INTRODUCTION TO PROBLEM SOLVING

Key Points

1. Definition and Levels of Decision Making
2. The Seven Steps of the Army Problem Solving Process
3. The Roles of Knowledge, Intuition, Judgment, and Ethics

The good leader must have ethos, pathos, and logos. The ethos is his moral character, the source of one’s ability to persuade. The pathos is the ability to touch feelings, to move people emotionally. The logos is the ability to give solid reasons for an action, to move people intellectually.

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Introduction

Good decision making is a fundamental leadership skill. Whether you are leading in a business, a government agency, a university, or on a battlefield, making good decisions is essential. Many of the key decisions leaders make involve problems they must solve. A problem is an existing condition or situation in which what you want to happen is different from what is happening.

When problems arise, leaders must analyze the cause of the problems and determine the best possible way to solve them. Every leader uses a system to help in the problem solving process. Leaders may not be conscious of the system they use, but they inevitably use some kind of problem solving process.

Unfortunately, many of the unconscious problem solving systems leaders use lead them to make poor decisions. The reason is simple: When leaders react to what they see on the surface, but don’t take time to uncover the underlying factors at the root of many problems, their quick decisions may simply make the problem worse. A quick decision in response to superficial problems is often a poor decision. When a warning light goes off on your car’s dashboard, the problem is not a red light on the dashboard. Something is wrong with the engine. If you react to the problem of the dashboard light and solve that problem by disconnecting a wire that leads to the dashboard—a quick, easy, inexpensive fix—you are far from solving the problem. The better way to address a problem is to systematically and logically analyze what is taking place and what you can do in response.

This lesson provides an overview of the Army problem solving process—a systematic, logical approach to problem solving and decision making that leads to better decisions. When you lead men and women in battle, good decision making is not a luxury.

The Battalion Dining In

Your battalion commander has tasked you to plan a dining in. Traditionally, such an event is held at the hotel and conference center on campus, but one week before the dining in, this hotel must close unexpectedly due to flooding from a broken water line. What will you do? Cancel or reschedule the dining in? Move it to another location? You must make a decision quickly, and you must be able to defend your decision to your battalion commander. What steps will you take to solve this problem?
Decision making involves selecting the line of action you believe will most likely lead to successfully completing your mission. This involves sound judgment, logical reasoning, and wise use of resources. Decision making starts the process of solving the problem. Thus, decision making is knowing whether to decide, then when and what to decide. It includes understanding the consequences of your decisions.

Civilian authors have written extensively about problem solving and decision making, producing a number of models for both. For decision making, most Army leaders follow one of two processes, depending on the level of their authority. Lieutenants and other leaders at company level and below follow the troop leading procedures (TLP). The TLP are designed to solve tactical problems. Leaders at battalion level and above follow the military decision making process (MDMP). The MDMP is designed for organizations with staffs that help the commander make and implement decisions. Both TLP and MDMP are established and proven methods that combine elements of the planning and operating leadership actions to save time. Both follow the Army problem solving process discussed below.

The Seven Steps of the Army Problem Solving Process

Problem solving is a daily activity for Army leaders. Army problem solving is a systematic way to arrive at the best solution to a problem. It applies at all levels and includes the steps you need to develop well-reasoned, supportable solutions (see Figure 4.1). It incorporates risk management techniques appropriate to the situation.

You must remain as objective as possible when solving problems. The goal is to prepare an unbiased solution or recommendation based on the facts. Problem solving is an important Army leadership action. It is essential to good staff work.

The Army problem solving model has seven steps.

![Figure 4.1 Seven Step Problem Solving Model]
Step 1—Identify the Problem

The first step in problem solving is recognizing and defining the problem. This step is crucial, as the actual problem may not be obvious. Determine what the problem is by clearly defining its scope and limitations. Allow sufficient time and energy to clearly define the problem before you move on to other steps of the problem solving process.

A problem exists when there is a difference between the current state or condition and a desired state or condition. You should identify problems from a variety of sources. These include:

- Higher headquarters directives or guidance
- Decision maker guidance
- Subordinates
- Your personal observations.

