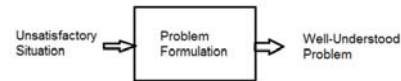## Problem Formulation:

- **Einstein:** "*The mere formulation of a (   ) is far more essential than its solution, which may be merely a matter of mathematical or experimental skill.*"

- Problem Formulation:

  - Definition: "The process of (   ) a <u>dissatisfied situation</u> into a <u>well-understood problem</u>"

  - Focus: Understanding the problem ("Needs"), Not finding detailed solution to the problem

- Why do we do this? What's the purpose?
  - Need Identification
  - Problem Definition, and
  - Clear set of **Requirements (Technical & Socio-Cultural)** that can guide the design process through to its completion

1

Identifying Needs and Defining Problem - "How to"

- **Identify Needs**
  - Dissatisfied situation - -- problem/needs or research topic of the team
    - Ask your project advisor what he/she **needs** for the team for the academic year
    - Ask what **specific problem** you're asked to solve
    - Ask what does the final product (solution) look like
    - Don't consider Exact Solution yet --- this will limit your solution ideas !!! → Just settle with <u>a general solution</u> 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 Problem Formulation

2

No rush to "solution"

Checkout Line Complaints: Problem Identification

Blind Men and the Elephant

 Lesson?

Problem Formulation in the Context of Value Proposition

☐ **"Value Proposition"**

  ☐ **Why I am the best person for the position**

☐ **Contents: NABC**

  ☐ Customer's **N**eed : Identify customer's need

  ☐ My **A**pproach: Provide my team's <u>Conceptual</u> approach

  ☐ **B**enefits to the Customer: Describe the benefits provided by our approach

  ☐ Why My approach is better than Alternatives and **C**ompetition's: What our solution is better than others.

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

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Example of Value Proposition - 1

☐ 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**)

  ☐ Movie rentals represent a $5 billion business opportunity that you currently cannot access.

  ☐ The only parts of rentals that people really <u>dislike</u> are the obligation to return the tapes plus the late fees.

  ☐ Customers find that it is <u>inconvenient and wastes</u> time.

☐ (**Approach**)

  ☐ We have <u>developed a system</u> that allows you to provide videos on demand to your customers using your cable system, with access to all the movies of Blockbuster.

  ☐ <u>Our approach</u> makes use of one of your currently unused channels, with no changes to your system.

  ☐ In addition, you do not need to invest any capital. Each movie costs your customers $6.99, the same cost as a rental at a video store.

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

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Example of Value Proposition - 1

- (**Benefits** per costs)
  - You will <u>receive</u> $5 of new revenue per movie rented, with a margin of 20 percent after paying for the movie costs.
  - Your customers will have all the <u>pause and fast forward functions</u> of a VCR when watching the movie, and they <u>do not have to return</u> the movie when done. <u>Late fees</u> are gone.
  - We estimate you could <u>capture a market share</u> of 20 percent.
- (**Competition**)
  - Our system <u>is patented</u>, and it is the <u>only one</u> to include all of these features.
  - Online rentals represent new competition for both you and us, but they have a handling-cost disadvantage of 75 cents per tape.
  - Sending videos back is inconvenient, plus they cannot provide spontaneous purchases.

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

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

- **<u>1 sentence for each element</u>**
- <u>Needs</u>: People dislike the obligation to return the tapes plus the late fees
- <u>Approach</u>: We have developed a system that allows you to provide videos on demand to your customers with access to all the movies, which does not require you to invest any capital because you receive the cost difference between your license fee and the customer cost.
- <u>Benefits:</u> 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.
- <u>Competitiveness</u>: Our system is patented, and it is the only one to include all of the streaming features.

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Example of Value Proposition – Exercise 1

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

- Approach

- Benefit

- Competitiveness

Problem Formulation Exercise 2

(Situation)

A group of Howard students happened to have a chat with an agent of Jimmy Hendrix and Eric Clapton, and the group learned that the artists wished to have their stage amplifier all cordless.

1 sentence each on
Need:
Approach (conceptual solution)
Benefit:
Competitiveness:

What is your team's Problem Statement?

- Discuss this problem in your team's next weekly meeting
- Form ("Problem Statement Form") will be provided
- How to fill out a problem statement form?
  - 1. List for each of the 4 elements
  - 2. For each element, make out 1 sentence from the listed items.
  - 3. Fill the "Final statement" with the 4 sentences.

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

Academic Semester/Year: (Fall 20___)

Project Name or Title	
Project Team Members	
Project Advisor	
Project goal/scope	
Project Deliverables	
Problem Statement (A. list/itemize each of the 4 elements; B. Make out 1 sentence for each element; and C. Fill out the last box with the 4 sentences made in B above.)	Needs (Dissatisfied Conditions/Situations): • • •
	Approach: • • •
	Benefits: • • •
	Competitiveness: • •
	4-sentence problem statement: