DOD Mentoring Resource Portal

CRITICAL THINKING AND PROBLEM SOLVING LESSON

Information for Supervisors Portfolio
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LESSON: CRITICAL THINKING

"Philosophy ought to question the basic assumptions of the age. Thinking through, critically and carefully, what most of us take for granted is, I believe, the chief task of philosophy, and the task that makes philosophy a worthwhile activity."-Peter Singer

Mission success depends on thoughtful employees capable of reason and logic.
This lesson discusses inductive and deductive reasoning, creative thinking, and effective presentation of written and oral arguments.

OBJECTIVES

After completing this lesson, you should be able to:

- Define critical thinking terminology and concepts.
- Discuss the distinctions between inductive and deductive reasoning
- Describe the use of inductive and deductive reasoning
- Describe how to effectively present both written and oral arguments
- Describe the use of critical thinking to solve problems and generate solutions

REASONING TERMS

Key reasoning terms include:

- Problem
- Opportunity
- Symptom
- Quantitative standards
- Qualitative standards

- Decision
- Data assessment
- Risk
- Risk assessment
- Risk management

Problem
A problem is a discrepancy between existing conditions and the desired or expected conditions, as determined by a deviation from a specified standard.

Opportunity
An opportunity is a favorable set of circumstances for making improvements or innovations.

Symptom
A symptom is a circumstance or clue indicating the existence of something else, alerting you to a potential problem.

Standard
A standard is a basis for comparison; a reference point or benchmark against which performance or achievement can be measured. Standards can either be quantitative or qualitative. These will be discussed later in more detail.

Decision
A decision is a commitment to act or a selection from among alternatives, in order to achieve a defined goal.

Once all data has been collected, and the problem, potential causes, and potential solutions have been identified, it's now time to make a decision.

While some decisions are best made by a single, well-informed individual, some decisions are best made by a group, depending on who will be affected by the decision and who can contribute effectively to the decision making process. Decisions should be made by individuals with the authority to see that they are carried out. Often, employees will be asked to be part of the solution, to make recommendations, but are not the ones to actually make the decisions. The decision-making process will be discussed later.

Data Assessment
Analytical thinking, and later, decision making is only as good as the data collected, or used to assess the problem, draw conclusions, and make decisions. Issues concerning the collection and use of data usually cover the following three major areas:

- Data sources: Concerned with the recency, quality, relevancy, and source of information gathered.
- Adequacy: Concerned with whether there is enough data on which to draw conclusions and make decisions.
- Completeness: Concerned with the need to collect additional data when current data is incomplete.

Risk, Risk Assessment and Risk Management
Risk is defined as the possibility of loss or injury. A problem, on the other hand, is defined as a discrepancy between existing conditions and the desired or expected conditions, as determined by a deviation from a specified standard. The difference between a risk and a problem is a function of time - a problem is already present or so close to occurring that there are no real risk management options available. However, if an analyst takes steps to manage a risk, the risk can be minimized or even eliminated. Risk management will be discussed more in-depth in the next lesson.

INDUCTIVE AND DEDUCTIVE REASONING

Inductive Reasoning
Inductive reasoning is defined as arriving at a conclusion based on a set of observations. In simpler terms, inductive reasoning means forming an opinion, making a decision, or reaching some kind of conclusion based solely on information participants have seen, heard, or experienced in the past.

Example:
For example, owning several gas guzzling pickup trucks might lead a person to conclude that pickup trucks are gas guzzlers. If that person sees an ad for a new model of pickup truck, his/her inductive reasoning may lead to the opinion that this new truck is also a gas guzzler.

An important consideration is that inductive reasoning is most reliable when there is a great range of information or experience on which to base a conclusion.

Deductive Reasoning
Deductive reasoning is defined as arriving at a conclusion based on previously known facts. In simpler terms, deductive reasoning means forming an opinion, making a decision, or reaching some kind of conclusion based on information that is known to be true, such as rules, laws, or principles.

Example:

If a movie theater has a pricing policy as shown here, and an adult wants to see a movie that starts at 8:10 p.m., he/she knows that ticket will cost $7.50. Once deducing or determining the price of admission, the moviegoer can then make additional decisions, e.g.,

- Whether or not to offer to pay
- How many people to invite to attend the movie
- Whether or not to take the kids, or take them on another day
- Whether to bring own treats to movie

TICKETS	CHILDREN (UNDER 12)	ADULTS
Matinee (Before 5:00 pm)	$4.00	$5.50
Evenings	$6.00	$7.50

CREATIVE THINKING

Creative thinking includes:
- Looking for new combinations and connections
- Developing 'what if' scenarios
- Considering approaches never thought of before
- Encouraging the flow of new ideas

Obstacles to Creative Thinking

Analysts may encounter a number of both external and internal obstacles when trying to come up with creative strategies and resolve problems

Table 5-1: Internal and External Obstacles

OBSTACLES	
External	Internal
• Lack of time • Conflicting goals • Tension • Environment • Short turnarounds	• Fear of criticism • Lack of confidence

Overcoming Obstacles

Breaking down a problem into smaller components, as practiced so far in this course, will help improve one's creative thinking skills. Creativity is a skill that can be learned and developed. Creative thinking allows analysts to think "outside the box."

PROBLEM SOLUTION GENERATION METHODS

There are several methods to generate creative ideas including:

- Brainstorming
- Free Association
- Assumption Smashing
- Mind Mapping

Brainstorming

Brainstorming is a group creativity technique which is useful for generating ideas. It is usually led by a facilitator. In brainstorming, the analyst begins with a problem definition and writes down as many ideas as come to mind.