When identifying the problem, actively seek to identify its root cause, not merely the symptoms on the surface. Symptoms may be the reason that the problem became visible. They are often the first things people notice and frequently require attention. But focusing only on a problem's symptoms may lead to false conclusions or inappropriate solutions. Using a systematic approach to identifying problems helps avoid the “solving symptoms” pitfall.

To identify the root cause of a problem, you should do the following:

- Compare the current situation to the desired end state
- Define the problem's scope or boundaries
- Answer the following questions:
  - Whom does the problem affect?
  - What is affected?
  - When did the problem occur?
  - Where is the problem?
  - Why did the problem occur?
- Determine the cause of obstacles between the present situation and the solution—many times a problem's causes are simply obstacles between the current situation and the desired end state
- Write a draft problem statement
- Redefine the problem as necessary as you gain and assess new information.

After identifying the root causes, develop a problem statement. You write a problem statement as an infinitive phrase, such as, “To determine the best location for constructing a multipurpose vehicle wash rack facility during this fiscal year.” When the problem under consideration is based on a directive from a higher authority, it is best to submit the problem statement to the decision maker for approval. This ensures that you have understood the decision maker’s guidance before you continue.

Once you have developed the problem statement, make a plan to solve the problem. Make the best possible use of available time, and allocate time for each problem solving step. Doing this provides you a series of deadlines to meet in solving the problem. Use reverse planning to prepare a problem solving timeline, then use this timeline to periodically assess your progress. Don’t let real or perceived pressure cause you to abandon solving the problem systematically. You can change time allocations as necessary, but don’t ignore them.
Step 2—Gather Information

After completing the problem statement, continue to gather information relevant to the problem. Gathering information begins with defining the problem and continues throughout the problem solving process. Never stop acquiring new or additional information and assessing its impact.

When gathering information, define unfamiliar terms. This is particularly important when dealing with technical information. Consider the intended audience in deciding what to define. For example, a product for an audience that includes civilians may require definitions of all Army terms. A technical report prepared for a decision maker unfamiliar with the subject should include definitions the reader needs in order to understand the report.

Gather information from primary sources whenever possible. Primary sources are people with first-hand knowledge of the subject under investigation, or documents they have produced. Methods of gathering information from primary sources include interviews, letters of request for specific information, and questionnaires.

You need two types of information to solve problems: facts and assumptions. Fully understanding these types of information is critical to understanding problem solving. In addition, you will need to know how to handle opinions and how to manage information when working in a group.

Facts

Facts are verifiable pieces of information that are objectively real. They form the foundation on which you base the solution to a problem. Regulations, policies, doctrinal publications, commander’s guidance, plans and orders, personal experience, and the Internet are just a few sources of facts.

Assumptions

Assumptions are information you accept as true in the absence of facts. This information is probably correct, but you cannot verify it. Appropriate assumptions used in decision making have two characteristics:

- They are valid; that is, they are likely to be true
- They are necessary; that is, they are essential to continuing the problem solving process.

If you can continue the process without making a particular assumption, discard the assumption. So long as an assumption is both valid and necessary, treat it as a fact. You should continually seek to confirm or deny the validity of your assumptions.

Opinions

When gathering information, evaluate opinions carefully. An opinion is a personal judgment that you or other individuals make. You can’t totally discount opinions. They are often the result of years of experience. Objectively evaluate opinions to determine whether to accept them as facts, include them as opinions, or reject them. You should neither routinely accept opinions as facts nor reject them as irrelevant—regardless of their source.

Organizing Information

Check each piece of information to verify its accuracy. If possible, two individuals should check and confirm the accuracy of facts and the validity of assumptions. The ability to establish whether a piece of information is a fact or an assumption is of little value if those working on the problem don’t know the information exists. Always share information with the decision maker, subordinates, and peers, as appropriate. A proposed solution to a problem is only as good as the information that forms the basis of
the solution. Sharing information among members of a problem solving team increases
the likelihood that a team member will uncover the information that leads to the best
solution.
Organizing information includes coordination with units and agencies that may be
affected by the problem or its solution. Determine who these are as you gather information.
Coordinate with other leaders as you solve problems, both to obtain assistance and to keep
others informed of situations that may affect them. Such coordination may be informal
and routine: For example, a squad leader checking with the squad on his right to make
sure their fields of fire overlap. Or it may be formal, as when a division action officer
staffs a decision paper with the major subordinate commands. At a minimum, always
coordinate with units or agencies that your solution might affect.

