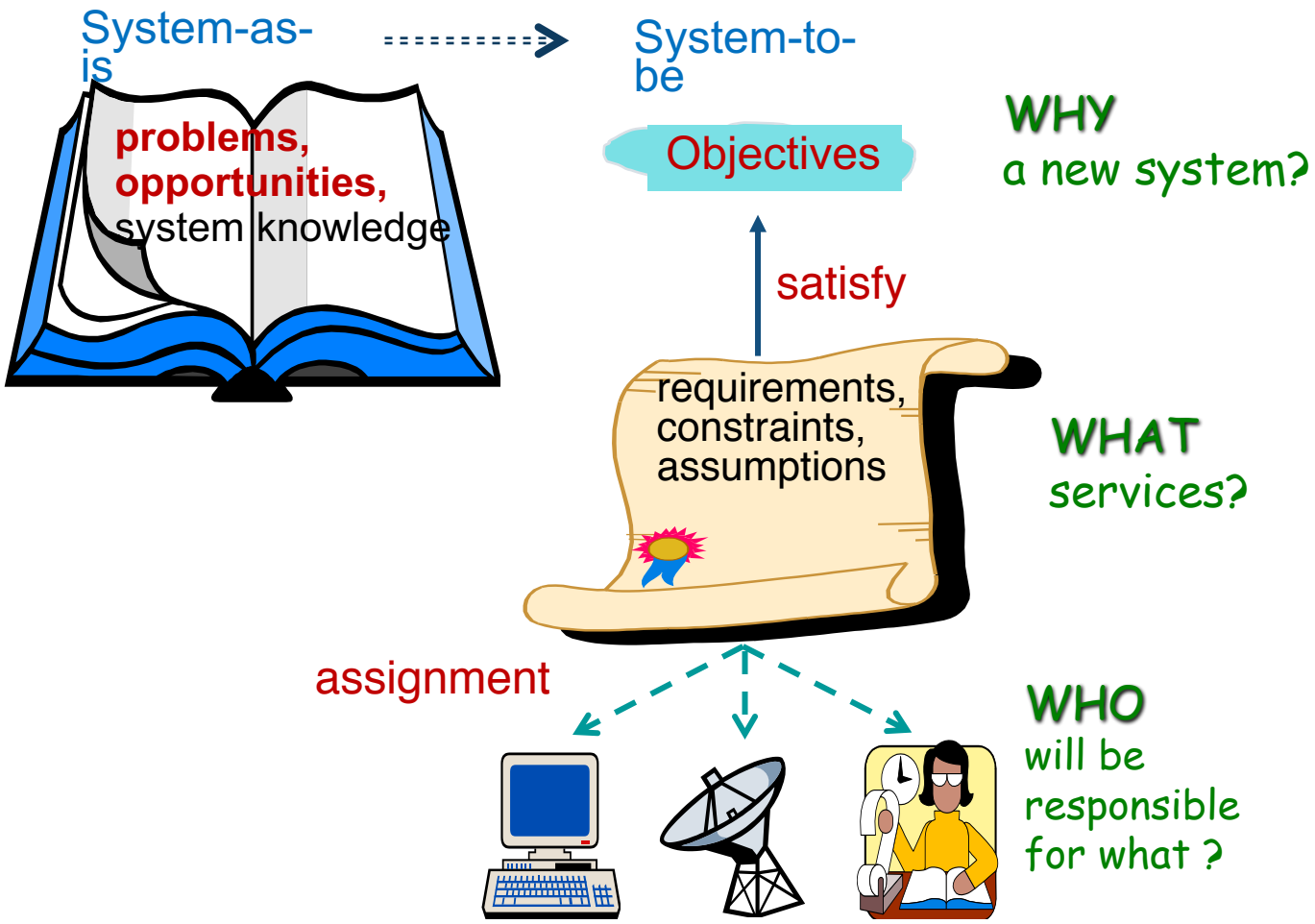

بسم الله الرحمن الرحيم

Software Requirement Engineering

LECTURER: SYED HASNAIN ABBAS BUKHARI

The scope of RE: WHY, WHAT, WHO



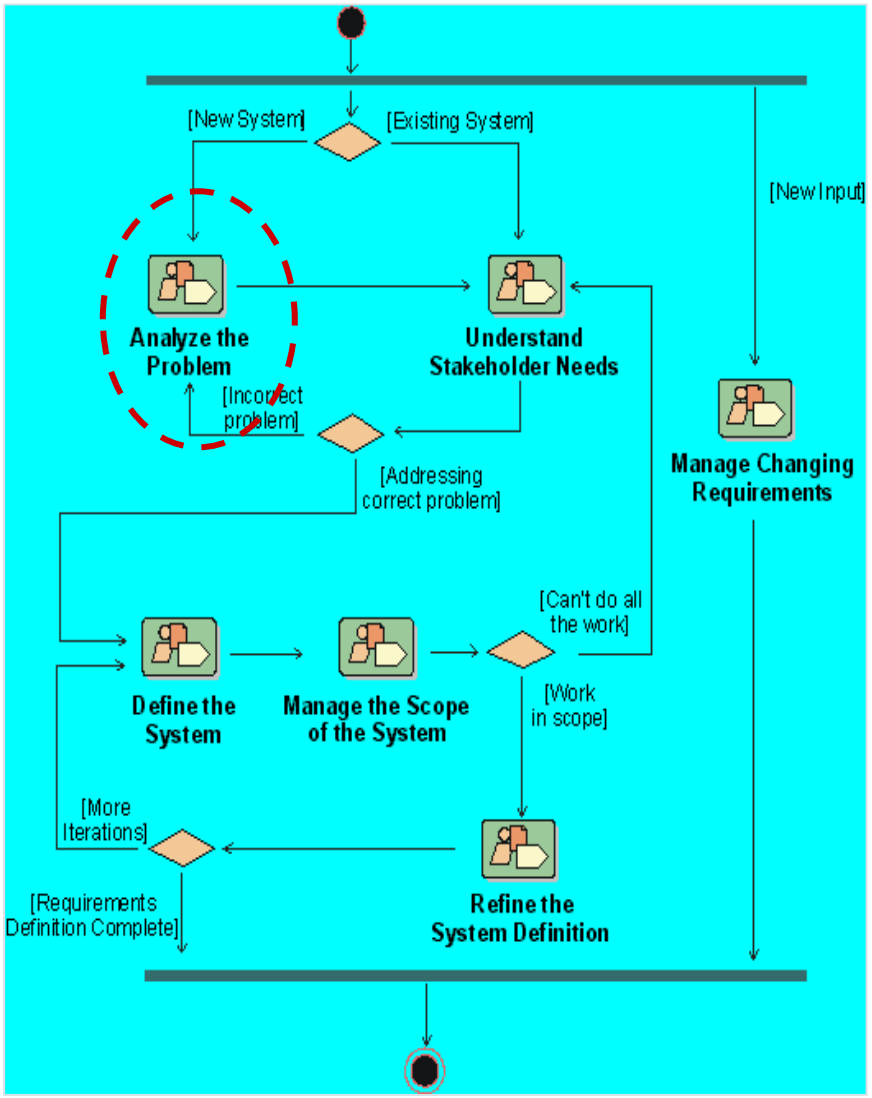
Definition of a Problem

“A problem can be defined as the difference between

things as ***perceived*** and things as ***desired”***

RUP Workflow Details

- Problem Analysis
- "The process of understanding real-world problems and user needs and proposing solutions to meet those needs."



Five steps – Analyzing the problem

1. Gain agreement on the problem definition
2. Understanding the root causes
3. Identify the stakeholders and the users
4. Define the solution system boundary
5. Identify the constraints to be imposed on the solution

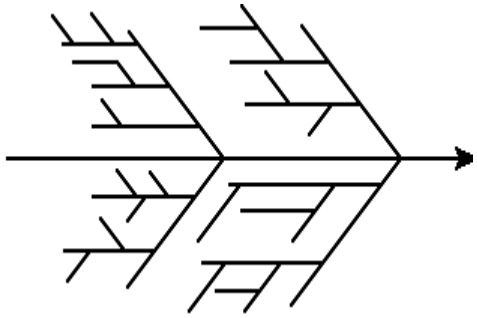
Gain Agreement

- **What is the problem?**
  - We technologists tend to rush headlong into solution providing rather than taking time to truly understand the problem.
  - **Suggestion:** Write it down, see if you can get everyone to agree on it.

- **What is the problem, really?**
  - Searching for root causes - or the “problem behind the problem” - often leads to a clearer understanding of the real problem.

Root Causes

- **Problem behind the problem**
- **How to find?**
  - Ask, and Ask
  - Gather data



- **Fishbone diagram**
  - Be sure everyone agrees on the effect or problem statement before beginning.
  - Be to the point.
  - For each node, think what could be its causes. Add them to the tree.
  - Pursue each line of causality back to its root cause.
  - Consider grafting relatively empty branches onto others.
  - Consider splitting up overcrowded branches.
  - Consider which root causes are most likely to merit further investigation.

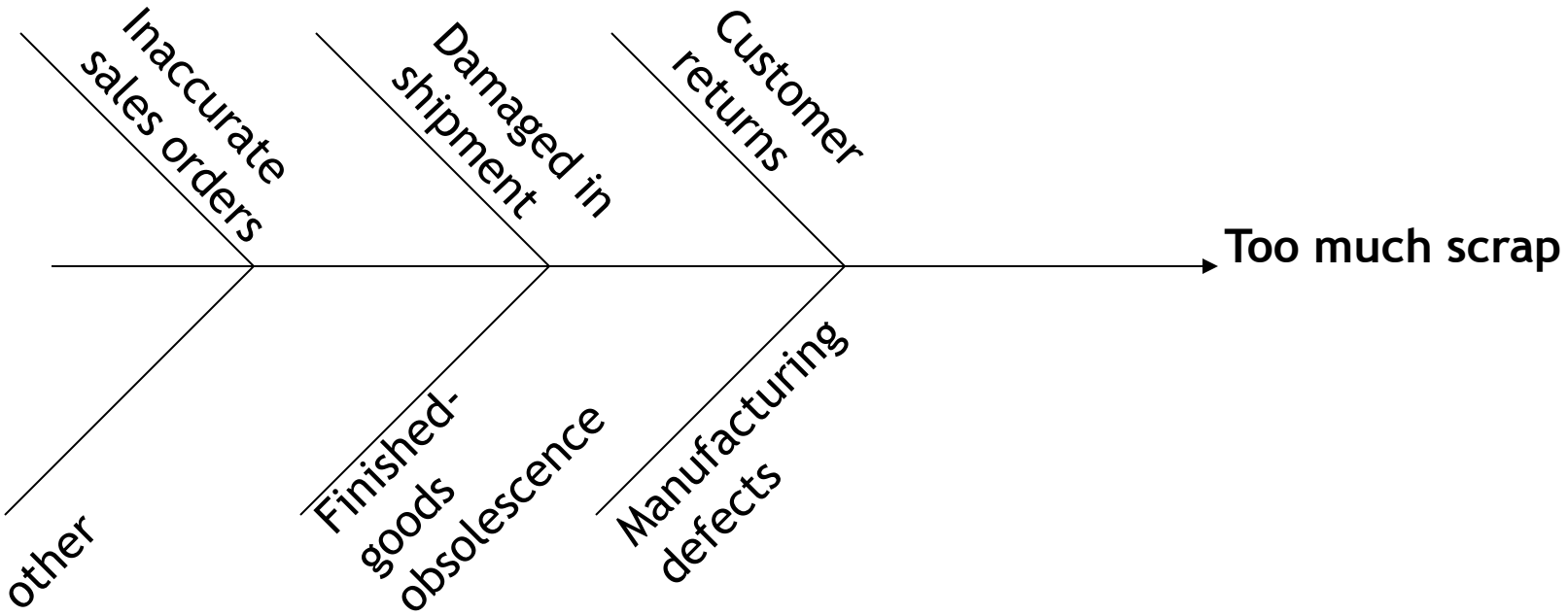
Root Causes

- **Fishbone diagram**
  - List the problem/issue to be studied at the "head of the fish".
  - Label each "bone" of the "fish“. The major categories typically utilized are:
    - The 4 M’s:
      - Methods, Machines, Materials, Manpower
    - The 4 P’s:
      - Place, Procedure, People, Policies
    - The 4 S’s:
      - Surroundings, Suppliers, Systems, Skills
  - Use an idea-generating technique (e.g., brainstorming) to identify the factors within each category that may be affecting the problem/issue.
    - For example, the team should ask... "What are the machine issues affecting/causing..."
  - Keep asking, "Why is this happening?" and put additional segments under each factor and subsequently under each sub-factor.
  - The team should reach consensus on listing those items in priority order with the first item being the most probable" cause.

Understanding The Root Causes

- Consider a real life example: a mail-order catalog company called GoodsAreUs, that manufactures and sells a variety items for home and personal use.
- As the company addresses the problem of insufficient profitability, it TQM (Total Quality Management) for problem solving, based on this experience the company quickly focused on its cost of nonconformance (cost of all things that produce waste, scrap etc.).
- Next step is to identify the problem behind the problem – factors that contribute to scrap problem.

Fishbone Diagram



Example: Missed Free Throws

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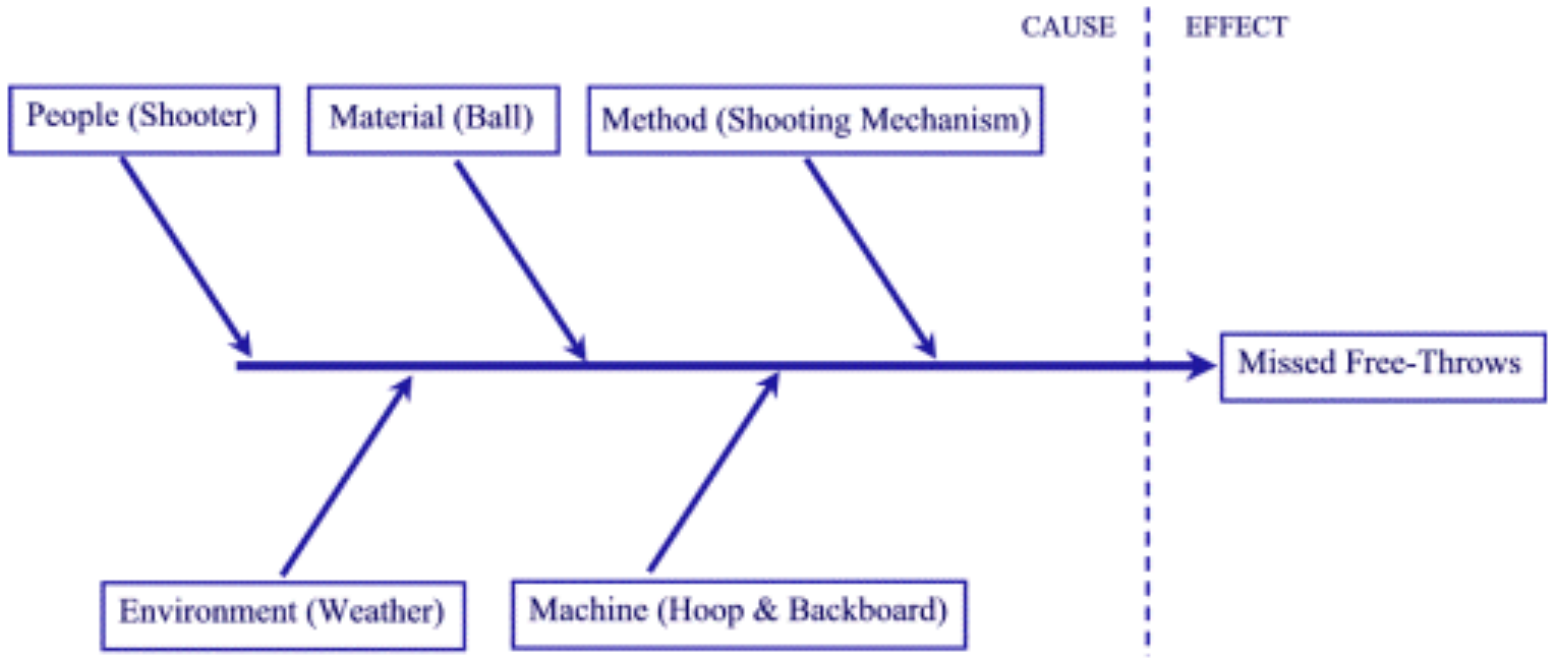

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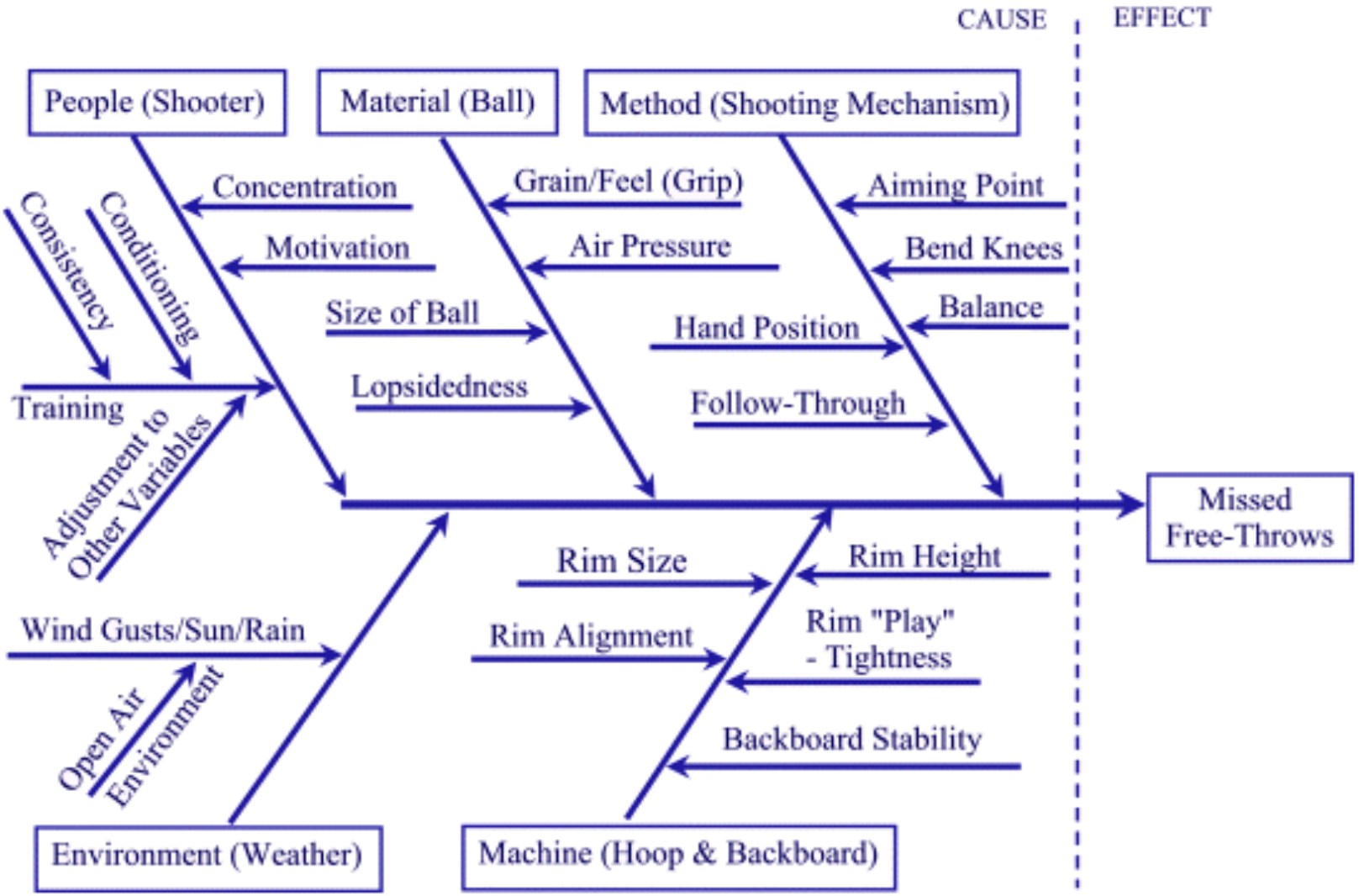
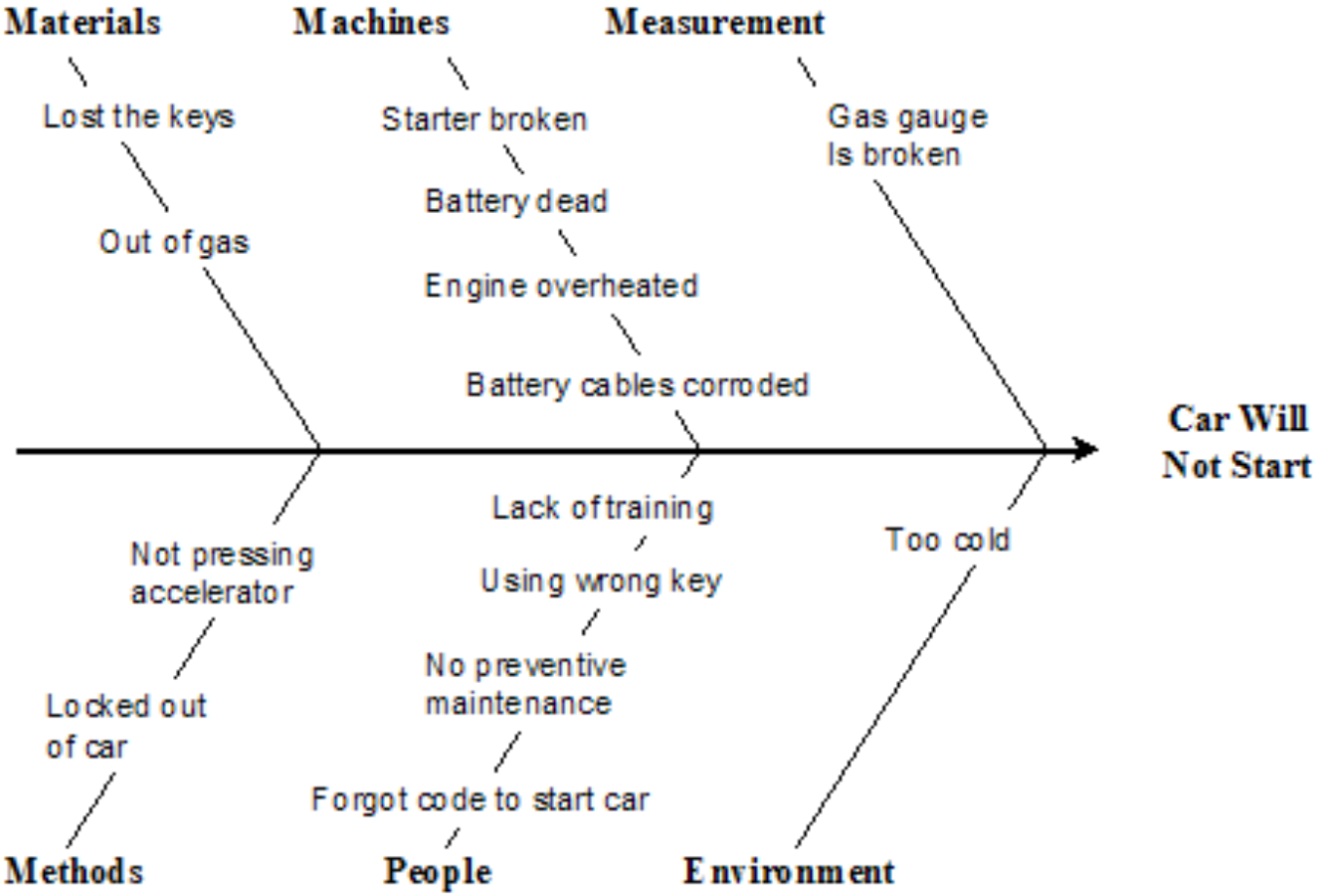


