

Problem Solving

(Lecture 5)

October 2005

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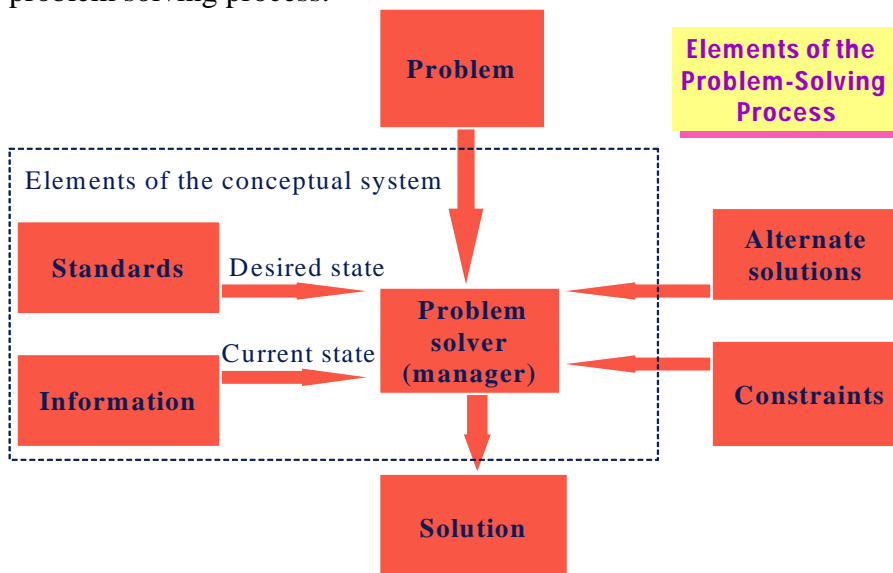
A problem is a condition that has the potential to cause exceptional harm or produce exceptional benefit. Thus, problem solving is the act of responding to problems so as to suppress their harmful effects or capitalize on the opportunity for benefit.

Decision Making and Problem Solving

A decision is the selection of a strategy or action. Decision making is the act of selecting the strategy or action that the manager believes will offer the best solution to the problem.

Elements of a Problem Solving Process

Several elements must be present in order for the manager to successfully engage in the problem solving process.



- The system standards describe the **desired state**- what the system should achieve.
- Managers must also have information that describes the **current state**-what the system is now achieving.
- The difference between the desired and the current states represents the **solution criterion**, or what it will take to bring the current state to the desired state. If the current state represents a higher level of performance, then the current state should be brought at a higher level. If this high level can be maintained, then the desired state should be raised.
- It's the manager's responsibility to identify **alternative solutions**. The manager typically relies on his/her own experience or obtains help from the non-computer portion of the information processor such as inputs from others both outside and inside the organization.
- The information system can then be used to evaluate each alternative. This evaluation should consider any possible constraints, which can be either internal or environmental. **Internal constraints** take the form of limited resources that exist within the firm.

Environmental constraints take the form of pressures from various environmental elements that restrict the flow of resources into and out of the firm.

Problems versus Symptoms

- Symptoms are produced by the problem
- The problem causes the symptoms
- When the problem is corrected the symptoms will cease, but not vice versa

Problem Structure

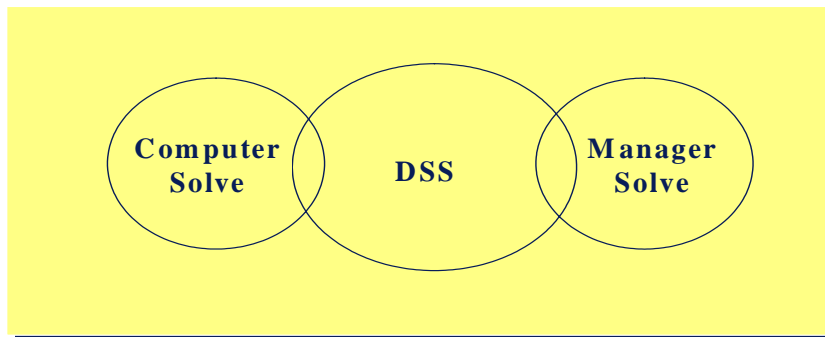
Structured Problem: consists of elements and relationships between elements, all of which understood by the problem solver.

Unstructured Problem: contains no elements or relationships that are understood by the problem solver.

Semi-structured Problem: contains some elements and relationships that are understood by the problem solver.

While computers can solve structured problems without management involvement, the manager has to do most of the work in solving unstructured problems.

As for semi-structured problems, both, the manager and the computer can jointly work toward a solution.(DSS concept)



Structured Semi-structured Unstructured

THE SYSTEMS APPROACH

According to John Dewey, a philosophy professor, there are three series of judgments involved in adequately resolving a controversy.

1. Recognize the controversy
2. Weigh alternative claims
3. Form a judgment

Dewey did not use the term *systems approach*, but he recognized the sequential nature of problem solving- beginning with a problem, then considering different ways to solve it, and finally selecting the solution that appears best.

During the late 1960s and 1970s, computer manufacturers, management scientists, and information specialists were all searching for ways to use the computer in solving the manager's problems systematically. The recommended framework for using the computer became known as the **systems approach**- a series of problem solving steps that ensure the problem is first understood, alternative solutions are considered, and the selected solution works.

A Series of Steps

It consists of 10 steps, grouped into three phases, while each phase consists of a particular type of effort that the manager must expend.

- **Preparation Effort** prepares the manager for problem solving by providing systems orientation.
- **Definition Effort** consists of identifying a problem to be solved and then understanding it.
- **Solution Effort** involves identifying alternative solutions, evaluating them, selecting the one that appears best, implementing that solution, and following up to ensure that the problem is solved.

Phase I: Preparation Effort

- Step 1. View the firm as a system
- Step 2. Recognize the environmental system
- Step 3. Identify the firm's subsystems

Phase II: Definition Effort

- Step 4. Proceed from a system to a subsystem level
- Step 5. Analyze system parts in a certain sequence

Phase III: Solution Effort

- Step 6. Identify the alternative solutions
- Step 7. Evaluate the alternative solutions
- Step 8. Select the best solution
- Step 9. Implement the solution
- Step 10. Follow up to ensure that the solution is effective

Decisions are made at each step of the definition and solution phases

PREPARATION EFFORT

The three preparatory steps do not have to be taken in order, as they jointly produce the desired frame of mind for addressing problems.

Step One-View of the Firm as a System

The manager must view his/her firm as a system and see how it fits the general systems model.

Step Two- Recognize the Environmental System

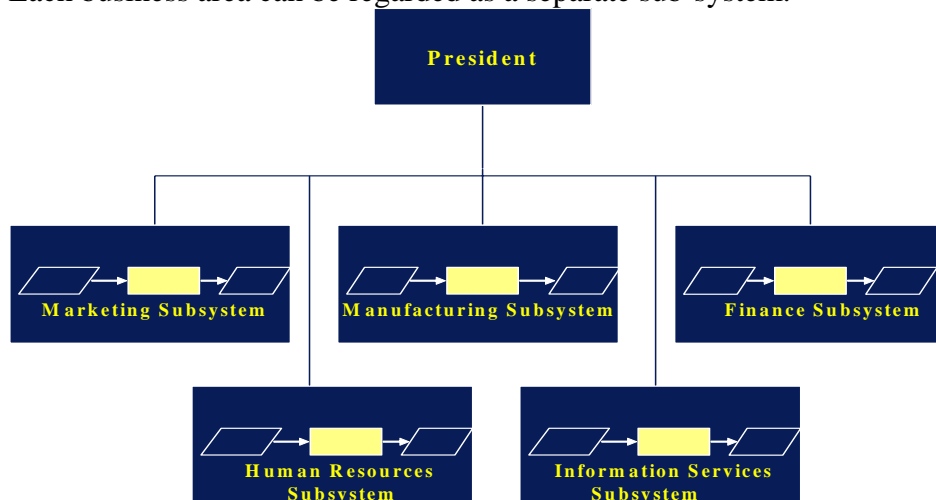
The firm's relationship to its environment is also important. The eight environmental elements (*discussed in Lecture3*) provide an effective way of positioning the firm as a system in its environment.

Step Three- Identify the Firm's Subsystems

The major subsystems of the firm can take several forms.

- **Business areas**

Each business area can be regarded as a separate sub-system.



- **Levels of management**

The manager can also regard the levels of management as subsystems. The subsystems have a superior-subordinate relationship and are connected by both information and decision flows. Top management makes decisions that filter down through the organization. The firm creates the products and services on the lower level, and information describing the activity flows up through the organization. Seeing the firm in this manner makes the information flows clearer.

- **Resource flows**

The manager can also use resource flows as a basis for dividing the firm into subsystems. The finance area specializes in the money flow, and the human resources area specializes in the personnel flow. Some manufacturing firms have added a separate materials management unit to handle the material flow through the manufacturing and marketing functions.

DEFINITION EFFORT

Definition effort is stimulated by a feedback signal that indicates things are going better or worse than planned. This signal serves as a **problem trigger** by initiating the problem-solving process.

The trigger can be:

1. An action
2. The passage of time
3. From within the firm or the environment

Once the problem is identified, the manager can call on the analyst to assist in problem understanding. The analyst is skilled in converting an ill-defined problem into the specifications of a new or revised system. The manager and the analyst use a combination of information-gathering methods to understand the problem.

The definition effort consists of two steps:

- proceed from a system to a subsystem level
- analyze system parts in a certain sequence

Step Four- Proceed from a System to a Subsystem Level

As the manager seeks to understand the problem, the analysis begins on the system for which the manager is responsible. The system can be the firm or one of its units. The analysis then proceeds down the system hierarchy, level by level.

The manager first studies the position of the system in relation to its environment.

- Is the system in equilibrium with its environment?
- Are resources flowing between the system and its environment in the desired manner?
- Is the system meeting its objectives of providing products and services to the environment?

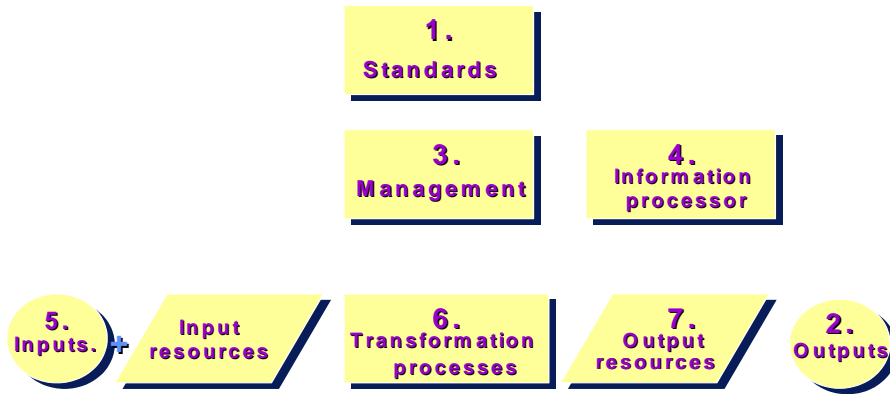
Next the manager analyzes the system in terms of its subsystems.

- Are the subsystems integrated into a smoothly functioning unit?
- Are all of the subsystems working toward the system objectives?

The purpose of this top-down analysis is to identify the system level, where the cause of the problem exists.

Step Five- Analyze System Parts in a Certain Sequence

As the manager studies each system level, the system elements are analyzed in sequence.



1. Evaluate standards.

Management sets the standards and must ensure that they have certain characteristics:

- They must be valid. That is, they must be a good measure of system performance.
- They must be realistic. A 20 percent increase in sales is not realistic if it has never been achieved before and there is no basis for such optimism.
- They must be understandable to those who are expected to meet them.
- They should be measurable. (eg. realize a profit of 10% of sales)

2. Compare system outputs with standards

The manager evaluates the system output by comparing them with the standards. If the system is meeting its standards, there is no need to continue with the systems approach to problem solving. In this case, the manager can reevaluate the standards in light of the good current performance and check if they need to be raised.

3. Evaluate management

A critical appraisal is made of the system's management and organizational structure.

- Does a management team exist in terms of both the required quantity and quality?
- Are there enough managers, and do they have the right skills and abilities? The signals that indicate this to be a problem are (1) managers working excessively long hours and (2) decisions that prove to be faulty.
- Does the organizational structure help or hinder the problem-solving process?

4. Evaluate the information processor

It is possible that a good management team is present, but the team simply is not getting the information it needs. If this is the case, the needs must be identified and an adequate information system must be designed and implemented.

5. Evaluate the inputs and input resources

At this level, the conceptual system is no longer of concern, and the problem exists within the physical system. An analysis is made of both the physical resources in the input element of the system and the resources flowing through that element from the environment.