Step 3—Develop Criteria
The next step in the problem solving process is developing criteria. A criterion is a standard,
rule, or test by which you can judge something—a measure of value. You develop criteria
to assist you in formulating and evaluating possible solutions to a problem. Criteria are
based on facts or assumptions. You should develop two types: screening criteria and
evaluation criteria.

Screening Criteria
Use screening criteria to ensure the solutions you are considering can solve the problem.
Screening criteria define the limits of an acceptable solution. As such, they are tools to
establish the baseline products for analysis. You may reject a solution based solely on
applying your screening criteria. Five categories of screening criteria are commonly applied
to test a possible solution:

- **Suitability** – solves the problem and is legal and ethical
- **Feasibility** – fits within available resources
- **Acceptability** – worth the cost or risk
- **Distinguishability** – differs significantly from other solutions
- **Completeness** – contains the critical aspects of solving the problem from start to
  finish.

Evaluation Criteria
After developing your screening criteria, develop your evaluation criteria in order to
differentiate among possible solutions. Well-defined evaluation criteria have five elements:

- **Short Title** – the criterion name
- **Definition** – a clear description of the feature you are evaluating
- **Unit of Measure** – a standard element used to quantify the criterion. Examples of
  units of measure are US dollars, miles per gallon, and feet
- **Benchmark** – a value that defines the desired state, or “good” for a solution in terms
  of a particular criterion
- **Formula** – an expression of how changes in the value of the criterion affect the
  desirability of the possible solution. State the formula in comparative terms (for
  example, more is better) or absolute terms (for example, a night movement is better
  than a day movement).

A well-thought-out benchmark is critical for meaningful analysis. Analysis judges a
solution against a standard, telling you whether that solution is good in an objective
sense. It differs from comparison, which judges possible solutions against each other, telling
you which is better or worse in a relative sense.
Benchmarks are the standards you use in analysis. They may be set down by regulations or guidance from the decision maker. Sometimes you can infer the benchmark from the tangible return expected from the problem's solution. Often, however, you will establish benchmarks yourself. Four common methods for doing this are:

- **Reasoning** – the benchmark is based on personal experience and your judgment as to what would be good
- **Historical precedent** – the benchmark is based on relevant examples of prior success
- **Current example** – the benchmark is based on an existing condition, which is considered desirable
- **Averaging** – the benchmark is based on the mathematical average of the solutions you are considering. Averaging is the least preferred of all methods because it essentially duplicates the comparison process.

In practice, the criteria by which you make choices are almost never equally important. Because of this it is often convenient to assign weights to each evaluation criterion. Weighting criteria establishes the relative importance of each with respect to the others. Weighting should reflect as closely as possible the judgment of the decision maker or acknowledged experts. For example, you might judge that two criteria are equal in importance, or that one criterion is slightly favored in importance, or moderately or strongly favored. If you assign these verbal assessments numerical values, say from 1 to 4 respectively, you could use mathematical techniques to produce meaningful numerical criteria weights.

Additionally, pair-wise comparison is an analytical tool that brings objectivity to the process of assigning criteria weights. In performing a pair-wise comparison, you methodically assess each evaluation criterion against each of the others and judge its relative importance. A computer equipped with simple software easily performs the mathematical algorithms.

This process does not in any way diminish the importance of your judgment. Rather it enables you to bring that judgment to bear with greater precision and in problems of greater complexity than might otherwise be possible. Regardless of the method you use to assign criteria weights, you should state the rationale for each when recommending or making a solution.

### Step 4—Generate Possible Solutions

After gathering information relevant to the problem and developing criteria, you formulate possible solutions. Carefully consider the guidance the commander or your superiors have provided, and develop several alternative solutions. You should consider several alternatives, but too many possible solutions may result in time wasted on similar options. Experience and time available determine how many solutions to consider, but you should consider at least two solutions. Doing this will enable you to use both analysis and comparison as problem solving tools. Developing only one solution to “save time” may produce a faster solution but risks creating more problems from factors you didn’t consider.

You should follow two steps when developing solutions:

- Generate options
- Summarize the solution in writing, sketches, or both.

### Generate Options

Creativity is key to developing effective solutions. Often, groups are more creative than individuals. Those working on solutions should have some knowledge of or background in the problem area, however.
The basic technique for developing new ideas in a group setting is brainstorming. In brainstorming, everyone present participates freely in the discussion. Its rules include:

- State the problem and make sure all participants understand it
- Appoint someone to record all ideas
- Withhold judgment of ideas
- Encourage independent thoughts
- Aim for quantity, not quality
- “Hitchhike” ideas—combine your thoughts with those of others.

At the conclusion of brainstorming, discard solutions that clearly do not approach the standards described by your screening criteria. If this informal screen leaves only one solution or none, then the group must generate more options.

**Summarize the Solution in Writing and Sketches**

After generating options, accurately record each possible solution. The solution statement must clearly portray how the action or actions will solve the problem. In some circumstances the solution statement may be a single sentence (for example, “Purchase Model XYZ computers”). In other circumstances the solution statement may require more detail, including sketches or concept diagrams. For example, if the problem is to develop a multipurpose small-arms range, you may choose to portray each solution with a narrative and a separate sketch or blueprint of each proposed range.

**Step 5—Analyze Possible Solutions**

Having identified possible solutions, analyze each one to determine its merits and drawbacks. If criteria are well defined and include careful selection of benchmarks, your analysis is greatly simplified.

Use screening criteria and benchmarks to analyze possible solutions. Apply screening criteria to judge whether a solution meets minimum requirements. For quantitative criteria, measure, compute, or estimate the raw data values for each solution and each criterion. In analyzing solutions, which involves predicting future events, it’s useful to have a process for visualizing those events. Wargaming, models, and simulations are examples of tools that can help you visualize events and estimate raw data values for use in analysis. Once you have determined the raw data values, judge them against applicable screening criteria to determine if a possible solution merits further consideration. Screen out any solution that fails to meet or exceed the set threshold of one or more screening criteria.

After applying the screening criteria to all possible solutions, use benchmarks to judge them with respect to the desired state. Data values that meet or exceed the benchmark indicate that the possible solution achieves the desired state and thus is “good” with respect to that criterion. Data values that fail to meet the benchmark indicate a solution that is not good in terms of the criterion you have identified.

For each solution, list the respects in which analysis reveals it to be good or not good. It is quite possible that every solution you are considering will fail to reach the benchmark, and so be considered not good in terms of a particular criterion. When this occurs, you must acknowledge that there are no good solutions under consideration in that particular respect.

Be careful not to compare solutions during analysis. To do so undermines the integrity of the process and may tempt you to jump to conclusions. Examine each possible solution independently to identify its strengths and weaknesses. Be careful also not to introduce new criteria.
Step 6—Compare Possible Solutions

During this step, compare each solution against the others to determine the best solution. Comparing solutions identifies which solution best solves the problem based on the evaluation criteria. Use any comparison technique that helps reach the best recommendation. The most common technique is a decision matrix. Table 4.1 shows a decision matrix you might develop in solving the Battalion Dining In problem at the beginning of this section.

<table>
<thead>
<tr>
<th>Location</th>
<th>Cost</th>
<th>Distance from campus</th>
<th>Room size</th>
<th>Menu</th>
</tr>
</thead>
<tbody>
<tr>
<td>Criterion weight</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Banquet Hall A</td>
<td>$450</td>
<td>5 miles</td>
<td>Seating for 200</td>
<td>Unlimited</td>
</tr>
<tr>
<td>Banquet Hall B</td>
<td>$500</td>
<td>15 miles</td>
<td>Seating for 100</td>
<td>Limited</td>
</tr>
<tr>
<td>Banquet Hall C</td>
<td>$250</td>
<td>10 miles</td>
<td>Seating for 100</td>
<td>Limited and of questionable quality</td>
</tr>
</tbody>
</table>

You may use quantitative techniques (such as decision matrices, select weights, and sensitivity analyses) to support comparisons. But they are tools to support the analysis and comparison. They are not the analysis and comparison themselves. You should summarize the quantitative techniques clearly so a reader need not refer to an annex for the results.

