

Requirements Basics and Gathering

Functional and Non-Functional Requirements, SMART
Technique, Requirements Elicitation

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You Have Questions?



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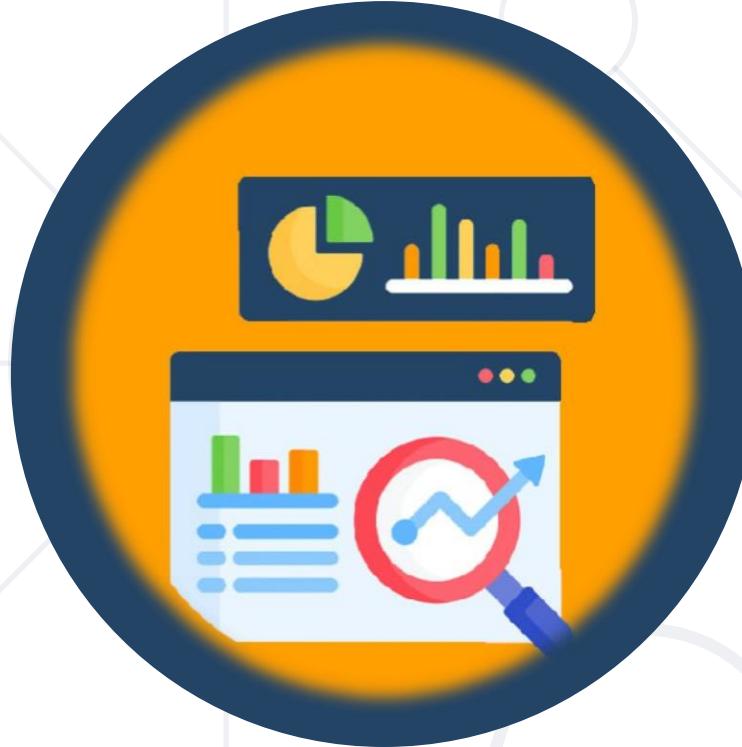
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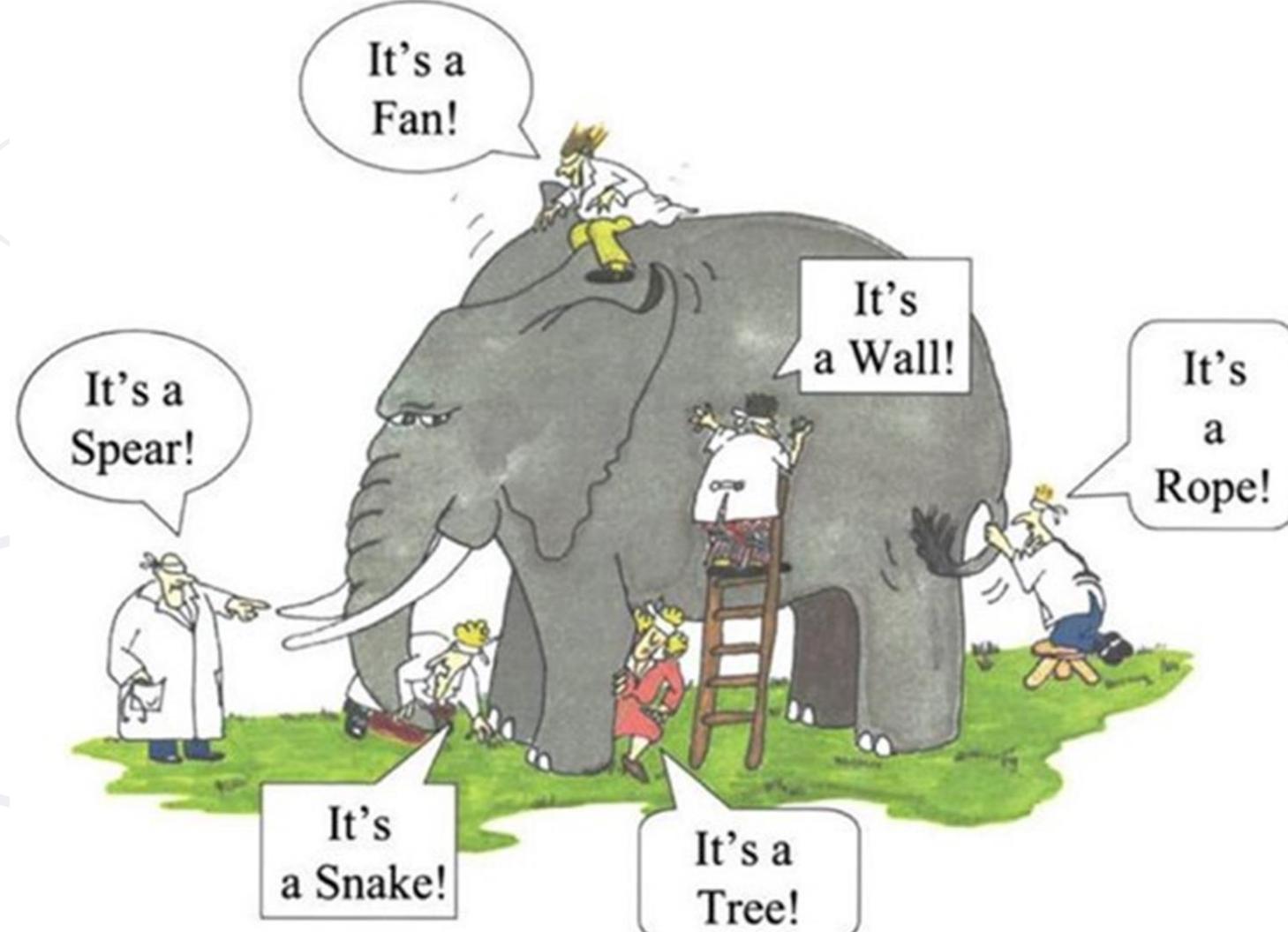
1. What is Requirement in an IT Project?
2. What Requirement Categories there are?
 - Functional and Non-Functional Requirements
 - Project Constraints
3. SMART Technique for Requirements Structure
4. How to Elicit Requirements from Stakeholders?





What is Requirement in an IT Project?

Perception & Interpretation: The Blind Men and the Elephant



How Could This Be Prevented?

Manchester Airport: IT failure causes check-in delays

22 June 2019

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Universal credit IT system 'broken', whistleblowers say

Service centre staff say glitches having harmful effect on huge number of claimants

Case studies: 'It was more about getting them off the phone'

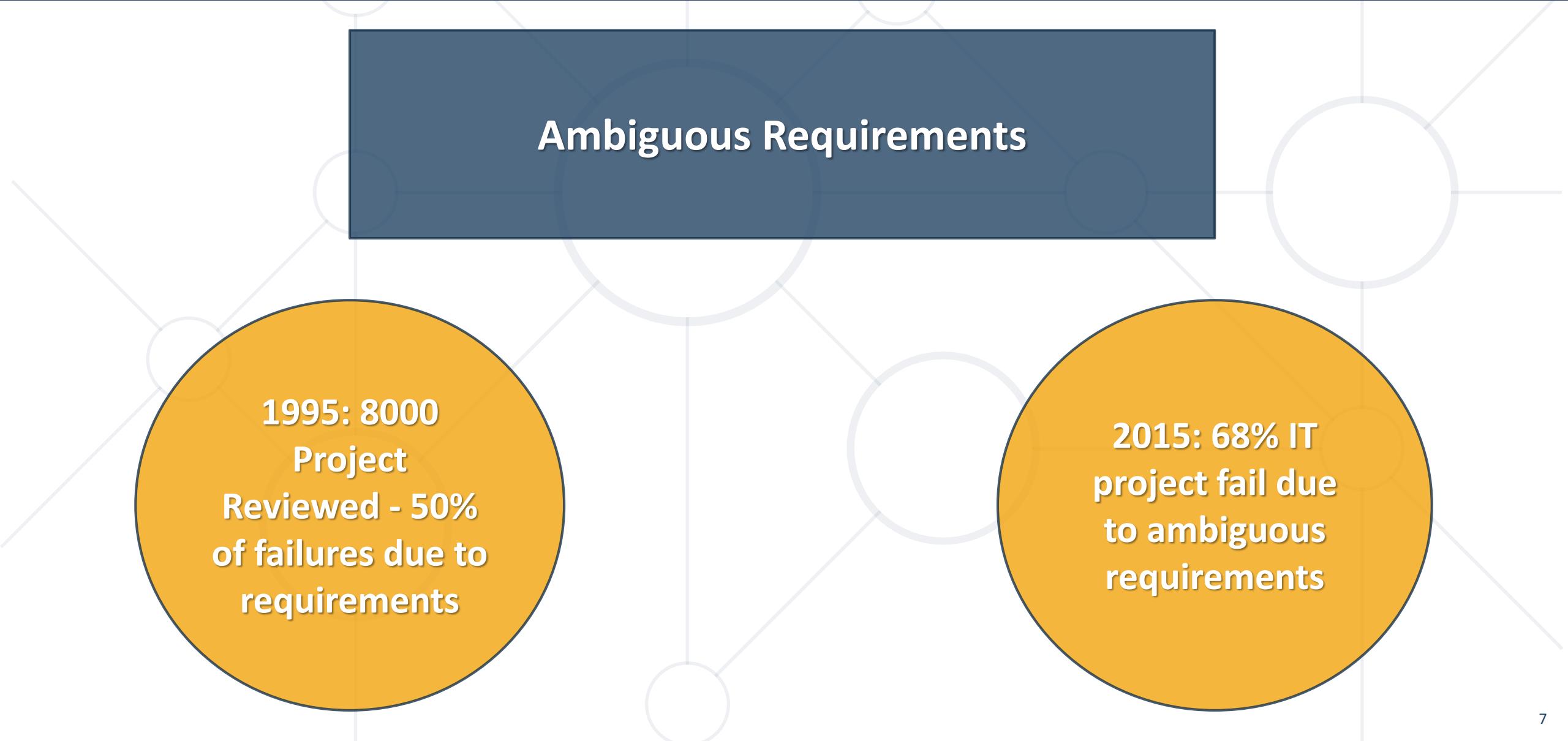


Whistleblowers say errors in the 'cobbled-together' system have led to benefit payments being delayed for weeks. Photograph: PA

Universal credit is so riddled with design flaws and process faults that it is practically guaranteed to generate mistakes and delays that would push vulnerable benefit claimants into hardship, according to whistleblowers.

Critical Factors in IT Project Failures: The Weight of Ambiguous Requirements

Ambiguous Requirements



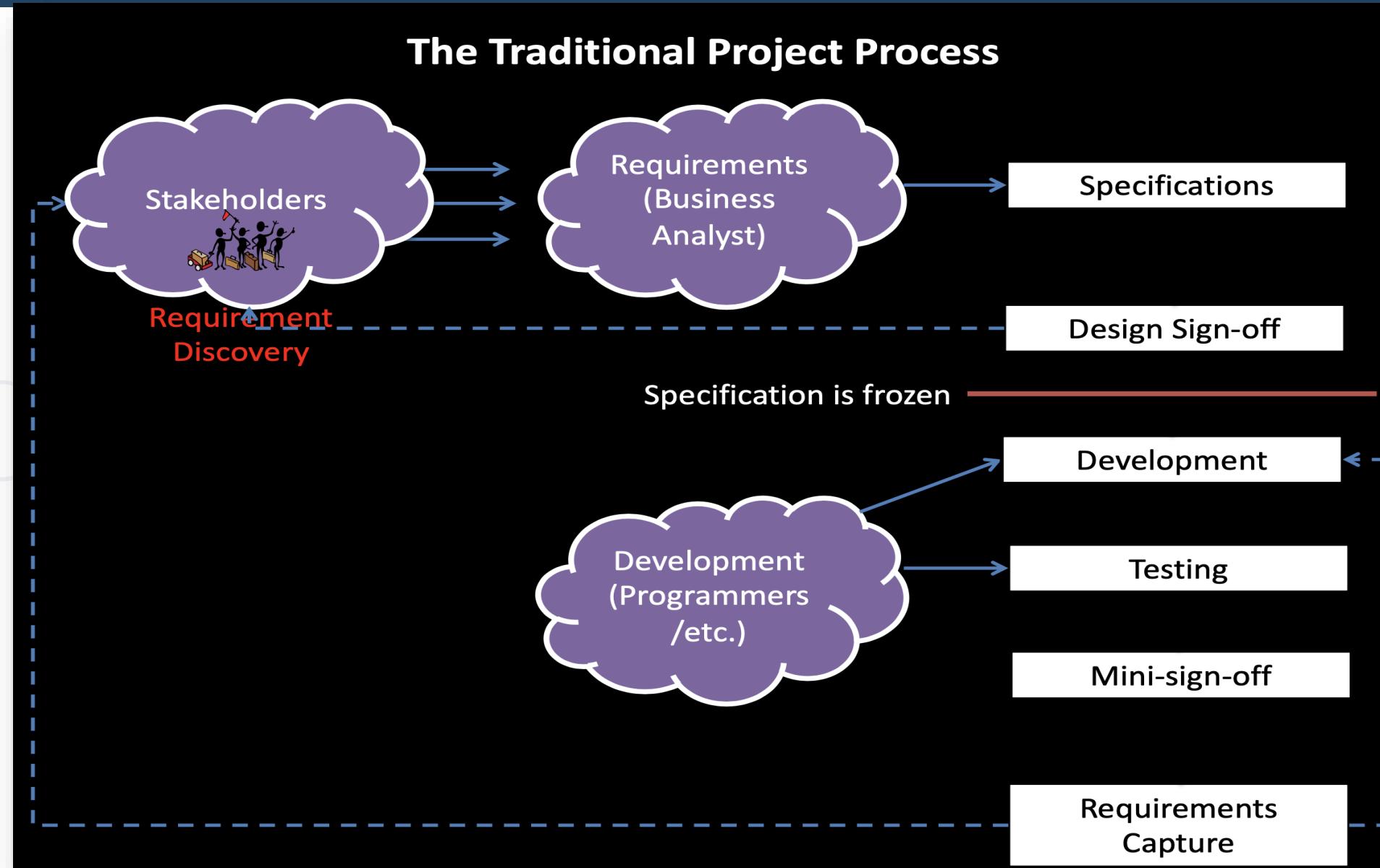
1995: 8000
Project
Reviewed - 50%
of failures due to
requirements

2015: 68% IT
project fail due
to ambiguous
requirements

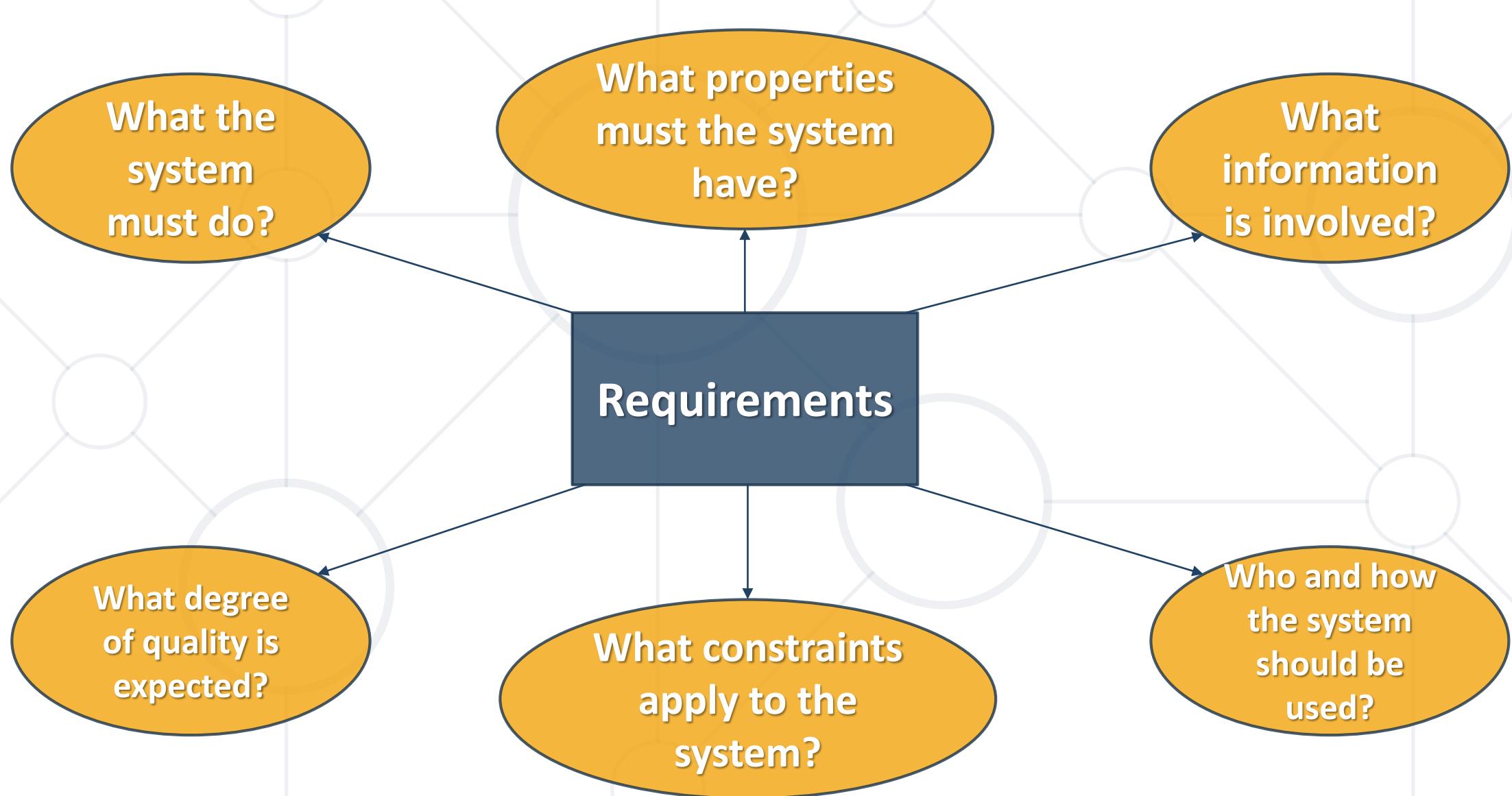
What is Requirement in IT Projects?

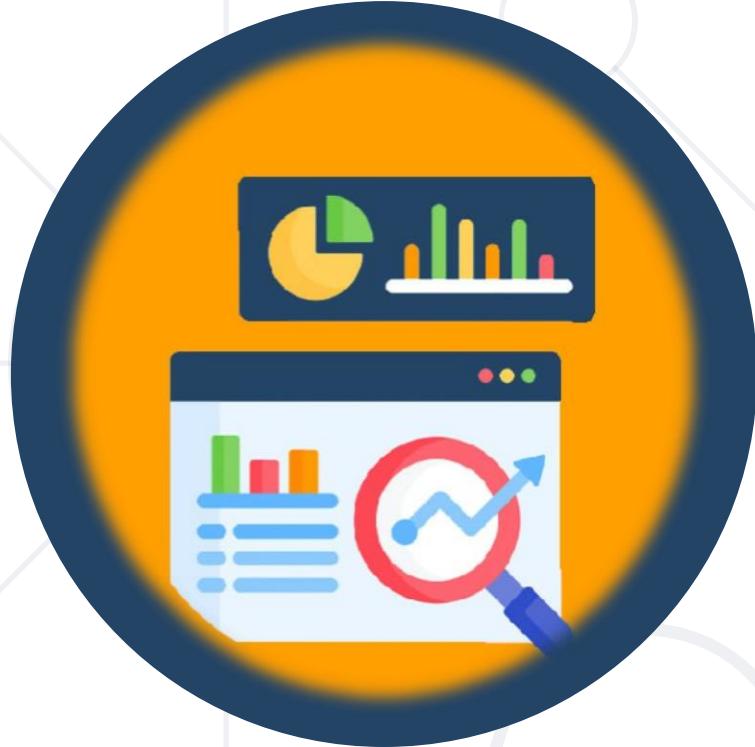
- *Barry Boehm (1981) defines requirements as "designing the right thing".*
 - List of **WHAT** the Stakeholders need
 - List of **WHAT** the System/App must do to Satisfy those needs
 - List of **WHAT** components must be built/developed
 - List of **WHAT** each component must **DO** and **HOW** they will **INTERACT**

The Traditional Project Process



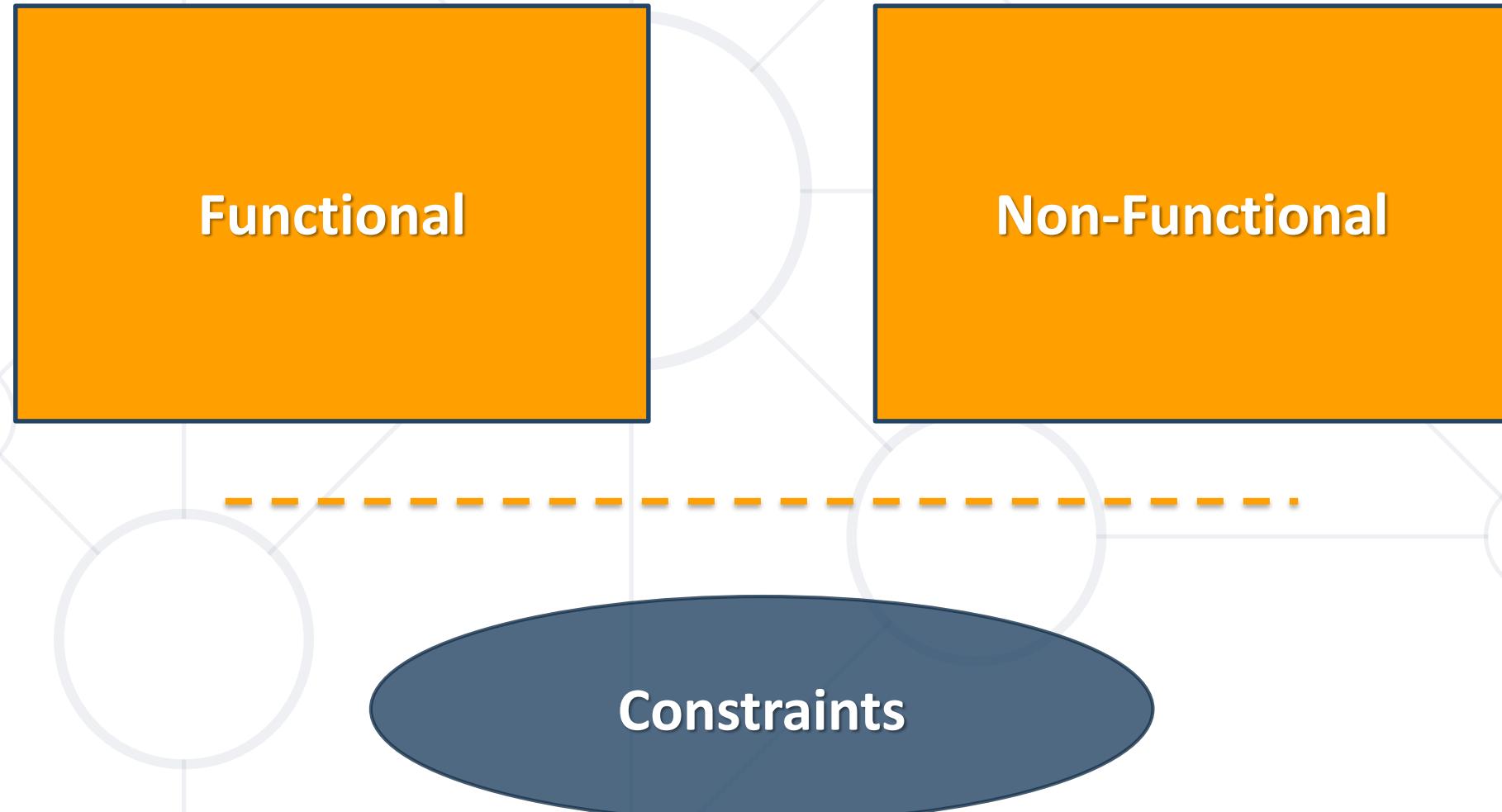
What Do Requirements Focus On?





What Requirement Categories There Are?

Categories of Requirements



Functional Requirements

Things the product must do

Action the product must take

Scope of the Product

Defines the boundaries and connections to other products

Functional and Data Requirements

Things the product must do and data manipulated by the functions



Non-Functional Requirements

Properties or qualities the product must have

How the product will behave

Look and Feel Requirements

Usability Requirements

Performance Requirements

Operational Requirements

Legal Requirements

Security Requirements

Cultural and Political Requirements

Maintainability and Portability Requirements

Functional vs. Non-Functional

Objective

Describe **What** the product does

Describe **How** the product works



Functional vs. Non-Functional

End Result

Define Product
Features

Define Product
Properties



Functional vs. Non-Functional

Focus

Focus on User
Requirements

Focus on User
Expectations



Functional vs. Non-Functional

Documentation

Captured in **Use Case**

Captured as **Quality Attribute**



Functional vs. Non-Functional

Essentiality

Mandatory

Not Mandatory but
Desireable



Functional vs. Non-Functional

Origin Type

Usually defined by
User

Usually defined by
**Developers or other
Tech experts**



Functional vs. Non-Functional

Testing

Component, API, UI
Testing, etc.

**Tested before NF
testing**

Performance, Usability,
Security, etc.

**Tested after Functional
testing**



Functional vs. Non-Functional

Types

External Interface,
Authentication,
Authorization Levels,
Business Rules, etc.

Usability, Reliability,
Scalability, Performance,
etc.



Functional vs. Non-Functional



Functional vs Non-Functional Requirements (1)

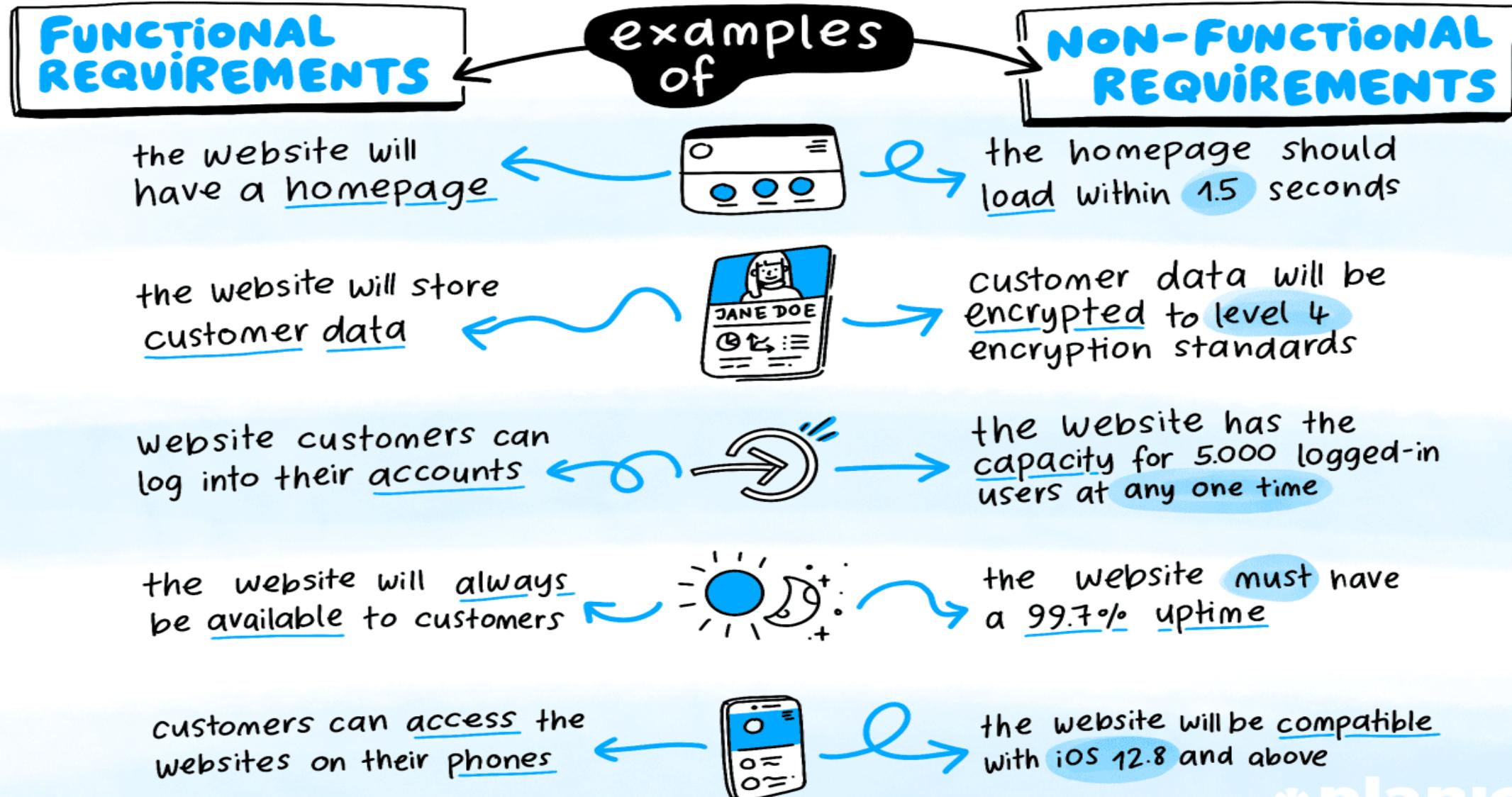


A Functional Requirement for a milk box would be “ability to contain fluid without leaking”.



A NF Requirement for a hard hat would be “must not break under pressure of less than 12,000 PSI”.

Functional vs Non-Functional Requirements (2)



Product Constraints

Purpose of the Project

Reason for building the product

Intended end-users and how they affect product usability

Naming Conventions and Definitions

Assumptions – assumptions developers are making

Users of the Product

People that interact with the product

Limitations of the project and restrictions on design

Outside influences that make a difference to this product

Product Constraints Examples

- The product budget must not exceed \$50,000
- The product shall run on the company's existing machines
- Implementation of the product cannot interrupt daily business
- The last 5 years of historical data needs to be made available in the product

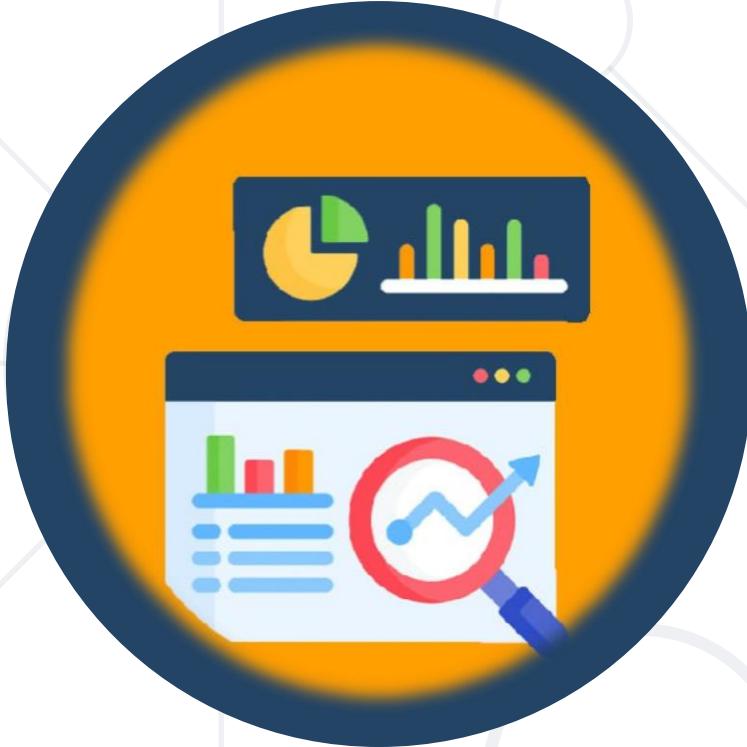
Bad vs Good Requirements

Bad Requirements



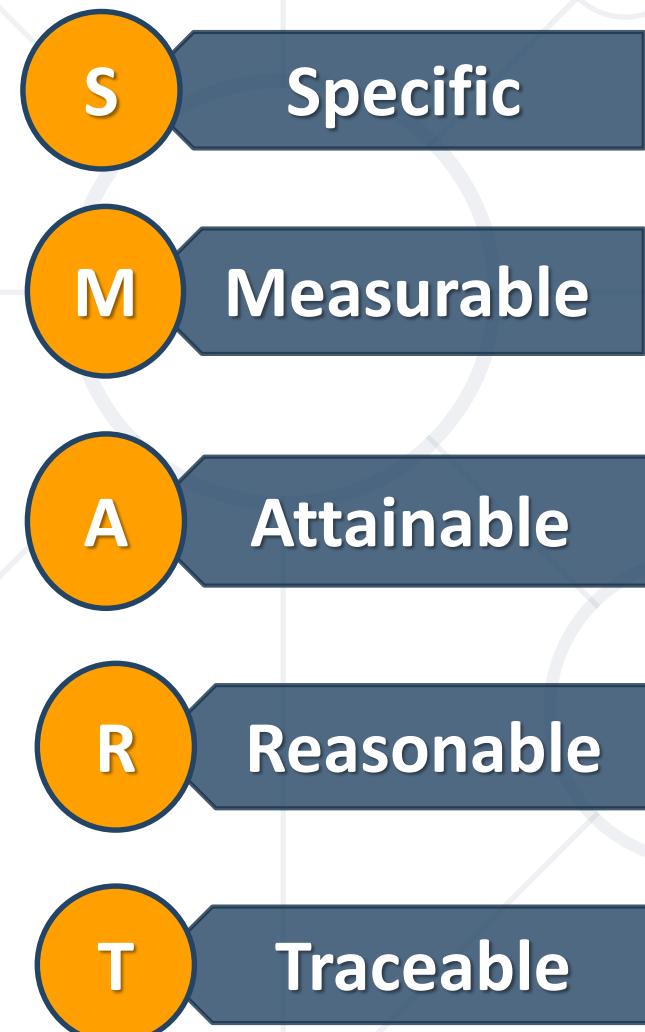
Good Requirements





SMART Technique for Requirements Structure

SMART Requirements



SMART Requirements

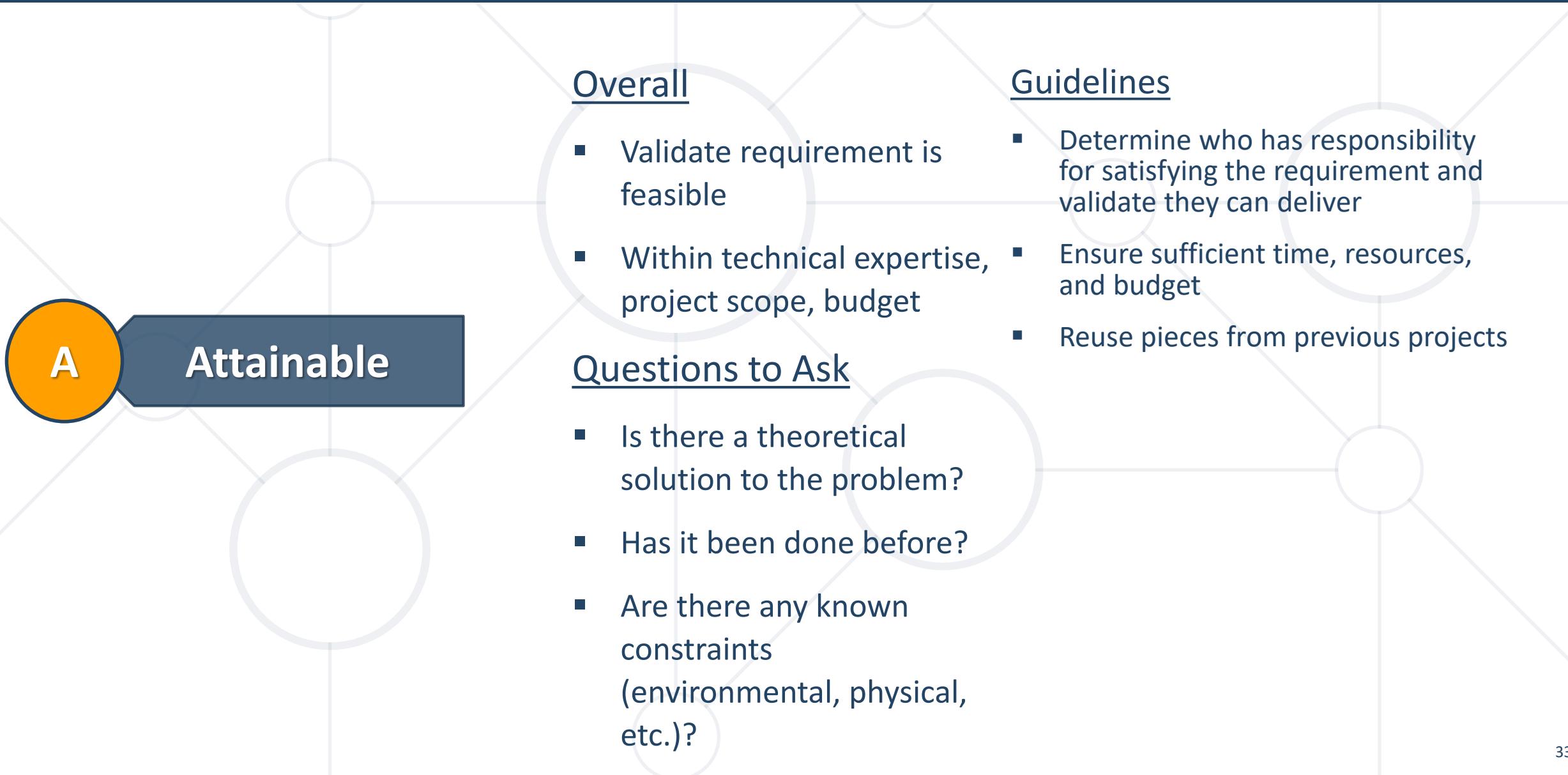




Overall

- Measure progress towards goal
- Indicators should be quantifiable
- Questions to Ask
- How much?
- How many?
- How will I know when it is accomplished?

- Guidelines
- Ensure measurable during requirement elicitation
- Validate unequivocal success can be proven with that requirement
- Determine tests that will need to be used to verify the requirement was met





Overall

- Validate the effort is worth the requirement

Questions to Ask

- Is this worthwhile?
- Is the timing right?
- Does this match our other efforts/needs?

Guidelines

- Run all requirements through a 'sanity check'
- Ensure the requirement makes sense in context



Overall

- Trace requirement through design, implementation, and testing

Questions to Ask

- Can I ensure this requirement has been met in the design solution?
- Can I ensure this requirement has been met in the implementation?
- Can I ensure this requirement has been met during testing?