6. Evaluate the transformation processes

Inefficient procedures and practices might be causing difficulties in transforming the inputs into outputs. Automation, robotics, computer aided design and computer-aided manufacturing (CAD/CAM), and computer integrated manufacturing (CIM) are modern day examples of efforts to solve transformation problems.

7. Evaluate the output resources

Here the manager considers the physical resources in the output element of the system.

SOLUTION EFFORT

Solution effort involves a consideration of the feasible alternatives, a selection of the best one, and its implementation.

Step Six- Identify Alternative Solutions

The manager identifies different ways for solving the same problem. The manager seldom attempts to solve problems alone. Problem solvers frequently engage in **brainstorming**, an informal activity in which participants present their views, which are then discussed by the group. A more formal approach is called a **JAD session**. JAD stands for **joint applications design** and is a group decision support system approach to problem solving. The group discussion is guided by a leader called a facilitator, and the proceedings are recorded in written form by scribes.

Step Seven- Evaluate the Alternative Solutions

All of the alternatives must be evaluated using the same **evaluation criteria**- measures of how well an alternative would solve the problem. The evaluation clarifies the advantages and disadvantages of implementing each alternative. However, the fundamental measure is the extent to which an alternative enables the system to meet its objectives.

Step Eight- Select the Best Solution

Henry Mintzberg, a management theorist, has identified three ways that managers go about selecting the best alternative:

- **Analysis**- a systematic evaluation of options, considering their consequences on the organization's goals.
- **Judgment**- the mental process of a single manager.
- **Bargaining**- negotiations between several managers.

Step Nine- Implement the Solution

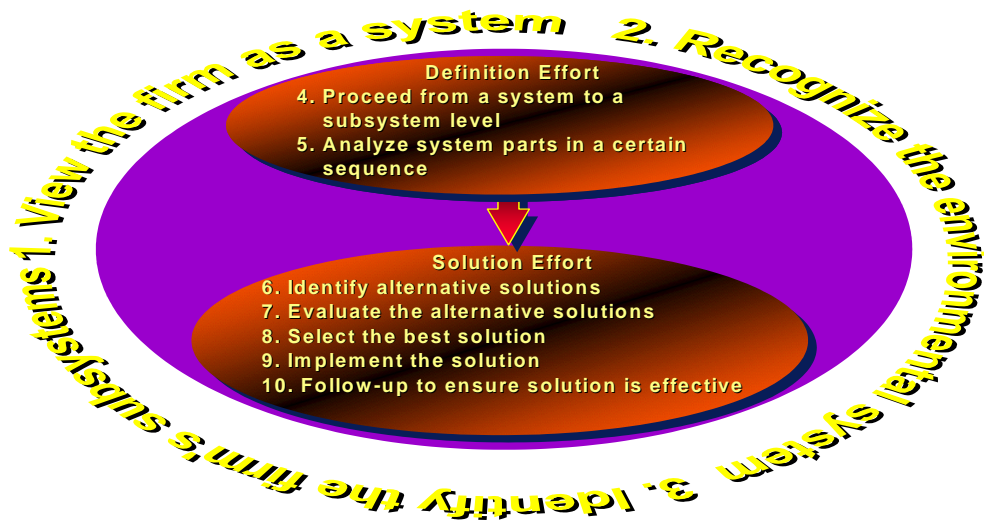
The problem is not solved simply by selecting the best solution. It is necessary to implement the solution.

Step Ten- Follow Up to Ensure That the Solution is Effective

The manager should stay on top of the situation to ensure that the solution achieves the planned performance. When the solution falls short of expectations, it is necessary to retrace the problem-solving steps to determine what went wrong.

This process is repeated until the manager is satisfied the problem has been solved.

REVIEW OF THE SYSTEMS APPROACH



Although it is not difficult to understand each step of the systems approach separately, fitting them together into a single process requires much effort. Managers develop this integrative skill through experience.

A good starting point is the *preparation effort* that the manager should expend before problem solving begins. The manager should view his or her organizational unit as a system residing within a larger environment super-system and consisting of several subsystems. This orientation represents the outer ring.

The manager engages in functional disposition by proceeding from system to subsystem and by analyzing systems parts in a certain sequence. Together these activities constitute *definition effort* in the upper circle of the figure.

Once the problem has been identified, it can be solved by following the remaining five steps in the lower circle- *the solution effort*.