Example: Car will not start



Problem Definition

- **Writing down in standard format**

Elements	Description
The Problem of	Describe the problem
Affects	Identify stakeholders affect by the problem
The result of which	Describe the impact of this problem on stakeholders and business activities
Benefits of	Indicate the proposed solution and list a few key benefits

Example CASE

HOLIS

HOLIS Case Study

- Background for the Case Study
- Lumenations, Ltd., has been a worldwide supplier of commercial lighting systems for use in professional theater and amateur stage productions for more than 40 years.
- What's needed is a *new* marketplace, not too remote from what the company does best, but one in which there is substantial opportunity for growth in revenue and profits.

Problem Definition

Problem Statement — For Lumenations	
The problem of	Slowing growth in the company's core professional theater marketplaces
Affects	The company, its employees, and its shareholders,
The result of which	Is unacceptable business performance and lack of substantive opportunities for growth in revenue and profitability.
Benefits of	New products and a potential new marketplace for the company's products and services include ❑ Revitalizing the company and its employees ❑ Increased loyalty and retention of the company's distributors ❑ Higher revenue growth and profitability ❑ Upturn in the company's stock price

Problem Definition

Problem Statement - For the Homeowner	
The problem of	The lack of product choices, limited functionality, and high cost of existing home lighting automation systems
Affects	The homeowners of high-end residential systems
The result of which	Is unacceptable performance of the purchased systems or, more often than not, a decision “not to automate”
Benefits of	The "right" lighting automation solution could include ❑ Higher homeowner satisfaction and pride of ownership ❑ Increased flexibility and usability of the residence ❑ Improved safety, comfort, and convenience

Problem Definition

Problem Statement - For the Distributor	
The problem of	The lack of product choices, limited functionality, and high cost of existing home lighting automation systems
Affects	The distributors and builders of high-end residential systems
The result of which	Is few opportunities for marketplace differentiation and no new opportunities for higher-margin products
Benefits of	The "right" lighting automation solution could, include ❑ Differentiation ❑ Higher revenues and higher profitability ❑ Increased market share

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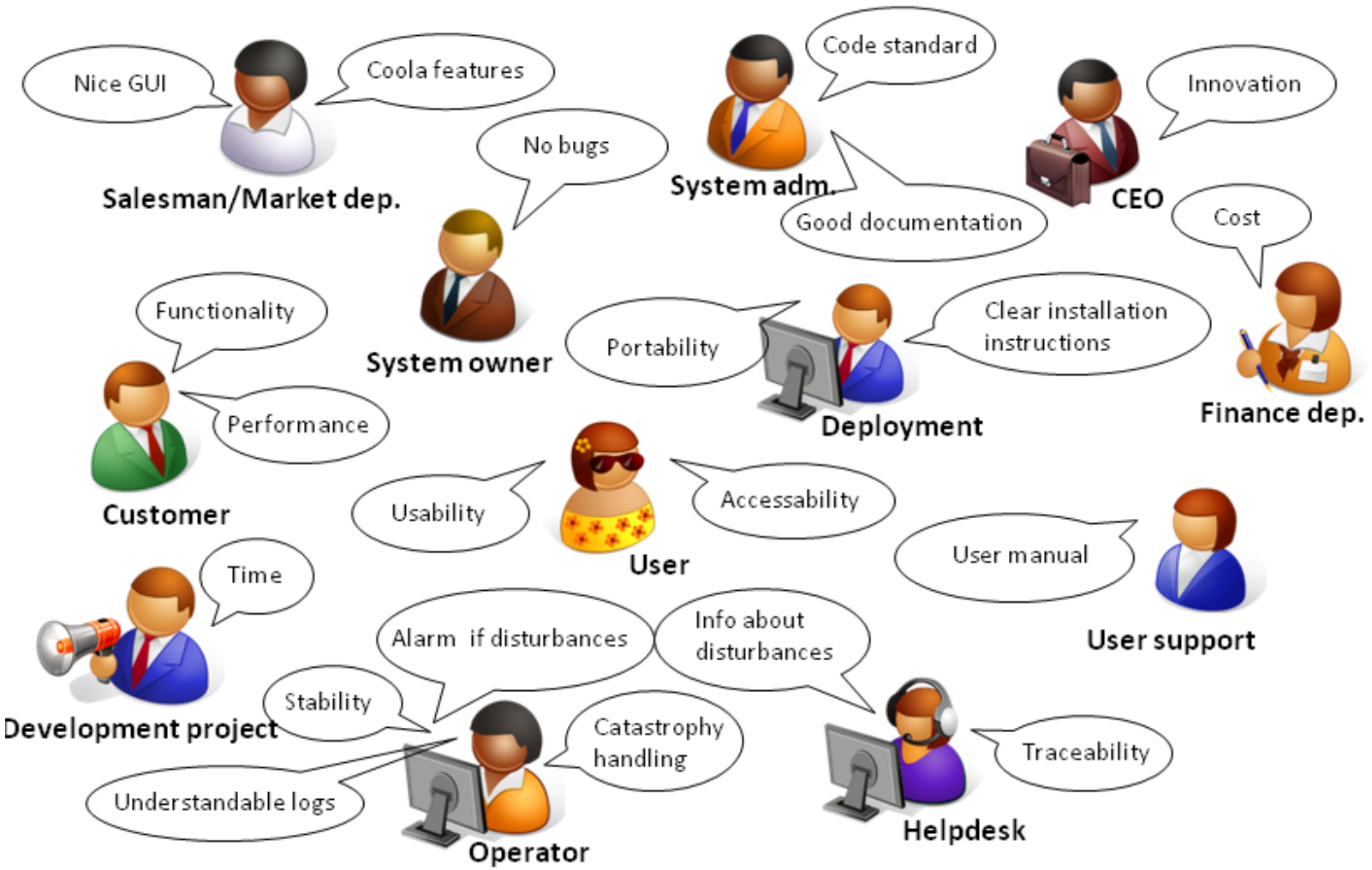
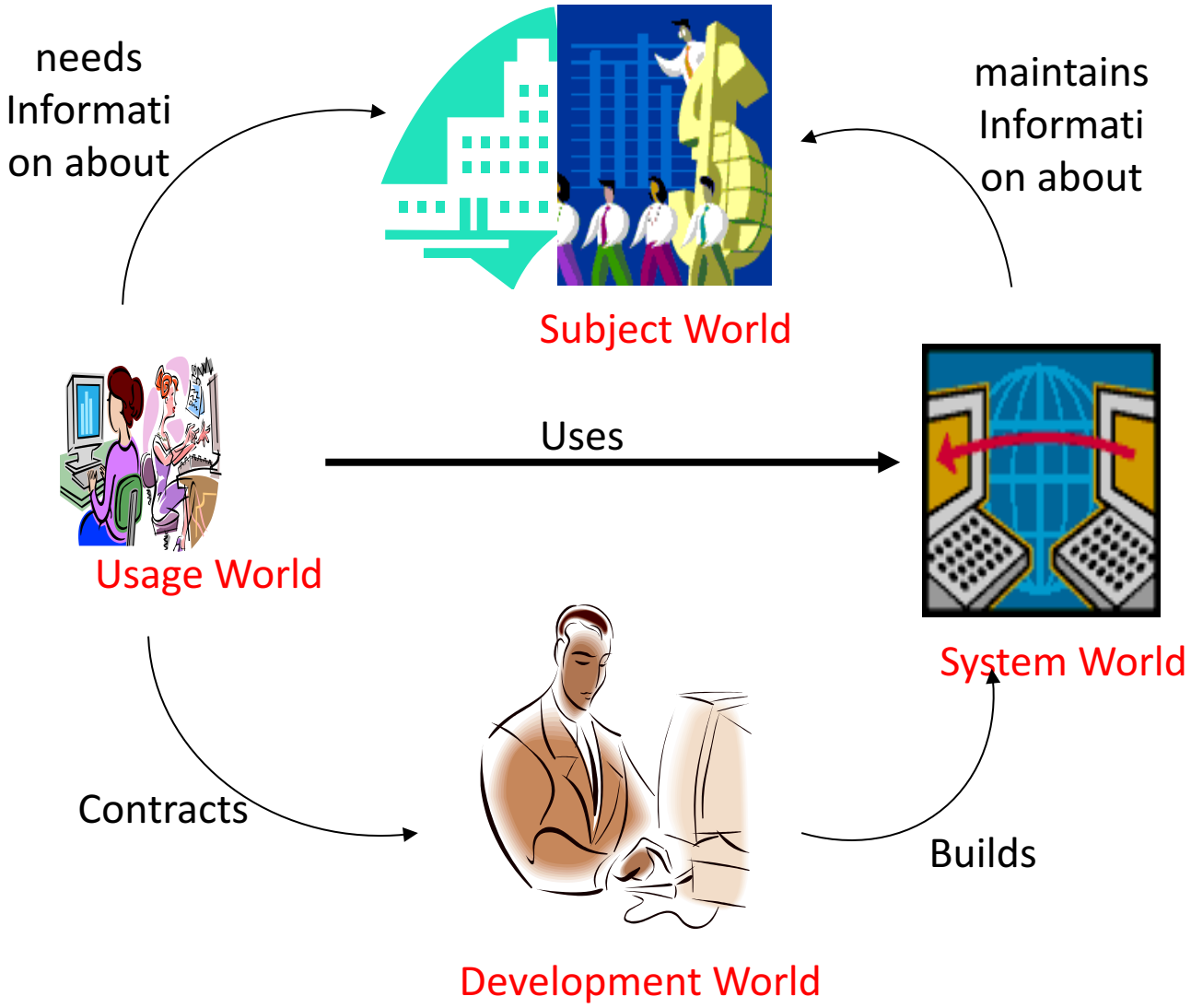
Identifying stakeholders

- **Freeman's classical definition "A stakeholder is any group or individual who can affect or is affected by the achievement of the organization's objectives"**
- **There are different kinds of stakeholders, such as the people as well as groups inside and outside an organization.**
- **Narrow definition**
  - Those groups or individuals who are vital to the survival and success of the project
    - You, Development team, Customers, Managers (within the company who are involved with approvals)
- **Wider definition**
  - Any individuals, group, or organizations who can affect, or be affected by the decisions and actions taken with respect to the project e.g., Public interest groups, Trade associations etc

Stakeholders and users



Stakeholders and Users in The four worlds



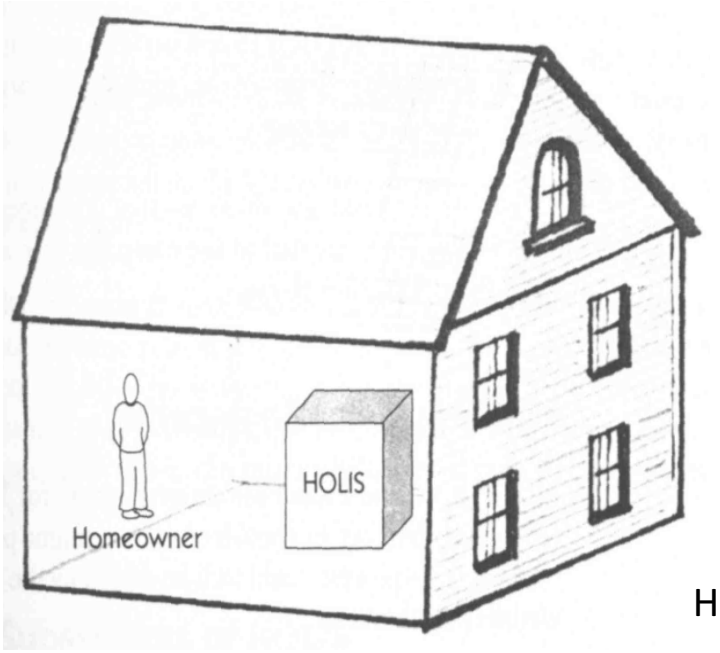
Stakeholders and Users in The four worlds

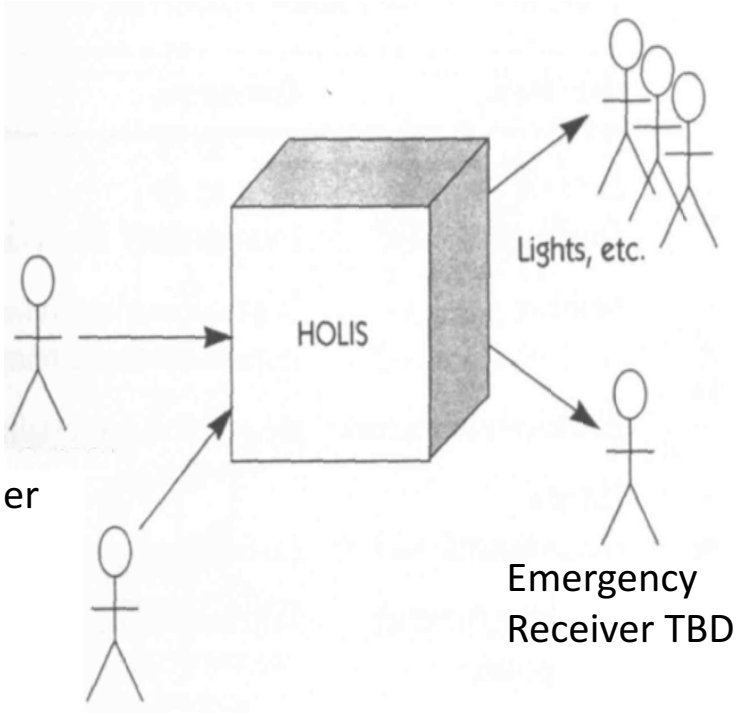
- **Subject World: The subject matter of the information system:**
  - e.g., customers, accounts, transactions for a bank information system
- **Usage World: The environment within which the planned system will operate**
  - e.g., people, such as managers, clerks, customers; also business processes such as handling a withdrawal, a deposit of foreign currency
- **System World: What the system does within its operational environment**
  - what information it contains and what functions it performs.
    - e.g., system records all transactions in a database, reports on transactions for a particular account, gives account balance
- **Development World: The development process, team, schedule, required qualities (security, performance,…) etc.**
  - e.g., system to be delivered in 12 months, fully tested to standard, etc

Question-based Approach

- **Relevant questions that help identify relevant groups and individuals:**
  - Who are the initiators of the system?
  - Who are the sponsors of the system?
  - Who have to adopt the system and make it work?
  - Who are the intended users?
  - Who will receive the output of the System?
  - Who are the intended developers and operators of the System?
  - Who will be impacted and affected by the system?
  - Who will win or lose by using the System?

