

The Hard Made Easy Book Series

DECISION

A Guide to Creative Decision Making & Critical Thinking

MAKING

Take Charge of Your Decisions
in Every Part of Your Life
for Greater Success & Happiness

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FEATURING:

- Step-by-Step Guide to Making Effective Decisions
- Basic Principles for the 11 Stages of Decision Making
- Guides to Stimulate Your Thinking
- Easy-to-Use Worksheets to Facilitate Decision Making
- Helpful Charts, Checklists and More...

The Importance of and the Need for Complete Problem Solving and Decision Making

“Nothing is More Important”

In *Research Briefings* (1986), Nobel Laureate Herbert Simon (father of Artificial Intelligence) states:

“The work of managers, of scientists, of engineers, of lawyers – the work that steers the course of society and its economic and government organizations – is largely work of making decisions and solving problems. It is work of choosing issues that require attention, setting goals, finding or designing suitable courses of action, and evaluating and choosing among alternative actions. The first three of these activities – fixing agendas, setting goals, and designing actions – are usually called *problem solving*, the last, evaluating and choosing, is usually called *decision making*. Nothing is more important for the well-being of society than that this work be performed effectively, that we address successfully the many problems requiring attention at the national level (the budget and trade deficits, AIDS, national security, the mitigation of earthquake damage), at the level of business organizations (product improvement, efficiency of production, choice of investments), and at the level of our individual lives (choosing a career or a school, buying a house).”

More on the Need

In *Complex Problem Solving* (1991), edited by Sternberg and Frensch, Wagner states:

“Mintzberg’s (1973) influential studies of what managers actually do, as opposed to what they are supposed to do, or what they say they do, provided unwelcome news to proponents of rational approaches to managerial problem solving. Mintzberg found that even successful managers rarely, if ever, employed rational approaches. Rather than following a step-by-step sequence from problem definition to problem solution, managers typically groped along with only vague impressions about the nature of the problems they were dealing with, and with little idea of what the ultimate solution would be until they found it (Mintzberg, Raisinghani, and Theorel, 1976). Isenberg (1984) reached a similar conclusion in his analysis of how senior managers solve problems. The senior managers he studied did not follow the rational model of first defining problems, next assessing possible causes, and only then taking action to solve the problem. Instead they worked from general overriding concerns, and they worked simultaneously at a number of problems.”

There Is a Great Need for a Foundation Devoted to Decision Making and Problem Solving

In *Decision Making* (1982) Herbert Simon states:

“Although a number of projects have been and are funded by private foundations, there appears to be at present no foundation for which decision making and problem solving are a major focus of interest.” Here it is 25 years later, and we still don’t have a foundation to fill this need. In February 2007 I hit 91 years of age. There is a need for a foundation devoted to decision making and problem solving to continue and expand my efforts. Please spread the word about the need for a foundation.

How much a foundation spends is not usually a measure of how much good it accomplishes. Problem solving and decision making improvement by millions of people could cause such a tremendous contribution to making America and the world a better place to live. Therefore, I claim that a foundation devoted to problem solving and decision making endowed with \$50 million or less could equal what a foundation endowed with \$500 billion will accomplish.

Introduction to Decision Making

As Nobel Laureate Herbert Simon and many others have said, decision making is of major importance.

In *The Professional Decision Thinker* (1983), Ben Heirs states:

“The same logic, I believe, applies to our managers and leaders. *We can no longer afford to depend upon their natural thinking talents alone.*”

This is correct, so here is a well-researched way that decision makers should proceed on decision problem thinking.

Decision makers should understand the stage principle of decision making and problem solving.

Centuries ago it was recognized that there were basic mental activity stages to problem solving and decision making. These stages are subject neutral. They will, of themselves, solve nothing. They are a guide. These stages also have been called steps, phases, processes, elements, ingredients, set of operations, elementary constituents, and others. It is desirable to standardize on one name, such as stages.

The value of the stage method. Without method we are left with chance and aimless wandering. Because there are basic stages to problem solving and decision making, we are able to have a method or model to follow. Over the years, thousands of model formulas have been offered for these mental activity stages. After a thorough review of the literature and selecting features from the best of them, a formula – SM-14 – is now available as a standard. It consists of 11 stages and 3 ingredients. It is complete and practical. It is long enough to cover the major stages and ingredients, but not so long as to be impractical to teach and use.

Memorize this major basic principle

There are well-defined major stages of mental activity to problem solving and decision making

Critical thinking. This term is constantly used. If you research its real meaning, you find it is actually decision making and problem solving thinking.

Public policy and government. Every day at all levels of government public policy decisions are being made. Because of inadequate teaching of decision making, there are often wrong decisions made. Our leaders, media, and reporters would all benefit from the widespread use of the SM-14 formula.

Management in all organizations. It is self-evident that better problem solving and decision making by managers can greatly improve an organization’s profits and goals. A number of studies have shown that managers do not achieve much over 50% correct results in their decision making and problem solving. This percentage may be low, but regardless of what it is, the use of SM-14 would greatly improve results. Remember that managers are also managers of the decision making of personnel under their supervision. In recent years decision making is being pushed further and further down the ranks of employees. So, if our management leaders improve their decision making knowledge and skills, the benefit would be widespread.

The Big Picture of Problem Solving and Decision Making

Importance of Problem Solving and Decision Making

On page 2 I quoted Nobel Laureate Herbert Simon on the importance of problem solving and decision making. While he covered a wide area, there are many other instances in which it is of supreme importance. Just a very few are preserving the earth, preventing wars, human health, and improving government in all areas.

What's Going on in Teaching Decision Making

Problem solving and decision making are taught to a limited extent in many schools and colleges. Various formulas for the stages are sometimes included and other times not. Many reports call for students to be proficient in problem solving and decision making. The need for teaching critical thinking is often mentioned without the realization that critical thinking is really problem solving and decision making. Not much action results from these reports to improve problem solving and decision making. Many businesses have various training courses for their employees. Government agencies have hurt rather than helped.

To make a long story short, the teaching and use of today's body of knowledge of problem solving and decision making is very poor. There is little or no recognition of the need for a standard model such as SM-14. As a result we are, as a nation, doing a very inadequate job of problem solving and decision making.

What We Need to Do

- Individuals should study this booklet and thus improve their problem solving and decision making. They should become life long students of the subject. They should encourage their children and friends to do the same.
- Those in the teaching profession should do everything they can to teach problem solving and decision making following the SM-14 model.
- Employers should institute training courses. Organizations should promote problem solving and decision making.
- Design a national plan to improve problem solving and decision making for teaching in our schools and for the education of those already working.

Coming up next - Divisions of decision making.

- Intuitive decision making. This is explained on the next page.
- Short formula for decision making, SM-4 on page 6.
- Full formula for the complete method of creative decision making, SM-14. This covers the 11 stages of mental activity and the 3 supporting ingredients of decision making. This is explained on page 7.
- Specific individual "sciences" of features of decision making are explained on page 8.

After these pages explaining the four divisions of decision making is a Condensed Guide and Worksheet for Applying the Complete Method of Creative Decision Making (SM-14). It is inserted there as an introduction to the two pages of each of the stages and ingredients of SM-14 that follows. This or the two-page guide on pages 47 and 48 should be used whenever you are working on an important decision.

Intuitive Decision Making

In the course of a day, you make hundreds of decisions and other problem solutions, usually based on your intuition. These are called by such names as intuitive decisions, instantaneous decisions, gut feelings, leaps of understanding, hunches, arbitrary guesses, jumping to conclusions, hasty decisions, sixth sense, quick guesses, snap judgments, and other terms.

Many of these decisions are simple, unimportant, and in the habit-type class. Others are of varied importance that you make instantly because of time urgency, a good enough answer will suffice, or you correctly or incorrectly have confidence in your intuition. Often you have no control. The decision just pops up. Intuitions may also develop from observations or unconsciously over a period of time.

What is intuition? There are disagreements as to what it really is. It is often difficult to distinguish between illumination and intuition. Intuitive thinking enables you to unconsciously utilize hundreds and thousands of bits and pieces of knowledge you possess in memory. Your mind functions fast, without any realization of a detailed review of a process of analytical reasoning. In seconds you can have a leap of understanding or it can warn you, encourage you, provide an answer or inkling, a criticism, a prediction, an idea, or a solution.

Many intuitive thoughts may be important, so too many errors of intuition can hurt your success, relationships, or reputation. Therefore, it is important and up to you to develop your intuitive base.

Your intuitive base or brain skill. This is very important to everyone and especially for those in managerial positions. A good intuitive base depends on a great number of things, such as:

- Curiosity
- A good memory
- Emotional stability
- Freedom from biases
- An extensive body of knowledge
- A variety of experience memories and accurate interpretation of them
- Memory of other peoples' experiences and accurate interpretation of them
- Ability to distinguish between relevant and irrelevant concepts
- Good reasoning and analytical ability
- Creative ability

Note: The above attributes also describe a person with wisdom as well as good judgment.

Claims of superiority for intuitive thinking. A few authors claim that intuitive decisions are superior to analytical ones. There is much evidence that challenges this. So don't rely on it. An intelligent person will, for an important decision, verify the accuracy of his or her intuition.

It is important that your knowledge base include SM-4 and SM-14. The more you know about the method of complex decision making, the better will be your intuitive decisions. Also, it is more likely that you will remember that for important decisions you should verify your intuitive ideas.

A Short Formula for Decision Making

Complex decisions should normally be put through all the stages of SM-14. However, a shorter formula is needed for

- An easily remembered formula you can use at any time.
- Decisions not complex enough or important enough to spend the time and effort going through the 11 stages of SM-14.
- The problem decision you are working on is important but urgency is so great there is no time to go through the 11 stages of SM-14.
- You are in a place or situation in which research facilities are not available.

Many of the progressive authors of books on decision making offer formulas that range from three stages to eight or more. The trouble is that for widespread teaching of decision making we need a short formula suitable as a standard. It should also be an abbreviated version of a complex formula such as SM-14. Here is one that I recommend. Commit this to memory and use it often.

SM-4

Problem
Alternatives
Evaluate
Challenge

<u>Four-Word Short Formula</u>	<u>Brief Description</u>	<u>Stage of SM-14</u>
Problem	(Define carefully)	#2
Alternatives	(Search and generate)	#5
Evaluate	(Based on evidence select best)	#6
Challenge	(Check to be sure it is best)	#8

Very important to remember – Your ability to be successful in using the abbreviated formula depends on knowing how to use the full formula. So study SM-14.

Supporting Ingredients. Remember particularly that you will be using the supporting ingredients of SM-14 in the actions you take in using the short formula so be sure to study them in learning the full SM-14 formula.

Full Formula for the Complete Method of Creative Decision Making – SM-14

It is hard to believe, especially in view of the vast amounts of intellectual thinking that has occurred in recent centuries, that no correct and full model for problem solving and decision making exists. SM-14 fills the need now.

Knowledge is power, but only if you learn how to apply it through problem solving and decision making. The decision making process is essentially a problem solving procedure, so the basic stages and ingredients are the same.

Presented here are good basic principles that will help you the rest of your life. I personally spent more than 18 years in my second retirement career to intensively summarize the knowledge on problem solving and decision making that others have spent years, even lifetimes, accumulating. This knowledge is yours for free. So read on for the best knowledge on decision making.

The scientific method is the master method of knowledge, problem solving, and decision making. Thus it is suitable for all domains. The SM-14 formula of 11 stages and 3 ingredients provides an easy-to-follow guide to this complete method of creative problem solving and decision making for all fields, including our personal lives. This formula will be described here. Because the scientific method has been used for centuries, there is a well-developed body of knowledge about the stages, problem-solving and decision-making techniques, procedural principles and theories, attributes and thinking skills available to help you make decisions.

I cannot express strongly enough the importance of learning and understanding the stage and ingredient principle of problem solving. It is the foundation for complex problem solving and decision making.

If you make an intensive study of the literature, you will find that there are basic mental activity stages to problem solving and decision making. These stages are subject neutral. They will, of themselves, solve nothing. They are a guide. These stages also have been called steps, phases, processes, elements, ingredients, set of operations, elementary constituents, and others. It is desirable to standardize on one name, such as stages.

The literature also shows that thousands of model formulas have been offered for these mental activity stages. After a thorough review of the literature and selecting features from the best of them, a formula – SM-14 – is now available. It consists of 11 stages and 3 ingredients. It is complete and practical. It is long enough to cover the major stages and ingredients, but not so long as to be impractical to teach and use.

A guide or model formula, being subject neutral, will not solve decision problems. So, certain ingredients were recognized as necessary to use at these mental activity stages. In the SM-14 model these have been combined into three ingredients, numbered 12, 13, and 14, described on pages 32-37. They are applied at all stages of mental activity to actually accomplish results.

Be sure to use either the one-page or two-page guide forms that are on page 9 and pages 47 and 48. these forms will be a big help to you in learning SM-14 and in making more accurate decisions. The 11 stages of SM-14 are described on pages 10-31.

Specific Individual “Sciences” of Features of Decision Making

The decision maker today is faced with this condition: the world has become much more complex and this process continues at an ever-increasing rate.

The knowledge of many of the individual features of decision making has increased tremendously in recent years. Some are now organized sciences. Others are just little “sciences” or bodies of knowledge. This will necessitate more specialization by decision makers. It will require decision making to be taught across the curricula from kindergarten through college and university. At the higher levels, it will require courses every year or term.

On complex decisions, the decision maker of today often uses decision groups or teams in an effort to get a variety of opinions and expertise. Or consultants are employed to aid the process. At other times, the decision makers must do their own research. The problem is that we can’t be experts in everything, especially in these complex times.

It is not easy to abstract decision making guidance from existing books, although they can be of help. It is to fill this guidance need that I spent a year on meta-analysis of decision making literature in preparing this booklet.

To improve your decision making, you should follow this booklet each time you work on a complex decision problem. The experience you gain will also aid you in developing your intuitive decision base.

In using it you will soon find that there are many specific individual “sciences” or bodies of knowledge about features of decision making. To illustrate, I list below just a few of these subjects.

Modeling	Mathematics
Artificial intelligence	Economics
Researching	Stress and emotions
Psychology	Planning
Team decision making	Value engineering
Charting and graphing	Expected utility theory
Bounded rationality	Urgent decisions
Forecasting	Internet
Behavioral theory	Communications

And the list goes on and on. Some of these I cover later.

Coming up next – A one-page “Condensed Guide and Worksheet for Applying the Complete Method of Creative Decision Making (SM-14).” This also serves as a preview. Following this guide are two pages for each of the 11 mental activity stages and for the 3 supporting ingredients of SM-14.

A two-page guide with additional space for notes is available on pages 47 and 48.

Condensed Guide and Worksheet for Applying The Complete Method of Creative Decision Making (SM-14)

STAGES OF SM-14	SPACE BELOW FOR YOUR COMMENTS AND NOTES
1. Curious Observation	<i>Be alert. What decisions are needed? Be skeptical. Prevent trouble.</i>
2. Is there a <u>Problem</u> ?	<i>Define the decision carefully. Real purpose? Urgent? Present in form of question.</i>
3. Goals & Planning	<i>Break the decision into sub-decisions. Set goals and plan ahead.</i>
4. Search, Explore, & Gather the Evidence	<i>Search the library and the internet. Follow leads. Explore all angles. Build files.</i>
5. Generate Creative & Logical <u>Alternative Solutions</u>	<i>Search for ideas. Read publications to trigger your imagination. Consult others.</i>
6. Evaluate the <u>Evidence</u>	<i>Chart and rate evaluations of your tentative solutions. Compare and test them.</i>
7. Make the Educated Guess (Hypothesis)	<i>Choose the best solution as your working hypothesis. Make predictions to be tested.</i>
8. <u>Challenge</u> the Hypothesis	<i>Test. Experiment. Control the variables. Attempt to falsify.</i>
9. Reach a Conclusion	<i>Communicate results. Can others test and confirm your conclusion?</i>
10. Suspend Judgment	<i>Keep an open mind. Be ready to accept new evidence. Knowledge is forever changing.</i>
11. Take Action	<i>Submit your solution to peer review or take other appropriate action.</i>
SUPPORTING INGREDIENTS:	
12. Creative, Non-logical, Logical & Technical Methods	<i>Use all types of action methods at all stages to actually accomplish results.</i>
13. Procedural Principles & Theories	<i>Follow those used by professional researchers, but "anything (ethical) goes."</i>
14. Attributes & Thinking Skills	<i>Be honest, good team worker. Communicate. Use creativity. Reason logically.</i>

For a two-page guide, see pages 47 and 48. Not copyrighted – from Decisionmaking.org

Stage 1 Curious Observation

The complete method of creative problem solving and decision making depends on people using curious observation to find problems that need to be solved and decisions that need to be made. Curiosity is a personal attribute that, if continually exercised, will keep you ahead of the competition and successful in all phases of life.

Curiosity, when carried through all the stages of the complete method of creative decision making, results in better judgment, more jobs, increased wages, cheaper and more available food, longer life and better health, improved housing, improved management decision making, and a more pleasant and prosperous life for people in general.

Albert Einstein said, “I have no special gift, I am only passionately curious” and “The formulation of a problem is far more often essential than its solution.” A solution may be a result of mere skill, while the discovery of a problem or decision requires an inquisitive, curious mind.

Our Five Senses Are used to Find Problems to Be Solved and Decisions that Need to Be Made. We use our five senses – hearing, sight, smell, feel, and taste – in curious observation to stimulate and aid our mental activities in finding decisions that need to be made. Tools, microscopes, and instruments such as computers are means by which we extend our senses.

Prevention – Find Decisions that Need to Be Made. Only by constantly being curious, alert, and constructively discontent will you recognize a situation in which a decision is needed – now or in the future – in order to prevent big losses, extra trouble, crises, or to achieve your objectives. Remember the old saying: an ounce of prevention is worth a pound of cure. Organizations not alert to needed decisions can make colossal blunders. Use your imagination to see the big picture of what you are working on.

Aids to Arouse Your Curiosity:

- Read newspapers, magazines, professional journals, and books.
- Check various internet sites on subjects you are interested in.
- Have discussions with family, friends, and associates on the process of decision making.
- Observe what goes on around you all day long. Pay special attention to changes that are constantly occurring.
- Attend exhibits, conventions, and professional meetings.

To Help Train Yourself to Be Curious and Understand What You See:

- Don't accept anything as a “fact” or “true.” Develop a healthy and practical skepticism.
- Ask why and what if.

Use Your Curiosity and Thinking Ability to:

- Reflect on motives, feelings, needs, and reactions of people involved with or assigned to you.
- Think reflectively. Inquire. Turn thoughts over and over in your mind.
- Visualize and imagine.

- Let your curiosity lead you to be dissatisfied. Improvements come because of dissatisfaction.
- Be progressive.
- Motivate yourself to make the world a better place to live.
- Think about thinking. Constantly improve your thinking skills and judgment.

Even When Presented with a Decision to Be Made, Begin at Stage 1 by Being Curious About:

Who was involved in the matter leading up to the decision that is needed?

What were events leading up to the decision that is needed?

When did the events begin to develop?

Where did this occur?

Why did the matter reach the decision stage? Any urgency?

How did my involvement in the decision-problem develop?

Remember as You Proceed:

- Develop curiosity as one of your personal attributes and use it throughout decision making.
- Be curious about what other personal attributes you need to be a good decision maker. See Supporting Ingredient 14.
- Learn to anticipate troubles, errors, and changes needed.
- Knowing and practicing use of the SM-14 model will give you self-confidence.
- Decision making is a process and must move along the stages presented here.

Before proceeding through the 11 stages of decision making, remember the supporting ingredients;

Ingredient 12 – Creative, Non-logical, Logical, and Technical Methods

Ingredient 13 – Procedural Principles and Theories

Ingredient 14 – Attributes and Thinking Skills

You must use these at all the stages of the process of decision making. You might want to glance at them now to remind yourself that you will need them as you proceed through the next stages of SM-14.

Next . . . Stage 2. After finding or being given a problem that requires a decision, you should present it in the form of a question at Stage 2. If any ideas on what the decision should be occur to you, consider them tentative, no matter how good they may seem to you (but keep a list of them).

Stage 2 Is There a Problem?

Present the decision needed in the form of a question. An idea, problem, decision, or tentative theory should be presented in the form of a question because it encourages you to keep an open mind and thus seek a good decision and not prove a statement. A question is a tool and a guide for productive thinking.

Warning: The correct answer to the wrong question is no solution to the real problem. Incorrectly playing around with a symptom of the real problem will put you on the wrong course. Be sure to seek out the real basic purpose and problem or decision needed and follow the decision process.

Classify in your mind the problem decision to help define it properly:

- A major or minor one?
- A short-term or long-term one?
- A policy decision? Be careful of setting a precedent.
- A group decision or team assisted? Consult others for their definitions.
- A technical, legal, financial, personal, social, religious, business, professional, union, political, environmental, management decision or another class?
- A reversible decision or a permanent one?
- Not of great importance. The first alternative that will work is OK.
- Is the problem routine and subject to programming?