Guidelines

- Requirements should include
- Originators
- Assumptions
- Business justifications
- Dependencies on other requirements
- Importance

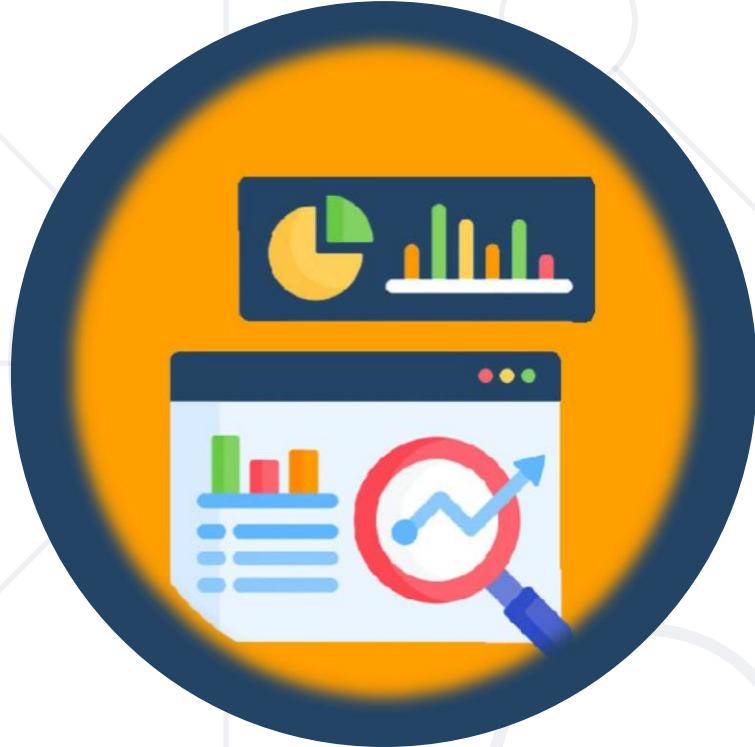
Tips for Producing Valid Requirements

- Should use the word **shall**
- Only one **shall** per requirement
- Written in short, simple sentences
- Consistent terminology
- Stated positively
- Accompanied by notes and comments to support and clarify
- Stated imperatively
- Don't use **will** and **should**



Phases of the Requirements Process





How to Elicit Requirements from Stakeholders?

Requirements Elicitation



Brainstorming

Brainstorming is a creative thinking technique for coming up with new ideas and solving problems.

- Solve Problems
- Generate Ideas
- Create Consensus



Brainstorming Types

Individual

Project team member creates a list of ideas.

Open

Participants call out ideas that are captured by scribe.

Structured

Participants write down their ideas and Facilitator goes participant to participant to have them share one idea each. Continue until all ideas are exhausted.

Brainstorming Pros and Cons

Advantages	Disadvantages
Helps to explore different possibilities and uncover new requirements.	Dominant participants overshadowing others or group think, where conformity hinders the exploration of diverse perspectives.
Rapid generation of a large number of ideas, fostering creativity and innovation.	Ideas are not discussed/explored.
Involves multiple perspectives and different project contexts.	True meaning may be ambiguous or misunderstood.
Promotes equal participation as it engages team members and stakeholders actively, making them feel involved in the requirement elicitation process.	Time constraints may result in rushed discussions, leading to superficial or incomplete requirement generation.

How to Conduct Brainstorming? (1)

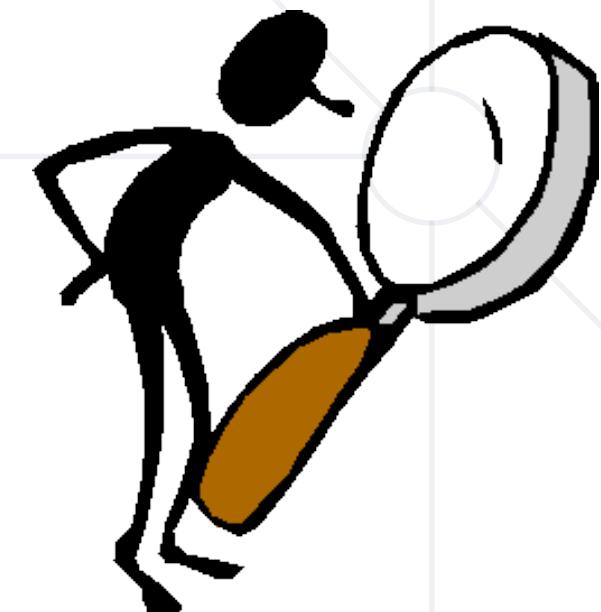
- Determine type of brainstorming meeting ahead of time. Publish an agenda prior to the brainstorming session
- Clearly state the objective of the meeting
- Create environment to encourage participation
- Establish ground rules
 - Do not discuss ideas during the brainstorming session – only questions to clarify
 - Do not dismiss or discount an idea or person
 - Do build on others' suggestions and ideas
 - Do have fun

How to Conduct Brainstorming? (2)

- Establish roles
 - Timekeeper
 - Scribe
 - Facilitator
- Create process for combining, categorizing, and summarizing like ideas
- If complex, create multiple meetings to keep meeting fatigue low
- Schedule follow-up meetings
- Prioritize final ideas to plan further analysis
 - Allow votes for top ideas

Observation Studies involve watching how users interact with a system, process, or product in their natural environment.

- Real-time
- Feedback
- User's Perspective



Observation Types

Direct

Provides firsthand insights into user behaviors, workflows, and challenges, leading to accurate requirement capture.

Contextual
Inquiry

Combines observation with interviews, where the analyst observes users in their work environment and engages in conversations to gather additional insights.

Remote

Involves observing users or stakeholders remotely using technology such as video conferencing or screen sharing.

How to Conduct Observation Studies?

- Target what parts of the app/system you want to see being used in real-time
- Set expectations with the users
- Watch users engaged in real tasks
- Ask for immediate feedback whenever possible
- Take notes of key actions and problems
 - Nobody can talk better about what they do, and why they do it, than they can while in the middle of doing it
- **Not all situations can be represented**



Systematic discussion to drive out accurate requirements quickly

- Personal
- Structured questioning
- Flexible discussion

Interview Types

Structured

Follows a predefined set of questions or topics, ensuring consistency across interviews and enabling easier comparison of responses.

Semi-
Structured

Combination of predefined questions and the flexibility to explore additional topics or follow-up on interesting points raised during the conversation.

Group
Interviews

Involves interviewing multiple stakeholders or users simultaneously, fostering discussion and capturing diverse perspectives within a group setting.

Interviewing Pros and Cons

Advantages	Disadvantages
Promote interactive discussions to explore detailed information	Require access and commitment of stakeholders
Identify conflicts or discrepancies about stated needs or requirements	Creation of scripted interview questions can be time consuming
Encourage participation and build relationships by establishing rapport with the stakeholder	Stakeholders have difficulty describing their future needs, so the focus is usually focused on what they do currently
Enable observations of nonverbal behavior	Resulting documentation is subject to interpretation of the interviewer
Allow immediate follow-up to ensure understanding	Transcription and analysis of interview data can be complex and expensive

How to Conduct Interviewing? (1)

- Determine the **best interview type** to accomplish your goals
- Appropriately **prepare** for the interview with a script
- **Schedule** interviews ahead of time to accommodate stakeholders
- **Match the pace** of the interviewee
 - If they are cautious, talk slowly; If they are in a hurry, talk quickly
- Frequently **ensure they understand**
- Let interviewee know **what will be done** with the information

How to Conduct Interviewing? (2)

