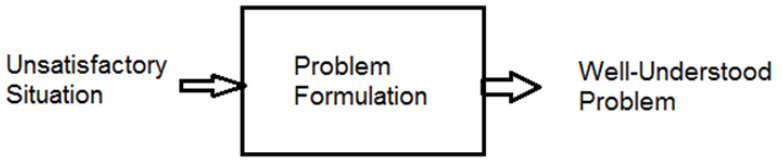
Problem Formulation

EECE401 Senior Design I



- **( ):** "*The mere formulation of a **problem** is far more essential than its solution, which may be merely a matter of mathematical or experimental skill.*"
- Problem Formulation:
  - Definition: "The process of **converting** a dissatisfied situation into a well-understood & right problem"
  - Focus: Understanding the problem ("Needs" or "Dissatisfied Situation"), Not finding detailed solution to the problem
- Why do we do this? What's the purpose?
  - **Need Identification** (so that we do not solve solved-problems)
  - **Meet the needs** (so that not wasting resources)

Problem in identifying the **Right** problem

- **( ):** "If I were given one hour to save the planet, I would spend 59 minutes defining the problem and one minute resolving it." – Importance of in-depth understanding (or diagnosis) of the problem
- **Status**
  - ☒Most do not heed nor follow the above wise words

Checkout Line Complaints: Problem Identification

Situation: Customer Complaint: Cashiers talk each other while serving customer.

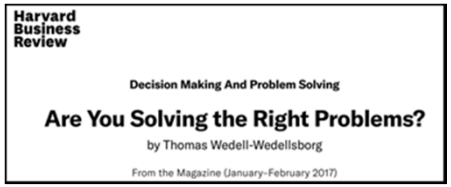
Store Manager's Response:

Problem in identifying the **Right** problem

- **Einstein:** "If I were given one hour to save the planet, I would spend 59 minutes defining the problem and one minute resolving it." – Importance of in-depth understanding (or diagnosis) of the problem
- **Status**
  - Most do not apply a rigorous process for understanding the dimensions of the problem
    - Organizations speed toward a solution
    - They fear that they spend too much time defining a problem
    - Superiors may punish for taking so long to get to the start line
  - They may solve a wrong problem
    - Wasting time and money
    - Reduced odds of success

Problem in identifying the **Right** problem

- **(Einstein):** "If I were given one hour to save the planet, I would spend 59 minutes defining the problem and one minute resolving it." – Importance of in-depth understanding (or diagnosis) of the problem
- **Status**
  - ☒ They do not re-frame the problem ("Outsider's view")


Harvard Business Review

Decision Making And Problem Solving

Are You Solving the Right Problems?

by Thomas Wedell-Wedellsborg

From the Magazine (January–February 2017)

Identifying Needs and Defining for our own project problem

- **Identify Needs**
  - Dissatisfied situation, needs, or problems
    - Given Project:
      - Ask your project advisor or Competition Rules what he/she/competition **needs** for the team (until you fully grasp)
      - Ask what specific problem is given to solve
      - Ask what the final product looks like
    - Your own project:
      - What undesired situation you try to change/improve;
      - What specific needs you try to meet
      - what **specific problem** you try to solve
      - Ask what the final product looks like

Identifying Needs and Defining Our Project Problem

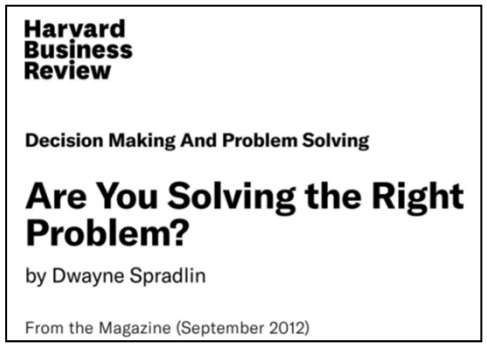
Caution

- Don't consider Exact Solution yet --- this will limit your solution ideas !!! → Just settle with a general solution idea
- **No Rush to get an exact solution** when Needs are to be Identified:
- **If you're in a hurry**
  - A **wrong problem** may be solved!
  - A symptom (not the cause) may be solved!
  - **A part** of the problem may be solved!
  - So, instead, spend more time in the needs, problems, or undesired situations (instead of finding solutions)