Suggestions to help you in defining the decision problem:

- How urgently is the decision really needed? The more time to research the better.
- Determine the present state and goal state to help define the problem.
- Review with groups and others issues, purpose, and proposed questions.
- Too broad a question can't be solved, but too narrow a question limits results.
- Be clear and brief but thought provoking. Put thoughts on paper or computer.
- Review the origin of issues or problem. Try to see the big picture and complete process.
- Do you have enough information? If not, jump ahead to Stage 4 and search for more.
- Consider whether this problem is part of a system that involves other decisions.
- Cut the problem down to size. You don't want a lengthy description of the decision problem. The great complexity that exists today requires considering the limits on human rationality.
- Create concept maps and models, and arrange diagrams to help frame the question.
- Restate or reframe the decision several different ways before the final choice.
- Disconfirm or ask what is wrong with the decision needed.
- Skip reading all the stages of SM-14 may help you reach the real question.
- In comparing look for similarities and differences.
- If you have already started a list of tentative solutions or decisions, consult it to see whether they affect your definition of the problem or sub-problems.
- If you are mathematically inclined, present the question in a different form.
- Is the decision so complex that you should consult with or hire an expert?
- Keep in mind what you want to achieve, preserve, and prevent.

Complex decision can be solved more easily by breaking them down to sub-problems. In complex problem solving and decision making, the major question often seems impossible to answer or very difficult to solve. However, the standard decision making technique is to “divide and conquer.” You should analyze the problem for its major sub-problems and sub-sub-problems and plan to solve these first. Prepare a written list. In view of this, you can keep your question simpler knowing that sub-problems will be broken out in arriving at a decision solution.

Advantage of presenting the decision problem as a question. If you make a statement such as “We need to build a branch plant in New Jersey,” your study will be slanted toward substantiating the statement. However, if you state instead, “Do we need to build a branch plant in New Jersey?” your study will challenge whether it is really needed. If a branch plant is needed, should it be in New Jersey, Pennsylvania, New York, or elsewhere?

Urgent, Emergency, or Containment Decision

- Is the person in charge capable of rapid mental processes?
- Is it really needed immediately? Were communications and judgment correct?
- Can it be broken down quickly into sub-problems? Will solving a sub-problem eliminate the urgency and be the best decision making strategy?
- Quickly mentally review what you want to achieve, preserve, and prevent.
- What will the loss in waiting be against the gain in properly studying the problem?
- If there is time, quickly review this book and make notes on one of the model guide forms.
- Even if there is urgency, consider several alternative decisions.
- Is it dangerous? Lives involved?
- Consider assembling an emergency task force.
- Predict consequences and alert people.
- Anticipate stress for yourself and others.
- A good intuitive background will be of great help.
- Don’t make decisions in the heat of anger and unnecessary urgency.
- The person presenting the urgency of a decision may be biased.

Look for the big picture. Before defining your decision problem, try to look at the big picture. This is not always easy. Think and read extensively on the area of your decision. If you have symptoms, trace them back to the real problem. Is the real problem part of an even greater problem?

Be careful of “common sense” statements and prevailing assumptions. Challenge statements and opinions of experts and authoritative leaders. Consider what is really needed instead of opinions.

Look ahead. While it is early to look ahead to the possible outcome of your decision process, it may help you in defining it, so do so. Also consider what decisions will be needed after this one.

Next . . . Stage 3. Now that you know the decision needed, consider your goals and do your planning. Your goals will influence and guide you in your search for a successful decision.

Goals

These are the end results you want to achieve as a result of the decision you arrive at. Up until the previous half-century, people just gave a little thought to these and kept them in mind when solving problems and making decisions. Today everything is so much more complex that we must spend time to investigate our goals thoroughly and reduce our work to writing or to computer. Here are some things to consider in setting your goals.

- Before setting goals, do your goal research. How do your goals relate to your or to your organization's overall goals? Be sure you see the big picture.
- Goals must be realistic, achievable, and challenging and must provide growth.
- We usually have multiple objectives. Conflicting goals must be analyzed.
- Review initial state, present state, and goal state.
- Aim for exactness on important points, but remember that perfection is not always possible or affordable. Consider "good enough."
- Goals may be short term, medium, or long term.
- Cover the real purpose of the decision; stay properly focused.
- Be sure goals are worth cost/benefits. What degree of risk is acceptable?
- Consider moral values, ethics, emotions, and happiness.
- Are people and resources available to research the decision?
- Sometimes goals have to be reached by degrees.
- Remember what you want to achieve, preserve, and prevent.
- Goals must not upset the full system or process they are part of.
- Consider sub-goals to achieve the major goal.
- Reaching goals now may be costly but may pay off big in the future.
- If a decision group is involved, enlist them in setting goals.
- Goals may have to change as the world is constantly changing.
- Everything is not black and white. Think also in shades of gray.
- Are your "facts" really knowledge or only opinions or assumptions.
- Consider the consequences of reaching goals. You may have to make tradeoffs.
- Enlist an assistant or expert to help. Are they familiar with decision models?
- Use your imagination or seek creative thinkers.
- Remember human factors. Review behavioral psychology. Good judgment is essential.
- Consider working backward from Stage 11 to clarify goals.
- How will the community and religious factions react to goals?
- Be careful of the "expected utility theory." People don't always do what is best for them.
- Anticipate the possibility that your goals will produce conflicts and opposition.
- How will your competitors or opponents react to your goals?
- How will your goals fit into cultural values and society?
- Constraints may limit or affect your goals.
- Consider legal, environmental, community, or global restrictions.

Planning

In today's era of complexity, budgets, and government grants, we need to plan carefully and keep proper records. The SM-14 formula provides an ideal base for planning. Here are some points to keep in mind:

- Place priority on identifying and solving sub-problems or sub-decisions.
- Organize your advisors, team, and consultants. Watch for counter actions.
- Keep your lines of communication working properly.
- Line up your time, supplies, resources, facilities, and people.
- Use models, artificial intelligence, and other technologies.
- Line up libraries, books, and internet sites that will help you.
- Keep a log and financial records that may be required.
- Multiple goals and objectives with consequences are usually involved.
- Ask subordinates or family what problems the decision will cause them.
- Be careful of being too optimistic or pessimistic. Balance these.
- Keep in mind economy of time, money, thought, and energy.
- Cost/benefits or effectiveness are of prime importance.
- What future cost or obligations may be involved?
- Establish your priorities. Be careful to see the big picture.
- Compile your list of criteria and values. Cost of tradeoffs?
- Prepare sketches, charts, diagrams, and other visual aids.
- Be innovative and creative. Watch for ideas, methods, processes, and strategies.
- Think globally, in both what to do and affects of global activities.
- Take steps to counteract the rumor mill.
- Consider moral values, ethics, emotions, stresses, and anxieties.
- Have plans for each stage of SM-14. It is a flexible method.
- Seriously consider contrary evidence and opinions.
- What repetitive and routine decision can be programmed or modeled?
- Explore risks involved and what degree of risk you will take.
- Compile a list of tentative solutions as you go along.
- Consider legal, political, environmental, and community restrictions.
- When is a decision really needed? Avoid a biased call for action now.
- Carefully consider your competitors' and opponents' counter actions to your decision.
- Study what is involved in making decisions under uncertainties.
- Review past experiences, but interpret them carefully.
- Assign responsibilities. Consider peoples' core competences. Motivate your people.
- Beware of being wrongly influenced by sunk costs.
- Draw up a list of anticipated obstacles and difficulties. Consider constraints.
- Check on assumptions, opinions, judgments, and your biases and those of others.
- Beware of dishonesty, false information, selective presentation of facts, and hidden agendas.
- Ask for honest feedback and audit of your plan as you proceed.
- If mathematical calculations will help, have a qualified person to do them.
- Consider decisions you will have to make after this one. Look ahead.
- Consider establishing a permanent planning room.

Next . . . Stage 4. We begin to work on searching, exploring, and gathering the evidence about our decision problem.

Stage 4 Search, Explore, and Gather the Evidence

An efficient search for information and evidence is essential for making a good decision. Search everywhere. Explore all angles, leads, clues, strategies, techniques, and sources of information. Pick out the essential principles of the material you read, see, or hear. Write them down in an organized way. Read supporting ingredients 12, 13, and 14 before starting your search. Here are some ideas to help you and trigger your mind.

Organize your sources of information, data, processes, and supplies:

- Use internet search engines
- Visit libraries; read periodicals
- Visit new and used bookstores
- Seek discussions with friends
- Take field trips; go to conventions
- Accumulate your own library
- Use Post-it notes to mark pages
- Build a file system for papers
- Set up computer files
- Decide what supplies you need

Limited information principle. Before loading your mind with data, other people's opinions, and so-called "facts," list all alternative decisions that you can think of for your main problem and any sub-problems. This allows you to use your imagination before being influenced by prevailing thoughts and theories.

Limit your search. There is a universe of data and information. Don't depend only on the internet for information. Limit your search to a practical amount and don't overload your mental capacity to understand by collecting too much. To avoid this, organize proper file folders, notebooks, computer files, and keep a log.

Economy. Keep in mind budget, cost/benefit, cost effectiveness, time, and energy. This is of special importance in management decision making.

Determine your strategy. You are going to:

- Do a complete search.
- Do a limited search
- Look for "good enough" alternatives
- Review purposes, goals, and objectives

Generate creative and logical solutions (Stage 5). This is listed as a separate stage to be sure that it is done. In actual practice, you should be watching for and thinking about alternate solutions to evaluate at Stage 6 while you are searching, exploring, and gathering evidence. Review Stage 5 now.

Explore the history of similar decision problems previously solved.

Work ahead on other stages. If you find information useful for the stages ahead, make notes for those stages as you search. Your search should trigger visions and scenarios of what may be ahead. Remember what you want to achieve, preserve, and prevent.

Decisions under uncertainty, probability theory, and risk. Decision making usually involves the future. Therefore, it involves uncertainty and the difficult task of predicting the future. It is valuable to know probability theory rather than just guessing.

How much risk are you willing to take? See page 42 of this booklet for some guidance. As you search, watch for information that will reduce the uncertainty and risk. Talk to customers, employees, friends, associates, and government officials. See also page 43 on Forecasting, Predicting – Decisions Under Uncertainty.

Communicate and consult. Keep your decision group, associates, and those affected up to date. In complex situations, consider consulting those with expert knowledge.

Behavior theory. See page 41. It is important to understand behavior theory.

Consequences. As you find alternate solutions that will be studied at Stage 6, be alert for information about the possible consequences. Look for both favorable and unfavorable consequences.

Always be alert for **accidental or surprise discoveries.**

Things to be careful of:

- Over-confidence
- Biases – yours and others
- Wrong assumptions
- Ignoring contrary evidence
- Conflicting opinions
- Lurking situations
- Laws, regulations, environment
- So-called rather than real experts
- Old data or information
- Competition
- Things that don't seem right
- Changing environment
- Numbers that can lie
- Not using the stages of SM-14

Possible methods, processes, strategies, and technologies:

- Redefine the problem as needed
- Anticipate the unexpected
- Use statistics and sampling
- Be flexible; vary your attack
- Use checklist, models, analogies
- Use sketches, trees, concept maps
- Use flow charts, spread sheets, symbols
- Do tests and experiments
- Work backwards
- Initiate nature
- Spot key factors
- Control variables
- Use software
- List attributes of subject
- Trial and error
- Use quantitative analysis

Next . . . At Stage 5 make a special effort to find creative alternatives.

Stage 5

Generate Creative and Logical Solutions

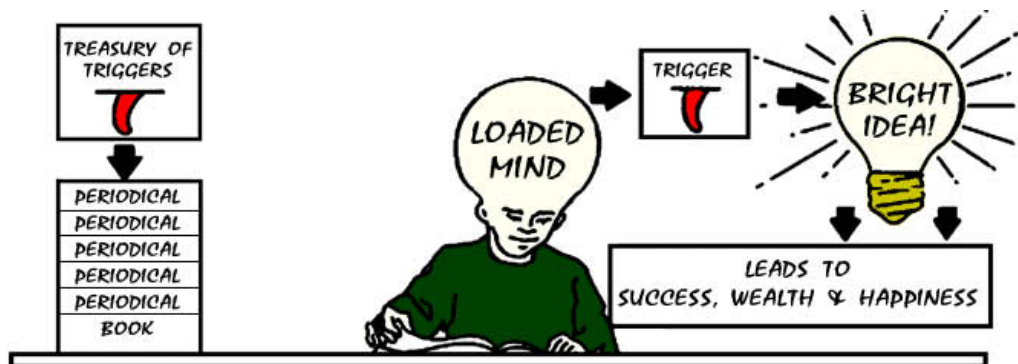
Your objective is to accumulate a number of alternative decisions and their consequences for evaluation at Stage 6. Hopefully, you already have some from your activities at previous stages. To be sure you have a good assortment, here are some suggestions for finding alternative solutions.

Intuition. We all make many decisions intuitively every day. They are based on our store of knowledge in working memory, past experiences, recognition of patterns, and other factors. In complex decision making, you should write down your intuitive decision solutions. They should be considered tentative and evaluated along with others you generate.

Logical solutions. Many decisions can be arrived at by using gradual, systematic, steady, analytical, judicial reasoning and logic. Gather all the data and fit it together.

Innovative solutions – find existing ideas. An innovator loves ideas, new things. An innovator does not necessarily create these ideas or new things but uses curious observation to seek out existing ones suitable for his/her use and purpose. By using a little ingenuity, innovators adapt these ideas, processes, strategies, or new things to fit their personal or job-related management decisions. There are many good ideas that are not being used. Millions of ideas are buried in the literature. Seek them out! Look internationally as well as at home.

You Can Produce Ideas by Using Triggers



Load your mind with data, principles, and concepts related to your problem. **Have discussions** with others. **Attend conventions.** Wander around a store. Read books, articles, advertisements, etc. that may contain triggers to set off:

- Flash of illumination (leap of imagination)
- Reflective thinking leading to gradual insight

Record the idea immediately.

Triggers also bring out of long-term memory things not always in working memory.

Creative destruction. Remember, the creation of new inventions and innovations cause the destruction of old markets, technologies, ideas, etc. Be prepared for this. Look ahead to make the right decisions.

Reflective or speculative thinking:

- Talk to yourself in both language and images.
- Daydream about your problem, even while doing other things.
- Jump back and forth between logical and creative, imaginative and wild, thinking.

You Can Produce Ideas and Solutions with Rest-Illumination or Rest-Reflective Gradual Insight

First – Load your mind with (in relation to your problem):

- Information
- Concepts
- Theories



- Basic principles
- Data
- Needs

NEXT – REST YOUR MIND BY:



*Sleep or preparation
for sleep*



*Vacation ~ Travel
~ Hobbies ~*



*Exercise ~ Shower
~ Grooming ~*



Work on a new project



Do not wait! You must start to think reflectively about your problem again.

Eureka! A flash of illumination . . .

Or, more often, a gradual insight to an:

Idea Solution Decision Lead Clue Theory Concept

Write it down immediately! Don't depend on memory!

Great information on creativity. The Creative Education Foundation has many books and holds seminars on creativity. Write to them at 289 Bay Road, Hadley, MA 01035.

Remember. At Stages 4 and 5 you have accumulated a lot of data, information, and knowledge about your decision problem. You have watched for a number of possible decisions you could make. Now you sort through them and select a number of them you think have the most possibilities. At the next stage you will evaluate and compare them in more detail.

Stage 6 Evaluate the Evidence

This is your schedule:

- Here at Stage 6 you will seek and evaluate the evidence, criteria, and consequences about your alternative decisions and choose the most promising one.
- At Stage 7 the best one becomes your educated guess or hypothesis.
- At Stage 8 you will challenge and examine it in great detail to ensure accuracy and for self-corrections. To get an idea of what you will do, briefly review Stage 8 now.

Here are some situations you may encounter:

One outstanding decision. Sometimes you will have an alternative decision that stands out above all others. Be sure you are right. If so, take it to Stage 7. Then you must give it a full challenge at Stage 8.

End up with more than one decision to present. You then have a multiple hypothesis. This is not unusual, but it involves extra work at stages 7 and 8.

Too many alternatives. If you have more than 4 or 5 alternatives on your list, try to reduce the number to 4 or 5 in order not to waste time. Do any overlap? Have you covered basic goals?

Need for quick action. Maybe you should have a multi-timed decision. You take temporary action now, but then come back and determine final actions later.

Here are some suggestions for evaluating your alternatives:

Technical methods. Modeling, artificial intelligence, operations research, linear and integer programming, and other technical methods are being widely used by those with strong mathematical backgrounds. They are not covered here. For information, see books and the internet or consult experts.

Charts, graphs, fault trees, accounting data, rates, analyses, surveys, and others. You should use them in your evaluations. The literature on decision making shows a wide variety of them.

Example of Simple Ben Franklin or Ledger Evaluation Form:

Advantages or Benefits	Disadvantages or Adverse Consequences
<i>List below</i>	<i>List below</i>

Criteria in evaluation. There is a wide variety of criteria. Many fall under headings such as suitability, feasibility, acceptability, emotions, and not too harmful. See supplemental pages on problemsolving.net.

Bounded rationality. Or in plain words, “good enough.” You can’t always gain the best solution, so you settle for a good enough decision or solution.

Consequential thinking. Develop your ability to foresee and predict consequences of various alternatives.

Example of Standard Evaluation Chart:

Adverse consequences Benefits Goals Other	R	Alternative 1	R	Alternative 2	R	Alternative 3	R	Alternative 4	R
Here you list whatever you checked above. In the R column you can rate importance to you		In these columns you can list information about items in main columns and also rate if desired							

Evaluations of the alternatives in the chart above. These can be whatever fits the decision you are working on. For example, they can be descriptive words, ratings of high, low, medium, a rating of 1 to 10, etc. Also may cover probability of occurring, importance to you, or other rating.

Statistical quality control and probability theory. The literature gives many cases of people making incorrect estimates of the future because they don't use statistical quality control and probability theory. To become a good decision maker, study them or have help available.

Decisions under uncertainty – forecast the future – predicting. These are all involved in making decisions that involve the future. Study them to become a better decision maker.

Risk versus reward. Decision making involves risk taking. Know your degree of willingness to take a risk to avoid later regrets. Make good evaluations to reduce risk as much as possible. Study your key uncertainties.

Testing, research, experimenting, sampling, and surveys. Do these wherever they would be helpful to improve evidence. Attempt to falsify your theories as well as confirm them.

Past experiences. These are usually of great assistance to you. However, the literature warns that people often forget, are selective in remembering, etc. So be careful.

Other things to consider or do:

- Beware of prevailing opinions
- Emotions of participants
- Better information may be coming
- Check all assumptions
- What is fact, what is opinion
- Have fall back alternatives
- Delayed gratification
- Refine goals as you progress
- Consider reframing the question
- Ask disconfirming questions
- Analyze yourself
- Decision making can be stressful
- Maximizer versus satisfier
- Thinking aloud may help
- Decisions are often under conflict
- Are social consequences involved?
- Write things down – keep a log
- Beware of buck passing
- Criticize your own work
- Consider contingencies

Next . . . In Stage 7, make your selected alternative your educated guess or hypothesis.

Stage 7

Make the Educated Guess (Hypothesis)

You have brought forward the best alternative decision you chose at Stage 6. It now becomes your educated guess or hypothesis. A hypothesis is also sometimes called an informed guess, a tentative theory or decision. However, “working hypothesis” describes it more exactly, as it is on trial and you will be challenging it at Stage 8.

Here at Stage 7 you will make sure that your hypothesis meets certain standards. Then you will make prediction about your hypothesis that you will check on at Stage 8 when you challenge your hypothesis extensively.

The method of multiple working hypotheses. Although you usually have only one hypothesis, at times you may end up with more than one you want to present. This is especially so in decision making, planning, diagnosis of illness, geology, and the social sciences. This will require more work at Stage 8, when you give your multiple hypotheses extensive challenge.

Desirable characteristics or traits of a decision-type hypothesis:

- Be sure it is explicitly stated to help in challenging at Stage 8.
- It must be better than any rival hypothesis.
- It brings order out of chaos.
- It is consistent with existing knowledge and data.
- It is relevant, fruitful, adequate, and logically achievable.

Hypothesis explained in writing. Normally, predictions should be made about the consequences of a hypothesis so that they can be explored and tested, if possible. However, sometimes a written explanation is prepared instead of testing predictions.

Predictions to test and check at Stage 8. In challenging your hypothesis at the next stage, you will be helped if you have some predictions to test or check. People have always placed a high value on the ability to predict the future. Making a decision usually involves predicting what will happen in the future. This is very difficult. Often, testing these predictions results only in an educated guess if the future is involved.

The first step. List factors. Predictions will be based on:

- Benefits, disadvantages, good and bad consequences
- Near-term and long-term consequences
- Tradeoffs – lose something to gain something
- Conflicts that may be involved
- Evidence or prior experiences

Expand your anchoring base of knowledge. Use your previous base of knowledge about the decision and expand on it. Make surveys, consult with associates, and possibly hire experts.

Cost/benefit and cost effectiveness. These are often the most significant feature in decision making and require special attention, especially in management decision making.

Probability theory, statistical quality control, decisions under uncertainty. There is a huge body of knowledge about these that you may want to study. They are important in decision making. The study of game theory will help you understand probability theory.

Decisions involving conflict. There is a lot of literature covering these that should be read – or hire an expert. In general, be careful of the emotional aspect. Do not be too optimistic or over-confident.

Imagining and visualizing the future. This strategy or technique is often a help.

Behavioral theory. In predicting, keep in mind that people don't always do what they are supposed to do based on the expected utility theory. See page 41 for what to guard against.

Real world versus our model of the real world. Analyze the differences.

Analyze and control your biases and values. This is essential.

Can't-win position. Often if you predict successfully, you may be resented. If you predict incorrectly, you are criticized. However, you must take risks to achieve anything.

Examples of some types of predictions:

- If this decision is made, the consequences will be . . .
- A model we prepared shows this will happen . . .
- A cost/benefit comparison shows this favorable result . . .
- Experiment shows . . .
- A customer survey shows they will . . .
- Employees interviewed state they will . . .
- If this decision is made, sales will . . .
- If this decision is made, future monthly expenses will be . . .
- If this decision is made, our competition will . . .
- A mathematical computation shows . . .
- A scenario we prepared estimates . . .
- A computer simulation program shows . . .
- The proposed new location will produce these savings . . .
- Moving to the new location, we will lose this percentage of our workforce . . .
- Purchasing this new house will increase our monthly expenses by . . .

Next . . . At Stage 8 you will challenge your hypothesis or decision and predictions.

Stage 8

Challenge the Hypothesis (Decision)

Challenging forces a more accurate decision. One of the important reasons the scientific method is called “the greatest idea of all time” is its self-correcting features. Of these, Stage 8 – Challenge the Hypothesis – is a major feature.

Rather than just going ahead and implementing the best alternative or decision you arrived at in Stage 6, you made it your hypothesis. Now you severely challenge it. Thus, you find any errors in it before others do. This saves time, money, and your reputation and makes you more accountable for your actions.

At Stage 6, you listed the consequences – good and bad – of the decision. Perhaps some changes were made or rewording done at Stage 7. You also made predictions. Now bring these data forward. They will be your base for challenge. Reexamine now. Is there more research you should do? Are there any more consequences you should add to your list? Unidentified consequences can cause a lot of trouble.

Now you must challenge your decision with confirming and disconfirming evidence.

Confirmation, verification, justification, and validation. These and falsification theory are complicated subjects on which there is a whole body of literature. Here are some basic ways to confirm, verify, justify, and validate:

- Observation, test, and/or experimentation
- Mathematical calculations
- Statistical verification, sampling, surveys
- Verification by elimination of all competing hypotheses
- Verification by consistency with existing knowledge
- Prior experiences
- Predictions presented and examined that support your views

Disconfirming or falsifying. It is a human tendency to support one’s own beliefs, but accurate decision making requires that you make an effort to seek and consider impartially all disconfirming evidence. Consider these and other ways to falsify your claims:

- Pay special attention to any predictions that falsify your views.
- Put the decision into partial or full use on a trial basis.
- Present a contrary or competing decision and try to support it.
- Have a consultant or decision making group present any disconfirming views.
- Construct a fault tree of possible adverse consequences.

Your decision doesn’t survive your challenge. If this occurs, you have to retreat to a prior stage. Continue your efforts to find a suitable decision.

Evaluating your decision. Remember my comments at Stages 6 and 7 about

- Technical methods
- Charts, graphs, fault trees
- Criteria
- Good enough
- Statistical and probability theory
- Risk versus reward
- Past experience
- Control your biases
- Written explanation of a hypothesis
- Time based on importance
- Cost/benefit and cost effectiveness
- Visualizing the future
- Decisions under conflict
- Behavioral theory

Other things to keep in mind:

- Effect of decision on the whole system – Decision usually affects other things.
- Predicting, challenging, and testing – You have to do these things to improve the accuracy of your forecast. Since they involve the future, they will never be perfect. However, doing them is far superior to relying on “common sense,” intuition, and popular opinion.
- Variables – In testing, vary only one thing at a time. Keep others fixed.
- Loaded mind – Read widely. It is the loaded mind that finds clues.
- Vested interest – They must be ignored to make a real challenge.
- Rules, customs, procedures – Try not to let them spoil your challenge.
- Time and budget – Watch them closely.
- Tradeoffs – They are often needed to obtain your objective. Cost of tradeoffs?
- Decisions under uncertainty – With the unknown future involved, risk is inevitable. Risk must be taken, but use research to limit it as much as possible.
- Competition – Don’t forget to estimate your competitors’ or opponents’ reaction to your decision.
- Contrary evidence – Be sure you have not ignored it.
- Avoid self-deception – Use insight in analyzing your own work.
- Has your decision held up? – If all the challenges have weakened it, you may have to restate it or go back to another stage.
- Existing computer models – Check to see if they can help you.
- Judgment – It is extremely important in decision making.
- Keep good records – People may want to examine or repeat your findings.
- Rule out fraud – Be sure no one has given you fraudulent data.

Do your best. If you have a technical background and are familiar with statistical quality control, probability theory, modeling, artificial intelligence, falsification theory, sampling, forecasting, surveying, and other technical methods, you will be well prepared for challenging. If not, get from these pages what is needed on complex decision making. You may want to consult experts or find people in your organization or who you know to help you. Otherwise, just do the best you can after reviewing these pages.

Next . . . You have challenged your decision; now we take the resulting refinement to Stage 9 – Reach a Conclusion.

Stage 9 Reach a Conclusion

Having followed the stages of SM-14, you are ready to reach your final, or concluding, hypothesis (or decision). It is no longer just an educated guess, but a more certain conclusion. You have challenged your best alternative and found that it survived your challenge. You cannot claim it is “the truth” or a certainty, but you can say, “Based on the evidence available today, the balance of probability favors the view that your decision is a good conclusion to the question at issue.”

Some qualities and conditions your concluding decision should cover:

- Be stated clearly, concisely, and in terms and language easy to understand.
- Must answer the problem (Stage 2) as finally defined.
- Is practicable and implementable.
- Fits into the present system.
- It is legal and ethical.
- It is not one you will regret later. You are prepared for the risks involved.
- Any stress that results your health can endure.
- As the future is involved, there are many uncertainties, but qualified reviewers would give your research a good grade.
- It takes into consideration short- , medium- , and long-term needs.
- You have shared your conclusion with any team or group. If it is a personal decision, you have shared it with those with whom you have close relationships.

Use your imagination. Creative destruction. Consider the outcomes of your decision. Put yourself in the position of those affected. Try reading their minds. Use rest-illumination (see Stage 5). Creativity is great, but it often causes the destruction of existing products and conditions in our personal lives. After reaching your decision, think up a scenario of what is likely to happen. Remember the old economics principle of creative destruction.

Quiet retreat. Before or while reaching a final decision, you or your group may want to retreat to a location away from your usual one.

Implementation of decision. At Stage 11, you will take action to implement your decision. In preparation for this, use the checklist on the next page to consider implementation.

Contingency planning. Decisions involve many uncertainties. After making your decision, unexpectedly you may see develop war, environmental disasters, big changes in financial markets, changes in consumer desires, failure of health, and on and on. Therefore, have contingency plans for what you will do if serious changes affect your decision. Consider the terms if you have to draw back.

Evidence you accepted. At times you have accepted evidence to support your views. Review the reliability of this evidence.

Implementation checklist. Change is often resented because of jealousy, resistance to change, skepticism, bias, loss of prestige, wrong assumptions, financial loss, authoritarianism, and inability to admit being wrong.

Here are some other things to consider about implementation:

- Are you or your team qualified? Or must you obtain advice and assistance?
- Will you do it all at once or in stages?
- Any tests, trial implementation, or experiments?
- Soften the changes for those affected?
- If any goofs or errors, correct them immediately.
- Arrange for good, fast, and honest feedback
- Intelligent compromises are often needed.
- Who or what actions may try to harm implementation?
- Don't forget competitors' or opponents' responses.
- Have good plans for implementation and presentation of plans.
- Be sure implementation plans are efficiently communicated.
- Beat or anticipate the rumor mill; it can cause headaches.
- Beware of "yes men" giving you feedback they think you want.
- Any government, legal, or ethics to consider?
- Any faction that will fight the implementation?
- Has the market changed since you did your research?
- Be sure the people involved realize risks are being purposely taken.
- Set completion or target dates.
- Clear up irrational ideas that may harm implementation.
- Allocate time, resources, budget, etc.
- Identify possible bottlenecks, errors, or other potential troubles.
- Will outside experts or consultants be needed?
- Be careful to assign responsibilities.
- Measure progress as you proceed.
- If available, read case histories of similar decisions.
- Use charts and graphs to help implementation.
- Consider what the future may be after implementation.
- If things don't go well, upgrade your plans, strategies, processes, and efforts.
- If any one thing seems to be a big problem, apply the SM-14 model to it.
- What else may interfere?
- Don't let this list scare you – things can go well.

Next . . . Before taking action, we pause at Stage 10 to consider that in problem solving and decision making you must always keep an open mind.

Stage 10 Suspend Judgment

This is the stage for final deep mental reflection. The nature of knowledge requires that you possess some humility about the results of your work, even though you are ready to take action. While you have spent a lot of time and effort to reach a final decision, you must now change your attitude and suspend judgment. Do not fall in love with your concluding decision. Watch for other concepts or trains of thought as you implement your decision.

Dr. Crook's 1958 advice on suspended judgment:

- Stick to your conclusion until it is proven wrong.
- Keep an open mind and be ready to accept new evidence.
- Opinions thought correct today in light of present knowledge may be thought incorrect tomorrow because of new discoveries or projection of new ideas.

The greatest idea of all time – the scientific method. You have followed the mental activity stages of this method as applied to decision making and can feel proud of your achievement.

The nature of science is to seek the truth. This is often claimed, but it has come to be realized that “the truth” only means as far as it can be ascertained. Professor Gordon Childe (1936) explained that a final conclusion means “on the evidence available today, the balance of probability favors the view that...”

Other thoughts on suspending judgment:

Worry. In suspending judgment you should not be too uncertain or worry too much. Both of these can hurt your decision making efforts.

Shades of gray. Things are usually not just yes or no, true or false, or good or bad. Wait until you have heard or researched all the data before you reach a conclusion. Don't be misled by the first person's opinion you hear or the first data given to you. Keep an open mind. Remember the shades of gray principle.

Opposite of open mindedness. People with closed minds ignore contrary evidence, possibilities, and may have biases they can't see or overcome. They often can't see shades of gray or understand that the truth is seldom obtainable in complex matters.

Look beyond this decision. You are going to take action on your concluding decision. What happens after this occurs and takes effect? What is the next problem?

Don't stick with a wrong or faulty decision because of a closed mind. If, after you take action, events occur that indicate it is not entirely or partially correct, take prompt action. Remember, you have suspended judgment and have foreseen possible trouble.

Checklist of Possible Troubles after Making Decisions under Uncertainty

Remember Dr. Crook's advice about sticking to your conclusion until proven wrong as you now advance to Stage 11 – Take Action. However, as a help to you in keeping an open mind and to trigger your mind, here is a checklist of things that may occur. The probability of their occurring may be low, but the impact could be great. Remember that there is always risk in making progress, so don't let them scare you away from going ahead.

Change resistance	Relationships go sour
Fact versus opinion confused	Cost/benefit changes
Variables not controlled	Product failure
Data used not correct	Crisis mishandled
Too optimistic or pessimistic	Lack of time
Probability factors wrong	Implementation faulty
Lack of contingency planning	System breakdown
Didn't fit into system	Hidden errors
Biased appraisal of consequences	Control problems
No plan for irregular operations	Wrong classifications
Didn't keep up with changes	Incomplete reporting
Poor communications	Change in material cost
No spot testing	Mechanical or instrument failure
Poor analyses	Short of supplies
No skepticism	Medical error
Action avoided	Diseases or wrong diagnosis
Faulty design	Murders or kidnappings
Interpretation wrong	Terrorism or explosions
No experimenting	Competitors' counteractions
No screening	Death of key person
Wrong process used	Legal problems
Errors or sloppiness	Foreign affairs troubles
Inadequate search	Transportation delays
Misjudgments	Unfavorable trends
Quick fixes fail	Technology problems
Faulty assumptions	Safety problems
Misleading information	Company policies or bureaucracy
Inadequate training	Fads occur
Irrelevant thinking	Water problems
Theft, fraud, or greed	Energy supply or cost
Misplaced blame	Bankruptcies or financial problem
Not invented here attitude	Accident or fire
Pride, jealousy, ambition	Strike or labor problems
Nepotism	Weather or environmental problems
Refuse to work together	Media problems
Anger or emotional response	Intoxication or drugs
Stress or fear interferes	Public policies
Personal consequences	Religion problems
Denials or lies	Multiple causes
Responsibilities neglected	Math or measurement error
Interpersonal conflicts	Social problem

Stage 11 Take Action

This stage is also the “gaining acceptance” of your decision stage. No matter how correct your decision is, you may meet with resistance, as change is often hard to achieve. Have the courage, however, to go forward and present, sell, or fight for your decision.

Delayed implementation. There will be many instances in which you may have to wait for approval or even modifications of your decision by an authoritative person or body. Remember you will often actually be submitting more than one choice of a decision. Prepare an effective presentation or report. Consider following SM-14 as a model in formatting the report. Be ready with a contingency plan if approval is not received.

Recommending a public policy decision. You may want to write a report for the public, a person, a committee, a periodical, etc. you may have to campaign, lobby, or take other action to have it reviewed or accepted.

Submit your work for peer review. Is the nature of your decision something that should be submitted to a journal for peer review?

Ready to implement – taking action. It may be a personal decision or one you have authority to go ahead and implement. You may do so at once. Or you set the wheels turning to prepare a plan of implementation for more complex situations or for management decision making. In complex situations that are important enough, you may want to apply the SM-14 model in preparing a plan of action.

Obstacles to acceptance. Many decisions may be readily accepted. However, others may meet with opposition and counteraction. Consult the checklist at Stage 11 to anticipate obstacles and counteractions.

Aids to acceptance:

- Consider hiring a public relations firm to help on acceptance of complex decisions.
- Throughout Stages 1 through 10, be thinking of ways you might gain acceptance of your coming decision.
- Use your communication skills.
- If you run into a roadblock, make an end run around it.
- Form a group, committee, team to help you.
- Compile a list and contact those who will benefit most.
- If it is a personal matter, consult family members.
- Review information on decision implementation
- Run tests, pilot programs, surveys, or do additional research.
- Communicate with all concerned. Use charts and graphs.
- Measure progress as you proceed.
- Include a bibliography of literature you reviewed.
- Use motivation principles to gain cooperation.

Other thoughts on taking action:

- State any limitations, ifs, ands, and buts.
- Be sure you allocate time, budget, and resources to implementation.
- Be ready with a contingency plan if you hit road blocks.
- Be careful to assign responsibilities and measure progress.
- Check on the accuracy of probability estimates as you progress.
- Have organized feedback and safety checks.
- Cost/benefits, effectiveness, risk versus reward should be watched.
- Plan to have a history of your decision by providing time later to look back. This aids in learning lessons from your experiences.
- Often a challenge occurs and you start on a new path, then another challenge occurs and again you start on a new path. You must investigate challenges carefully and try to overcome them to avoid this.
- Does implementation require goal revisions?
- Be careful of legal and environmental violations as you proceed.
- Seek feedback from your associates on how you are doing.
- Use humor when personal conflicts arise to overcome them.

Reminder and warning. Lots of things can go wrong. Review the checklist of troubles at Stage 10.

Decision sciences. Many universities have courses on decision making. Numerous aspects of decision making have been made a “science.” Some courses offer short formulas. I have found none that offered a decision making model as complete as SM-14.

Professional societies. In the decision making field, there are a number of professional societies, such as the Society for Judgment and Decision Making, and the Decision Analysis Society.

Look back. Keep your decision current and correct. Progress requires continual improvement.

Look ahead. What comes next after implementing this decision?

New problems. Does your decision cause new problems?

Next . . . The scientific method, the complete method of problem solving and decision making, is not only a method or guide but also a system of originating, refining, extending, and applying knowledge. The next three supporting ingredients contribute to understanding the system. Thus, the following pages about Ingredients 12, 13, and 14 will help guide you. Your success depends on their proper application. Ingredient 12 comes next. Remember that this is a supporting ingredient, not a stage.

You cannot describe or teach what the complete method of creative problem solving and decision making method or guide is without having supporting ingredients, as it is really a system. This system needs to be explained. These ingredients 12, 13, and 14 of SM-14 should be reviewed before and while proceeding through Stages 1 to 11. Since SM-14 has these supporting ingredients, it is an excellent teaching method for all methods of problem solving, no matter what they may be called!

The supporting ingredients are action methods. When they are applied to any of the mental activity Stages 1 to 11, they can help solve or decide. This is in contrast to Stages 1 to 11, which are subject neutral and merely guides to the mental activities of problem solving and decision making. The supporting ingredients are described here.

What you should do. If you are currently working on a decision, follow the stages of SM-14. Use the intuitive background you have already developed as you proceed. Read the supporting ingredients to get the idea of the whole SM-14 system. As you have time, study and practice decision making using the material in these supporting ingredients while working on Stages 1 to 11.

Creative Methods. Creativity is often described as taking two existing ideas and combining them into a new and better idea. Here are some methods to use to be more creative:

- The method of reflective thinking – see Stage 5
- The method of triggers – see Stage 5
- The method of rest-illumination – see Stage 5
- The method of brainstorming – see books on creativity
- The method of innovation – see Stage 5

Those who wish to learn more about how to become more creative should write to the Creative Education Foundation for their literature at 289 Bay Road, Hadley, MA 01035.

Non-logical Methods. This is a catch-all class for methods not normally considered logical. It may, on first impression, seem odd to use non-logical methods, but everyone uses them all the time. Time is often the main reason they are used. Examples are guesses, assumptions, habits, emotions, trial and error, arbitrariness, closed mindedness, experimenting, opinions, risk taking, intuition, fictions, etc.

In using non-logical methods, be alert to how they affect the accuracy of your research, judgment and decision making.

Logical Methods. Any method based on sound reasoning is classified here as logical. Taking a course in formal logic at a college or university is desirable for those who will be doing research or complex problem solving and decision making.

Usually, however, people use “semi-intuitive” logic resulting from their base of experiences, thinking skills, and knowledge.

Psychologists have identified many areas where people think they are making correct decisions or reasoning logically but consistently make errors.

Some examples of well-known logical methods based on reasoning and experience are controlling variables, surveying, falsification, reviewing the literature, pattern identification, classifying, weighing the evidence, diagramming, avoidance of fallacies, precise definitions, and argument structuring.

Technical Methods. No standard exists to determine what methods to term “technical.” A method involving measuring, mathematics, use of tools, instruments, and apparatus can be termed “technical.” Some authors point out that these technical methods are really the only ones that can accurately be called methods of science or scientific methods, since most others are used in all fields.

A few examples of technical methods are

- Artificial intelligence
- Modeling
- Automation
- Measuring procedures
- Use of higher mathematics
- Engineering
- Genetics
- Solid state electronics
- Nuclear power
- Robot design

Often the term “apply scientific methods” is used. People may mean:

- Apply the technical methods that have been closely associated with scientists.
- Apply the scientific method, its stages and supporting ingredients.
- Any method as long as it is used with the care and thoroughness that has come to be associated with the word scientist or scientifically.

It is recommended that this term not be used in order to avoid confusion.

Your own methods. In problem solving and decision making, there are thousands to millions of various methods used. Some are well known and used repeatedly, but others are created daily by problem solvers. You may want to originate your own methods in your decision making activities.

Next . . . Methods are effective in decision making, but you must apply them properly. Ingredient 13 covers procedural principles and theories.

Planning room – creative destruction. New creative, logical, and technical methods lead to new business and industry and the death or decline of others. Establish a room or center devoted to innovation and planning for changes that are coming.

Ingredient 13 Procedural Principles and Theories

The complete method of creative problem solving and decision making was originally developed by scientists with contributions from philosophers, psychologists, and many members of other domains. It was originally called the experimental method, the method of discovery, the method of inquiry, and then most commonly the scientific method or scientific method. Even though it is not a perfect method, it was such a phenomenally successful method that this scientific approach spread to all domains to some extent.

There are no official standards for the procedural principles and theories used with it. They are quite extensive. I present here some of those that apply to decision makers. On the next page I cover ethics involved in decision making.

The basic procedural principle is to follow the 11 stages of SM-14. These 11 stages represent the mental activity stages of the complete act of problem solving and decision making thought. Proceeding in a systematic manner avoids aimless wandering. However, as these stages are subject neutral, you need to apply the supporting ingredients to actually reach a decision.

Procedural principles and theories are also mentioned on pages describing Stages 1 – 11. However, I call special attention to the important ones below.

- Do not ignore contrary evidence.
- Strive to control biases, prejudices, and conflicts of interest.
- Give due credit to team members, advisors, and others.
- Exercise a practical, skeptical view of all data and assumptions.
- Flexibility in procedure. You may skip from stage to stage.
- Tests or experiments should be repeatable by others.
- Communicate with those affected by or helping in the decision.
- Divide difficult problems into sub-problems.
- You often must settle for “good enough,” as perfection is not always possible.
- Control variables in reasoning or testing to get better results.
- Effort must be made to falsify or disconfirm important evidence.
- Intelligent compromise is often necessary for good human relationships.
- Environmental, legal, and social considerations should be kept in mind.
- Maintain confidentiality where needed.
- No claims of infallibility should be made.
- Use mathematics. Quantitative methods should be used when possible.
- The use of your imagination is essential. Rational thinking is not enough.
- Look for patterns, similarities, and differences.
- Keep in mind what you want to achieve, preserve, and prevent.

The procedures for applying personal attributes are covered in Ingredient 14.

Ethical Decision Making

Successful problem solving and decision making cannot be achieved without ethical decision making. This applies whether you are working on a personal, business, public, or other decision.

