General Problem-Solving Concepts

Chapter 1
Problem Solving in everyday life

• People make decisions every day to solve problems that affect their lives
  • Important problems
  • Unimportant problem
• Bad/Good decision
Six Steps of Problem Solving

• There are six steps to follow to ensure the best decision:

1. **Identify the problem.**

• The first step toward solving a problem is to identify the problem

• **What is the specific problem?** (This means you should determine what is that you want to change)

• **Clearly define the goal that you want to achieve.** (What are you trying to achieve?)

• **Determine what are the inputs and outputs**

• If you don’t know what the problem is, you cannot solve it.
Six Steps of Problem Solving – Cont.

2. Understand the problem

- You must understand what is involved in the problem before you can continue toward the solution.
- This includes understanding the knowledge base of the person or machine for whom you are solving the problem.
- Also, you also must know your own knowledge base. You cannot solve a problem if you do not know the subject. For example, to solve a problem involving accounting, you must know accounting.
- You can’t automatically desired the information.
Six Steps of Problem Solving – Cont.

3. **Identify alternative ways to solve the problem**
   - Generate as many potential solutions as possible
   - List the features for each possible solution
   - You might want to talk to other people to find other solutions than those you have identified.
   - Alternative solutions must be acceptable ones
Six Steps of Problem Solving – Cont.

4. Select the best way to solve the problem from the list of alternative solutions

• In this step, you need to identify and evaluate the pros and cons of each possible solution before selecting the best one

• In order to do this, you need to select criteria for the evaluation
5. List instructions that enable you to solve the problem using the selected solution

- These numbered, step-by-step instructions must fall within the knowledge base set up in step 2
- Do Stage
  - Planning: Create a numbered, step-by-step set of instructions
Six Steps of Problem Solving – Cont.

6. Evaluate the solution

- To evaluate or test a solution means to check its result to see if it is correct, and to see if it satisfies the needs of the person(s) with the problem.

- Test the solution
  - Are the results accurate?
  - Does the solution solve the original problem?
  - Does it satisfy the needs of the user?
  - Is it acceptable to the user?
Now let’s put problem-solving into action!
Take the problem of what to do this evening

1. Identify the problem
   - How do the individuals wish to spend the evening?

2. Understand the problem
   - The only solutions that should be selected are ones that everyone involved would know how to do

3. Identify alternatives
   a. Watch television
   b. Invite friends over
   c. Play video games
   d. Read a book
   Etc.
Take the problem of what to do this evening – Cont.

4. Select the best way to solve the problem
   a. Weed out alternatives that are not acceptable
   b. Specify the pros and cons of each remaining alternative, and weigh them to make the final decision.

• This solution will be the best alternative if all the other steps were completed well.

5. Prepare a list of steps (instructions) that will result in a fun evening.

6. Evaluate the solution.
   • Are we having fun yet?
### Problem Description

Today is the final day for Abeer in high school, she & her family gathered to decide which university for here to attend.

### Steps

<table>
<thead>
<tr>
<th>Identify the problem.</th>
<th>Identify the problem.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Problem:</strong> Enrolling in a university &amp; department</td>
<td><strong>Goal:</strong> Name university and department that she will this year.</td>
</tr>
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<table>
<thead>
<tr>
<th>Understand the problem.</th>
</tr>
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<tbody>
<tr>
<td><strong>Facts:</strong></td>
</tr>
<tr>
<td>• Searching for Universities available.</td>
</tr>
<tr>
<td>• Knowing her grades, hobbies, specialties and Gender.</td>
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<table>
<thead>
<tr>
<th>list possible solutions to the problem</th>
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<tbody>
<tr>
<td>• go local university. (speed, not have desired section, monthly reward)</td>
</tr>
<tr>
<td>• go a broad. (trip expenses, have desired section, free enrolment, monthly reward)</td>
</tr>
<tr>
<td>• go private university. (trip expenses very expensive, school I prefer, enrolment is not free)</td>
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<table>
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<tr>
<th>Select the best solutions to the problem.</th>
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<tbody>
<tr>
<td><strong>Criteria:</strong></td>
</tr>
<tr>
<td>1. enters high ranked university and desired section.</td>
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<tr>
<td>2. Not expensive.</td>
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<tr>
<td>3. Free.</td>
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<tr>
<td>So, solution 2.</td>
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<tr>
<th>List instructions (Do Stage)</th>
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<tbody>
<tr>
<td>1. Send an enrol application to the university.</td>
</tr>
<tr>
<td>2. Wait for reply.</td>
</tr>
<tr>
<td>3. Pack your stuff, go to university.</td>
</tr>
<tr>
<td>4. Attend first day.</td>
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<tr>
<th>Evaluate the solution (Review and Revise).</th>
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<tbody>
<tr>
<td>I felt lonely, grades were low.</td>
</tr>
<tr>
<td>So, must change solution (revaluate)</td>
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Problems

- People solve problems daily at home (example?), or work (example?)
- The better the decisions you make (for example at work), the more valuable that person will be to the company.
- In each case, the six steps in problem solving can be followed
- Most people use them without even knowing it
Types of Problems

• Problems do not always have straightforward solutions
• **Algorithmic solutions**
  • Problems that can be solved with a series of actions
  • Ex: Baking a cake
  • The solution will be the same each time the algorithm is followed
  • The solution of a problem can be reached by completing the actions in steps. These steps are called the **algorithm**.
• **Heuristic solutions**
  • Solutions that cannot be reached through a direct set of steps
  • Example: expanding a company
  • These solutions require reasoning built on knowledge and experience, and a process of trial and error
  • The results may not produce the same results each time the algorithm is executed
Problem Solving with Computers – Cont.

- Computers are built to deal with algorithmic solutions, which are often difficult or very time consuming for humans.

- People are better than computers at developing heuristic solutions.

- The field of computers that deals with heuristic types of problems is called artificial intelligence.

- Artificial intelligence enables a computer to do things like build its own knowledge bank and speak in a human language.
Problem Solving with Computers

• **Solution**
  - The instructions listed during step 5 of problem solving - the instructions that must be followed to produce the best results
  - The result may be: More Efficient, Faster, More Understandable, or Reusable

• **Results**
  - The outcome or the completed computer-assisted answer
  - May take any form: Printout, Updated files, Output to monitor, speakers, etc.

• **Program**
  - The set of instructions that make up the solution after they have been coded into a particular computer language