The following are basic guidelines for brainstorming.

- "Crazy" ideas are welcome; they help generate more ideas.
- Don't worry if you get stuck – just keep moving.
- It is good to "piggy-back" on others' ideas.
- Do not clarify or discuss ideas; write down every idea.
- Do not judge any ideas and accept every idea, no matter how absurd you may think it is.
- Treat all ideas equally, no matter what the participant's status is or based on any other organizational factors.
- Ensure that every participant contributes.

Free Association

Free association is a technique that often helps clear writer's block. It is amazing how many ideas just one word can generate. To perform free association, take any word and put it in the center of the page. From this central point, expand thoughts outward like the branches on a tree or spokes on a wheel. At the top of each new branch, place a word associated with the center word. Then add branches to that new word. Simply by performing this activity, analysts may generate some ideas not otherwise identified through the use of a linear approach to problem solving.

Assumption Smashing

Assumption smashing is similar to free association except that those participating list all of the assumptions associated with a situation or problem, and then explore what happens if the assumptions are dropped. The point of assumption smashing is that sometimes people take things for granted or simply as a given. If one allows himself or herself to think outside of those constraining assumptions, many options not otherwise identified may become possible.

Mind Mapping

Mind mapping takes the free association technique one step further. The difference is that not all the connections are strictly linear. Where appropriate, find ways to link together related branches, using connecting lines or overlapping circles. Mind mapping is conducted by following the four steps below:

Step 1: Place topic or subject in center of empty page.
Step 2: Place main themes on the page and connect them with lines to the center topic.

Step 3: Ensure that minor themes radiate out from main themes.
Step 4: Make sure all branches are connected somehow to the main center of the tree.

STRATEGIES FOR DELIVERING SOLUTIONS

The discussion of critical thinking is not complete without exploring strategies to share conclusions. The person delivering the message must:

- Identify the purposes for communicating,
- Analyze target audiences, and
- Develop their messages.

Once these tasks have been accomplished, the next step taken by the communicator is to deliver their messages using a variety of strategies.
The four key strategies for delivering messages are:

- Verbally (oral arguments)
- Non-verbally
- Visually (various forms of written arguments)
- Blend of strategies

Competent communicators recognize that these four strategies for delivering messages are rarely used alone. However, for the purposes of learning, we will examine and practice each strategy individually, and then combine the strategies to learn how they work together.

Strategy 1: Verbal

Delivering messages verbally is the oldest form of communication, and several techniques have stood the test of time. When delivering a message verbally or by "oral argument", competent communicators know they are most likely to get their meaning across if they speak:

- Clearly,
- Concisely
- Courteously
- With conviction

Table 5-2 provides examples of verbal strategies.

Table 5-2: Verbal Strategy Examples

VERBAL STRATEGY	GOOD	BETTER	BEST
Clarity	Over the next couple of days, I want to find out how much this project is going to cost and how long it will take to complete.	We need to track what this project is costing and where we are on meeting our project timeline.	We need to keep our costs in line with our budget.

VERBAL STRATEGY (CONTINUED)	GOOD	BETTER	BEST
Conciseness	I've worked on enough projects over the years to know that no matter how much we have in our budget, it's easy to go over.	This project is going to be difficult but we need to make sure we don't go over on our budget.	We need to keep our costs in line with our budget.
Courtesy	I'll think about it.	Thanks for speaking up.	I appreciate you letting me know your views.
Conviction	I'm pretty sure we can come close to meeting our deadline and to keeping within our budget.	I think we might make our deadline and possibly stay within our budget.	We will finish this project on time and on budget.

Audiences are more apt to listen – and believe – when they can hear and understand words spoken respectfully and sincerely.

Strategy 2: Non-Verbal

Another strategy for delivering messages involves non-verbal techniques. While these techniques often accompany verbal delivery methods, competent communicators recognize the value non-verbal strategies bring to message delivery. Non-verbal strategies include:

- Eye contact
- Gestures
- Tone
- Attitude
- Presence
- Space
- Position
- Setting

Communicators rely in part on non-verbal behavior to deliver their messages. These behaviors – eye contact, gestures, tone, attitude and presence – help communicators engage their audiences by gaining and keeping audience attention. Many people use the behavioral and environmental elements of non-verbal strategies to help their audiences feel more at ease and better able to receive messages. Table 5-3 provides examples of non-verbal communication and the reactions audiences have to this type of communication.

Table 5-3: Non-Verbal Strategies – Behavior

BEHAVIOR	EXAMPLES	AUDIENCE MEMBERS
Eye contact	Scanning of audience members	…feel seen and appreciated
Gestures	Pointing at graphics, "Follow Me" motions	…know where to look …feel invited
Tone	Emphatic, pleased, urgent, angry, open, quizzical, patient	…infer expected responses
Attitude	Confident, certain	…trust communicators
Presence	Expert, problem solver, decision maker	…are apt to listen to – and believe – communicators

BEHAVIOR	EXAMPLES	AUDIENCE MEMBERS
Space	Respectful distance from audience	...can relax and feel safe, not threatened
Position	Standing to give presentation or instruction; sitting to participate in discussion	...can pace themselves in terms of attention and responsiveness to message
Setting	Appropriate to message: Board meetings in conference rooms; team meetings in work space	...can take cues about appropriate response to the delivery of the message

Strategy 3: Visual

A third strategy for delivering messages focuses on the implementation of visual techniques, including written communications. In today's organizations, communicators use a combination of 'old-fashioned' and cutting edge visual aids, or tools, to deliver content, construct format, and accommodate for varying circumstances. Tools for delivering messages using visual strategies can be divided into two categories:

- Manual – Constructed by hand
- Digital – Involving a computer

Communicators rely on both types of visual strategies to strengthen the delivery of messages. Table 5-4 associates the outlines the features of messages to be delivered in terms of manual and digital tools.

Table 5-4: Visual Strategies

FEATURES	MANUAL TOOLS	DIGITAL TOOLS
Format	Paper Print-outs White Boards	Computers & Projectors 'Smart' Boards Web/Podcasts
Circumstances	Less Formal Impromptu Events	More Formal Scheduled Events
Content	Notes Outlines Sketches Feedback	Slide shows/Graphics Charts & Graphs Real-time data

While visual tools can be complex enough to deliver messages without using verbal or non-verbal strategies, people most often use visual strategies in conjunction with the other strategies.

Strategy 4: Blended

In today's organizations, technology is a fundamental component of communication. Drawing from the human and the technical elements of verbal, non-verbal and visual strategies, communicators construct a blended strategy that utilizes those techniques that will ensure the successful delivery of messages.

Table 5-5 provides a matrix linking delivery strategies – verbal, non-verbal, and visual – to communication scenarios with various communicators, messages, and audiences.

Table 5-5: Blended Strategies – Verbal, Non-Verbal & Visuals

COMMUNICATION SCENARIOS			
Format of Communication	Conversation	Meeting	Presentation
Communicator	Employee	Team Lead	Manager / Team Lead
Audience	Co-worker	Team	Management
Message	If we finish the project on time, we will exceed our goal by 20%.	Due to budgetary constraints, our team will taking on the following additional responsibilities.	Our research shows that two of the three projects have produced measurably positive results.

Strategies				
	Verbal	Conciseness Conviction	Clarity Courtesy	Clarity Conciseness
	Non-verbal	Eye Contact Tone Attitude Space	Eye Contact Presence Position Setting	Eye Contact Gestures Tone Presence
	Visual	Schedules Budgets Graphs	Reports Org charts White boards	Computer / LCD Charts/Graphs Data Reports

Effective communicators recognize the power of the blended strategy for message delivery.

LESSON SUMMARY

The topics discussed in this lesson include:

- Critical thinking terminology and concepts.
- The distinctions between inductive and deductive reasoning
- The use of inductive and deductive reasoning
- How to effectively present both written and oral arguments
- The use of critical thinking to solve problems and generate solutions

LESSON: PROBLEM SOLVING

"If I had an hour to solve a problem and my life depended on the solution, I would spend the first 55 minutes determining the proper question to ask; for once I knew the proper question, I could solve the problem in less than five minutes."-Albert Einstein

Problems are opportunities, but only for the agency whose employees are effective problem-solves.

This lesson discusses the steps involved in a process-based approach to problem solving, quantitative and qualitative standards for defining problems, risk assessment, and decision making.

OBJECTIVES

After completing this lesson, participants will be able to:

- Utilize the process-based approach for problem solving
- Identify methods used for generating creative and logical solutions
- Discuss the impact of risk in a decision-making environment
- Discuss strategies for empowering employees to be problem solvers

PROCESS-BASED APPROACH TO PROBLEM SOLVING

A problem results from a discrepancy between actual results and those results that are expected or desired. A process-based approach has proven to be a highly effective means of solving a problem.

The method begins with analyzing the problem:

Step 1: Recognize a Problem Exists

Step 2: Collect Data

Step 3: Analyze and Evaluate

Step 4: Select a Probable Cause

Step 5: Verify the Cause

The quality and validity of each step is dependent on the preceding steps. Avoid taking shortcuts. The time spent defining and analyzing the problem will save invaluable time in the long run, since the individual making the decision will have the criteria needed to make an effective decision.

Step 1: Recognize a Problem Exists

There are many ways to recognize that a problem exists. Some of these methods are formal, while others are informal, including:

- Listening to coworkers ("water cooler chat" or "the office grapevine")
- Meetings
- Formal complaint processes

Step 2: Collect Data

Recall from its definition that a problem requires a discrepancy between reality and the desired or expected conditions and associated standards. The purpose of collecting data is to learn everything

about the problem, especially to help in identifying its cause. Avoid analyzing the data as it is collected. Rather, define what is happening in terms of:

- What
- Who
- Where
- When
- How often
- How many

Step 3: Analyze and Evaluate

Always do a thorough job of explaining the collected data. Don't cut corners. While time is always a critical factor, it will pay off in the long run to have as much data as possible when beginning to generate solutions and make decisions.

Step 4: Select a Probable Cause

It is important to have a well-formulated, concise problem description. Then, a comparison can be made between specific points of the problem description or symptoms (i.e., who, what, where, when, how often, and how many) with potential causes. The most probable cause is the one that matches the most elements of the problem description. It is also helpful to break down the possible causes by category as identified below, especially to see if there are any special categories that are causing you the most difficulty:

- People
- Organization
- Procedures
- Machines or equipment
- Materials

- Location
- Process
- Distribution channels
- Leadership
- Other

Step 5: Verify the Cause

Once a probable cause has been selected, the analyst should then verify that they have identified the correct cause, especially:

- If there are uncertainties about the validity of the assumptions.
- If the corrective action being considered has a high cost in terms of money, time, and/or personnel.
- If the problem has a serious impact on the entire organization.

Then, the cause should be verified by:

- Conducting interviews, particularly if the probable cause included personnel.
- Observing, particularly if the probable cause is a procedure.
- Experimenting, particularly if the probable cause is a machine or material.

If the verification reveals the analyst has not identified the true probable cause or that there may be additional causes, he or she should return to step two in the process (collect data) and start again.

QUANTITATIVE AND QUALITATIVE STANDARDS

Quantitative and qualitative standards are a critical part of the problem identification framework. In order to identify a problem – a gap between expectations and results – there must be references against which expectations and results are measured.

Quantitative Standards

A quantitative, or objective, standard is unbiased, is based on facts, and is not influenced by personal feelings, interpretations, or prejudice.

Quantitative standards used to measure desired results include:

- 95% of applications will be processed within ten days.
- 90% of customers will be satisfied or highly satisfied with customer service.

Qualitative Standards

A qualitative, or subjective, standard is based on attitudes, opinions, and experiences, and describes an individual's perceptions of characteristics.

Qualitative standards used to measure expected conditions (desired results) include:

- Reports are formatted according to agency style guide.
- Products reflect sound analytical thinking.

Table 6-1 offers a comparison between quantitative and qualitative standards.

QUANTITATIVE	QUALITATIVE
A quantitative, or objective, standard is:	**A qualitative, or subjective standard is:**
- Unbiased - Based on facts - Not influenced by personal feelings, interpretations, or prejudice.	- Biased - Based on attitudes, opinions, and experiences - Describes individuals' perceptions of characteristics

Table 6-2 provides examples of quantitative and qualitative standards by which existing and expected conditions may be measured in order to identify problems.

	EXAMPLES		
Standards	Expected Conditions (Desired Results)	Existing Conditions (Actual Results)	Problem (Gap)
Quantitative	95 percent of applications will be processed within ten days.	80 percent of applications will be processed within ten days.	15 percent of applications are taking longer to process than expected.
	90 percent of customers will be satisfied or highly satisfied with customer service.	70 percent of customers will be satisfied or highly satisfied with customer service.	20 percent of customers are not satisfied with customer service.

Qualitative	Reports are formatted according to agency style guide.	Some reports are not formatted to agency style guide.	Not all reports are formatted to agency style guide.
	Products reflect sound analytical thinking.	Some products do not reflect sound analytical thinking.	Not all products reflect sound analytical thinking.

PROBLEMS, SYMPTOMS, AND SOLUTIONS

Problem or Solution?

A common error made when identifying a problem is to define a problem in terms of its *solution*.

Example:

When describing a problem*, one might say, "The problem is that we need a system to track loan defaults."

Solution	**Problem***
Establishing a tracking system	Loan defaults are not being tracked

Determining a solution to a problem is a much later step in the process of problem solving.

Problem or Symptom?

Another common error made when identifying a problem is to define a problem in terms of its *symptoms*.

Example:

When describing a problem*, one might say, "The problem is that loan defaults are increasing."

Symptom	**Problem***
Increasing loan defaults	Loan defaults are not being tracked

A symptom is a circumstance or clue indicating the existence of a potential problem. Identifying symptoms can be helpful in identifying the problem.

Symptoms warn us that something is wrong, and sometimes they are the only indication there is a problem.

However, defining a problem in terms of its symptoms may obscure the real cause and lead to symptomatic solutions that fail to correct the basic condition.

PROBLEM ANALYSIS – COLLECTING AND ASSESSING DATA

Recall from its definition that a problem results from a discrepancy between actual results and those results that are expected or desired.

Once the problem – the gap between desired and actual results – has been identified, it is important to analyze the problem.

In order to achieve the most accurate analysis, one should:

1. Collect data about the problem
2. Assess the collected data

It is critical that these two steps should be conducted separately. Avoid analyzing data as it is collected, because this could influence both the type of information collected and the manner in which that information is collected.

Collecting Data

In order to effectively analyze a problem, problem solvers must conduct a thorough collection of all relevant data. In order to achieve this, problem solvers should:

- Ask relevant questions during problem analysis
- Identify existing data sources for each question and gain access to those sources

Ask Relevant Questions

The following questions can help problem solvers identify the parameters of their investigation:

- What?
- Who?
- Where?
- When?
- How often?
- How many?

Identify Data Sources

When collecting information for use in identifying a problem, it is important to recognize:

- Sources of data
- Constraints upon data

When identifying sources of data, it is important to recognize the *type* of data. As with the standards used to help identify problems, data can be either:

- **Quantitative** (objective), or
- **Qualitative** (subjective)

Quantitative Data

Quantitative data is information that is generally considered unbiased, based on facts, and not influenced by personal feelings, interpretations, or prejudice

Quantitative data is usually represented numerically

- 5% of all applications are received after the closing date.
- At least 100 applications are received after the closing date

Facts

Facts are information which can be quantified and verified, and remain 'true' regardless of people and politics.

Sources of facts include:

- Research
- Experimentation and studies
- Observed events, past or present, that were either personally observed or reported.[1]

Qualitative Data

Subjective or qualitative data is data that is based on attitudes, opinions, and experiences. Subjective or qualitative data describes an individual's perceptions and is usually represented verbally.

- The tension was so great that you could cut it with a knife.
- No one in that office helps customers.

Stakeholders

Stakeholders are individuals, groups, and organizations that are affected by the problem, or its solution. Decision makers, elected officials, community leaders, and those close to the problem are very important to identify.

It is also critical to recognize truth, bias, or prejudice in stakeholder's opinions.

Triangulation (comparing information from several different sources) will help you minimize bias and prejudice in stakeholder data.[2]

Experts

Expert opinion can save both time and work because it is often difficult to get "all the facts."

The downside of expert opinion is that it also may be biased.

Experts often rely on heuristics (rules of thumb) to reach judgments quickly. The following heuristics are known to cause experts to introduce bias in their responses:

- Availability – Judging the likelihood of an event by how easily examples can be recalled or imagined
- Representativeness – Judging an event by how closely it represents a stereotypical member of a group
- Anchoring and adjustment – Failing to adjust adequately to a new value when, after picking a starting value or anchor, new information comes to light.
- Affect – Responding to positive or negative information about the benefit of an activity affects an individual's perception/inference of the risk. [3]

Constraints Upon Data

In addition to identifying sources of data, problem solvers must also recognize the constraints upon both the data sources and the data itself. Constraints upon data may be difficult, or impossible, to change.

Possible constraints include:

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[1] Study Guides and Strategies. 2008. Problem Solving and Decision Making: Defining and Gathering. Retrieved from http://www.studygs.net/problem/problemsolvingV1.htm

[2] Landsberger, J., Problem Solving and Decision Making: Defining and Gathering, 2007. Retrieved from http://www.studygs.net/problem/problemsolvingV1.htm

[3] United States Coast Guard. 2008. Retrieved from http://www.uscg.mil/hq/g-m/risk/e-guidelines/RBDMGuide.htm

- Technical – Limited equipment or technology
- Political – Special interest restrictions
- Legal – federal, state, or local laws or statutes
- Economic – Cost restrictions
- Social – Restrictions by organized groups with special interests
- Human – Limited ability of relevant people to understand or initiate solutions
- Time – Requirements for a solution in a short period of time[4]

If a solution is surrounded by too many constraints, the constraints themselves may be the problem.

Assessing Data

Once data has been collected, the next step is to conduct a thorough and critical assessment of those data. When assessing the quality of data earmarked for use in solving problems, there are several critical characteristics of the data that must be evaluated. These characteristics include:

- Recency
- Quality
- Completeness
- Relevancy

Recency

Problem solvers must be discerning when collecting data pertaining to an issue they are seeking to resolve. Data that is out-of-date can skew the problem-solving process and delay or possibly prevent the implementation of a viable solution.

When Did the Problem Occur?

However, be careful when establishing criteria for aging data. As discussed, there are problems that have 'always' existed, while other problems have only recently occurred. Thus, five-year old data may not be 'too old' for a problem that has been ongoing, while five-week old data may not be recent enough for a problem which has just occurred.

Quality

Judging the quality of data requires both quantitative and qualitative criteria. Facts, figures, and historical accounts can be verified, validated, and, in some cases, recreated. Likewise, a subjective evaluation of the data can result in the exclusion of data with errors or redundancies.

Making a Distinction Between Quality and 'Good'

Subjectivity can hinder the assessment of data, particularly when problem solvers have an agenda which delays or prevents finding effective solutions to problems. Data that supports an alternate agenda may be considered 'good', even if it is inaccurate, contains errors, or, in some other way, lacks quality. Thus, it is critical that problem solvers take care when selecting the standards by which problems are identified, and distinguishing between problems, and solutions and symptoms.

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[4] FEMA. 2005. Decision Making and Problem Solving: Independent Study. pp 2.19

Completeness

When assessing data, problem solvers must determine if all pertinent data has been collected. In order to ensure the collection is complete, problem solvers should identify the facets of a problem and collect any related data.

- Logistics – Details /events surrounding problem
- People - Stakeholders, participants, affected parties
- Record – Internal / external accounting of problem
- Related Actions / Reactions – Consequences of the problem and of various responses to the problem (including no action)

Incomplete Data Leads to Incomplete Solutions

A solution constructed upon incomplete data will solve only part of the problem or – more likely – will fail to solve the problem at all.

Relevancy

When assessing data pertaining to a problem, it is critical that problem solvers collect only those data which are relevant. In today's world of seemingly endless supplies of information, it is easy to collect too much data. However, information that is irrelevant to a problem can distract problem solvers and disrupt problem solving efforts.

Similar Problems – and Solutions?

Relevancy of data is similar to recency of data in that it is possible to mistakenly identify some pertinent data as irrelevant.

Data pertaining to similar problems – particularly those which have been successfully resolved – should be considered. Additionally, data pertaining to events surrounding the occurrence of problems should be considered, as they may contain valuable insights both about the origins of the problem as well as what actions could be taken to avoid the problem in the future.

SOLUTION GENERATION AND EVALUATION

When generating potential solutions to a problem, it is important to separate the 'creative' part of the process from the 'evaluative' part of the process. The best solution for a problem may be the one that, at first glance, seems the most 'out there'.

Thus, in order to maximize the range of options from which a potential solution may be drawn, it is critical that evaluation and judgment be set aside during the creative part of the solution generation process.

Equally important, however, is the need for focus once the options have been generated. It is unproductive to continue brainstorming once that portion of the process has ended. Sometimes, the worst solution to a problem is better than the best solution that never leaves the 'drawing board'.

GENERATING SOLUTIONS

As discussed earlier, there are three different methods to generate creative ideas:

- Brainstorming

- Free Association
- Assumption Smashing
- Mind Mapping

EVALUATING SOLUTIONS

After generating ideas, they need to be evaluated and sorted through to reach a practical decision of those you want to use or develop further. Each idea is assessed to determine whether it is promising, intriguing, or important to consider and develop as a promising solution.

This step is not about generating an absolute, final decision, or attaining closure about solutions to the problem. The goal of this step is to identify possibilities that are promising, intriguing, or inviting.

Rules for Focusing Options

When focusing options, it is critical that a shift be made from generating ideas to focusing on ideas. Treffinger et al. offer four guidelines for focusing on ideas:[5]

1. **Look for the Strengths:**

- Analyze ideas constructively:

    - Screen
    - Select
    - Support your choices

- Look for strengths or the positive aspects of each option.
- Get the best out of ideas rather than just criticizing them.

2. **Be Deliberate and Explicit:**

- Choices and decision will be easier if the process is deliberate and methodical
- Options can be communicated, and discussed better when everyone is explicit in expressing choices and reasons clearly
- Work hard to become aware of, and overcome, hidden agendas

3. **Consider both novelty and appropriateness:**

- Be sure to consider both novelty and appropriateness of the possibilities.

4. **Stay on course:**

- Keep focused on the destination.
- Make decisions and correct course as necessary.
- Keep the objective in mind.

Focusing Methods

This provides an overview of two different methods of focusing on the options. These methods include:

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[5] Treffinger, D.J., Isaksen, S.G., & Stead-Dorval, B., Creative Problem Solving: An Introduction, Waco, Texas: Prufrock Press, 2006, pp. 9-11

- Selecting Hits
- Sorting Options

Note that this is a small sampling of creative methods used to focus on the options. Refer to almost any book on problem solving for more.

SELECTING HITS

'Selecting Hits' is a focusing tool used to screen a large number or a wide variety of options. To use 'Selecting Hits', identify the most promising or appealing options and mark them with a dot or other mark.

Isaksen, et al. say that an option may be a hit when it is:[6]

- On target
- Relevant
- Interesting
- Intriguing
- Fascinating
- Workable
- Clear
- Right 'on the money

One method of using 'Selecting Hits' is to give each team member a number of dots. Each member then places their dots on the options that they think might be a "hit."

SORTING OPTIONS

Another option used for focusing options is to sort options into categories. To use 'Sorting Options', sort the entire list of ideas into categories. If there are too many items to sort, use 'Selecting Hits' first to trim the list to a manageable level.

Isaksen et al. offer some suggestions for categories:[7]

- Musts vs. Wants
- Short Term vs. Long Term
- Useful vs. Novel
- Simple vs. Complex
- Fits Existing System vs. Demands New System

'Sorting Options' can also be accomplished using a matrix to evaluating options using two pairs of categories.

DECISION MAKING AND RISK

Pitfalls of Decisions

When you engage in the decision-making process, there are many obstacles or pitfalls that you may run into along the way. A few of the pitfalls to good decision making include:

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[6] Isaksen, S.G., Dorval K.B., & Treffinger D.J., Creative Approaches to Problem Solving: A Framework for Change, Buffalo, New York: Creative Problem Solving Group, 2000, p. 79

[7] Isaksen, S.G., Dorval K.B., & Treffinger D.J., Creative Approaches to Problem Solving: A Framework for Change, Buffalo, New York: Creative Problem Solving Group, 2000, p. 123

- Here are a few of the pitfalls in making good decisions:
- Unintended consequences or side effects
- Lack of complete context or sufficient data
- Relocating " the monkey" to someone else's back
- Overly simplistic treatment of multiple issues
- Lack of buy-in from the people who must implement
- Failure to see "outside the box"
- Failure to consider discrete solutions for various elements of the problem
- Defense of a decision for the wrong reasons
- Failure to move fast enough to be effective
- Failure to recognize the political implications of an otherwise good decision. [8]

RISK MANAGEMENT PROCESS

Risk management is a continuous six-step process.

Step 1 – Identify the risk:

State the risk in terms of condition and consequence(s) – capture the context of the risk, e.g., what, when, where, how, and why. For example, if a major funding decrease is being proposed for a program, the analyst must identify and define the risks associated with the decrease. How will this impact program staffing? When will the funding decrease take effect? What is the impact on the current client base? What impact will the decrease have on other related programs?

Step 2 – Analyze the risk:

Evaluate the risk probability, impact/severity, and time frame (when action needs to be taken). For example, if a budget cut next year will result in a nationwide 15% decrease in staff, what is the probability a specific office will be downsized? By how much? What happened in the last budget cut of a similar nature?

Step 3 – Develop a Risk Management Plan:

Formalize the data captured in terms of a plan per se; assign responsibility and determine an approach to address the risk. For example, if a program's guidelines change as proposed, it may increase a specific office's caseload by 20%. What can that office staff do to prepare for that change now? Who is responsible to do what to address the risks?

Step 4 – Track the risk:

Acquire/update, compile, analyze, and organize risk data. For example, the initiation of a new electronic performance tracking system is being installed in a regional office next week. The office staff must develop a tracking system to monitor the installation to determine if the risk control measures are working.

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[8] Group Mind Express. 2008. Effective Decision Making. Retrieved from
http://www.groupmindexpress.com/lib/Effective%20Decision%20Making.pdf.

Step 5 – Control/mitigate the risk:

Decide how to proceed. For example, an analyst observes that applicants are failing to complete the newly revised housing choice voucher forms. The analyst implemented a risk control plan, offering telephone support to walk applicants through the new form. The analyst observed a 20% increase in the number of completed forms after only two weeks of offering telephone support. The analyst has executed a control plan and should continue to track the situation.

