IT2755
Software Engineering
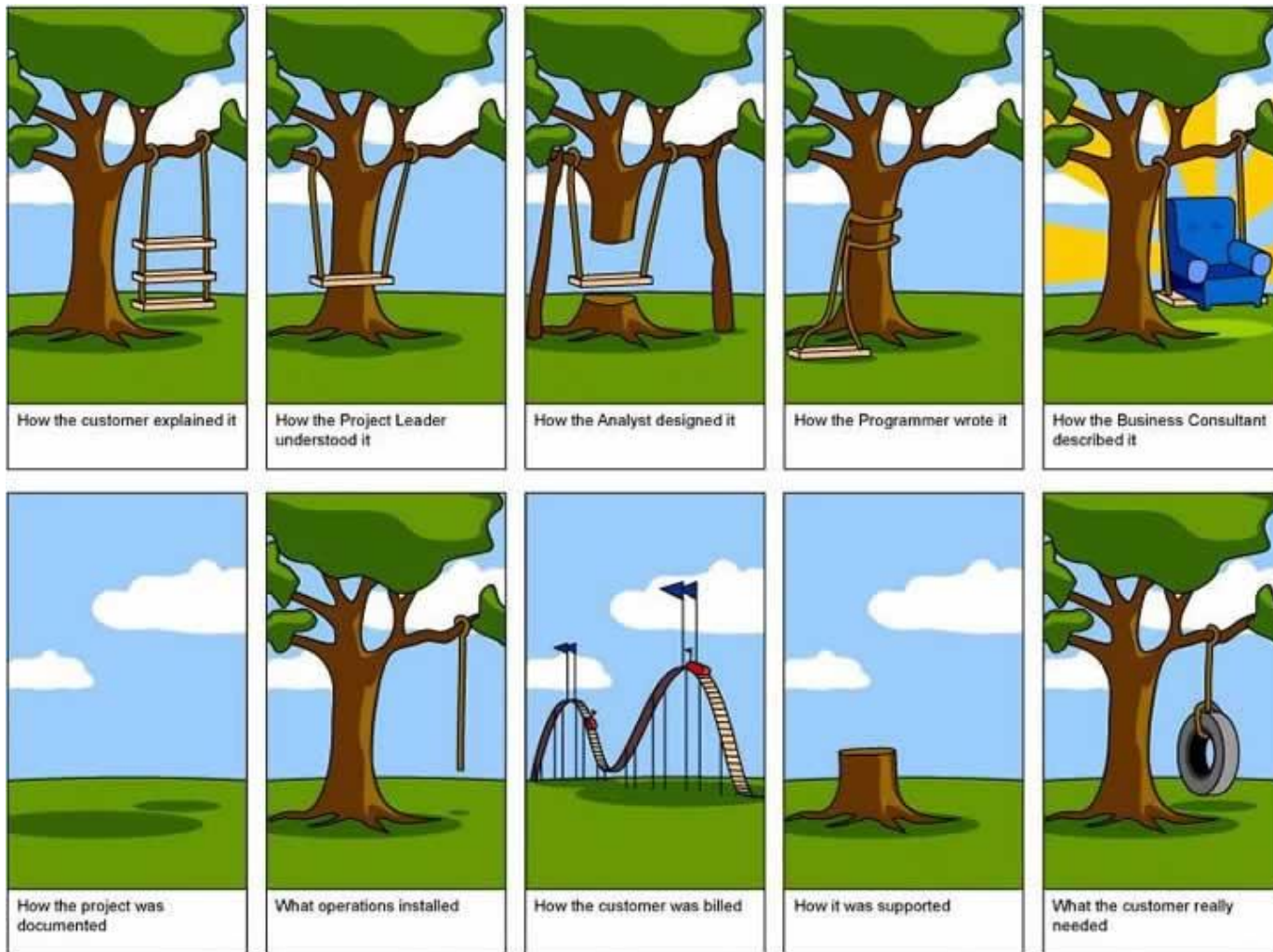
Requirement Development

Learning Outcomes

1. To identify the key activities in requirements gathering

2. To identify functional and non-functional requirements for a system

3. To describe the different techniques for information gathering including their advantages and disadvantages

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The famous cartoon entitled "Project Cartoon" captures the sad reality behind bad requirements gathering (Source: ProjectCartoon)

Requirements Development

- **Objective:** To **understand** and **document business needs** and **processing requirements** for a system.