HOLIS - Stakeholders





Lumenations Services

Stakeholders - Actors

- **Homeowner:** The homeowner who uses HOLIS to control the lighting
- **Lights:** The various lights that HOLIS, in turn, controls
- **Lumenations Services:** The manufacturer that has the ability remotely dial HOLIS and perform the remote programming
- **Emergency Receiver:** An undefined actor who will likely receive emergency messages

Stakeholders – Non Actors

- **External**
  - Distributors
  - Builders
  - Electrical contractors
- **Internal**
  - Development team
  - Marketing/product management
  - Lumenations general management

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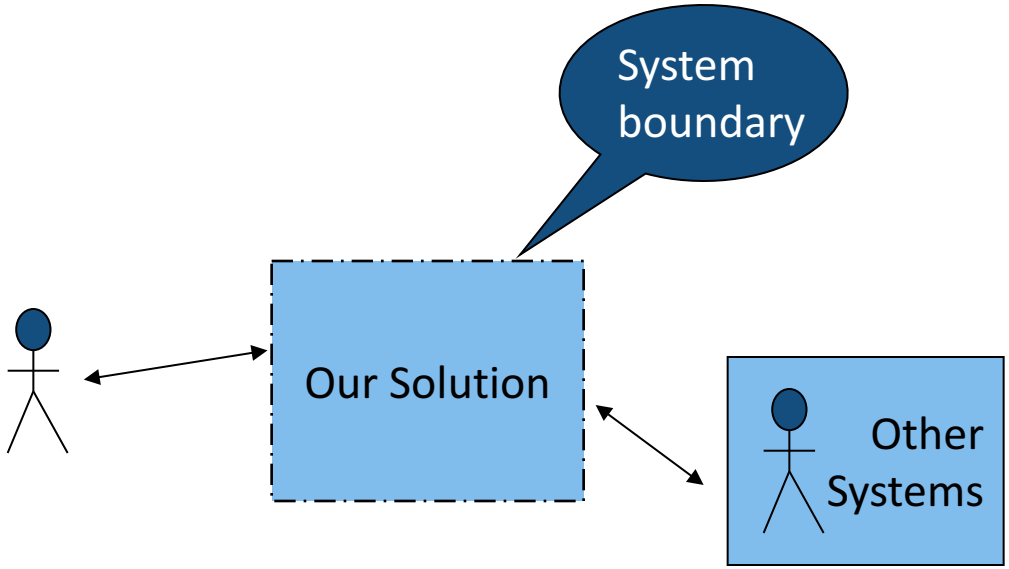
System Boundary

- **The System boundary defines the border between the solution and the real world that surround the solution**
  - Our system/solution
  - Things that interact with our system



Systems Scope

- **Defines the boundaries of the system (what is in scope and what is out of scope?)**
  - The events outside the system that cause the system to react,
  - The actors outside the system that interact with the system,
  - The information that flows between the system and the actors outside the system,
  - The major functions included in the system,
  - The user population.

Define Initial Scope and Context (example)

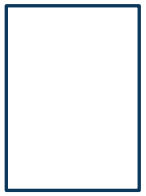
- **A clothing retailer decides to start selling its products over the Internet with a goal to achieve 15% of its sales via online purchase. The new Web site will include**
  - A detailed online catalog (drawn from an existing product databases), with facilities for order acceptance, tracking, and fulfillment i.e., shipping out the ordered products).
  - The system should display approximate stock levels and automatically back-order out-of-stock goods.
  - The retailer's large database of customers who order products over the telephone must integrate smoothly with the Web site.

Define Initial Scope and Context (example)

- **The system needs to interact with a number of entities and systems, including:**
  - Customers accessing the Web site over the Internet
  - The retailer's existing product database
  - The retailer's existing customer database
  - External systems for validating credit card details and submitting payments
  - The retailer's accounts system
  - The retailer's warehouse management system
  - An external product distribution system

System boundary- UML

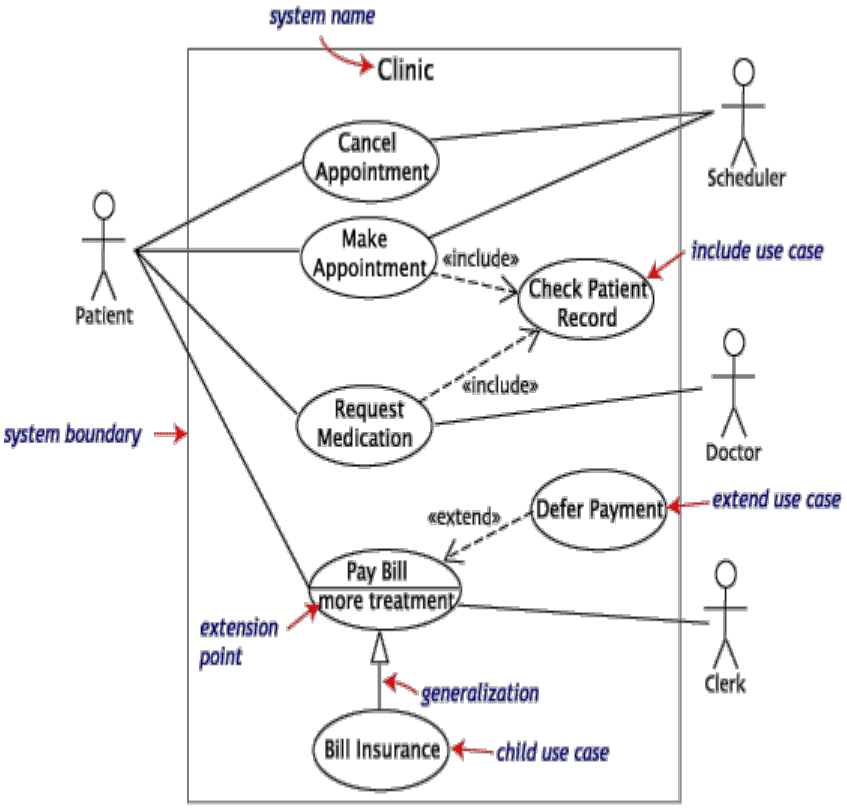
- A system cannot have infinite functionality. So, it follows that use cases also need to have definitive limits defined. A system boundary of a use case diagram defines the limits of the system.
- A system boundary is a **rectangle** that you can

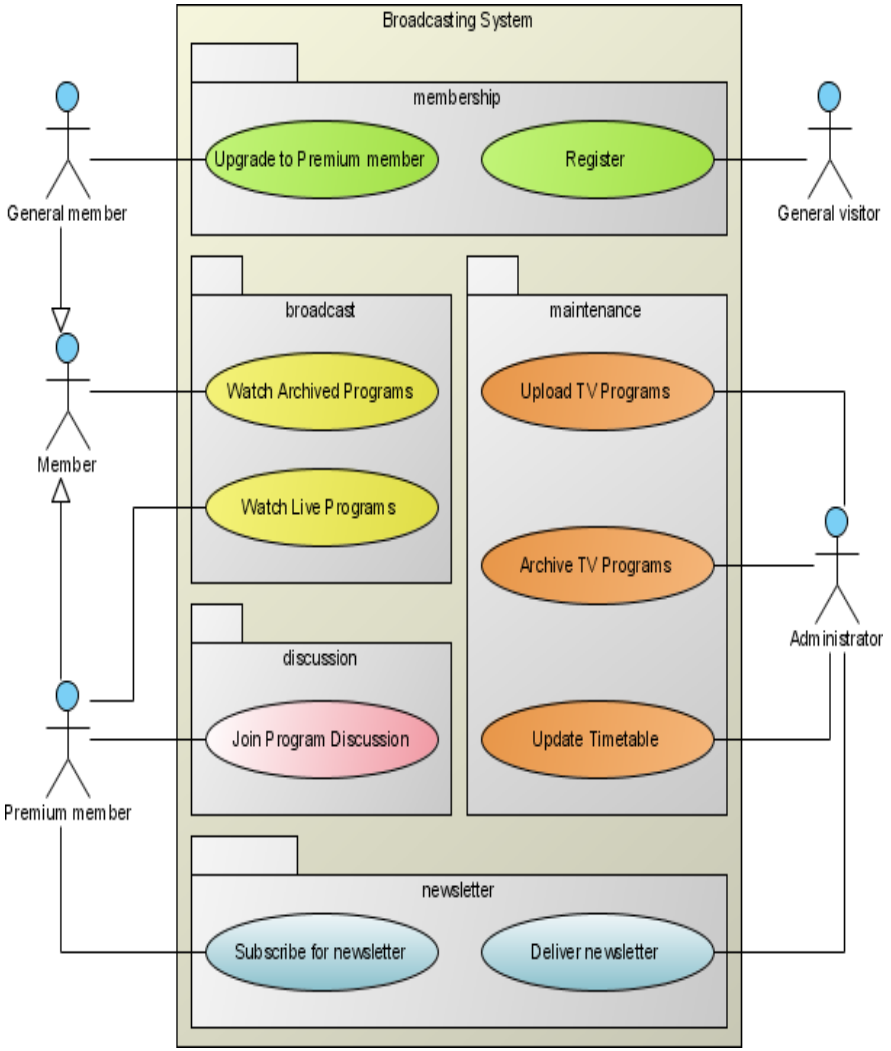


draw in a use-case diagram to separate the use cases that are internal to a system from the actors that are external to the system.

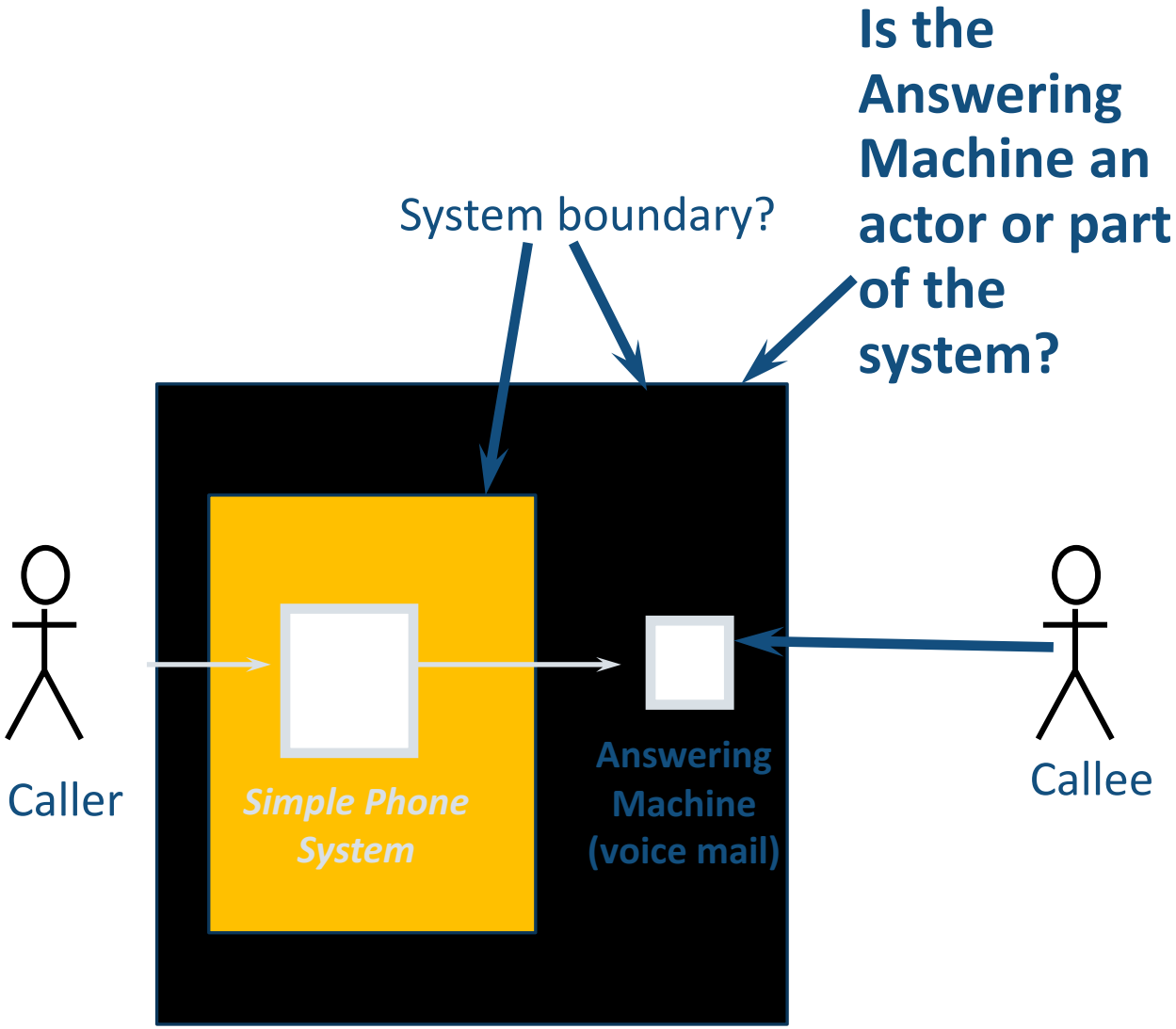
- A system boundary is an optional visual aid in the diagram, it does not add semantic value to the model.
- The system boundary is potentially the entire system as defined in the problem statement.

System boundary- UML



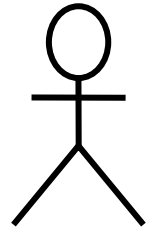


Actors Help Define System Boundaries



Use Actors to Help Define Boundaries

- **An Actor**
  - Is **not part of the system**
  - Is a **role** a user of the system can play
  - Can represent a **human**, a **machine**, or **another system**
  - Can **actively interchange information** with the system
  - Can be a **giver of information**
  - Can be a **passive recipient of information**