Problem-Definition Process – 3 steps

Step 1: Establish the Need

- Answer the following 2 questions
  - What is the basic need?
    - Focus on the heart of the problem (instead of jumping to a solution)
    - Try to re-frame the problem
  - What is the desired outcome?
    - Understand the perspectives of customers and other beneficiaries
    - Address the question qualitatively and quantitatively: (ex) improve energy generation 10% by January 2025”



Problem-Definition Process

- Step 2: Justify the Need & Contextualize the Problem
  - Answer the following 2 questions
    - Is the effort aligned with our ability/competence?
      - Is working on the problem in sync with our strength and abilities?
      - Is the problem big/small enough for us to handle within 2 semesters?
    - What have others tried to solve the problem?
      - Why isn't there any solution yet?
      - Why have some approaches have failed?
- Step 3: Write the "Problem Statement"
  - Clear full description helps people inside and outside the organization quickly grasp the issue

Problem Statement in the Context of Value Proposition

- **"Value Proposition"**
  - **Why my solution is the best**

- **Contents:**
  - Customer's Need : Identify customer's need
  - Approach: Provide my team's Conceptual approach
  - Desired Outcomes (or Benefits): Describe the benefits provided by our approach

  - *Source: "Practice of Innovation" by C. R. Carlson

Value Proposition - Example

- Paul Cook, a Silicon Valley Hall of Fame entrepreneur. It is the value proposition presented to a cable company executive for a video-on-demand system.
- "I understand that you are looking to expand your business. I think we might be able to help.
- (**Need**/Problems/Undesired Situation)
  - What people really dislike are the obligation to return the tapes plus the late fees.
  - Customers find that it is inconvenient and wastes time.
- (Conceptual **Approach**)
  - A video on demand allows your customers to use your cable system, with access to all the movies of Blockbuster.
  - Our approach makes use of one of your currently unused channels, with no changes to your system.
- (Desired Outcomes or **Benefits**)
  - Your customers will have all the pause and fast forward functions of a VCR when watching the movie, and they do not have to return the movie when done.
  - Late fees are gone.
  - We estimate you could capture a market share of 20 percent.

Example of Value Proposition – **Final Problem Statement**

- **Order:**
  - **Itemization**
  - **Sentencization: 1 sentence for each element**
- Needs/Problems/Undesired Situation: People dislike the obligation to return the tapes plus the late fees
- Approach (Concept): A video on demand allows your customers to use your cable system, with access to all the movies of Blockbuster, which makes use of one of your currently unused channels, with no changes to your system.
- Benefits: Customers will have all the pause and fast forward functions of a VCR when watching the movie, and they do not have to return the movie when done, which leads for you to capture a market share of 20 percent.

Example of Problem Formulation – Exercise 1

- Subject: Hands-Free Phone Holder
  - **1-sentence** for each of the 4 elements

- **Itemization**
  - Need/problem/undesired situation
    - *
    - *
    - 1-sentence:
  - Conceptual Approach
    - *
    - *
    - 1-sentence:
  - Desired Outcomes or Benefit
    - *
    - *
    - 1-sentence
- **3-sentence Problem Statement:**

Example of Value Proposition – Exercise 2

- Subject: Pager/Beeper (as proposed in era of the Landline only phone system)
  - **1-sentence** for each of the 3 elements

- Itemization
  - Need/problem/undesired situation
    - *
    - *
    - 1-sentence:
  - Conceptual Approach
    - *
    - *
    - 1-sentence:
  - Desired Outcomes or Benefit
    - *
    - *
    - 1-sentence:
- 3-setence Problem Statement:

What is your team's Problem Statement?

- Discuss this problem in your team's next weekly meeting
- Form ("Problem Statement Form") in the Class Webpage
- How to fill out a problem statement form?
  - 1. List all for each of the 3 elements
  - 2. For each element, make out 1 sentence from the listed items.
  - 3. Fill the "Final statement" with the 3 sentences.

Problem Statement Form
For Senior Design Classes EECE401 and EECE404
Electrical Engineering and Computer Science
Howard University

Academic Semester/Year: (Fall 20___)

Submission Date	
Project Title	
Project Team Name	
Project Team Members	
Project Advisor	
Project Final Product	
Problem Statement (A. list/itemize each of the 3 elements; B. Make out 1 sentence for each element; and C. Fill out the last box with the 3 sentences made in B above.)	Needs (Problems/Dissatisfied Conditions/Situations): • • •
	Approach (Concept): • • •
	Benefits: • • •
	3-sentence problem statement: