



# SLIIT

*Discover Your Future*

# Lecture 02

## Design Mindset



SLIIT  
FACULTY OF COMPUTING

# Design Mindset

- Design thinking
- Participatory design
- Behavioral sciences



Focus on Human Values  
Empathy for the people you are designing for and feedback from these users is fundamental to good design.



Show Don't Tell  
Communicate your vision in an impactful and meaningful way by creating experiences, using illustrative visuals, and telling good stories.



Craft Clarity  
Produce a coherent vision out of messy problems. Frame it in a way to inspire others and to fuel ideation.



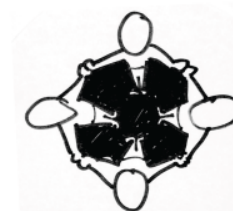
Embrace Experimentation  
Prototyping is not simply a way to validate your idea; it is an integral part of your innovation process. We build to think and learn.



Be Mindful Of Process  
Know where you are in the design process, what methods to use in that stage, and what your goals are.



Bias Toward Action  
Design thinking is a misnomer; it is more about doing than thinking. Bias toward doing and making over thinking and meeting.



Radical Collaboration  
Bring together innovators with varied backgrounds and viewpoints. Enable breakthrough insights and solutions to emerge from the diversity.

# What is Design thinking?

- It is a design methodology that provides a solution-based approach to solving problems.
- To handle complex problems that are ill-defined or unknown,
  - by understanding the human needs involved
  - by re-framing, the problem in human-centric ways
  - by creating many ideas in brainstorming sessions
  - by adopting a hands-on approach in prototyping and testing

**Example Case Study**  
Marking Automation  
for Programming  
Modules at SLIIT-FOC

# Design Thinking as an iterative process

- In which we seek to
  - understand the user
  - challenge assumptions
  - redefine problems
  - attempt to identify alternative strategies
  - solutions that might not be instantly apparent with our initial level of understanding.

**Users ::** Lecturer-In-Charge, Instructors

**Assumptions ::** this is impossible(!)

**Redefine problem ::** supplement human marker with automation

**Alternative strategies ::** Data Driven Marking Automation using ML

**Solutions that may not be apparent with our initial level of understanding**  
:: define a programming language to define test cases



# Design Thinking ...

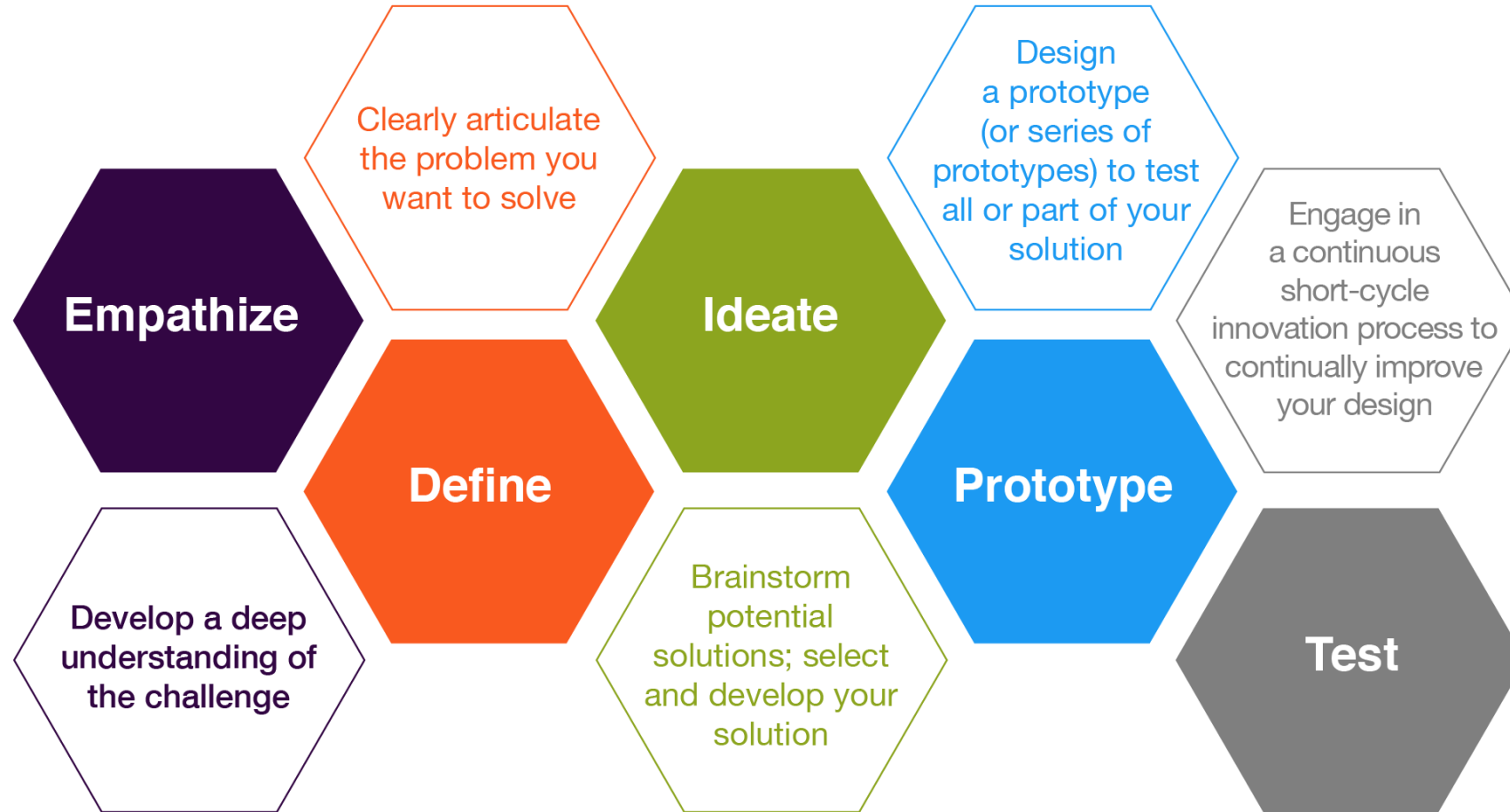
- Helps us in the process of questioning:
  - questioning the problem
  - questioning the assumptions
  - questioning the implications
- Also involves ongoing experimentation:
  - sketching,
  - prototyping,
  - testing, and trying out concepts and ideas



# The five phases of Design Thinking

- Hasso-Plattner Institute of Design

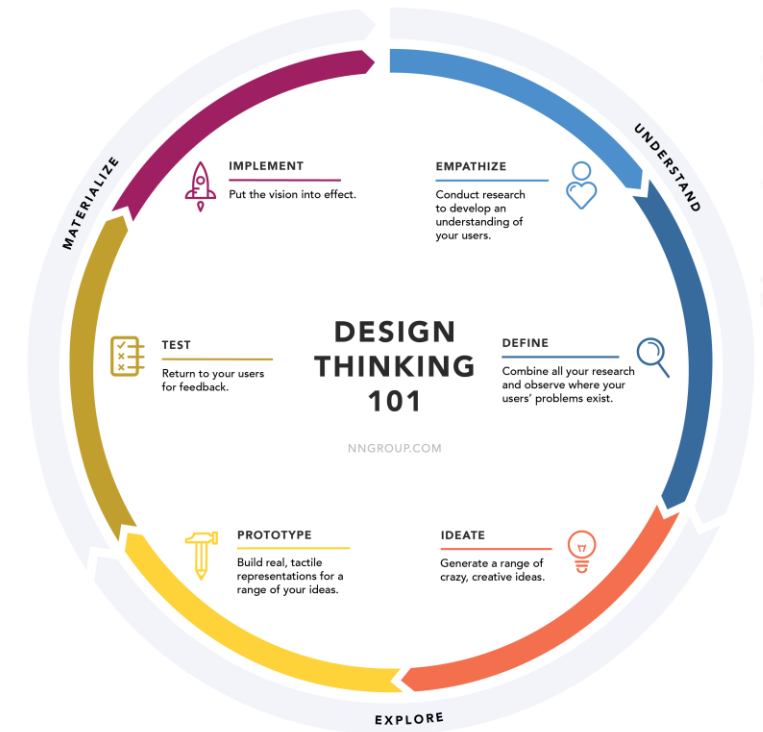
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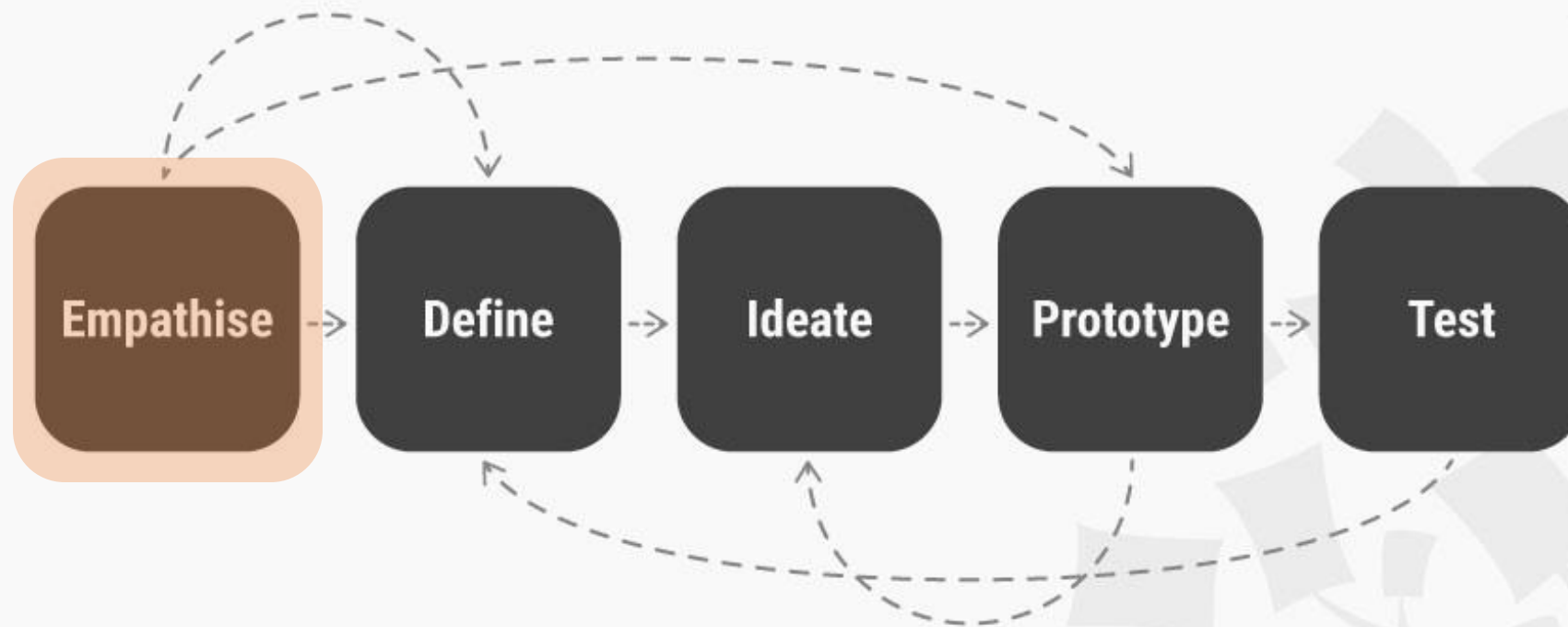
# Design Thinking's Phases

It is important to note that

- The five phases, stages, or modes are not always sequential.
- They do not have to follow any specific order
- can often occur in parallel and repeat iteratively.
- should not understand the phases as a hierarchal or step-by-step process.
- Instead, look at it as an overview of the modes or phases that contribute to an innovative project, rather than sequential steps.



# Design Thinking: A 5 Stage Process



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Source: <https://www.interaction-design.org/literature/article/5-stages-in-the-design-thinking-process>



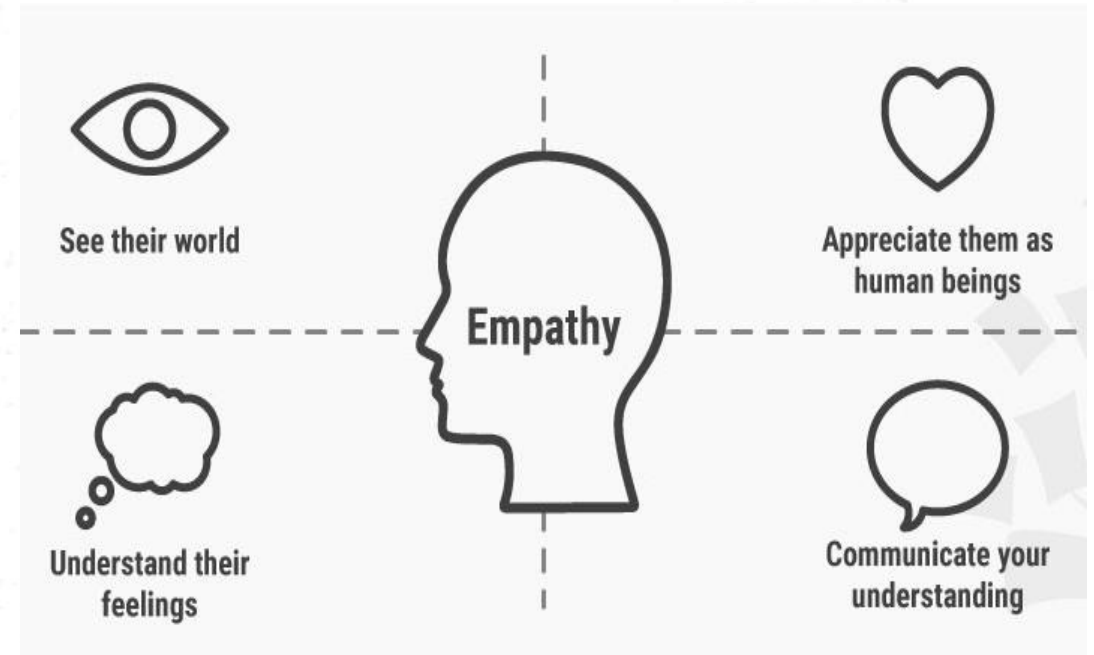
# Empathize – Why?

- Empathy is crucial to a human-centered design processes
- Empathy allows design thinkers to set aside their own assumptions about the world in order to gain insight into users and their needs.
- Depending on time constraints, a substantial amount of information is gathered at this stage to use during the next stage.
- To develop the best possible understanding of the users, their needs, and the problems that underlie the development of that product.

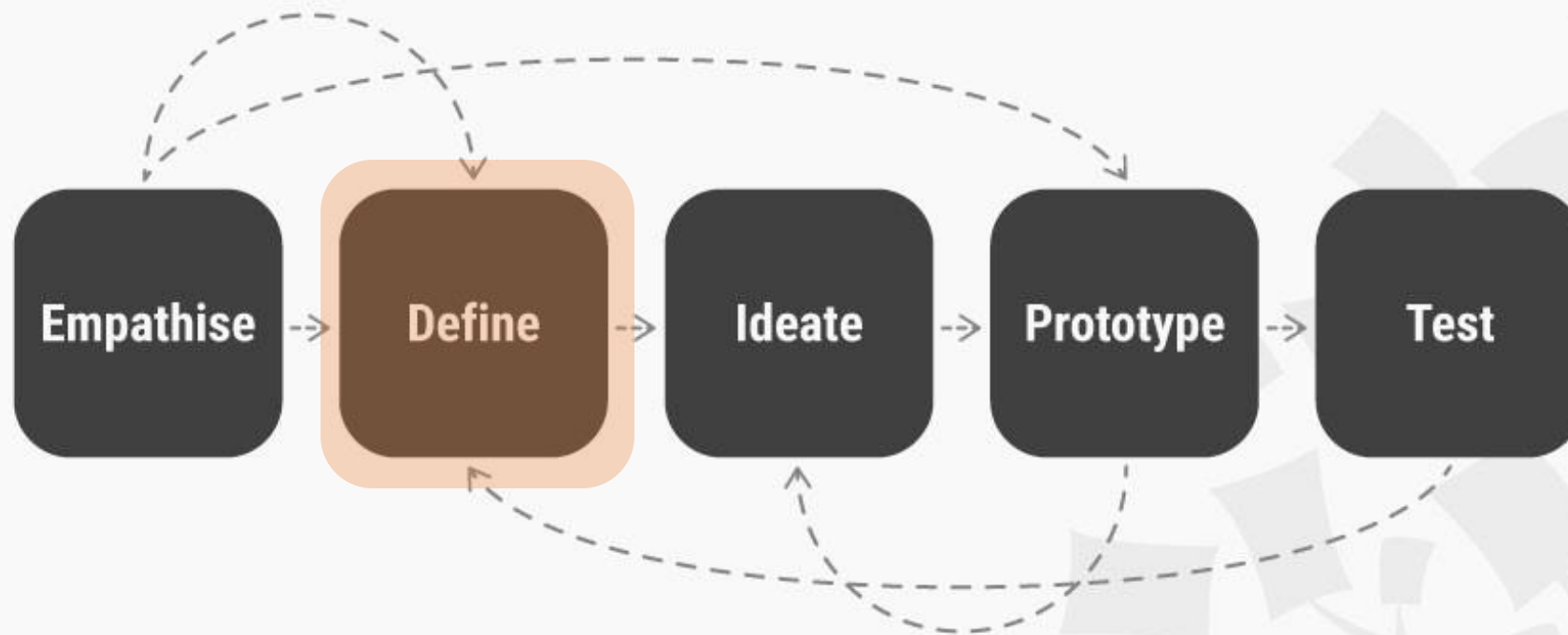


# Empathize - How?

- Consulting experts to find out more about the area of concern through observing
- Empathizing with people to understand their experiences and motivations
- Immersing yourself in the physical environment so you can gain a deeper personal understanding of the issues involved.



# Design Thinking: A 5 Stage Process



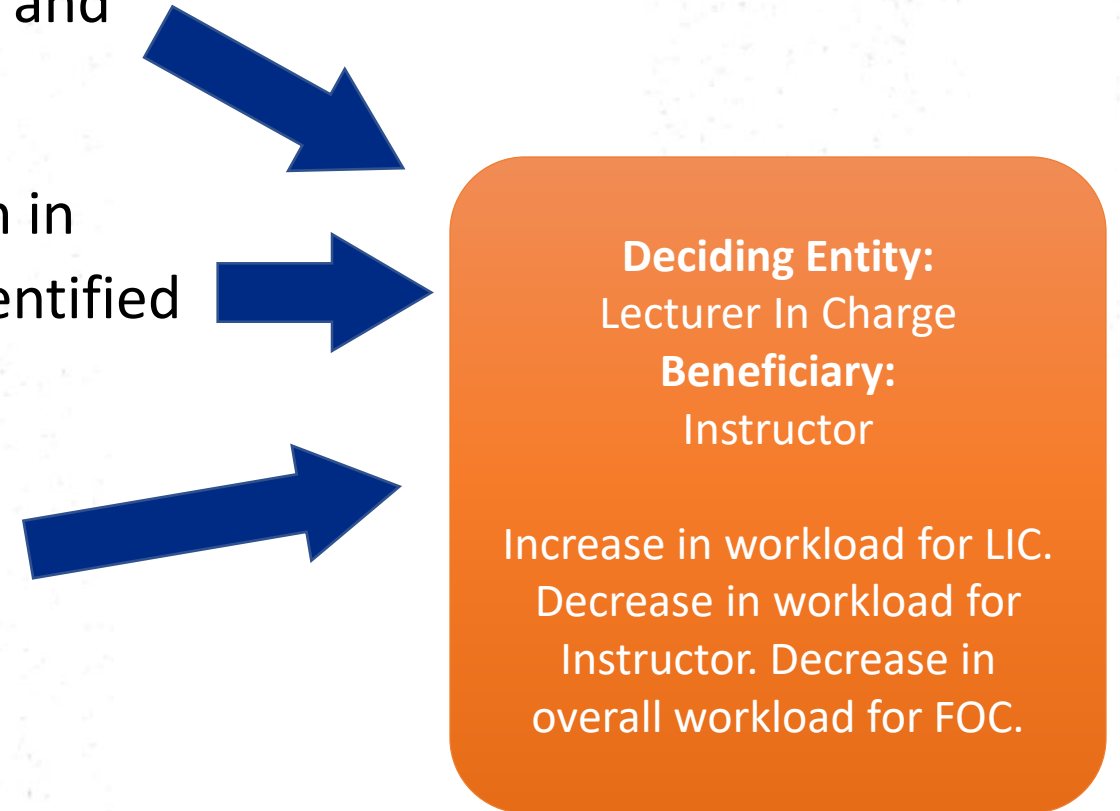
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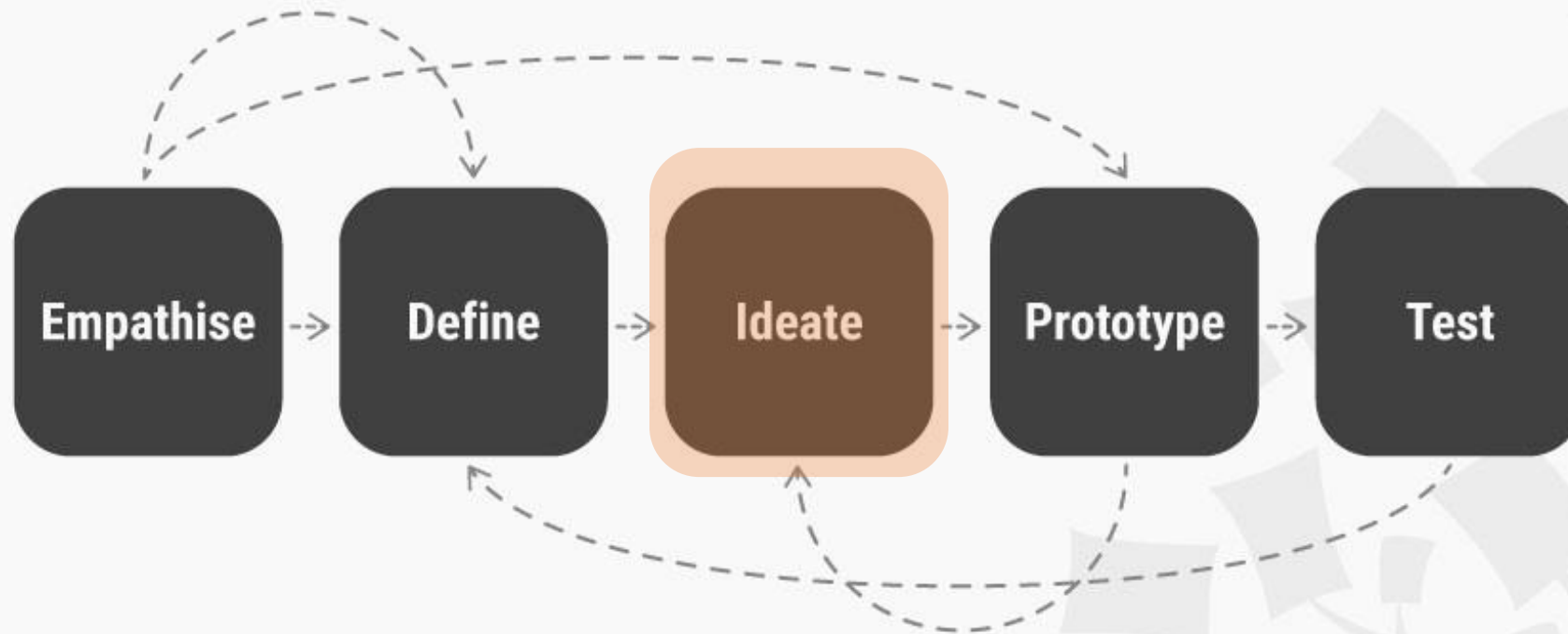
Source: <https://www.interaction-design.org/literature/article/5-stages-in-the-design-thinking-process>

# Define

- Put together the information that created and gathered during the Empathize stage.
- Analyze observations and synthesize them in order to define the core problems that identified up to this point.
- Seek to define the problem as a problem statement in a human-centered manner.



# Design Thinking: A 5 Stage Process



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Source: <https://www.interaction-design.org/literature/article/5-stages-in-the-design-thinking-process>



# Ideate - Prerequisites

- Designers are ready to start generating ideas.
- Understand users and their needs in the Empathize stage
- Observations are analyzed and synthesized in the Define stage
- Ended up with a human-centered problem statement.

## Results of Empathizing User Needs:

Minimal extra workload for LIC  
Minimal learning curve  
Should not be too technical  
Should be bug free(!!!)  
Easy to upgrade without complete redesign

*A user-friendly marking automation solution*

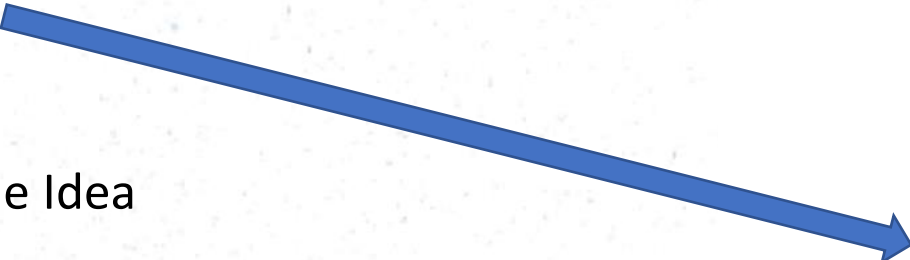


# Ideate – How?

- With this solid background, team members can start to "think outside the box" to identify new solutions to the problem statement which is created,
- Can start to look for alternative ways of viewing the problem.

We have an  
entire lecture  
on Ideation  
Techniques in  
a future week

# Ideate – How?

- There are hundreds of Ideation techniques such as
    - Brainstorm
    - Brain-write
    - Worst Possible Idea
    - SCAMPER
    - Many more....
  - Brainstorm and Worst Possible Idea sessions are typically used to stimulate free thinking and to expand the problem space.
  - Important to get as many ideas or problem solutions as possible at the beginning of the Ideation phase.
- 

## Overall Solutions

Data Driven Marking Automation  
Use static-code analyzers  
Use commercial solutions

## How to define marking-scheme

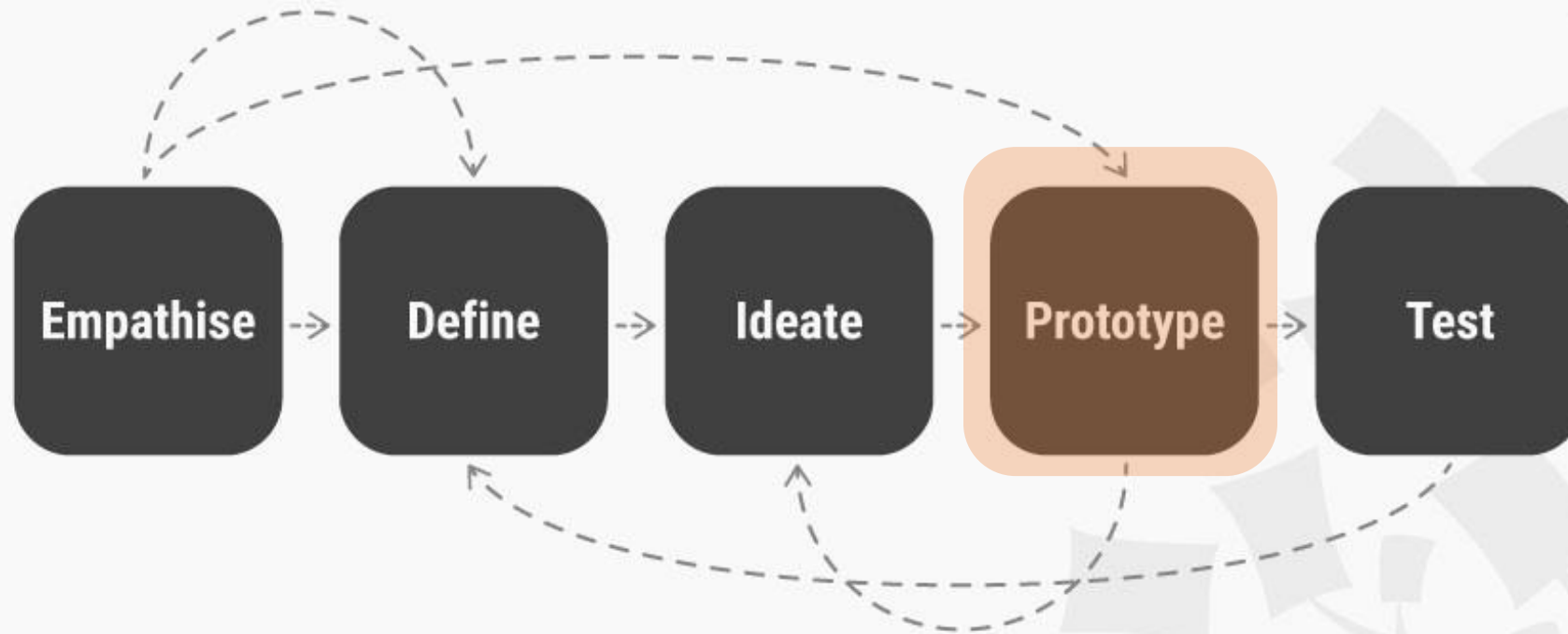
Unit-Test Style  
File Based Input/Outputs  
Programming Language

## Introduce

To staff and students



# Design Thinking: A 5 Stage Process



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Source: <https://www.interaction-design.org/literature/article/5-stages-in-the-design-thinking-process>

# Prototype – How?

- The design team will now produce several inexpensive, scaled down versions of the product or specific features found within the product
- Can investigate the problem solutions generated in the previous stage.
- Prototypes may be shared and tested
  - within the team itself
  - in other departments
  - a small group of people outside the design team.

## Prototyped Solutions

Unit-Test Style  
File Based  
Input/Output  
Programming  
Language



# Prototype

- This is an experimental phase.
- The aim is to identify the best possible solution for each of the problems identified during the first three stages.
- The solutions are implemented within the prototypes, and, one by one
- They are investigated and either accepted, improved and re-examined, or rejected based on the users' experiences.

## Get Users Involved

Obtained sample submissions and marks given from LIC's and instructors

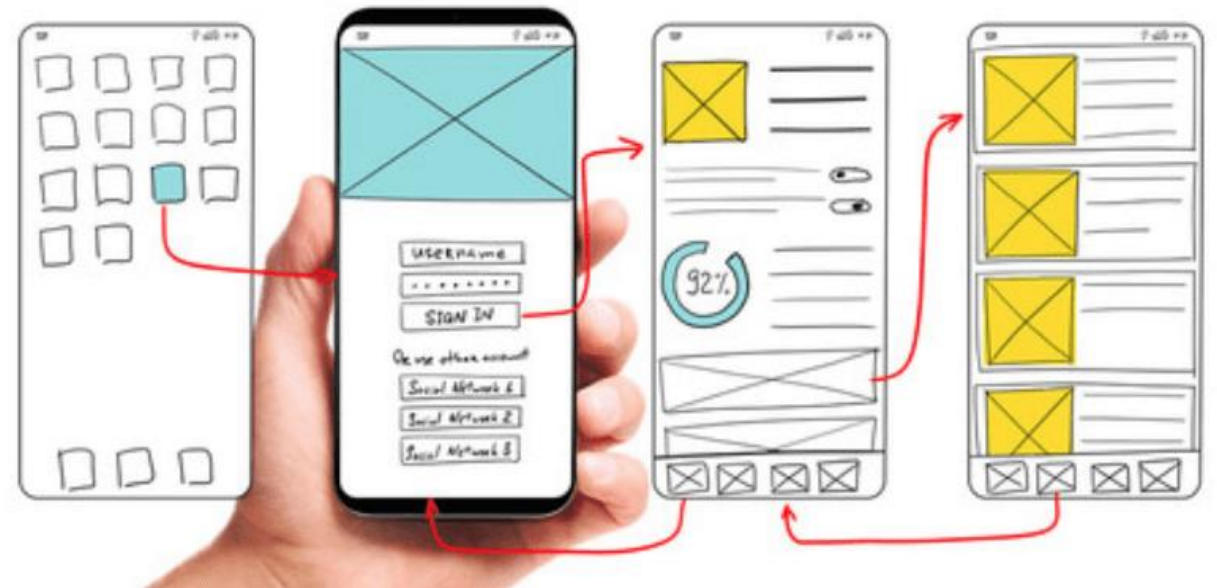
Performed demo's for module teams



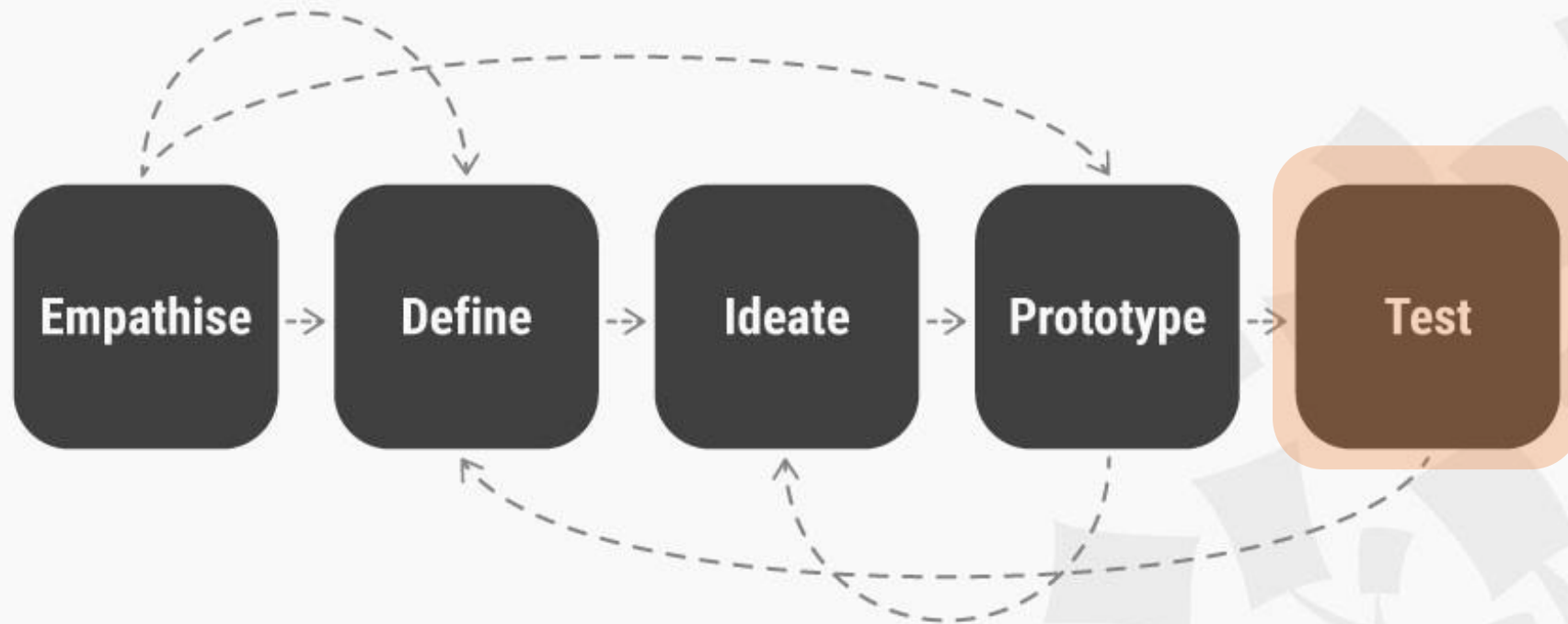
# Prototype

By the end of this stage,

- The design team will have a better idea of
  - constraints inherent to the product and the problems that are present
- Clearer view of how real users would behave, think, and feel when interacting with the product.



# Design Thinking: A 5 Stage Process



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# Test

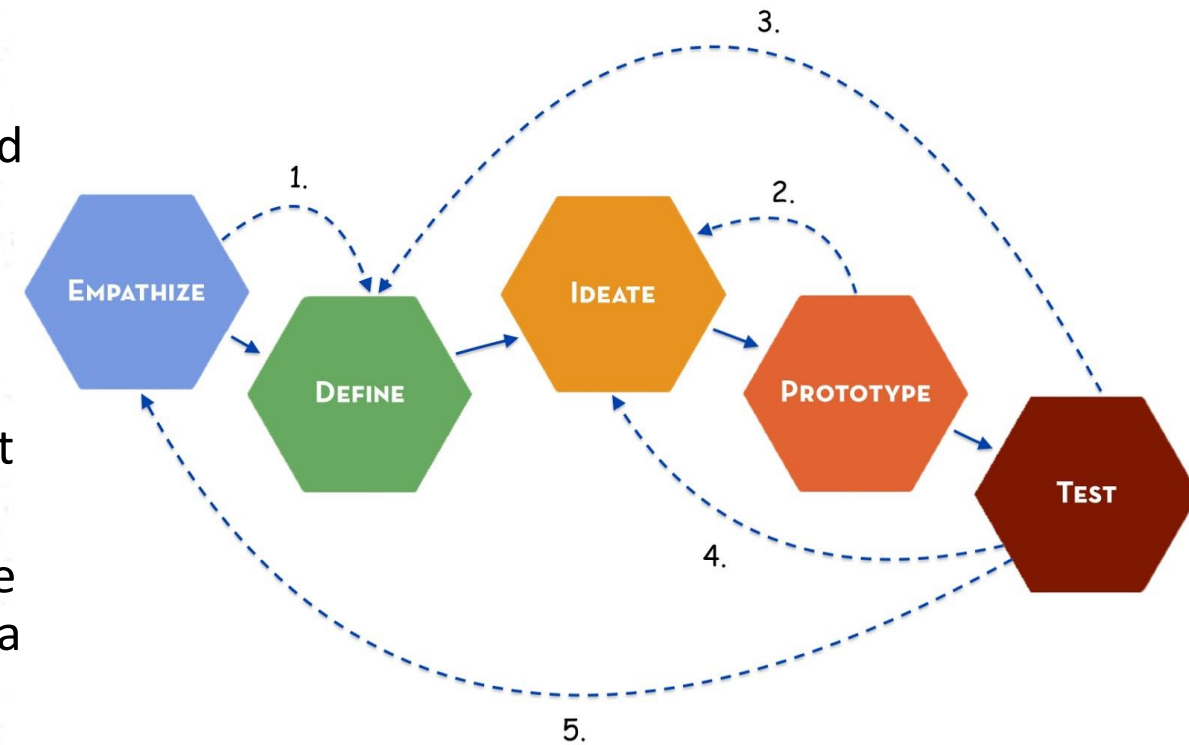
- Designers or evaluators rigorously test the best solutions identified during the prototyping phase.
- This is the final stage of the 5 stage-model, but in an iterative process,
- The results generated during the testing phase are often used to redefine one or more problems and inform the understanding of the users, the conditions of use, how people think, behave, and feel, and to empathize.

## Identified Issues

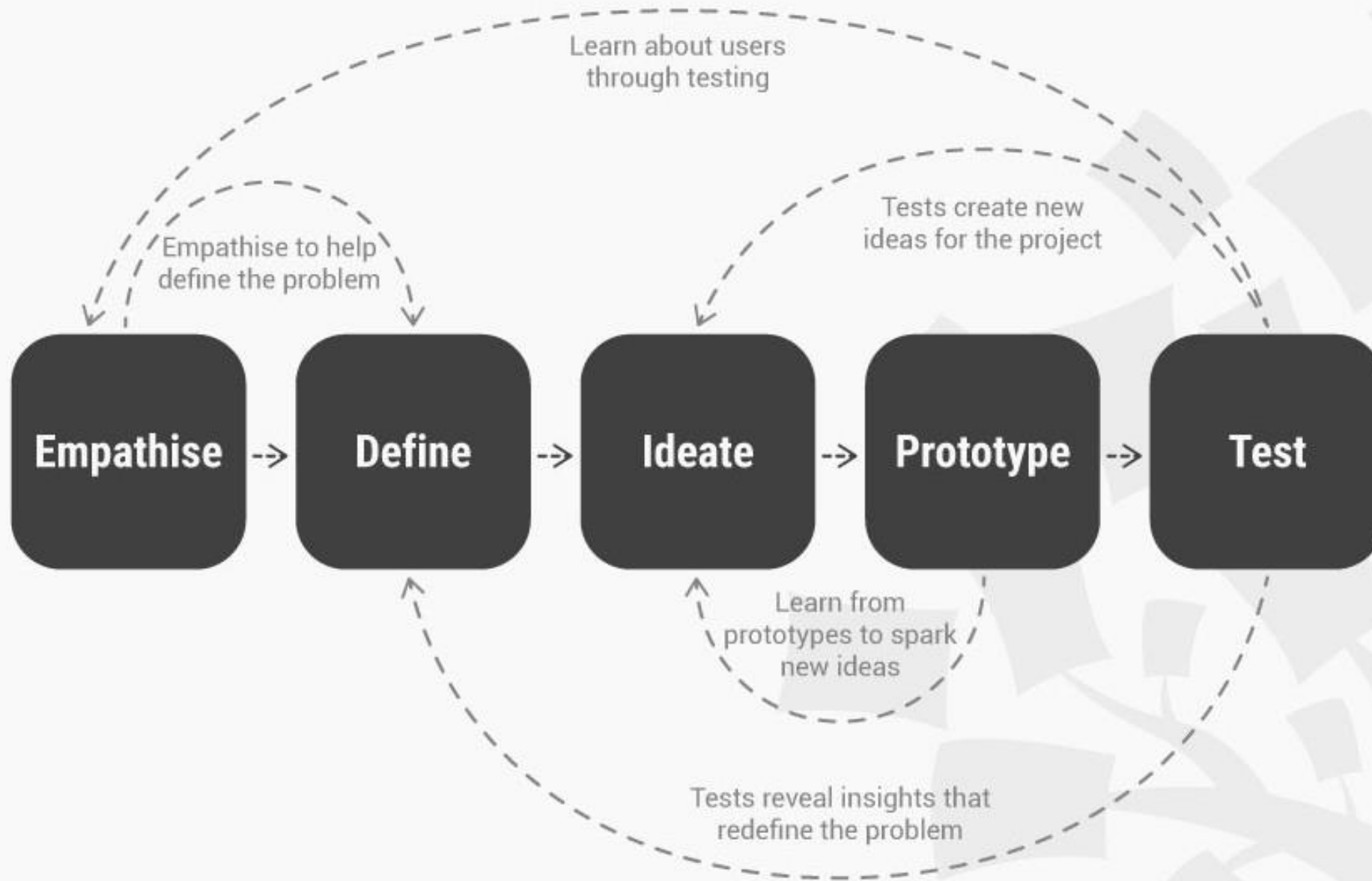
Running on Linux  
Concerns by LIC's about  
maintenance and support  
Submissions are not in the  
required format  
What if the marks need  
changing  
Student submissions that  
do not compile(!!!)

# Non-Linear Nature of Design Thinking

- The five stages are not always sequential
- They do not have to follow any specific order and they can often occur in parallel and be repeated iteratively.
- The five-stage Design Thinking model is that it systematizes and identifies the 5 stages/modes you would expect to carry out in a design project and in any innovative problem-solving project.
- Every project will involve activities specific to the product under development, but the central idea behind each stage remains the same.







# Design Thinking – Summary

Design Thinking tackles complex problems by:

- Empathizing: Understanding the human needs involved.
- Defining: Re-framing and defining the problem in human-centric ways.
- Ideating: Creating many ideas in ideation sessions.
- Prototyping: Adopting a hands-on approach in prototyping.
- Testing: Developing a prototype/solution to the problem.

## Final Design

1. Design a domain specific language where the LIC can specify the marking scheme as a program
2. Design a compiler which will parse the DSL and generate an executable
3. This executable will be run against the student submissions, generating a web UI
4. The LIC can view and override marks using this UI

100%



# Participatory Design

- Participatory design is a process that involves developers, business representatives, and **users** working together to design a solution.
- It **actively involves users** in the design process to help ensure that the product designed meets their needs and is usable in the process.

## Form a Team 9 Developers

1 x Dept. Head  
6 x LIC's from various  
modules  
2 x AL's who regularly mark  
assignments  
1 x Instructor



# Participatory Design

- Designers try to learn the realities of the user's situation
- Users strive to articulate their desired aims and learn appropriate technological means to obtain them.

Source: "Routledge International Handbook of Participatory Design"

## Work Division

- 4 – design DSL
- 2 – write testing samples from their modules
- 4 - collect samples from other modules
- 3 – develop compiler



# Goals for Participatory Design

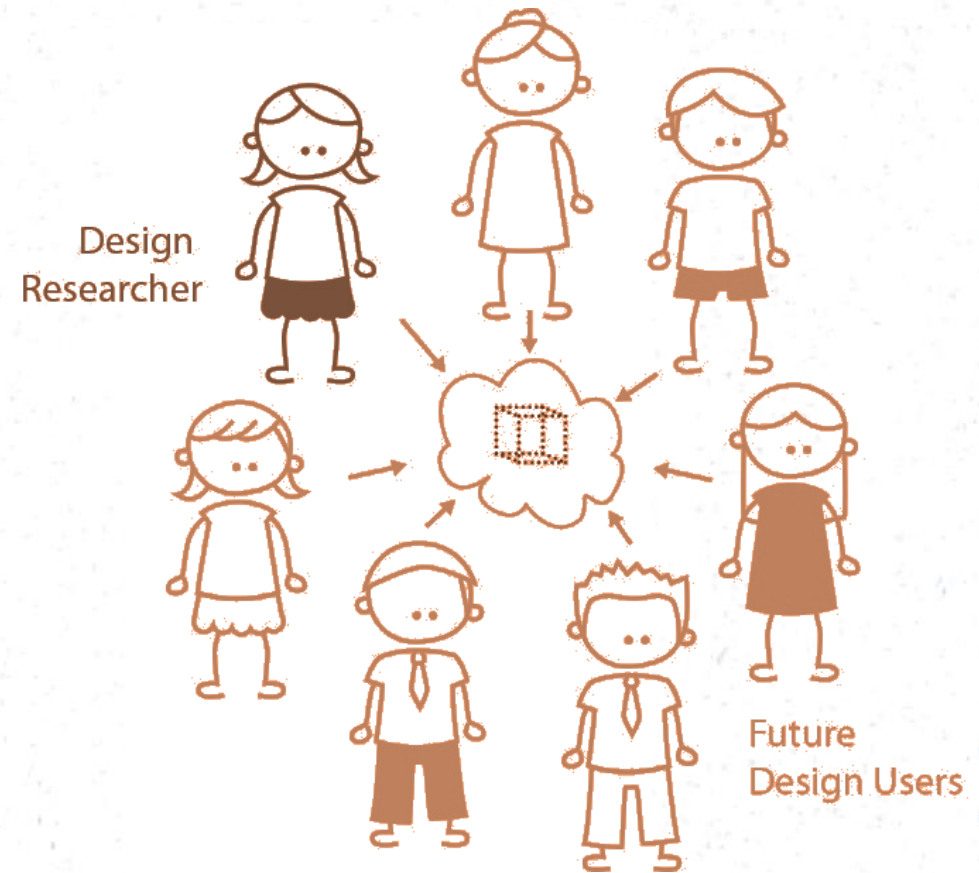
- Designers and users narrowed
- Mutual learning
- Users highly involved in design process
- Handle conflicting goals between workers/users and management

## Form a Team 9 Developers

1 x Dept. Head  
6 x LIC's from various modules  
2 x AL's who regularly mark assignments  
1 x Instructor

# Why involve users?

- Improve the knowledge upon which systems are built
- Enable workers to develop realistic expectations
- Reduce resistance to change
- Members participate in decisions that affect their work



# Levels of users' involvement

- Documented studies



This type of system has been used  
before in another university  
**Can be considered a documented study**

- Source for data gathering

- questionnaires
- observations
- interviews
- ethnography



We collect previous student  
submissions and marks from  
other LIC's outside the Team  
**Sources for data gathering**

- Part of design team

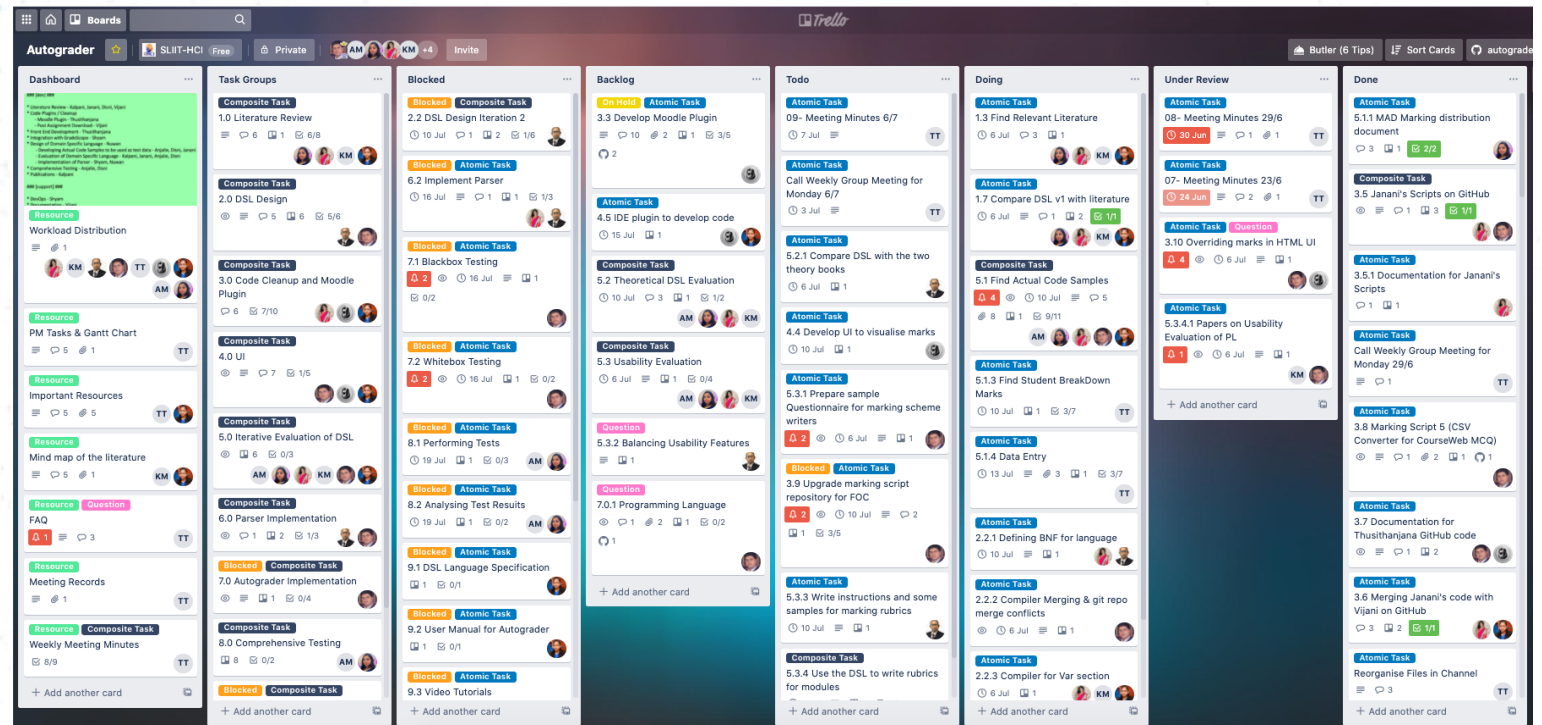


All 9 developers on the team  
are involved in teaching or  
instructing on modules  
**Part of design team**

[illegible]

## In Participatory Design, Designers:

- Coordinate activities
- Facilitate discussion
- Prepare materials
- Advocate solutions



# Participatory Design Terms

- Participatory design create situations in which the user becomes a partner in the design process.
- User-Centered Design [Landauer]
- Human-Centered Systems [Flanagan, Huang, Jones, and Kasif]
- Participatory Design [Muller and Kuhn]
- Contextual Design [Beyer and Holtzblatt]



# Participatory Design - Benefits

- Gives users a voice in the design process.
- Enables technical and non-technical participants to contribute equally.
- Shifts the focus from purely technical requirements and issues towards the needs of the business and users.
- A forum for developers to meet, work with, and understand their users.



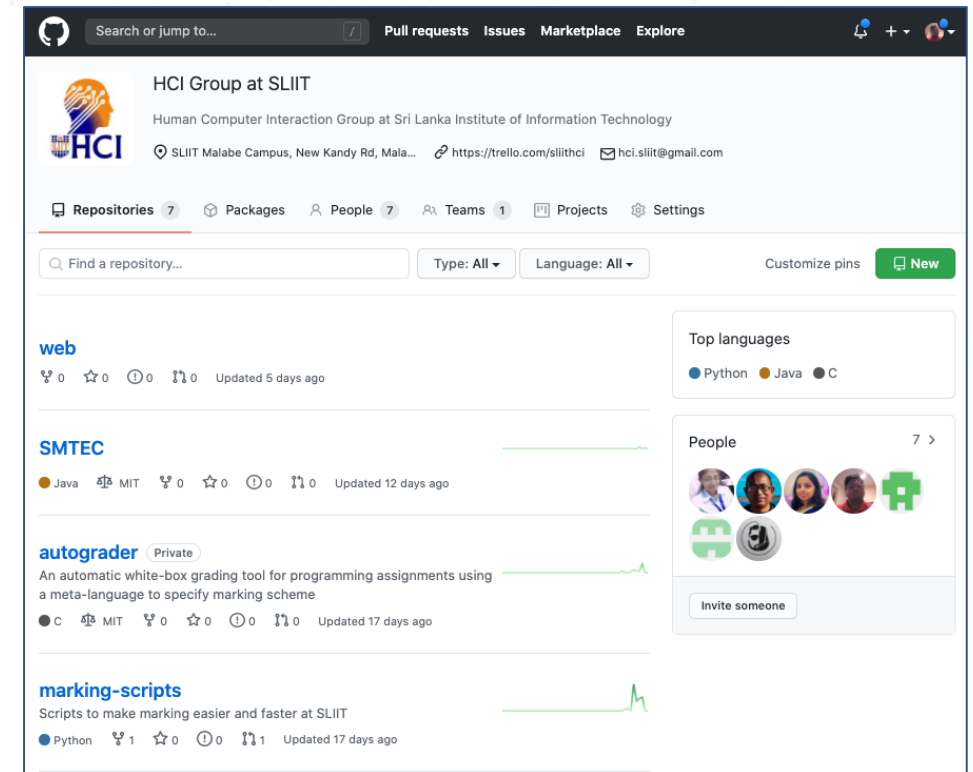
# Participatory Design - Benefits

- A forum for identifying issues and assigning them to people for resolution.
- A forum to specify Design Goals that can be used for current and future products or versions.
- Enables a team to rapidly design, evaluate and iterate design approaches.



# Limitations of Participatory Design

- Close collaboration between users and developers
  - Physical proximity
  - Resources and time to support collaboration
- Involvement of users
  - To access the “right” users
  - Users not comfortable with articulating desires
  - Users disappointed when visions are not realized
- Not all systems are workplace-based
  - What about consumer technologies?
  - What about systems for fun, or communication?
- PD ideology must be adapted for dealing with variations in the design



# Behavioral Sciences





100%

- [illegible]



# Why Behavioral Science is necessary for Design Thinking?

- Our behaviors are the manifestation of the conscious and non-conscious decisions we make
- Human decision-making and thus the emotion appraisals are a focal point of research that uses behavioral sciences.



# What is Cognition?

- Cognition is "the mental action or process of acquiring knowledge and understanding through thought, experience, and the senses"
- Cognition can also be described in terms of cognitive processes **Examples include:**
  - Attention
  - Perception and recognition
  - Memory
  - Learning
  - Reading, speaking and listening
  - Problem-solving, planning, reasoning and decision-making



# Understand cognition?

- Interacting with technology involves several cognitive processes
- Need to consider cognitive processes involved and cognitive limitations of users
- Provides knowledge about what users can and cannot be expected to do
- Good systems aim to reduce cognitive load per process involved



# Design Mindset - Conclusion

- Design thinking
  - Empathize, Define, Ideate, Prototype, Test
- Participatory design
  - Getting users involved in the design process
- Behavioral sciences
  - Understanding user psychology and cognition



Thank  
you