Step 7—Make and Implement the Decision

After completing your analysis and comparison, identify the preferred solution. For simple problems, proceed straight to executing the solution. For more complex problems, you may need a leader plan of action or formal plan. If a superior assigned the problem, prepare the necessary products (verbal, written, or both) needed to present the recommendation to the decision maker. Before presenting findings and a recommendation, coordinate your recommendation with those whom the problem or solutions affect. In formal situations, you present your findings and recommendations to the decision maker as staff studies, decision papers, or decision briefings.

A good solution can be lost if you can’t persuade the audience that it is correct. Every problem requires both a solution and the ability to communicate it. The writing and briefing skills you possess may ultimately be as important as good problem solving skills.

Based on the decision maker’s decision and final guidance, refine the solution and prepare the necessary implementing instructions. A decision maker can issue formal implementing instructions as a memorandum of instruction, policy letter, or command directive. Once you have given instructions, monitor their implementation, and compare the results to the criteria of success and the desired end state established in the approved solution. When necessary, issue additional instructions.

You must also build into the implementation plan a feedback system that provides timely and accurate information, periodic review, and the flexibility to adjust. Stay involved, and be careful not to create new problems because of uncoordinated implementation of the solution.
Remember: Army problem solving does not end with identifying the best solution or obtaining approval of a recommendation. It ends when you solve the problem.

The Roles of Knowledge, Intuition, Judgment, and Ethics

Even following these steps, you may find that some decisions require you to take into account your knowledge, your intuition, and your best judgment. Intuition tells you what feels right—it comes from accumulated experience and is often referred to as “gut feeling.” Don’t be fooled into relying only on intuition, however, even if it has worked in the past. A leader who says, “Hey, I just do what feels right,” may be hiding incompetence or may just be too lazy to do the homework needed to make a reasoned, thought-out decision. Don’t let that be you. Use your experience, listen to your instincts, but do your research as well. Get the facts and generate alternatives. Analyze and compare as many as time allows. Then make your decision, and act.

Remember also that any decision you make must reflect Army Values. While most problems are not ethical problems, they often have ethical aspects. Taking leave, for example, is a right Soldiers and Department of the Army civilians enjoy, but leaders must balance mission requirements with their subordinates’ desires and their own. Reconciling such issues may require ethical reasoning. As a leader, your superiors and subordinates expect you to take ethical aspects into account and make decisions that are right as well as good.

Critical Thinking

During your recent patrolling operation you (the patrol leader) and the assistant patrol leader (APL) are preparing to execute a reconnaissance mission in support of the commander’s intent in your recent operations order. During the planning phase of your operation you discover that you and your unit are not in the correct position and that you have left behind a critical piece of equipment—the GPS. What will you do? What steps will you take to ensure that you can complete your assigned mission within the allotted time frame?

Critical Thinking

Explain the importance of ethical standards and setting priorities in the problem solving process.
As a leader, you must also set priorities. You may be trying to say something about urgency if you give your subordinates a list of things to do and say, “They’re all important.” But the message you actually send is, “I can’t decide which of these is most important, so I’ll just lean on you and see what happens.”

Sometimes all courses of action may appear equally good (or bad), and any decision may appear equally right (or wrong). Situations like that may tempt you to sit on the fence, make no decision, and let things work themselves out. Occasionally, that may be appropriate. Remember that decision making involves judgment—knowing whether to decide. More often, though, problems left to themselves go from bad to worse. In such situations, making a decision may be less important than simply deciding to do something. Leaders must have the personal courage to say which tasks are more important than others. In the absence of a clear priority, you must set one. Not everything can be a top priority, and you can’t make progress without making decisions.

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**Critical Thinking**

Describe a situation in which no decision would be the best decision.

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**Solving a Training Problem**

A rifle platoon gets a new platoon leader and a new platoon sergeant within days of a poor showing in the division’s military operations on urbanized terrain (MOUT) exercise. The new leaders assume the platoon’s poor showing is a problem. Feedback from the evaluators is general and vague. The platoon’s squad and fire team leaders are angry and not much help in assessing what went wrong, so the new leaders begin investigating. In their fact-finding step they identify the following facts: 1) The Soldiers are out of shape and unable to complete some of the physical tasks. 2) The fire team leaders don’t know MOUT tactics, and some of the squad leaders are also weak. 3) Third Squad performed well, but didn’t help the other squads. 4) The Soldiers didn’t have the right equipment at the training site.

Pushing a bit further to get at the root causes of these problems, the new leaders uncover the following: 1) Platoon physical training (PT) emphasizes preparation for the Army Physical Fitness Test only. 2) Third Squad’s leaders know MOUT techniques, and had even developed simple drills to help their Soldiers learn, but because of unhealthy competition encouraged by the previous leaders, Third Squad didn’t share the knowledge. 3) The company supply sergeant has the equipment the Soldiers needed, but because the platoon had lost some equipment on the last field exercise, the supply sergeant didn’t let the platoon sign out the equipment.
The new platoon leader and platoon sergeant set a goal of successfully meeting the exercise standard in two months. To generate alternatives, they meet with the squad leaders and ask for suggestions to improve training. They use all their available resources to develop solutions. Among the suggestions is to shuffle some of the team leaders to break up Third Squad’s clique and spread some of the tactical knowledge around. When squad leaders complain, the platoon sergeant emphasizes that they must think as a platoon, not just a collection of squads. The platoon sergeant talks to the supply sergeant, who tells him the platoon’s previous leadership had been lax about accounting for property. Furthermore, the previous leaders didn’t want to bother keeping track of equipment, so they often left it in garrison. The platoon sergeant teaches his squad leaders how to keep track of equipment and says that, in the future, Soldiers who lose equipment will pay for it: “We wouldn’t leave our stuff behind in war, so we’re not going to do it in training.”

Building on Third Squad’s experience, the platoon leader works with the squad and fire team leaders to come up with some simple drills for the platoon’s missions. He takes the leaders to the field and practices the drills with them so they’ll be able to train their Soldiers to the new standard.

The platoon sergeant also goes to the battalion’s fitness trainers and, with their help, develops a PT program that emphasizes skills the Soldiers need for their combat tasks. The new program includes rope climbing, running with weapons and equipment, and road marches. Finally, the leaders monitor how their plan is working. A few weeks before going through the course again, they decide to eliminate one of the battle drills because the squad leaders suggested it wasn’t necessary after all.

The platoon leader and platoon sergeant followed the problem solving steps you just read about. Given a problem (poor performance), they identified the facts surrounding it (poor PT practices, poor property accountability, and unhealthy competition), developed a plan of action, and executed it. Where appropriate, they analyzed and compared different alternatives (Third Squad’s drills). They included their subordinates in the process, but had the moral courage to make unpopular decisions (breaking up the Third Squad clique). Will the platoon do better the next time out? Probably, but before then the new leaders must assess the results of their actions to make sure they’re accomplishing what their leaders want. Other aspects of this problem may crop up that were not apparent at first, and following this or any process doesn’t guarantee success. The process is only a framework that helps you make a plan and act. Success depends on your ability to apply your attributes and skills to implementing your plan.
Every once in a while, you may come across a decision that’s easy to make: yes or no, right or left, on or off. As you gain experience as a leader, some of the decisions you find difficult now will become easier. But you will always face difficult decisions that require imagination, that require rigorous thinking and analysis, or that require you to factor in your gut reaction. Those are the tough decisions, the ones the Army is paying you to make. As an experienced first sergeant once said to a brand new company commander, “We get paid the big bucks to make the hard calls.”

Leaders make decisions. Making the right decision is not always easy. The Army problem solving process helps you make fact-based, logical decisions. Some problems, however, will offer competing solutions, in which case you may have to rely on intuition, values, and priorities to arrive at a final decision. The hallmark of a competent leader is the ability to make the tough calls and the right decisions.

Learning Assessment

1. List the seven steps of the Army Problem Solving Process.
2. How do ethics come into play when making a decision?
3. Which Army Problem Solving Process is used at company level and below?

Key Words

problem
decision making
troop leading procedures
military decision making process
facts
assumptions

References

Field Manual 5-0, Army Planning and Orders Production. 20 January 2005.