1. To improve problem definition:
   - Make the strange familiar and the familiar strange.
   - Elaborate on definitions.
   - Reverse the definition.
2. To improve generation of alternatives:
   - Defer judgment.
   - Expand current alternatives.
   - Combine unrelated attributes.

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innovation (e.g., organization design, strategic orientation, and human resource systems). Excellent discussions of those factors are reviewed in sources such as DeGraff and Lawrence (2002), McMillan (1985), Tichy (1983), Tushman and Anderson (1997), Van de Ven (1997), and Amabile (1988). Instead, we will focus on activities in which individual managers can engage that foster innovation. Table 8 summarizes three management principles that help engender innovativeness and creative problem solving among others.

**Pull People Apart; Put People Together**

Percy Spencer’s magnetron project involved a consumer product closeted away from Raytheon’s mainline business of missiles and other defense contract work. Spence Silver’s new glue resulted when a polymer adhesive task force was separated from 3M’s normal activities. The Macintosh computer was developed by a task force taken outside the company and given space and time to work on an innovative computer. Many new ideas come from individuals being given time and resources and allowed to work apart from the normal activities of the organization. Establishing bullpens, practice fields, or sandlots is as good a way to develop new skills in business as it has proven to be in athletics. Because most businesses are designed to produce the 10,000th part correctly or to service the 10,000th customer efficiently, they do not function well at producing the first part. That is why pulling people apart is often necessary to foster innovation and creativity.

On the other hand, forming teams (putting people together) is almost always more productive than having people work by themselves. Such teams should be characterized by certain attributes, though. Nemeth (1986) found that creativity increased markedly when minority influences were present in the team; for example, when “devil’s advocate” roles were legitimized, a formal minority report was always included in final recommendations, and individuals assigned to work on a team had divergent backgrounds or views. “Those exposed to minority views are stimulated to attend to more aspects of the situation, they think in more divergent ways, and they are more likely to detect novel solutions or come to new decisions” (Nemeth, 1986: 25). Nemeth found that those positive benefits occur in groups even when the divergent or minority views are wrong. Similarly, Janis (1971) found that narrowmindedness in groups (dubbed groupthink) was best overcome by establishing competing groups working on the same problem, participation in groups by outsiders, assigning a role of critical evaluator in the group, having groups made up of cross-functional participants, and so on. The most productive groups are those characterized by fluid roles, lots of interaction among members, and flat power structures.

Innovativeness can be fostered when individuals are placed in teams and when they are at least temporarily separated from the normal pressures of organizational life. Teams, however, are most effective at generating innovative ideas when they are characterized by attributes of minority influence, competition, heterogeneity, and interaction. You can help foster innova-

<table>
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<th>Table 8</th>
<th>Three Principles for Fostering Innovativeness</th>
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<td><strong>PRINCIPLE</strong></td>
<td><strong>EXAMPLES</strong></td>
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</table>
| 1. Pull people apart; put people together. | • Let individuals work alone as well as with teams and task forces.  
• Encourage minority reports and legitimize “devil’s advocate” roles.  
• Encourage heterogeneous membership in teams.  
• Separate competing groups or subgroups. |
| 2. Monitor and prod. | • Talk to customers.  
• Identify customer expectations both in advance and after the sale.  
• Hold people accountable.  
• Use “sharp-pointed” prods. |
| 3. Reward multiple roles. | • Idea champion  
• Sponsor and mentor  
• Orchestrator and facilitator  
• Rule breaker |
tion among people you manage, therefore, by pulling people apart (e.g., giving them a bullpen) as well as putting people together (e.g., putting them on a team).

**Monitor and Prod**

Neither Percy Spencer nor Spence Silver was allowed to work on his project without accountability. Both men eventually had to report on the results they accomplished with their experimentation and imagination. At 3M, people are expected to allocate 15 percent of their time away from company business to work on new, creative ideas. They can even appropriate company materials and resources to work on them. However, individuals are always held accountable for their decisions. They need to show results for their “play time.”

Holding people accountable for outcomes, in fact, is an important motivator for improved performance. Two innovators in the entertainment industry captured this principle with these remarks: “The ultimate inspiration is the deadline. That’s when you have to do what needs to be done. The fact that twice a year the creative talent of this country is working until midnight to get something ready for a trade show is very good for the economy. Without this kind of pressure, things would turn to mashed potatoes” (von Oech, 1986: 119). One way Woody Morcott, former CEO at Dana Corporation, held people accountable for innovation was to require that each person in the company submit at least two suggestions for improvement each month. At least 70 percent of the new ideas must be implemented. Woody admitted that he stole the idea during a visit to a Japanese company where he noticed workers huddled around a table scribbling notes on how some ideas for improvement might work. At Dana, this requirement is part of every person’s job assignment. Rewards are associated with such ideas as well. A plant in Chihuahua, Mexico, rewards employees with $1.89 for every idea submitted and another $1.89 if the idea is used. “We drill into people that they are responsible for keeping the plant competitive through innovation,” Morcott said (personal communication).

In addition to accountability, innovativeness is stimulated by what Gene Goodson at Johnson Controls called “sharp-pointed prods.” After taking over the automotive group at that company, Goodson found that he could stimulate creative problem solving by issuing certain mandates that demanded innovativeness. One such mandate was, “There will be no forklift trucks allowed in any of our plants.” At first hearing, that mandate sounds absolutely outrageous. Think about it. You have a plant with tens of thousands of square feet of floor space. The loading docks are on one side of the building, and many tons of heavy raw materials are unloaded weekly and moved from the loading docks to work stations throughout the entire facility. The only way it can be done is with forklifts. Eliminating forklift trucks would ruin the plant, right?

Wrong. This sharp-pointed prod demanded that individuals working in the plant find ways to move the work stations closer to the raw materials, to move the unloading of the raw materials closer to the work stations, or to change the size and amounts of material being unloaded. The innovations that resulted from eliminating forklifts saved the company millions of dollars in materials handling and wasted time; dramatically improved quality, productivity, and efficiency; and made it possible for Johnson Controls to capture some business from its Japanese competitors.

One of the best methods for generating useful prods is to regularly monitor customer preferences, expectations, and evaluations. Many of the most creative ideas have come from customers, the recipients of goods and services. Identifying their preferences in advance and monitoring their evaluations of products or services later are good ways to get ideas for innovation and to be prodded to make improvements. All employees should be in regular contact with their own customers, asking questions and monitoring performance.

Customers are not just the end users of a business product or service. In fact, all of us have customers, whether we are students in school, members of a family, players on a basketball team, or whatever. Customers are simply those for whom we are trying to produce something or whom we serve. Students can count their instructors, class members, and potential employers as customers whom they serve. A priori and post hoc monitoring of their expectations and evaluations is an important way to help foster new ideas for problem solving. This monitoring is best done through one-on-one meetings, but it can also be done through follow-up calls, surveys, customer complaint cards, suggestion systems, and so on.

In summary, you can foster innovativeness by holding people accountable for new ideas and by stimulating them with periodic prods. The most useful prods generally come from customers.

**Reward Multiple Roles**

The success of Post-It Notes at 3M is more than a story of the creativity of Spence Silver. It also illustrates the necessity of people playing multiple roles in innovation and the importance of recognizing and rewarding those who play such roles. Without a number of
people playing multiple roles, Spence Silver’s glue would probably still be on a shelf somewhere.

Four crucial roles in the innovative process are the idea champion (the person who comes up with innovative problem solutions), the sponsor or mentor (the person who helps provide the resources, environment, and encouragement for the idea champion to work on his idea), the orchestrator or facilitator (the person who brings together cross-functional groups and necessary political support to facilitate implementation of creative ideas), and the rule breaker (the person who goes beyond organizational boundaries and barriers to ensure success of the innovation). Each of these roles is present in most important innovations in organizations, and all are illustrated by the Post-It Note example below.

This story has four major parts.

1. Spence Silver, while fooling around with chemical configurations that the academic literature indicated wouldn’t work, invented a glue that wouldn’t stick. Silver spent years giving presentations to any audience at 3M that would listen, trying to pawn off his glue on some division that could find a practical application for it. But nobody was interested.

2. Henry Courtney and Roger Merrill developed a coating substance that allowed the glue to stick to one surface but not to others. This made it possible to produce a permanently temporary glue, that is, one that would peel off easily when pulled but would otherwise hang on forever.

3. Art Fry found a problem that fit Spence Silver’s solution. He found an application for the glue as a “better bookmark” and as a note pad. No equipment existed at 3M to coat only a part of a piece of paper with the glue. Fry therefore carried 3M equipment and tools home to his own basement, where he designed and made his own machine to manufacture the forerunner of Post-It Notes. Because the working machine became too large to get out of his basement, he blasted a hole in the wall to get the equipment back to 3M. He then brought together engineers, designers, production managers, and machinists to demonstrate the prototype machine and generate enthusiasm for manufacturing the product.

4. Geoffrey Nicholson and Joseph Ramsey began marketing the product inside 3M. They also submitted the product to the standard 3M market tests. The product failed miserably. No one wanted to pay $1.00 for a pad of scratch paper. But when Nicholson and Ramsey broke 3M rules by personally visiting test market sites and giving away free samples, the consuming public became addicted to the product.

In this scenario, Spence Silver was both a rule breaker and an idea champion. Art Fry was also an idea champion, but more importantly, he orchestrated the coming together of the various groups needed to get the innovation off the ground. Henry Courtney and Roger Merrill helped sponsor Silver’s innovation by providing him with the coating substance that would allow his idea to work. Geoff Nicholson and Joe Ramsey were both rule breakers and sponsors in their bid to get the product accepted by the public. In each case, not only did all these people play unique roles, but they did so with tremendous enthusiasm and zeal. They were confident of their ideas and willing to put their time and resources on the line as advocates. They fostered support among a variety of constituencies, both within their own areas of expertise and among outside groups. Most organizations are inclined to give in to those who are sure of themselves, persistent in their efforts, and savvy enough to make converts of others.

Not everyone can be an idea champion. But when managers reward and recognize those who sponsor and orchestrate the ideas of others, innovation increases in organizations. Teams form, supporters replace competitors, and creativity thrives. Facilitating multiple-role development is the job of the innovative manager.

**SUMMARY**

In the twenty-first century, almost no manager or organization can afford to stand still, to rely on past practices, and to avoid innovation. In a fast-paced environment in which the half-life of knowledge is about three years and the half-life of almost any computer technology is counted in weeks and months instead of years, creative problem solving is increasingly a prerequisite for success. The digital revolution makes the rapid production of new ideas almost mandatory. This is not to negate the importance of analytical problem solving, of course. The quality revolution of the 1980s and 1990s taught us important lessons about carefully proscribed, sequential, and analytical problem-solving processes. Error rates, response times, and missed deadlines dropped dramatically when analytical problem solving was institutionalized in manufacturing and service companies.

In this chapter, we have pointed out a well-developed model for solving problems. It consists of
four separate and sequential stages: defining a problem; generating alternative solutions; evaluating and selecting the best solution; and implementing the chosen solution. This model, however, is mainly useful for solving straightforward problems. Many problems faced by managers are not of this type, and frequently managers are called on to exercise creative problem-solving skills. That is, they must broaden their perspective of the problem and develop alternative solutions that are not immediately obvious.

We have discussed and illustrated eight major conceptual blocks that inhibit most people’s creative problem-solving abilities. Conceptual blocks are mental obstacles that artificially constrain problem definition and solution and that keep most people from being effective, creative problem solvers.

Overcoming these conceptual blocks is a matter of skill development and practice in thinking, not a matter of innate ability. Everyone can become a skilled creative problem solver with practice. Becoming aware of these thinking inhibitors helps individuals overcome them. We also discussed three major techniques for improving creative problem definition and three major techniques for improving the creative generation of alternative solutions. Certain suggestions were described that can help implement these six techniques.