- Focus in WHAT users wants (plus Why) & NOT HOW to build the system.

- This task requires continuous inputs from users.

- Requirements activities linked to other development activities:
  - design, implementation, and testing

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System Requirements

To meet the needs of users, it is important to understand what functions the proposed system can offer. One approach is to identify :

Functional Requirements

Capabilities/features that the system MUST HAVE

Eg. An App that can support placing of orders by users

Non-functional Requirements

Constraints that the new system MUST MEET

Eg. Saving of orders must be completed in less than 2 seconds.

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Activity - Gather Detailed Information

- **Talk to users** of new system or similar systems

- **Read documentation** on existing system

- **Develop expertise** in **business area** of the system

- **Collect** technical information

  - Understand computer usage, work locations, system interfaces with other systems and software packages

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Activity - Identify Functional Requirements

- **Functional requirement**: system requirement that describes what the system <u>MUST</u> perform

- Typically, it is needed to support business processes

- Example: ATM functional requirements

  - ATM system shall validate the inserted ATM card

  - ATM system shall dispense money

  - ATM system shall alert staff when cash holding is below limit

  The above functions are needed to support say the banking services offered by a bank.

Activity-
Identify Non-Functional Requirements

- **Non-functional requirements** : these are **constraints** or characteristics expected from the system.

Eg. The system is to be developed using C#

   The system is required to support concurrently 1000 users.

- Normally include the following areas:

Performance	Does the system respond quickly enough for the user's needs ? Can it cope efficiently with the required volume of transactions ?
Usability	Are the options clearly displayed on the screen ?
Reliability	Can the customer have confidence that the system will behave consistently as expected ?
Security	What is the encryption method used to transmit or store classified data ?

Define Non Functional Requirements

- Example: ATM non-functional requirements
  - 1) ATM system shall be written in C++ language
  - 2) ATM system shall communicate with bank using 256bit encryption
  - 3) ATM system shall validate the PIN number in 5 seconds.

  1) A constraint placed for the development work
  2) A constraint placed on the security of the proposed system
  3) A characteristic on the performance of the system

Activity-
Prioritize Requirements

- Manage users requests according to user needs, urgency, complexity, estimated efforts needed…

- Balance between limitation of resources vs. user needs

- **Scope creep** (A challenge when managing requirements)

  - is the tendency of function list to grow (uncontrolled manner)

  - this can adversely **impacts** project progress:

    - Leads to cost overruns

    - May also cause implementation delays [slippage]

  - How to handle this ?

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Activity- Evaluate Requirements with Users

- Evaluate requirements with user till an acceptable requirement model is developed

- Evaluate all possibilities (scenarios) in the design and implementation of system

- **Validate** the accuracy and correctness of requirements *("Are we building the right product ?")*

- Process is **iterative**

    – Alternative models developed and continually revised

    Why this step is important ?

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Techniques for Information Gathering

- **Q**uestioning, **O**bserving, **R**esearching, **M**odeling

- Good questions initiate **process**

- Questions center around **three themes**

  - **What** are business processes?

  - **How** is the business process performed?

  - **What information** is required?