Ethics courses are being taught in our colleges and universities on an increasing scale. Many businesses and other organizations are giving employees training in ethics and establishing codes of ethics. There is now a large body of knowledge about ethics.

Conflicting purposes and theories are often involved in decision making. This makes it hard to determine a proper course.

Some violations of ethics of interest to decision makers. These have been abstracted from the literature as more applicable to decision makers.

- Changing results of research in some way in response to pressure from funding source
- Drawing important conclusions from incomplete data
- Deliberate forgery of research results
- Not answering honestly when questioned
- Having a conflict of interest without disclosing it
- Improper handling of funds budgeted for decision-making research
- Using theoretical expectations instead of actual statistical results
- Allowing political influences to alter research or decision
- Ignoring contrary results and selective presentation of evidence
- Improper control of variables in research to get better results
- Failure to correct errors discovered later
- Altering calibration of measurement devices
- Outside consulting not disclosed that may affect decision making process
- Acceptance or solicitation of gifts, etc. because of decision-related position
- Altering decision to gain favor with superior
- Using advance knowledge of decision for personal gain
- Co-authors of reports not accurately reported
- Non-disclosure of financial ties that might influence decision maker
- Personal expense reimbursements not honestly submitted
- Environmental, legal, and social considerations not kept in mind
- Failure to report weak spots in data and analyses
- Overoptimistic presentation of future projections to deceive

Federal policy on research misconduct. This may be viewed by going to www.ostp.gov. From this site: “Research misconduct is defined as fabrication, falsification, or plagiarism in proposing, performing, or reviewing research, or in reporting research results.”

Next ... Ingredient 14, Attributes and Thinking Skills. These are of prime importance in doing a good job of decision making.

Ingredient 14

Attributes and Thinking Skills

Both attributes and thinking skills are present in SM-14 as Supporting Ingredient 14. This is to keep the decision making model short and because there is some overlap of attributes and thinking skills.

Attributes. A definition of personal attributes includes character traits, personality traits, judgment, aptitudes, skills, emotions, values, thinking skills, etc. there are hundreds listed in the literature. From these I present some of the good ones for decision makers and problem solvers. Ideally you should study them. An alternative is to review this list now and at other times in the future. Develop a personal interest in learning about attributes. It will pay off big!

Honest	Integrity	Constructive discontent
Accurate	Intuitive	Customer oriented
Ambitious	Judgment	Drug free
Analyzer	Knowledgeable	Emotional intelligence
Challenger	Logical	Emotional stability
Changeable	Leadership	Error conscious
Communicator	Listener	Good writer
Compassionate	Mathematizer	Interpersonal skills
Competitive	Maturity	Interprets experiences properly
Comprehension	Memory	Judge of others' attributes
Conscientious	Methodical	Learns how to learn
Courageous	Moral	Life-long student
Creative	Motivated	Open minded
Curious	Organizer	Recognizes problems
Delegator	Originator	Risk taker
Discoverer	Passionate	Suspends judgment
Effective	Perserverant	Team worker
Efficient	Pride	Tolerance of ambiguity
Empathy	Prioritizer	Well rounded
Energy	Progressive	Will power
Entrepreneur	Respectful	Self-discipline
Exuberance	Responsible	Self-reliant
Fairness	Sensitivity	Seeks truth
Flexibility	Skeptical	Self-esteem
Foresight	Tolerant	Sense of proportion
Humility	Trustworthy	Technologically literate
Improviser	Visualizer	
Innovator	Conflict handler	

Induction. This is of primary importance to problem solvers and decision makers. It is defined here as the ability to understand or discover the underlying rules or principles in what you are reading or working with.

Thinking skills. The literature contains hundreds of thinking skills. I list below some of the most useful for decision makers. I eliminated any already listed as desirable attributes. These will be of use as a base for anyone who teaches the SM-14 decision making model. Others should review the list to help them see the big picture of decision making. These are the type of thinking skills you can improve, learn, and develop by repeated use of SM-14 in problem solving and decision making.

Rational thinking skills:

Associating	Inferring	Concept formation
Classifying	Interpretation	Consequences thinking
Combining	Hypothesizing	Correlation reasoning
Comparing	Measuring	Criteria evaluating
Composing	Motivating	Error detection
Contrasting	Open minded	Estimating and approximation
Convincing	Planning	Fact finding
Deduction	Preventing	Manipulating variables
Defining	Productive	Pattern recognition
Diagramming	Recognizing	Reading critically
Differentiating	Reflective	Reflective thinking
Discussing	Sampling	Sequencing and scheduling
Elaborating	Similarities	Searching internet
Evaluating	Subdividing	Value analysis
Experimental	Summarizing	Variable control
Forecasting	Urgency	
Generalizing	Bias detecting	
Induction	Cause and effect	

Creative thinking skills:

Big picture thinking	Illumination	Imagination
Brainstorming	Insight	Predicting
Day dreaming	Intuition	Trigger utilization
Idea association	Innovation	Visualization
Idea fluency	Incubation of ideas	

Please note that “critical thinking” is not included in the lists. Since the vast majority of our thinking is for problem solving and for decision problems, this term should be replaced by “problem solving thinking.”

Ingredient 14 winds up the SM-14 model for the complete method of creative problem solving and decision making.

**Good luck to you in using this method.
Tell others about it.**

Group or Team Decisions

There are often advantages to having a group or team participate in decision making. Usually, a wider variety of knowledge, experience, and expertise will be available. More ideas may be generated, people feel better about being part of procedure, communication is improved, and there are other advantages. This applies even if the final decision rests with one individual.

Use by groups of the Complete Guide and Worksheet for SM-14. This guide is new and a very helpful improvement that groups can now use. Look at the one- and two-page guides that are included in this booklet. You can freely duplicate them and

- Hold training sessions on their use.
- Pass out a blank guide form before or at meetings.
- Insert material you prepare before a meeting on the forms or attached to them.
- Cut headings from the two-page form and prepare a one-page form for each stage. This provides more space for advance material and participant notes.
- If you don't need to use the complete method, provide only pages for the short SM-14 formula.

The guide can serve as the agenda for your meeting. It will prevent wandering and bring out the decision making thinking of your entire group. SM-14 self-correction features will help ensure the best results. It's a new development in the decision sciences. If the SM-14 full formula form is too long for your group, use an SM-4 form, which has only four stages.

Decision sciences. There has developed a little science of group decision making. There are a number of books and many articles, book chapters, and internet sites on the subject. Here I present a few highlights about group decision making.

Members of the group. Select a group that in total has the necessary experience, expertise, interest, and thinking ability to accomplish reaching a good decision. Too large a group may slow the process but a larger one may provide a wider basis of knowledge, experiences, and expertise.

The group leader should know the level of experience of the various members of the group. The leader will have to evaluate the personal characteristics of the members, as experience isn't always productive of the best decision.

Missing information. Often a member of a group will ask for information which is not available immediately. Try to anticipate what members of the group might want.

In complex decision making you should still have one researcher or more who is assigned to use SM-14 in digging deep into the problem-decision. Even among a large group, all the issues may not be adequately brought out. So consider a study team or consultants who report to the larger group and is available to them during discussions on the decision.

Group leader. This is an important task. The leader needs the necessary skills to guide and bring out the best thinking of the group. The leader must be a coach, inspire the group, encourage conflict, and control members of the group.

Consultants- on conducting group meetings. There are consulting firms specializing in aiding groups in decision making.

Brainstorming (and variations). Groups frequently use this technique in the search for new alternatives or ideas. The leader should be experienced or a professional facilitator.

Strong majority opinions. These are often detrimental to a full airing of alternative courses of action, as people are reluctant to oppose the majority. The leader should be careful to encourage others to speak out.

Types of people you may encounter in groups. One of the biggest problems in arriving at a group decision is that there are often people who are a hindrance in the discussions.

Review these and be sure you avoid falling into one of these classifications:

No social skills	Won't worker
Boss supporters	Creative and practical
Strongly self-interested	Creative – wild ideas
Close-minded	Analytical
Bashful	Wanderer
Aggressive	Loafer
Bully	Overbearing expert
Wanders on tangents	Dominating
In a hurry	Fueder
Devil's advocate	One-upsmanshiper
Doomsayer	Penny pincher
Biased	Risk adverse
Status conscious	Emotional
Greedy	Against change
Jester	Politician
Job protector	Incredulist
Egotistic	

Good procedures:

- Group leader records ideas on blackboard or flip chart. Be careful not to get group drowned in data. Classify information following SM-14 as a guide.
- Ideas or alternatives are rated by the group.
- Keep the group on track – don't get into side issues.
- Present ratio analysis.
- Consider emotions of participants and those affected by the decision.
- Identify constraints that affect alternatives.
- Have a computer monitor at each team member's table position.
- Sometimes a retreat to a vacation-type resort may be advantageous.
- Keep records of how decisions are made. This facilitates looking back months or years later.

Implementation. Once a decision is reached, implementation should be discussed and planned for.

Management in All Organizations

It is self-evident that better decision making and problem solving by managers can greatly improve an organization's profits and goals. A number of studies have shown that managers do not achieve much over 50% correct results in their decision making and problem solving. Why is this?

Decision making has only been taught to a small extent in our colleges and universities. Many now offer a decision sciences course. But what has been lacking is widespread teaching of a good introductory course to decision making and a model formula suitable as a standard, such as SM-14. Various short models may be taught. Teaching a universal complete model such as SM-14 and a standard short model would be a tremendous advance.

In general, there has been a lack of understanding of the importance of studying decision making as a separate subject by all students. This site offers the material and guidance for our academic community to develop better introductory courses, especially since no copyright is claimed on the material on this site.

Remember that managers are also managers of the decision making of personnel under their supervision. In recent years decision making is being pushed further and further down the ranks of employees.

Scientific management is not just time and motion studies and efficiency of production workers. It is really the application of a model formula for the scientific method such as SM-14 to all phases of an organization. SM-14 should be included in all books on management.

Since decision making has not been adequately taught in the past, today's managers should study this site and ask others under them to do the same. Larger organizations should organize training courses based on the material presented here.

Individuals can greatly improve their chances of success if they are well education in decision making, which is the main basis for good judgment, intuitive decisions, and transfer of learning. Learning SM-14 results in being more creative and a better problem solver and understander of human nature. Don't delay; get started today.

There have been numerous reports in the media from top business and educational leaders that America's workers must become more competitive in this global competitive race. Managers and individuals can do their part by becoming better decision makers and problem solvers. This site points the way for how they can do so.

In *The Professional Decision Thinker*, Ben Heirs states:

“The same logic, I believe, applies to our managers and leaders. *We can no longer afford to depend upon their natural thinking talents alone.*”

So don't depend on just doing your best. Learn the SM-14 method that has been termed the “greatest idea of all time.”