We concluded by offering some hints about how to foster creativity and innovativeness among other people. Becoming an effective problem solver yourself is important, but effective managers can also enhance this activity among their subordinates, peers, and superiors.

**BEHAVIORAL GUIDELINES**

Below are specific behavioral action guidelines to help guide your skill practice in problem solving, creativity, and fostering innovation.

1. Follow the four-step procedure outlined in Table 1 when solving straightforward problems. Keep the steps separate, and do not take shortcuts—define the problem, generate alternative solutions, evaluate the alternatives, and select and implement the optimal solution.

2. When approaching a difficult or complex problem, try to overcome your conceptual blocks by consciously doing the following mental activities:
   - Use lateral thinking in addition to vertical thinking.
   - Use several thought languages instead of just one.
   - Challenge stereotypes based on past experiences.
   - Identify underlying themes and commonalities in seemingly unrelated factors.
   - Delete superfluous information and fill in important missing information when studying the problem.
   - Avoid artificially constraining problem boundaries.
   - Overcome any unwillingness to be inquisitive.
   - Use both right- and left-brain thinking.

3. When defining a problem, make the strange familiar and the familiar strange by using metaphors and analogies, to first focus and then to distort and refocus the definition.

4. Elaborate problem definitions by developing at least two alternative (opposite) definitions and by applying a checklist (e.g., SCAMPER).

5. Reverse problem definitions by beginning with end results and working backwards.

6. In generating potential problem solutions, defer any judgment until many solutions have been proposed. Use the four rules of brainstorming:
   - Do not evaluate alternatives as they are suggested.
   - Encourage wild or unusual ideas.
   - Encourage quantity over quality of ideas.
   - Build on others’ ideas.

7. Expand the list of current alternative solutions by subdividing the problem into its attributes.

8. Increase the number of possible solutions by combining unrelated problem attributes. Morphological synthesis and relational algorithms may be helpful.

9. Foster innovativeness among those with whom you work by doing the following:
   - Find a “practice field” where individuals can experiment and try out ideas and creative problem-solving techniques.
   - Put people who hold different perspectives into teams to work on problems together.
   - Hold people accountable for innovation.
   - Use sharp-pointed prods to stimulate new thinking.
   - Recognize, reward, and encourage the participation of multiple roles in the innovative process, including idea champions, sponsors, orchestrators, and rule breakers.
 Admiral Kimmel’s Failure at Pearl Harbor

In the summer of 1941, as relations between the United States and Japan were rapidly deteriorating, Admiral Kimmel, Commander in Chief of the Pacific Fleet, received many warnings concerning the imminence of war. During this period, he worked out a plan in collaboration with his staff at Pearl Harbor, which gave priority to training key personnel and supplying basic equipment to U.S. outposts in the Far East. The plan took account of the possibility of a long, hard war with Japan and the difficulties of mobilizing scarce resources in manpower and material. At that time, Admiral Kimmel and his staff were keenly aware of the risks of being unprepared for war with Japan, as well as the high costs and risks involved in preparing for war. They appear to have been relatively optimistic about being able to develop a satisfactory military plan and about having sufficient time in which to implement it. In short, all the conditions were present for vigilance, and it seems likely that this coping pattern characterized their planning activity.

During the late fall of 1941, as warnings became increasingly more ominous, a different pattern of coping behavior emerged. Admiral Kimmel and his staff continued to cling to the policy to which they had committed themselves, discounting each fresh warning and failing to note that more and more signs were pointing to Pearl Harbor as a possible target for a surprise air attack. They repeatedly renewed their decision to continue using the available resources primarily for training green sailors and soldiers and for supplying bases close to Japan, rather than instituting an adequate alert that would give priority to defending Pearl Harbor against enemy attack.

Knowing that neither their own sector nor the rest of the U.S. military organization was ready for a shooting war, they clung to an unwarranted set of rationalizations. The Japanese, they thought, would not launch an attack against any American possession; and if by some remote chance they decided to do so, it certainly wouldn’t be at Pearl Harbor. Admiral Kimmel and his staff acknowledged that Japan could launch a surprise attack in any direction, but remained convinced that it would not be launched in their direction. They saw no reason to change their course. Therefore, they continued to give peacetime weekend leave to the majority of the naval forces in Hawaii and allowed the many warships in the Pacific Fleet to remain anchored at Pearl Harbor, as sitting ducks.

Kimmel regularly discussed each warning with members of his staff. At times, he became emotionally aroused and obtained reassurance from the members of his in-group. He shared with them a number of rationalizations that bolstered his decision to ignore the warnings. On November 27, 1941, for example, he received an explicit “war warning” from the chief of naval operations in Washington, which stirred up his concern but did not impel him to take any new protective action. This message was intended as a strong follow-up to an earlier warning, which Kimmel had received only three days earlier, stating that war with Japan was imminent and that “a surprise aggressive movement in any direction, including attack on the Philippines or Guam, is a possibility.” The new warning asserted that “an aggressive move by Japan is expected within the next few days” and instructed Kimmel to “execute appropriate defensive deployment” preparatory to carrying out the naval war plan.
The threat conveyed by this warning was evidently strong enough to induce Kimmel to engage in prolonged discussion with his staff about what should be done. But their vigilance seems to have been confined to paying careful attention to the way the warning was worded. During the meeting, members of the staff pointed out to Kimmel that Hawaii was not specifically mentioned as a possible target in either of the two war warnings, whereas other places—the Philippines, Malaya, and other remote areas—were explicitly named. Kimmel went along with the interpretation that the ambiguities they had detected in the wording must have meant that Pearl Harbor was not supposed to be regarded as a likely target, even though the message seemed to be saying that it was. The defensive quality that entered into this judgment is revealed by the fact that Kimmel made no effort to use his available channels of communication in Washington to find out what really had been meant. He ended up agreeing with the members of his advisory group that there was no chance of a surprise air attack on Hawaii at that particular time.