Techniques for Information Gathering

A. Review reports, forms, procedure, descriptions

B. Conduct interviews and discussions with the users

C. Observe business processes

D. Building effective prototypes

E. Distribute and collect questionnaires

F. Conduct Joint Application Design sessions (JAD)

G. Research vendor solutions

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The Relationship between Information Gathering and Model Building

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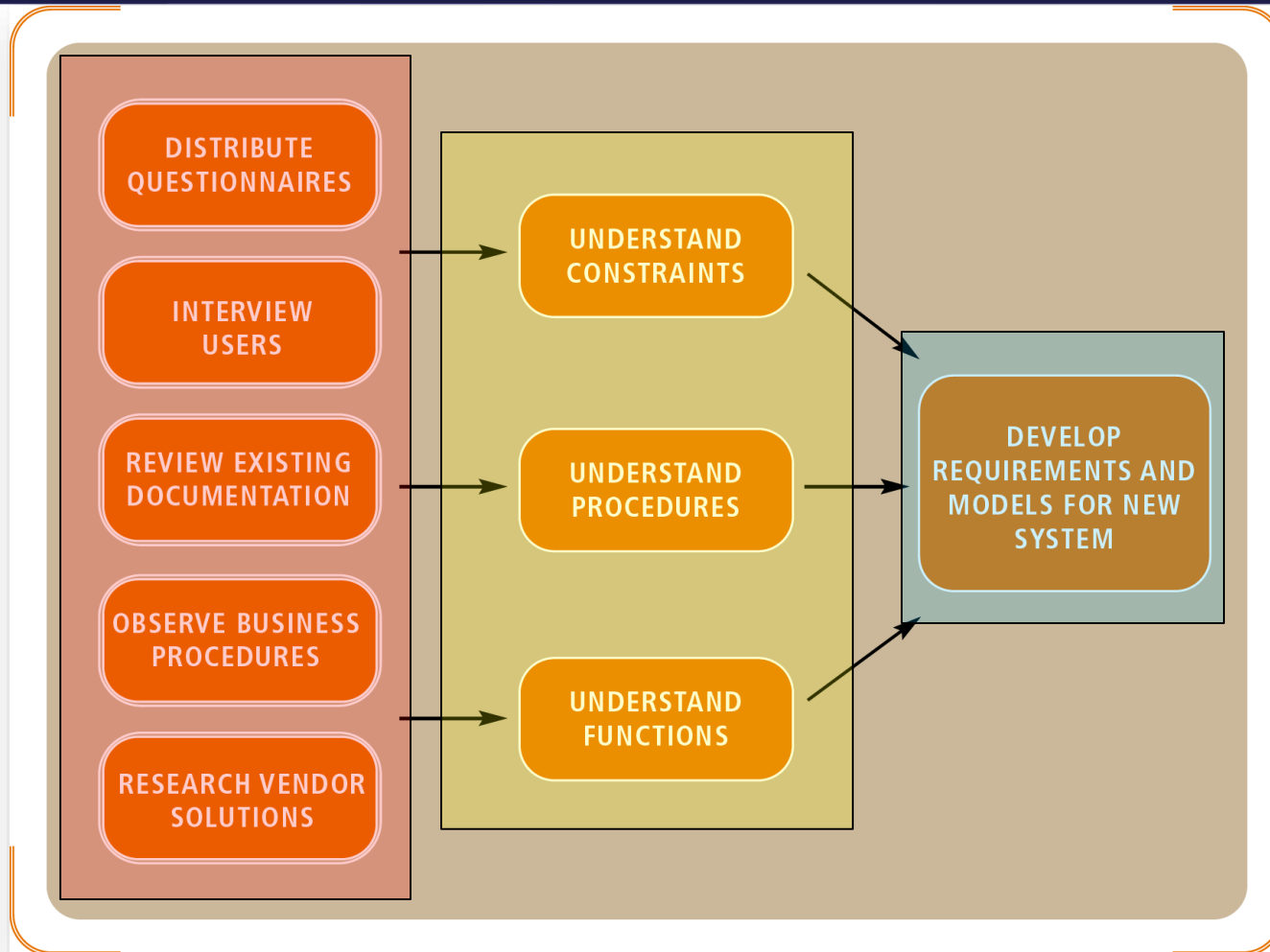
Review existing reports, forms, procedure, description