Behavior Decision Theory

A large amount of research has been done on behavior psychology as it affects decision making. In college decision science courses this is usually extensively covered. Here I have abstracted a few principles from the literature for you to keep in mind and for study.

Expected utility theory. This widely discussed theory claims that people should act to maximize their expected utility or benefit. However, much research has shown that they often don't do what is best for themselves.

Overly optimistic. People will often exaggerate benefits or future expectations and underestimate costs. They rely too much on their uneducated judgment.

People resist change. The more radical the change, the greater the resistance. Once committed to an idea, people are slow to change, even when confronted with contradictory evidence.

General beliefs. People tend to believe that which they notice is strongly believed by many others.

We pick people and actions we like. In making choices we tend to pick people and actions we like.

Sunk cost. If we have a lot of money or effort in a project, we tend to stick to it, even though it is not practical and should be abandoned.

Omission bias. We regret actions that fail to turn out to be beneficial more than we regret failing to take action on things that do turn out to be beneficial.

Risk. In choosing alternatives we prefer a small sure gain to an uncertain large one. We will risk a large loss to avoid a more certain small one.

Saving face or embarrassment. People will make unwise decisions to avoid having to admit that they goofed.

Expect errors. In complex situations errors are inevitable.

Ignoring contrary evidence. People tend to seek evidence supporting their views and fail to seek contrary evidence.

Improper interpretation and poor memory of past experiences. Often results in incorrect decisions.

Personal characteristics. We are all different. This affects our decision making thinking.

Anchoring trap. We tend to give disproportionate weight to the first information we receive.

People cannot process a lot of information. Thus the use of a method such as SM-14 helps them reach a better decision.

Risks Are Usually Involved in Decision Making

Risk taking is involved in decision making since you are usually dealing with decisions that involve an uncertain future. Decision making and risk taking are shared by many domains, such as mathematics and statistics, economics, business, political science, psychology, and other social sciences. There is even a *Journal of Risk and Uncertainty*. Since the subject is so well developed and complicated, all I do here is present some highlights.

Risk is part of growth. Risks must be taken to learn to be a good risk taker.

Fear of risks. This is often more emotional than rational, so you must stop to think and study the subject to take intelligent risks.

Use the SM-14 formula. One of best ways to reduce risk is to follow this formula in your complex decision making.

Proceed in incremental steps. Often risk can be reduced by proceeding in incremental steps in decision making or implementation.

Talk to people who have taken similar risks. This can be helpful.

Probability theory. Knowledge of this is often essential since the future is so uncertain.

Many people are afraid of risk taking. Research has shown that most people prefer a small sure gain to a larger uncertain one.

Company policies on risk taking. Those in charge of other risk takers have the problem of dealing with those who fear risk taking to the gambling type. Therefore it is advisable to have good communications on risk taking as this is the heart of the growth and success of enterprises.

Measure risk. Results should be measured against expectations. This way you provide for early correction of unexpected results.

Risk analysis. Determine what risks are involved, how they might be avoided or reduced, which are acceptable. Rate the various risks involved. What are the main or key uncertainties? What are the probable outcomes of these uncertainties?

Make a decision tree to better understand risk. A written visual diagram of the alternatives and the risks involved will help you make a decision.

Feelings of regret. How strong will your emotions be if you take a risk and end up losing?

Status quo tendency. There are many times people should take action but there is a human tendency to do nothing.

Relying on confirming evidence and ignoring contrary evidence. People have a tendency to rely on evidence confirming their views and ignoring or not seeking contrary evidence.

Forecasting, Predicting, Decisions Under Uncertainty

Probability theory, statistical decision theory, game theory. These are important to know in forecasting and predicting. If you are not familiar with them, seek consultants or others to help you on important business matters.

Some attributes and knowledge requirements for a good forecaster:

- A good logical reasoner and adequately researches a project
- Knows economics, accounting, cost vs benefits, and profit and loss
- Knows technology, current trends, and keeps up with the competition
- Imaginative and good visualizer. Reads extensively. Knows the big picture.
- Compensates for lack of any of these by seeking advice or study

Internet. Here you will find advice for predicting for various domains and sub-domains. Also seek books on the subject.

Decision sciences. There has been extensive development of decisions concerning consumer buying, medicine, election forecasting, credit extension, risks, and many other areas.

Forecasts need SM-14. Important decisions under uncertainties need to be made following SM-14 as a guide.

Avoid predictable surprises. Often a decision is needed but no action is taken until a crisis develops. Study Stage 1, Curious Observation, of SM-14 to avoid this.

Biased forecast. Forecasts made to suit top leaders or others can cause serious harm.

Predictions need to consider alternatives. Predictions made without following Stage 6, Evaluate the Evidence, of SM-14 will usually be of little value.

Anchoring and adjusting. Your knowledge of the past and present provides an anchoring base for predicting, but adjustments must be made for events that may occur in the future.

Predictions good and bad. Keep records of those you make. Past experiences are helpful in making forecasts, but research shows that memory is not always reliable. Read about other people's experiences in predicting.

Forecast of the future. The further your forecast is into the future the greater the chance it will be less accurate.

Review forecast periodically. Changes occur over time.

Important predictions. Apply all the stages of SM-14 to the prediction itself to help improve the reliability of the forecast.

Models and software programs. These can improve the reliability of forecasts.

Miscellaneous Strategies to Use in Decision Making

- Artful delay in making a decision is often beneficial.
- Even though you agree with someone, ask disconfirming questions.
- Compliment a person on his or her idea, but then suggest another idea.
- Establish a decision making room complete with computers, books, and files.
- If more information is needed, delay the decision.
- Give each participant 100 points to assign to alternatives. Total the results.
- Check on how fast competition reacts to your decision.
- Analyze people's characteristics. Base your strategy on them.
- After a decision session, hold a review with participants on how well it went.
- Appoint a sub-group to argue for a particular alternative view.
- When there are disagreements, pinpoint their source.
- Encourage disagreements at the beginning, since this involves review of ideas.
- It is not always win or lose, as there can be compromises of mutually acceptable decisions.
- Successful implementation requires adequate involvement and communication.
- Expert advice should often be sought. However, keep the big picture in mind.
- In writing reports, follow the format of the SM-14 formula.
- Read extensively to stimulate your imagination. This is an ever-changing world.
- Thinking out loud will often aid your reasoning. Use another individual as a sounding board.
- Right before retiring and first thing in the morning are times for ideas and illumination.
- Save and review short case histories as aids to your experience base.
- Develop tolerance for ambiguity, but learn how to eliminate it.
- Improve your ability to think. Read books on the subject.

Opportunities for You to Utilize My Non-copyrighted Material

In 2007 I am 91 years old and don't have the time or energy to take all the opportunities of making money from the material in this booklet. So there is a great opportunity for others to make money, do a public service, or advance their careers by using it. Remember that there are millions of dollars of research behind this material.

Public seminars and training sessions. These can be one or more sessions – inexpensive ones for beginners to more expensive ones for executives.

Booklet enlarged with math formulas. Those experienced in using math would welcome a booklet with math formulas included.

Booklet or books slanted toward special domains or sub-domains. My booklet is for all domains. Copies changed or enlarged and specialized for particular domains and sub-domains are needed.

Articles for periodicals. Decision making is done by everyone but needs to be improved. Write articles based on SM-14. Including Guide pages in your article.

College courses. Professors can use the booklet as a basis for courses they design and for textbooks. Good introductory courses are urgently needed in all domains and all grades.

High school courses. There have been a few high school courses in decision making. This booklet could be used to design a good high school level course.

Adult education courses. Decision making is an ideal subject to teach in adult education courses. Or place entire booklet on your company web site.

Revise published books. Many books should be revised to include material on SM-14 in decision making and problem solving.

Review your activities. There are many other opportunities.

Consultants. Can adapt and include SM-14 in their business. They can design kits for group decision making.

Short case histories. A big lack in my material is short illustrative case histories. Because of space and time limitations, I didn't include any, but they would make the material much more interesting to students. They can be general in nature or designed for specific domains.

Foreign language translations. All nations need to improve their decision making.

Software. I may or may not do something in this area, but others are free to use the material.

Quotations of others in my material. I have used a number of quotations under the fair use provision of the copyright act, but I have no right to them. If you use them, you do so on your own.

Many other opportunities. Just use your imagination.

Selected Bibliography

In addition to having reviewed several thousand books in the past 18 years on the scientific method, problem solving, decision making, thinking, and education, I reviewed my files and the books below on decision making in preparing this booklet. While I have contributed ideas and thought to this mega-analysis of decision making, it is largely based on research by our academic community.

Most Recommended Books:



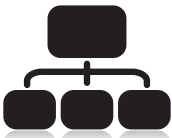




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Your Guide and Worksheet for Applying The Complete Method of Creative Decision Making (SM-14)

Stages of SM-14	Space for Your Comments and Notes
1 Curious Observation 	<p>Be alert. What decisions are needed? Be skeptical. Prevent trouble.</p>
2 Is there a Problem? 	<p>Define the decision carefully. Real purpose? Urgent? Present in form of question.</p>
3 Goals and Planning 	<p>Break the decision into sub-decisions. Set goals and plan ahead.</p>
4 Search, Explore and Gather Evidence 	<p>Search the library and the internet. Follow leads. Explore all angles. Build files.</p>
5 Generate Creative and Logical Alternatives 	<p>Search for ideas. Read publications to trigger your imagination. Consult others.</p>
6 Evaluate the Evidence 	<p>Chart and rate evaluations of you tentative solutions. Compare and test them.</p>
7 Make the Educated Guess (Hypothesis) 	<p>Choose the best solution as your working hypothesis. Make predictions to be tested.</p>

The four shaded stages (#2, 5, 6 and 8) represent the short SM-14 model for decision making (continued).

<p>8</p>	<p>Challenge the Hypothesis</p> 	<p>Test. Experiment. Control the variables. Attempt to falsify.</p>
<p>9</p>	<p>Reach a Conclusion</p> 	<p>Communicate results. Can others test and confirm your conclusion?</p>
<p>10</p>	<p>Suspend Judgement</p> 	<p>Keep an open mind. Be ready to accept new evidence. Knowledge is forever changing.</p>
<p>11</p>	<p>Take Action</p> 	<p>Submit your solution to peer review or take other appropriate actions.</p>
<p>Supporting Ingredients: Used at all the preceding stages of SM-14</p>		
<p>12</p>	<p>Creative, Non-logical, Logical and Technical Methods</p> 	<p>Use all types of action methods at all stages to actually accomplish results.</p>
<p>13</p>	<p>Procedural Principles and Theories</p> 	<p>Follow those used by professional researchers, but “anything (ethical) goes.”</p>
<p>14</p>	<p>Attributes and Thinking Skills</p> 	<p>Be honest and a good team worker. Communicate. Use creativity. Reason logically.</p>