- One person **conducts** the interview while the other **documents** the answers
 - If not possible, **record the interview**
- **Ask for examples** of their issues and document screenshots
- Interview **two to three users** for each user category you are targeting
- Be sure to **interview end-users**, not just senior management who think they know how the process/system is used

How to Conduct Interviewing? (3)

- Create a **thank-you email** appreciating their time and how the information will help create quality requirements
 - Sent with the interview invite
- Create a **follow-up email** telling the person how the information will be used and the next steps for the project
 - Sent after the interview
- Allow **time in the schedule** to debrief and finish documentation after each interview

Preparation of Interview Questions

- Start making questions after having an initial understanding of the problems
- Make questions open-ended
 - Avoid Yes/No questions if not necessary
- Avoid questions that may present personal opinions from your side (e.g., judgment or a conclusion)
- **Remember it is a discussion!**



Sample Interview Questions (1)

- 
- What are other ways you accomplish this goal?
 - Tell me about your frustrations with this process.
 - What makes a good day? A bad day?
 - If you could wave your magic wand and make it different, what would the process look like?
 - What standards or regulations should we be aware of?
 - What purpose is accomplished by using the product or process?

Sample Interview Questions (2)

- 
- What equipment, tools, templates, and inputs do people need to use it?
 - How long should tasks take?
 - What people do you share information with?
 - What failures cause the organization the most pain?
 - What didn't I ask that I should have?
 - If we could only change one thing in the process, what should it be?

Interview Document

- Name and role of interviewee
 - Include responsibilities and department
- Script for an interview with open-ended questions
 - Include possible follow up questions based on previously conducted interviews
 - **Adapt to the responses**
- Table for requirements, risks, assumptions or constraints



A Survey is a **systematic and structured data collection** method used to gather information, opinions, preferences, and feedback from a **wide range of stakeholders** related to a software development project.

- Quantitative analysis
- Easily shared
- Grouping information

Survey Types

Open-
Ended
Questions

Gives respondents an opportunity to answer in their own words.

Useful, but very time consuming to interpret and catalogue.

Closed-
Ended
Questions

A finite set of answers for each question.
Lends itself to statistical analysis.

Tough to create questions that are not leading or need an "Other" answer.

Survey Pros and Cons

Advantages	Disadvantages
Require limited stakeholder's time	Relatively low response rate
Effective at reaching geographically dispersed stakeholders	Poorly worded questions may provide inaccurate information
Scalable for large audiences	Use of open-ended questions requires more analysis by the business analyst
Relatively fast and inexpensive to administer	Require both instrument training and problem or business domain experience
Supplement more subjective information, such as opinions gained through interviews	Incentives for responding might be expensive

How to Conduct a Survey?

- Focus your questions on high-priority risks that have been identified
- Identify user satisfaction levels with existing systems to set a baseline
- Questions should be direct and unambiguous
- Save complex questions for later in the survey
- Create rewards for participating
- Create the survey with inexpensive online tools
- Notify the participants when the survey is available and continue to remind them to participate

Reviewing existing documentation that could include
User Guides, Prior system implementation documentation, Technical documentation, etc.

- Lessons learnt
- Formulate context
- Future considerations

Documentation Review Pros and Cons

Advantages

Current process documentation provides a great starting point

The authors of the documentation could potentially be key stakeholders

Identifies gaps from previous projects' implementation

Disadvantages

Existing documentation may be old and outdated

Most of the times some documents need additional technical input

Can be time consuming and may not provide the desired payback



Practice

Live Exercise in Class (Lab)

Task

Indicate which requirements are Functional and which are Non-Functional

- The app shall display the current time and date on the homepage.
- The system shall have a response time of less than 2 seconds for any user action.
- The website shall allow users to add products to their shopping cart.
- The system shall be compatible with the latest versions of major web browsers (Chrome, Firefox, Safari, and Edge).
- The tool shall enable users to create and edit documents using rich text formatting.
- The app shall provide an option for users to search for nearby restaurants based on their location.
- The system shall support a minimum of 1000 concurrent users without performance degradation.
- The system shall comply with accessibility guidelines (WCAG 2.1) to ensure usability for people with disabilities.

Initiate Requirements understanding process

- Start identifying the Requirements for the Project
 - Use the SMART Technique to validate the requirements
- Start High-Level grouping for Functional, Non-Functional Requirements or Constraints
- **Send 5 questions (as if you will be doing interview) by Monday**
 - The answers will be sent back to you
 - Some of the questions will be discussed in next Lecture
- **Think about this!**
 - If you didn't have the Case Study and worked for the same project, how would you approach the elicitation of requirements?

- What is **Requirement** in an **IT Project**?
- What **Requirement Categories** there are?
- Functional and Non-Functional **Requirements**
- SMART Technique for Requirements Structure
- How to **Elicit Requirements** from Stakeholders?



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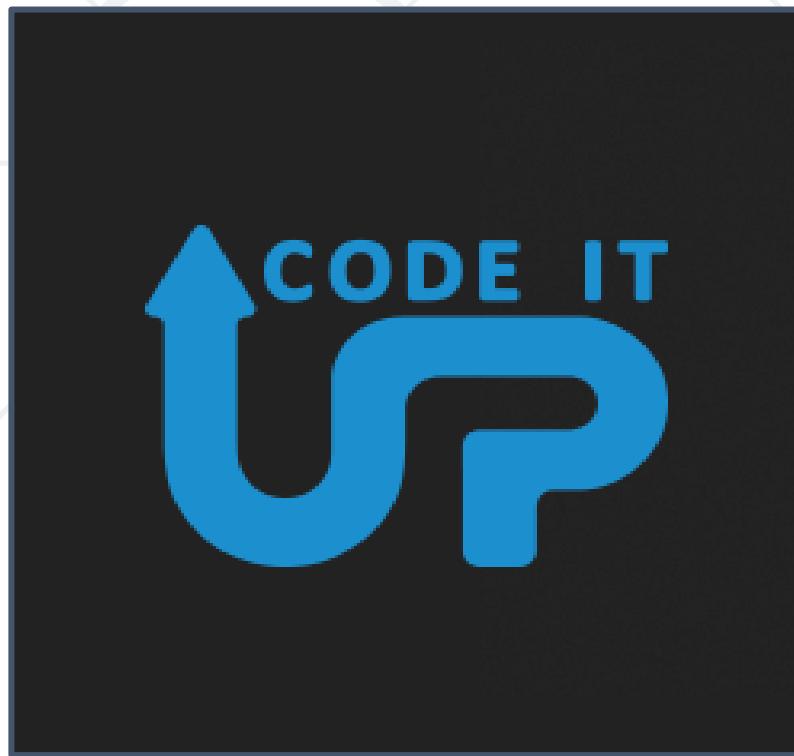
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