- **Various sources**:
  - Internal existing business documents and procedure descriptions
  - Other companies and professional organizations
  - Industry journals and magazines reporting "best practices"

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Review existing reports, forms, procedure, description

Pros: Allows analyst to get an understanding of organization before meeting the users

Cons: Documents may not match up to actual operations or outdated

When to use: Initial stages of investigation when analyst is unfamiliar with the organization

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Conduct interviews and discussions with the users

- Most widely used fact-finding technique

- Types of Questions: Mixture of Open and Close-ended questions

Conduct interviews and discussions with the users

Pros: Personal contact allows further probing with faster response time

Cons: Time-consuming and requires further rework on the interview information gathered

When to use: Require in-depth information on new /existing system

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Observe business processes

- Diagram all information gathered into workflows

  - **create activity diagrams**

    - Identify activities

    - Relationships between activities

    - Personnel responsible for the activities

Observe business processes

Pros: First-hand experience on system operations allowing validation of information and business performance

Cons: Can be intrusive with information confidentiality issue

When to use: Gather quantitative data about business and validation of conflicting information provided.

Building effective prototypes

- **Prototype:** an initial, look alike model with limited features of a real production system

- **3 types of prototypes**

  A. <u>Discovery prototype</u>

  – model created to verify concept and discarded

  – For example: to determine screen formats and processing sequences

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Building effective prototypes

B. <u>Evolving prototype</u>

- – working model that grows and may become part of system

C. <u>Mock-up</u>

- – example of final product for viewing only, not executable

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Building effective prototypes

Pros: Time and cost savings where inaccurate requirements can be discovered earlier with greater user involvement

Cons: Too much time spent on prototype rather than analysis

When to use: Projects with high interactivity with users

Distribute and collect questionnaires

- Allow collection of information from a large group of users

- Supports distributed geographical locations

- Should include

  - **Close-ended questions** (provide a direct response to that question. Do no invite discussion or elaboration)

  - **Opinion questions** (respondents are asked whether they agree or disagree with the statement)

  - **Explanation of procedure or problem**

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Distribute and collect questionnaires

Pros: Economical for large group with sporadic geographical location

Cons: Hard to construct good questions and constraint to probe further

When to use: Input required from large number of people who are geographically dispersed.

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Conduct Joint Application Design sessions (JAD)

- Speed up system requirements gathering by **compressing** all activities into a shorter series of JAD sessions

  - Fact finding, modeling, policy decision and verification done concurrently

  - Includes <u>all</u> stakeholders to finalize decisions required for project development.

    - E.g. JAD session leader, users, technical staff, project team members

Conduct Joint Application Design sessions (JAD)

Pros: Save time as finalized decisions can be made as all stakeholders are in the meeting

Cons: Difficult to coordinate JAD session for so many people

When to use: Project with constraint in timeline

Research Vendor Solutions

- Find existing solutions

- Involves a two-step process

  A. Develop **list of providers** from various sources

    - Directories of system solutions

    - Recommendations

    - Journals, magazines, and trade shows

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Research Vendor Solutions

B. Research the **details of each solution**

− Get specifics of the system

- Technical specifications

- A demo or trial system

- An on-site visit

- A printout of the screens and reports

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Research Vendor Solutions

Pros: Provides a platform for learning from past experiences

Cons: Insufficient analysis may lead to buying a "wrong" product

When to use: Features to support business is general and nothing too specific

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Summary

- **Activities in the Requirements Discipline:**
  - Gather detailed Information
  - Define functional and non functional requirements
  - Prioritize requirements
  - Develop User Interface dialogs
  - Evaluate requirements with users

- **Functional & non-functional requirements**

- **Techniques** for gathering requirements and their pros & cons

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