Step 6 – Communicate and document the risk:

Report the risk to the task stakeholders for possible input. This report should become a normal and recurring part of the reporting process. For example, an area office conducts a weekly staff status meeting. All stakeholders are present. The analyst should request to be put on the agenda to keep the stakeholders informed of potential risks.

RISK ASSESSMENTS

Analyzing the risk means determining the probability, impact, and timeframe of risk. The probability of the risk is usually defined in terms of ranges, e.g., 50%, 75%, 100%, or low, medium, high. The timeframe that the risk will occur is usually defined in terms of when the risk is likely to occur, e.g., near-term, long-term, etc. The magnitude of the risk is usually assessed in terms of the impact on cost, schedule, scope, and quality.

Table 6-3: Ranking Risks

RISK	RANK
0.9 (90%)	Very High
0.7 (70%)	High
0.5 (50%)	Moderate
0.3 (30%)	Low
0.1 (10%)	Very Low

Not all risks are equal – once they are identified, they need to be prioritized so that those that are more important will be addressed first. It is critical to remember that at any time when risks are identified, they need to be communicated to agency leaders and decision makers so that they may be effectively addressed.

Risks can never be fully avoided or transferred, so the analyst must prioritize them to determine where to expend resources.

Coping with Risk

- Risk avoidance: Refusing to undertake an activity where the risk seems too costly.
- Risk prevention (loss control): Using various methods to reduce the possibility of a loss occurring.
- Risk transfer: Shifting a risk to someone outside your organization.

- Risk assumption (self-insurance): Setting aside funds to meet losses that are uncertain in size and frequency.
- Risk reduction: Taking steps to reduce risk; for example: diversification, proactive mitigation, piloting the proposed solution, and proactive marketing, among others.[9]

THE DECISION-MAKING PROCESS: WHO DECIDES?

Some decisions are best made by a single, well-informed individual, while other decisions are best made by a group.

The criteria for determining which scenario is most effective for making the best decision include determining:

- Who will be affected by the decision
- Who can contribute effectively to the decision making process

See table 6-4 for examples of decision making types.

Table 6-4: Types of Decision Making

TYPE OF DECISION MAKING	DESCRIPTION
Individual	In individual decision making, the leader must make the decision alone, and input from others is limited to collecting relevant information.
Consultation	In consultation, the leader shares the issue with one or more people—seeking ideas, opinions, and suggestions—and then makes the decision. The leader considers the input of others, but makes the final decision.
Delegating	When delegating the decision, the leader sets the parameters, and then allows one or more additional people to make the final decision. Although the leader does not make the decision, he or she supports it.
Group	In group decision making, the leader and others work together until they reach a consensus decision. The opinion and point of view of each group member is considered. As a result of helping to make the decision, group members may be more apt to buy into the final decision and commit to supporting its implementation. [10]

Selecting a Decision Making Approach

Use the following questions to help determine a decision making approach:

- Selecting a Decision Making Approach
- Use the following questions to help determine a decision making approach:
- What is the timeframe of the decision? Is there a reasonable amount of time to make a decision?

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[9] Arsham, H. 2008. Merrick School of Business. The University of Baltimore. Tools for Decision Analysis: Analysis of Risky Decisions. Retrieved from http://home.ubalt.edu/ntsbarsh/opre640a/partIX.htm
[10] FEMA. 2005. Decision Making and Problem Solving: Independent Study. pp 3.8

- What is the level of the decision maker's expertise? Is the leader skilled and experienced enough to make a good decision?
- What is the level of expertise of potential group members? Are group members skilled and experienced enough to make a good decision?
- What is the commitment of others involved to the attainment of organizational goals? Do they share the objectives to be achieved by solving the problem?
- What are possible reasons others may have for wanting a problem to remain unsolved? For not using a specific approach?
- What is the complexity of the problem? Is the decision made complex due to complex/compound problems with many possible complex/compound solutions?
- How critical is commitment by others to the decision?
- What conflicts might arise among those affected by the decision?
- What agencies, individuals, elected officials, or community members are directly impacted by the decision?[11]

Examples:

- You have been working on a problem for some time. A decision must be made today. One of your subordinates is really up on the subject, but you know the correct decision must be made.
  Who makes decision: _____
- You feel very strongly that you know the issues best and can reach the best decision. However, there are different groups involved with the problem who, in your experience, work against decisions they oppose.
  Who makes decision: _____
- You know that the different groups involved have a history of working against decisions they oppose. However, the decision must be made today.
  Who makes decision: _____
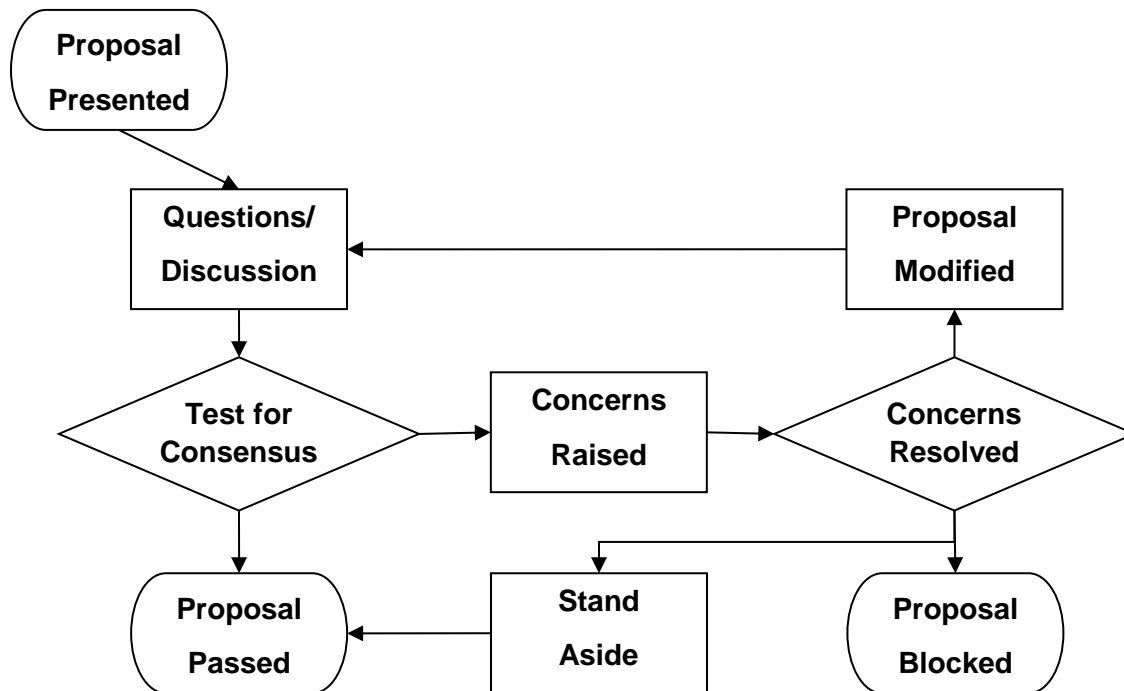
CONSENSUS DECISION MAKING

According to L. Steven Smutko, author of *Negotiation and Collaborative Problem Solving*,[12] the definition most often applied to consensus decision making is that of "conditional unanimity". Conditional unanimity is achieved when everyone can live with the decision.

See figure 6-1 for a diagram of a consensus decision making process.

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[11] FEMA. 2005. Decision Making and Problem Solving: Independent Study. pp 3.9
[12] Smutko, L. S. 2007. Negotiation and Collaborative Problem Solving. Raleigh, NC: North Carolina State University

Figure 6-1: A Consensus Decision Making Process

A CONSENSUS DECISION MAKING PROCESS

1. Proposal - The process starts with a proposal. One of the group members presents a proposal for solution of the problem.
2. Questions/Discussion – Clarifying questions are asked by anyone in the group. The proposal is discussed and debated. The proposal can be altered at this time.
3. Test for Consensus – The group can use any one of a variety of techniques such as a straw poll or a signal like thumbs up/middle/down.

- Thumb up – I have no objections and can support the proposal
- Thumb middle – I have concerns with the proposal, but choose not to block it
- Thumb down – I have major concerns with the proposal and block its passage

4. Concerns Raised – Group members must express their concerns.
5. Concerns Resolved – The group has one of three choices:

- Proposal modification – The proposal is modified and resubmitted for questions/discussion
- Proposal passage – Group members voice their concerns, and even if not resolved, choose to stand aside and let the proposal pass
- Proposal blockage – Group members voice their concerns, and if not resolved, block the proposal

Reaching Consensus

The group has reached consensus when ALL group members can say:

- "My personal views have been listened to and considered."
- "I have openly listened to and considered the ideas and views of every other group member."
- "I can support this decision and work towards its implementation, even if it was not my choice."[13]

Tips for Reading Consensus

- Do not employ win/lose techniques such as voting.
- To break a stalemate, look for the next most acceptable alternative.
- Do not encourage members to give in to keep harmony.[14]

Advantages of Group Decision Making

According to James Higgins, author of *101 Creative Problem Solving Techniques*, groups offer distinct advantages over individual decision making and problem solving:

- The group can usually provide a better solution. Groups can create a knowledge base greater than the sum of its parts as individuals build on each other's inputs.
- Those affected by the decision and/or those who must implement it will accept the decision more readily if they have a say in the decision.
- Group participation leads to better understanding of the decision.
- Groups help ensure broader searches for information and solutions.
- The propensity to take risk is balanced. Groups moderate between the risk taker and risk avoider.[15]

Disadvantages of Group Decision Making

There are also disadvantages to employing group decision making or problem solving:

- There is pressure to conform. Groups are susceptible to "group think", which is when people begin to think alike and not tolerate new ideas.
- One individual may dominate the group so that his/her opinions prevail over the group. Secret ballots and time constraints may help.
- Groups require more time to reach a decision.
- Excessive time spent reaching a decision may negate the advantages of a good decision.
- Groups may make better decisions than the average individual but seldom better than the superior individual. Superior by a group may result from the efforts of one group member.[16]

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[13] FEMA. 2005. Decision Making and Problem Solving: Independent Study. pp 3.12
[14] FEMA. 2005. Decision Making and Problem Solving: Independent Study. pp 3.12
[15] Higgins, J.M. 2006. 101 Creative Problem Solving Techniques. Winter Park, FL: New Management Publishing Company, pp 131
[16] Higgins, J.M. 2006. 101 Creative Problem Solving Techniques. Winter Park, FL: New Management Publishing Company, pp 132

LESSON SUMMARY

The topics discussed in this lesson include:

- The process-based approach for problem solving
- Methods used for generating creative and logical solutions
- The impact of risk in a decision-making environment
- Strategies for empowering employees to be problem solvers