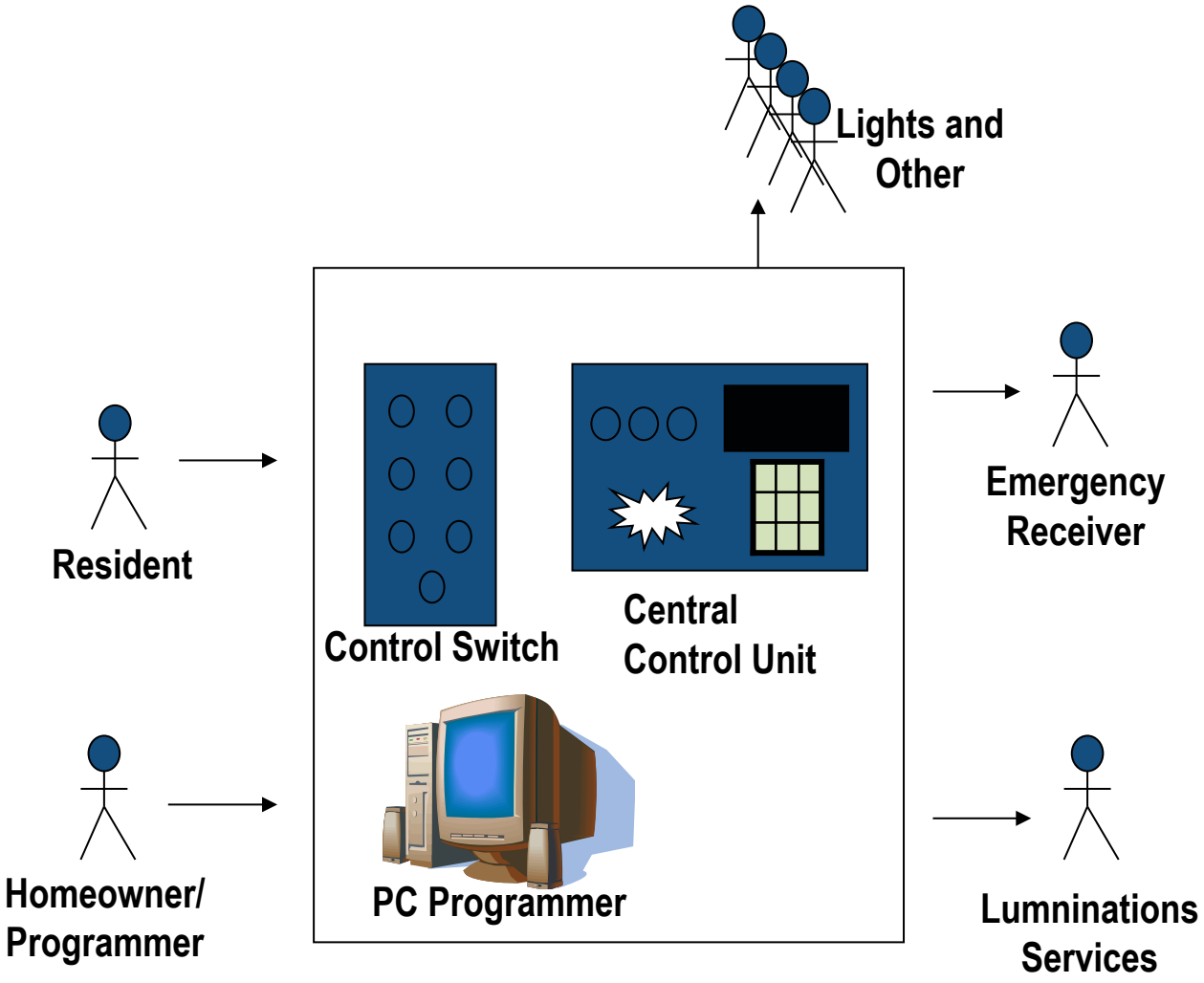


Actor

Useful Questions in Identifying Actors

- Who will supply, use, or remove information?
- Who will use this functionality?
- Who is interested in a certain requirement?
- Where in the organization is the system used?
- Who will support and maintain the system?
- What are the system's external resources?
- What other systems will need to interact with this one?

HOLIS SYSTEM BOUNDARIES



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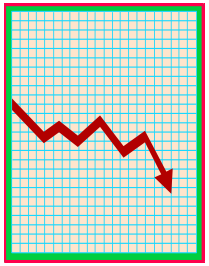
Identify Constraints

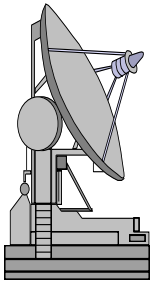
- A restriction on the degree of freedom we have in providing a solution

Environmental

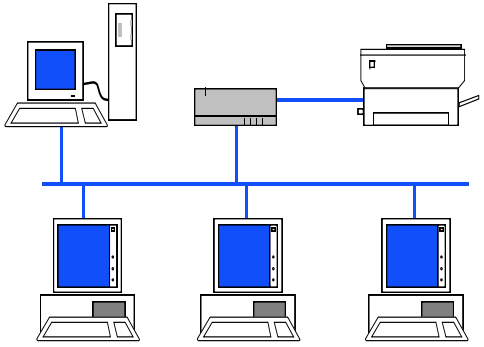
Political



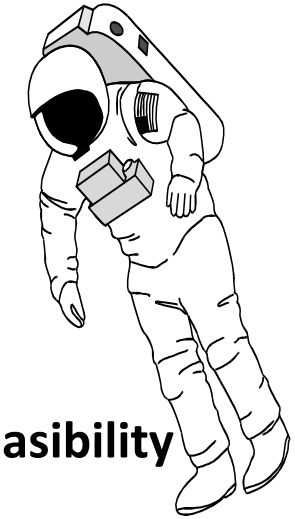
Economic



Technical



System



Feasibility

Constraints

- **Version 1.0 would be released to manufacturing by January 5, 2000**
  - The only product launch opportunity this year
- **The team would adopt UML modeling, OO-based methodologies, and the Unified Software Development Process**
  - We believe these technologies will provide increased productivity and more robust systems
- **The software for the Central Control unit and PC Programmer would be written in C++. Assembly language would be used for the Control Switch**
  - For consistency and maintainability; also, the team knows these languages
- **A prototype system must be displayed at the December Home Automation trade show**
  - To take distributors' orders for Q1 FY 2000

Constraints

- **The only Homeowner PC Programmer configuration supported would be compatible with Windows 98**
  - Scope management for release 1.0
- **The team would be allowed to hire two new full-time employees after a successful inception phase, with whatever skill set was determined to be necessary**
  - Maximum allowable budget expansion
- **The KCH5444 single-chip microprocessor would be used in the control switch.**
  - Already in use in the company

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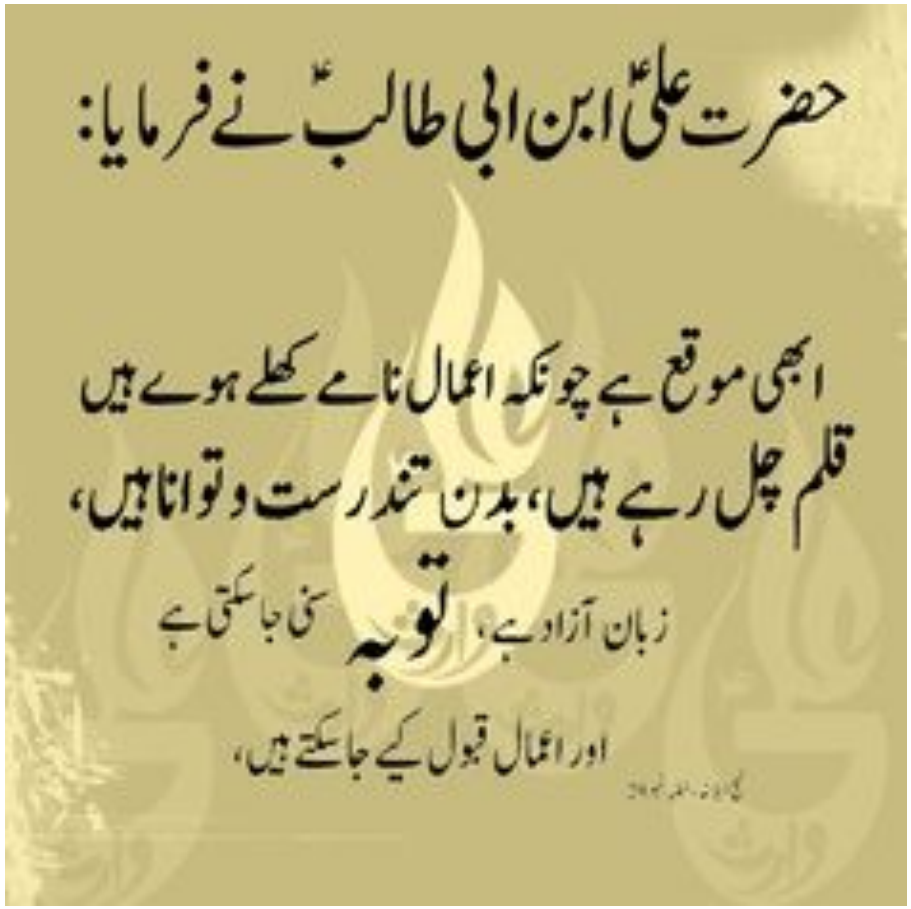
حضرت علیؑ ابن ابی طالبؑ نے فرمایا:
ابھی موقع ہے چونکہ اعمال نامے کھلے ہوے ہیں
قلم چل رہے ہیں، بدن تندرست و توانا ہیں،
زبان آزاد ہے، توبہ سنی جا سکتی ہے
اور اعمال قبول کیے جا سکتے ہیں،