Because he judged Pearl Harbor not to be vulnerable, Kimmel decided that the limited-alert condition that had been instituted months earlier would be sufficient. He assumed, however, that all U.S. Army units in Hawaii had gone on full alert in response to this war warning, so that antiaircraft and radar units under Army control would be fully activated. But, again, reflecting his defensive lack of interest in carrying out tasks that required acknowledging the threat, Kimmel failed to inquire of Army headquarters exactly what was being done. As a result, he did not discover until after the disaster on December 7 that the Army, too, was on only limited alert, designed exclusively to protect military installations against local sabotage.

On December 3, 1941, Kimmel engaged in intensive discussion with two members of his staff upon receiving a fresh warning from naval headquarters in Washington stating that U.S. cryptographers had decoded a secret message from Tokyo to all diplomatic missions in the United States and other countries, ordering them to destroy their secret codes. Kimmel realized that this type of order could mean that Japan was making last-minute preparations before launching an attack against the United States. Again, he and his advisors devoted considerable attention to the exact wording of this new, worrisome warning. They made much of the fact that the dispatch said “most” of the codes but not “all.” They concluded that the destruction of the codes should be interpreted as a routine precautionary measure and not as a sign that Japan was planning to attack an American possession. Again, no effort was made to find out from Washington how the intelligence units there interpreted the message. But the lengthy discussions and the close attention paid to the wording of these messages imply that they did succeed in at least temporarily inducing decisional conflict.

By December 6, 1941, the day before the attack, Kimmel was aware of a large accumulation of extremely ominous signs. In addition to receiving the official war warnings during the preceding week, he had received a private letter three days earlier from Admiral Stark in Washington stating that both President Roosevelt and Secretary of State Hull now thought that the Japanese were getting ready to launch a surprise attack. Then, on December 6, Kimmel received another message from Admiral Stark containing emergency war orders pertaining to the destruction of secret and confidential documents in American bases on outlying Pacific islands. On that same day, the FBI in Hawaii informed Kimmel that the local Japanese consulate had been burning its papers for the last two days. Furthermore, Kimmel’s chief naval intelligence officer had reported to him that day, as he had on the preceding days, that despite fresh efforts to pick up Japanese naval signal calls, the whereabouts of all six of Japan’s aircraft carriers still remained a mystery. (U.S. Naval Combat Intelligence had lost track of the Japanese aircraft carriers in mid-November, when they started to move toward Hawaii for the planned attack on Pearl Harbor.)
Although the various warning signs, taken together, clearly indicated that Japan was getting ready to launch an attack against the United States, they remained ambiguous as to exactly where the attack was likely to be. There was also considerable “noise” mixed in with the warning signals, including intelligence reports that huge Japanese naval forces were moving toward Malaya. But, inexplicably, there was a poverty of imagination on the part of Kimmel and his staff with regard to considering the possibility that Pearl Harbor itself might be one of the targets of a Japanese attack.

The accumulated warnings, however, were sufficiently impressive to Kimmel to generate considerable concern. On the afternoon of December 6, as he was pondering alternative courses of action, he openly expressed his anxiety to two of his staff officers. He told them he was worried about the safety of the fleet at Pearl Harbor in view of all the disturbing indications that Japan was getting ready for a massive attack somewhere. One member of the staff immediately reassured him that “the Japanese could not possibly be able to proceed in force against Pearl Harbor when they had so much strength concentrated in their Asiatic operations.” Another told him that the limited-alert condition he had ordered many weeks earlier would certainly be sufficient and nothing more was needed. “We finally decided,” Kimmel subsequently recalled, “that what we had [already] done was still good and we would stick to it.” At the end of the discussion, Kimmel “put his worries aside” and went off to a dinner party.


Discussion Questions

1. Identify the conceptual blocks that are illustrated in this case.

2. Outline the problem-solving steps followed by Kimmel and his advisors. What steps in analytical problem solving were skipped or short-circuited?

3. If you were Admiral Kimmel’s advisor, knowing what you know about problem solving, what would you have suggested to help his problem-solving processes? What kinds of conceptual blockbusters could have been useful to Kimmel?

4. What do you learn from this case that would help you advise Microsoft in its anti-competitive case with the federal government, or advise Barnes & Noble.com to displace Amazon.com, or advise American Greetings to become the dominant player in the greeting card business? What practical hints, in other words, do you derive from this classic case of analytical problem solving gone awry?

Innovation and Apple

In his annual speech in Paris in 2003, Steven Jobs, the lionized CEO of Apple Computer, Inc., proudly described Apple in these terms: “Innovate. That’s what we do.” And innovate they have. Jobs and his colleagues, Steve Wozniak and Mike Markkula, invented the personal computer market in 1977 with the introduction of the Apple II. In 1980, Apple was the number one vendor of personal computers in the world. Apple’s success, in fact, helped spawn what became known as Silicon Valley in California, the mother lode of high technology invention and production for the next three decades.

Apple has always been a trailblazing company whose innovative products are almost universally acknowledged as easier to use, more powerful, and more elegant than those of its rivals. In the last ten years, Apple has been granted 1300 patents,
half as many as Microsoft, a company 145 times the size of Apple. Dell Computer, by contrast, has been granted half as many patents as Apple. Apple has invented, moreover, more businesses than just the personal computer. In 1984, Apple created the first computer network with its Macintosh machines, whereas Windows-based PC’s didn’t network until the mid-1990s. A decade ago, Apple introduced the first handheld, pen-based computing device known as the Newton and followed that up with a wireless mouse, ambient-lit keyboards for working in the dark, and the fastest computer on the market in 2003. In 2003, Apple also introduced the first legal, digital music store for downloading songs—iTunes—along with its compatible technology, iPods. In other words, Apple has been at the forefront of product and technological innovation for almost 30 years. Apple has been, hands down, the most innovative company in its industry and one of the most innovative companies on the planet.

Here’s the problem. Today, Apple commands just two percent of the $180 billion worldwide market for PCs. Apple’s rivals have followed its creative leads and snatched profits and market share from Apple with astonishing effectiveness. From its number one position two decades ago, Apple currently ranks as the ninth largest PC firm—behind name-brand firms such as Dell, Hewlett-Packard, and IBM, but embarrassingly, also behind no-name firms such as Acer and Legend. These clone-makers, from Taiwan and China respectively, have invented no new products. Moreover, whereas Apple was once among the most profitable companies in the PC industry, its operating profits have shrunk from 20 percent in 1981 to 0.4 percent in 2004, one-tenth the industry average. Its chief competitor in software—Microsoft—sold $2.6 billion in software in the most recent quarter compared to $177 million for Apple.

What could possibly be wrong? If one takes serious the messages being declared loudly and prominently in the business press and in the broader global society today, innovation and creativity are the keys to success. “Change or die.” “Innovate or get passed over.” “Be creative to be successful.” A key tenant upon which progressive, market-based, capitalistic societies are based is the idea of creative destruction. That is, without creativity and innovation, individuals and organizations become casualties of the second law of thermodynamics—they disintegrate, wither, disorganize, and die. New products are needed to keep consumers happy. Obsolescence is ubiquitous. Innovation and creativity, consequently, are touted as being at the very heart of success. For more evidence, just skim over the more than 49,000 book titles when you log onto Amazon using “innovation.”

On the other hand, consider some of the most innovative companies in recent American history. Xerox Corporation’s famed Palo Alto Research Center gave the world laser printing, the Ethernet, Windows-type software, graphical user interfacing, and the mouse, yet it is notorious for not having made any money at all. Polaroid introduced the idea of instant images, yet it filed for bankruptcy in 2001. The Internet boom in the late 1990s was an explosion in what is now considered to be worthless innovation. And, Enron may have been the most innovative financial company ever.

On the other hand, Amazon, Southwest Airlines, eBay, Wal-Mart, and Dell are examples of incredibly successful companies, but without inventing any new products or technologies. They are acknowledged as innovative and creative companies, but they don’t hold a candle to Apple. Instead of new products, they have invented new processes, new ways to deliver products, new distribution channels, new marketing approaches. It is well-known that Henry Ford didn’t invent the automobile. He simply invented a new way to assemble a car at a cost affordable to his own workers. The guy who invented the automobile hardly made a dime.
The trouble is, creativity as applied to business processes—manufacturing methods, sales and marketing, employee incentive systems, or leadership development—are usually seen as humdrum, nitty gritty, uncool, plodding, unimaginative, and boring. Creative people, and creative companies, that capture headlines are usually those that come up with great new product ideas or splashy features. But, look at the list of Fortune 500 companies and judge how many are product champions versus process champions. Decide for yourself which is the driver of economic growth: good innovation or good management.


Discussion Questions

1. If you were to advise Apple on how to capitalize on its innovativeness, what would you say? How can Apple make money as a result of being so innovative?
2. What are the keys for nurturing innovativeness and creativity in a company? What do you think are the differences between Apple and other computer companies?
3. What are the major obstacles and conceptual blocks that face Apple right now? What do employees need to watch out for?
4. What tools for fostering creative problem solving are applicable to Apple, and which would not be workable? Which ones do you think are used the most there?

For more case material on this topic go to www.prenhall.com/onekey
SKILL PRACTICE

EXERCISES FOR APPLYING CONCEPTUAL BLOCKBUSTING

The purpose of these two exercises is to have you practice problem solving—both analytical and creative. Two actual scenarios are provided below. Both present real problems faced by real managers. They are very likely the same kinds of problems faced by your own business school and by many of your local businesses. Your assignment in each case is to identify a solution to the problem. You will approach the problem in two ways: first using analytical problem-solving techniques; second, using creative problem-solving techniques. The first approach—analytical problem solving—you should accomplish by yourself. The second approach—creative problem solving—you should accomplish in a team. Your task is to apply the principles of problem solving to come up with realistic, cost-effective, and effective solutions to these problems. Consider each scenario separately. You should take no more than five minutes to complete the analytical problem-solving assignment. Then take 15 minutes to complete the creative problem-solving assignment.

Individual Assignment—Analytical Problem Solving (5 minutes)
1. After reading the first case, write down a specific problem definition. What precisely worded problem are you going to solve? Complete the sentence: The problem I am going to solve is . . .

2. Now identify at least four or five alternative solutions. What ideas do you have for resolving this problem? Complete this sentence: Possible ways to resolve this problem are . . .

3. Next, evaluate the alternatives you have proposed. Make sure you don’t evaluate each alternative before proposing your complete set. Evaluate your set of alternatives on the basis of these criteria: Will this alternative solve the problem you have defined? Is this alternative realistic in terms of being cost-effective? Can this solution be implemented in a short time frame?
4. Now write down your proposed solution to the problem. Be specific about what should be done and when. Be prepared to share that solution with other team members.

**Team Assignment—Creative Problem Solving (15 minutes)**

1. Now form a team of four or five people. Each team member should share his or her own definition of the problem. It is unlikely that they will all be the same, so make sure you keep track of them. Now add at least three more plausible definitions of the problem. In doing so, use at least two techniques for expanding problem definition discussed in the text. Each problem definition should differ from the others in what the problem is, not just a statement of different causes of the problem.

2. Now examine each of the definitions you have proposed. Select one that the entire team can agree on. Since it is unlikely that you can solve multiple problems at once, select just one problem definition that you will work on.

3. Share the four or five proposed solutions that you generated on your own, even if they don’t relate to the specific problem your team has defined. Keep track of all the different alternatives proposed by team members. After all team members have shared their alternatives, generate at least five additional alternative solutions to the problem you have agreed on. Use at least two of the techniques for expanding alternatives in the text.

4. Of all the alternatives your team proposed, select the five that you consider to be the most creative and having the highest probability of success.
5. Select one team member from each team to serve as a judging panel. This panel is charged with selecting the team with the most creative and potentially successful alternatives to the problem. Team members cannot vote for their own team.

6. Each team now shares their five alternatives with the class. The judging panel selects the winner.

Moving Up in the Rankings

Business schools seem to have lost the ability to evaluate their own quality and effectiveness. With the emergence of rankings of business schools in the popular press, the role of judging quality seems to have been captured by publications such as BusinessWeek, U.S. News and World Report, and the Financial Times. The accreditation association for business schools, AACSB, mainly assesses the extent to which a school is accreditable or not, a 0–1 distinction, so a wide range in quality exists among accredited business schools. More refined distinctions have been made in the popular press by identifying the highest-rated 50; the first, second, or third tiers; or the top 20. Each publication relies on slightly different criteria in its rankings, but a substantial portion of each ranking rests on name recognition, visibility, or public acclaim. In some of the polls, more than 50 percent of the weighting is placed on the reputation or notoriety of the school. This is problematic, of course, because reputation can be deceiving. One recent poll rated the Harvard and Stanford undergraduate business programs among the top three in the country, even though neither school has an undergraduate business program. Princeton’s law school has been rated in the top five in several polls, even though, you guessed it, no such law school exists. Other criteria sometimes considered in various ranking services include student selectivity, percentage of students placed in jobs, starting salaries of graduates, tuition costs compared to graduates, earnings, publications of the faculty, student satisfaction, recruiter satisfaction, and so on. By and large, however, name recognition is the single most crucial factor. It helps predict the number of student applicants, the ability to hire prominent faculty members, fund-raising opportunities, corporate partnerships, and so on.

Many business schools have responded to this pressure to become better known by creating advertising campaigns, circulating internal publications to other business schools and media outlets, and hiring additional staff to market the school. Most business school deans receive an average of 20 publications a week from other business schools, and an editor at BusinessWeek reported receiving more than 100 per week. Some deans begrudge the fact that these resources are being spent on activities other than improving the educational experience for students and faculty. Given constrained resources and tuition increases that outstrip the consumer price index every year, spending money on one activity precludes it from being spent on others. However, most deans acknowledge that this is the way the game must be played.

As part of a strategy to increase visibility, one business school hired world-renowned architect Frank O. Gehry to design a new business school building. Photographs of models of the building are reproduced below. It is a $70 million building that houses all the educational activities of the school. Currently, this particular school does not appear in
the top 20 on the major rankings lists. However, like about 75 other business schools in
the world, it would very much like to reach that level. That is, the school would like to
displace another school currently listed in the top 20. One problem with this new land-
mark building is that it is so unusual, so avant-garde, that it is not even recognized as a
building. Upon seeing a photograph for the first time, some people don’t even know what
they’re looking at. On the other hand, it presents an opportunity to leapfrog other schools
listed higher in the rankings if the institution is creative in its approach. The challenge, of
course, is that no one is sure exactly how to make this happen.

**Keith Dunn and McGuffey’s Restaurant**

Keith Dunn knew exactly what to expect. He knew how his employees felt about him.
That’s why he had sent them the questionnaire in the first place. He needed a shot of con-
fidence, a feeling that his employees were behind him as he struggled to build McGuffey’s
Restaurants, Inc., beyond two restaurants and $4 million in annual sales.

Gathering up the anonymous questionnaires, Dunn returned to his tiny corporate
office in Asheville, North Carolina. With one of his partners by his side, he ripped open
the first envelope as eagerly as a Broadway producer checking the reviews on opening
night. His eyes zoomed directly to the question where employees were asked to rate the
three owners’ performance on a scale of 1 to 10.

A zero. The employee had scrawled in a big, fat zero. “Find out whose handwriting
this is,” he told his partner, Richard Laibson.

He ripped open another: zero again. And another. A two. “We’ll fire these people,”
Dunn said to Laibson coldly. Another zero.

A one.

“Oh, go work for somebody else, you jerk!” Dunn shouted.

Soon, he had moved to fire 10 of his 230 employees. “Plenty of people seemed to
hate my guts,” he says.

Over the next day, though, Dunn’s anger subsided. “You think, I’ve done all this for
these people and they think I’m a total jerk who doesn’t care about them,” he says.
“Finally, you have to look in the mirror and think, ‘Maybe they’re right.’”

For Dunn, that realization was absolutely shattering. He had started the company
three years earlier out of frustration over all the abuse he had suffered while working at
big restaurant chains. If Dunn had one overriding mission at McGuffey’s, it was to prove
that restaurants didn’t have to mistreat their employees.

He thought he had succeeded. Until he opened those surveys, he had believed that
McGuffey’s was a place where employees felt valued, involved, and appreciated. “I had
no idea we were treating people so badly,” he says. Somewhere along the way, in the day-
to-day running of the business, he had lost his connection with them and left behind the
employee-oriented company he thought he was running.

Dunn’s 13-year odyssey through some big restaurant chains left him feeling as limp
as a cheeseburger after a day under the heat lamps. Ponderosa in Georgia. Bennigan’s in
Florida and Tennessee. TGI Friday’s in Texas, Tennessee, and Indiana. Within one six-
month period at Friday’s, he got two promotions, two bonuses, and two raises; then his
boss left, and he got fired. That did it. Dunn was fed up with big chains.

At the age of 29, he returned to Atlanta, where he had attended Emory University as
an undergraduate and where he began waiting tables at a local restaurant.

There he met David Lynn, the general manager of the restaurant, a similarly jaded
29-year-old who, by his own admission, had “begun to lose faith.” Lynn and Dunn started
hatching plans to open their own place, where employees would enjoy working as much
as customers enjoyed eating. They planned to target the smaller markets that the chains
ignored. With financing from a friend, they opened McGuffey’s.

True to their people-oriented goals, the partners tried to make employees feel more
appreciated than they themselves had felt at the chains. They gave them a free drink and
a meal at the end of every shift, let them give away appetizers and desserts, and provided
them a week of paid vacation each year.

A special camaraderie developed among the employees. After all, they worked in an
industry in which a turnover rate of 250 percent was something to aspire to. The night
before McGuffey’s opened, some 75 employees encircled the ficus tree next to the bar,
joined hands, and prayed silently for two minutes. “The tree had a special energy,” says
Dunn.

Maybe so. By the third night of operation, the 230-seat McGuffey’s had a waiting list.
The dining room was so crowded that after three months the owners decided to add a 58-
seat patio. Then they had to rearrange the kitchen to handle the volume. In its first three
and a half months, McGuffey’s racked up sales of about $415,000, ending the year just
over $110,000 in the red, mostly because the partners paid back the bulk of their
$162,000 debt right away.

Word of the restaurant’s success reached Hendersonville, North Carolina, a town of
30,000 about 20 miles away. The managing agent of a mall there—the mall there—even
stopped by to recruit the partners. They made some audacious requests, asking him to
spend $300,000 on renovations, including the addition of a patio and upgraded equip-
ment. The agent agreed. With almost no market research, they opened the second
McGuffey’s 18 months later. The first, in Asheville, was still roaring, having broken the
$2 million mark in sales its first year, with a marginal loss of just over $16,000. By mid-
summer, the 200-seat Hendersonville restaurant was hauling in $35,000 a week. “Gee,
you guys must be getting rich,” the partners heard all around town. “When are you going
to buy your own jets?” “Everyone was telling us we could do no wrong,” says Dunn. The
Asheville restaurant, though, was developing some problems. Right after the
Hendersonville McGuffey’s opened, sales at Asheville fell 15 percent. But the partners
shrugged it off; some Asheville customers lived closer to Hendersonville, so one restau-
rant was probably pulling some of the other’s customers. Either way, the customers were
still there. “We’re just spreading our market a little thinner,” Dunn told his partners.
When Asheville had lost another 10 percent and Hendersonville 5 percent, Dunn blamed
the fact that the drinking age had been raised to 21 in Asheville, cutting into liquor sales.

By the end of that year, the company recorded nearly $3.5 million in sales, with nom-
inal losses of about $95,000. But the adulation and the expectation of big money and
fancy cars were beginning to cloud the real reason they had started the business.
“McGuffey’s was born purely out of frustration,” says Dunn. Now, the frustration was
gone. “You get pulled in so many directions that you just lose touch,” says Laibson.
“There are things that you simply forget.”

What the partners forgot, in the warm flush of success, were their roots.
“Success breeds ego,” says Dunn, “and ego breeds contempt.” He would come back
from trade shows or real estate meetings all pumped up. “Isn’t this exciting?” he’d ask an
employee. “We’re going to open a new restaurant next year.”
When the employee stared back blankly, Dunn felt resentful. “I didn’t understand why they weren’t thrilled,” he says. He didn’t see that while his world was constantly growing and expanding, his employees’ world was sliding downhill. They were still bussing tables or cooking burgers and thinking, “Forget the new restaurant; you haven’t said hello to me in months; and by the way, why don’t you fix the tea machine?”

“I just got too good, and too busy, to do orientation,” he says. So he decided to tape orientation sessions for new employees, to make a film just like the one he had been subjected to when he worked at Bennigan’s. On tape, Dunn told new employees one of his favorite stories, the one about the customer who walks into a chain restaurant and finds himself asking questions of a hostess sign because he can’t find a human. The moral: “McGuffey’s will never be so impersonal as to make people talk to a sign.” A film maybe, but never a sign.

Since Dunn wasn’t around the restaurants all that much, he didn’t notice that employees were leaving in droves. Even the departure of Tom Valdez, the kitchen manager in Asheville, wasn’t enough to take the shine off his “glowing ego,” as he calls it.

Valdez had worked as Dunn’s kitchen manager at TGI Friday’s. When the Hendersonville McGuffey’s was opening up, Dunn recruited him as kitchen manager. A few months later, Valdez marched into Dunn’s office and announced that he was heading back to Indianapolis. “There’s too much b.s. around here,” he blurted out. “You don’t care about your people.” Dunn was shocked. “As soon as we get this next restaurant opened, we’ll make things the way they used to be,” he replied. But Valdez wouldn’t budge. “Keith,” he said bitterly, “you are turning out to be like all the other companies.” Dunn shrugged. “We’re a big company, and we’ve got to do big-company things,” he replied. Valdez walked out, slamming the door. Dunn still didn’t understand that he had begun imitating the very companies that he had so loathed. He stopped wanting to rebel against them; under the intense pressure of growing a company, he just wanted to master their tried-and-true methods. “I was allowing the company to become like the companies we hated because I thought it was inevitable,” he says.

Three months later, McGuffey’s two top managers announced that they were moving to the West Coast to start their own company. Dunn beamed, “Our employees learn so much,” he would boast, “that they are ready to start their own restaurants.”

Before they left, Dunn sat down with them in the classroom at Hendersonville. “So,” he asked casually, “how do you think we could run the place better?” Three hours later, he was still listening. “The McGuffey’s we fell in love with just doesn’t exist anymore,” one of them concluded sadly.

Dunn was outraged. How could his employees be so ungrateful? Couldn’t they see how everybody was sharing the success? Who had given them health insurance as soon as the partners could afford it? Who had given them dental insurance this year? And who—not that anyone would appreciate it—planned to set up profit sharing next year?

Sales at both restaurants were still dwindling. This time, there were no changes in the liquor laws or new restaurants to blame. With employees feeling ignored, resentful, and abandoned, the restrooms didn’t get scrubbed as thoroughly, the food didn’t arrive quite as piping hot, the servers didn’t smile so often. But the owners, wrapped up in themselves, couldn’t see it. They were mystified. “It began to seem like what made our company great had somehow gotten lost,” says Laibson.

Shaken by all the recent defections, Dunn needed a boost of confidence. So he sent out the one-page survey, which asked employees to rate the owners’ performance. He was crushed by the results. Out of curiosity, Dunn later turned to an assistant and asked a favor. Can you calculate our turnover rate? Came the reply: “220 percent, sir.”

Keith Dunn figured he would consult the management gurus through their books, tapes, and speeches. “You want people-oriented management?” he thought. “Fine. I’ll give it to you.”
Dunn and Laibson had spent a few months visiting 23 of the best restaurants in the Southeast. Driving for hours, they’d listen to tapes on management, stop them at key points, and ask, “Why don’t we do something like this?” At night, they read management books, underlining significant passages, looking for answers.

“They were all saying that people is where it’s at,” says Dunn. “We’ve got to start thinking of our people as an asset,” they decided. “And we’ve got to increase the value of that asset.” Dunn was excited by the prospect of forming McGuffey’s into the shape of a reverse pyramid, with employees on top. Keeping employees, he now knew, meant keeping employees involved.

He heard one consultant suggest that smart companies keep managers involved by tying their compensation to their performance. McGuffey’s had been handing managers goals every quarter; if they hit half the goals, they pocketed half their bonus. Sound reasonable? No, preached the consultant, you can’t reward managers for a halfhearted job. It has to be all or nothing. “From now on,” Dunn told his managers firmly, “there’s no halfway.”

Dunn also launched a contest for employees. Competition, he had read, was a good way of keeping employees motivated.

So the CUDA (Customer Undeniably Deserves Attention) contest was born. At Hendersonville and Asheville, he divided the employees into six teams. The winning team would win $1,000, based on talking to customers, keeping the restaurant clean, and collecting special tokens for extra work beyond the call of duty.

Employees came in every morning, donned their colors, and dug in for battle. Within a few weeks, two teams pulled out in front. Managers also seemed revitalized. To Dunn, it seemed like they would do anything, anything, to keep their food costs down, their sales up, their profit margins in line. This was just what all the high-priced consultants had promised.

But after about six months, only one store’s managers seemed capable of winning those all-or-nothing bonuses. At managers’ meetings and reviews, Dunn started hearing grumblings. “How come your labor costs are so out of whack?” he’d ask. “Heck, I can’t win the bonus anyway,” a manager would answer, “so why try?” “Look, Keith,” another would say, “I haven’t seen a bonus in so long, I’ve forgotten what they look like.” Some managers wanted the bonus so badly that they worked understaffed, didn’t fix equipment, and ran short on supplies.

The CUDA contest deteriorated into jealousy and malaise. Three teams lagged far behind after the first month or so. Within those teams, people were bickering and complaining all the time: “We can’t win, so what’s the use?” The contest, Dunn couldn’t help but notice, seemed to be having a reverse effect than the one he had intended. “Some people were really killing themselves,” he says. About 12, to be exact. The other 100-plus were utterly demoralized.

Dunn was angry. These were the same employees who, after all, had claimed he wasn’t doing enough for them. But okay, he wanted to hear what they had to say. “Get feedback,” the management gurus preached; “find out what your employees think.” Dunn announced that the owners would hold informal rap sessions once a month.

“This is your time to talk,” Dunn told the employees who showed up—all three of them. That’s how it was most times, with three to five employees in attendance, and the owners dragging others away from their jobs in the kitchen. Nothing was sinking in, and Dunn knew it. He now was clear about what didn’t work. He just needed to become clear about what would work.

SUGGESTED ASSIGNMENTS

1. Teach someone else how to solve problems creatively. Explain the guidelines and give examples from your own experience. Record your experience in your journal.

2. Think of a problem that is important to you right now for which there is no obvious solution. It may relate to your family, your classroom experiences, your work situation, or some interpersonal relationship. Use the principles and techniques discussed in this chapter to work out a creative solution to that problem. Spend the time it takes to do a good job, even if several days are required. Describe the experience in your journal.

3. Help direct a group (your family, roommates, social club, church, etc.) in a carefully crafted analytical problem-solving process—or a creative problem-solving exercise—using techniques discussed in this chapter. Record your experience in your journal.

4. Write a letter to your dean or a CEO of a firm identifying solutions to some perplexing problem facing his or her organization right now. Write about an issue that you care about. Be sure to offer suggested solutions. This will require that you apply in advance the principles of problem solving discussed in this chapter.
Application Plan and Evaluation

The intent of this exercise is to help you apply this cluster of skills in a real-life, out-of-class setting. Now that you have become familiar with the behavioral guidelines that form the basis of effective skill performance, you will improve most by trying out those guidelines in an everyday context. Unlike a classroom activity, in which feedback is immediate and others can assist you with their evaluations, this skill application activity is one you must accomplish and evaluate on your own. There are two parts to this activity. Part 1 helps prepare you to apply the skill. Part 2 helps you evaluate and improve on your experience. Be sure to write down answers to each item. Don’t short-circuit the process by skipping steps.

Part 1. Planning

1. Write down the two or three aspects of this skill that are most important to you. These may be areas of weakness, areas you most want to improve, or areas that are most salient to a problem you face right now. Identify the specific aspects of this skill that you want to apply.

2. Now identify the setting or the situation in which you will apply this skill. Establish a plan for performance by actually writing down a description of the situation. Who else will be involved? When will you do it? Where will it be done?

   Circumstances:
   Who else?
   When?
   Where?

3. Identify the specific behaviors in which you will engage to apply this skill. Operationalize your skill performance.

4. What are the indicators of successful performance? How will you know you have been effective? What will indicate you have performed competently?

Part 2. Evaluation

5. After you have completed your implementation, record the results. What happened? How successful were you? What was the effect on others?

6. How can you improve? What modifications can you make next time? What will you do differently in a similar situation in the future?

7. Looking back on your whole skill practice and application experience, what have you learned? What has been surprising? In what ways might this experience help you in the long term?