



GENERAL SIR JOHN KOTELAWALA DEFENCE UNIVERSITY

# Engineering Product Design

ET 3153

# Outline

Design Thinking, Inclusive Design and Design for X.

General Introduction to Standards.

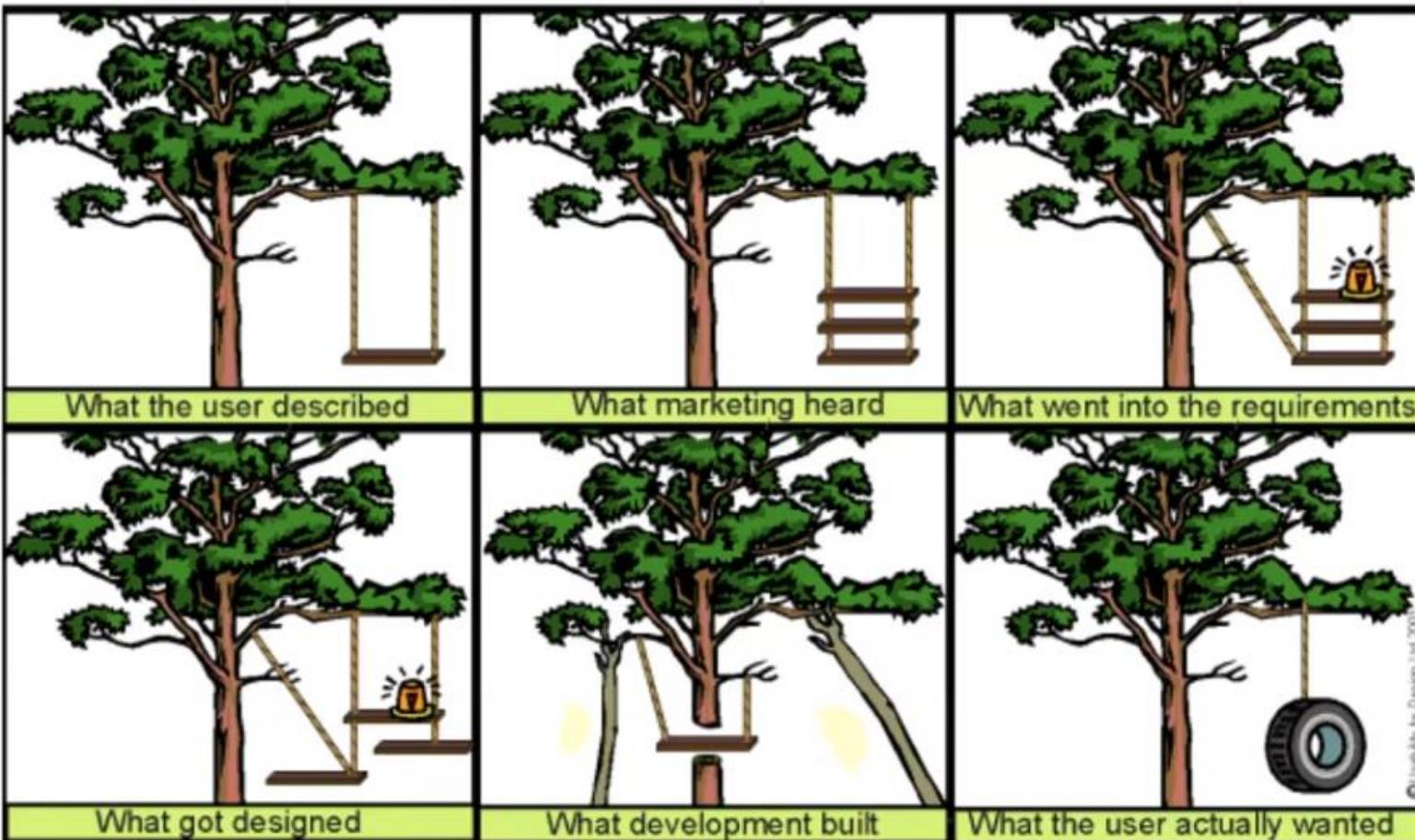
Design Practice.

Documentation.

Formulation of Product Marketing Strategy.

# Learning Objectives

- Gain knowledge on the key concepts of Design Thinking.
- Understand the mindset and methodology of Design Thinking.
- Identify the best practices.



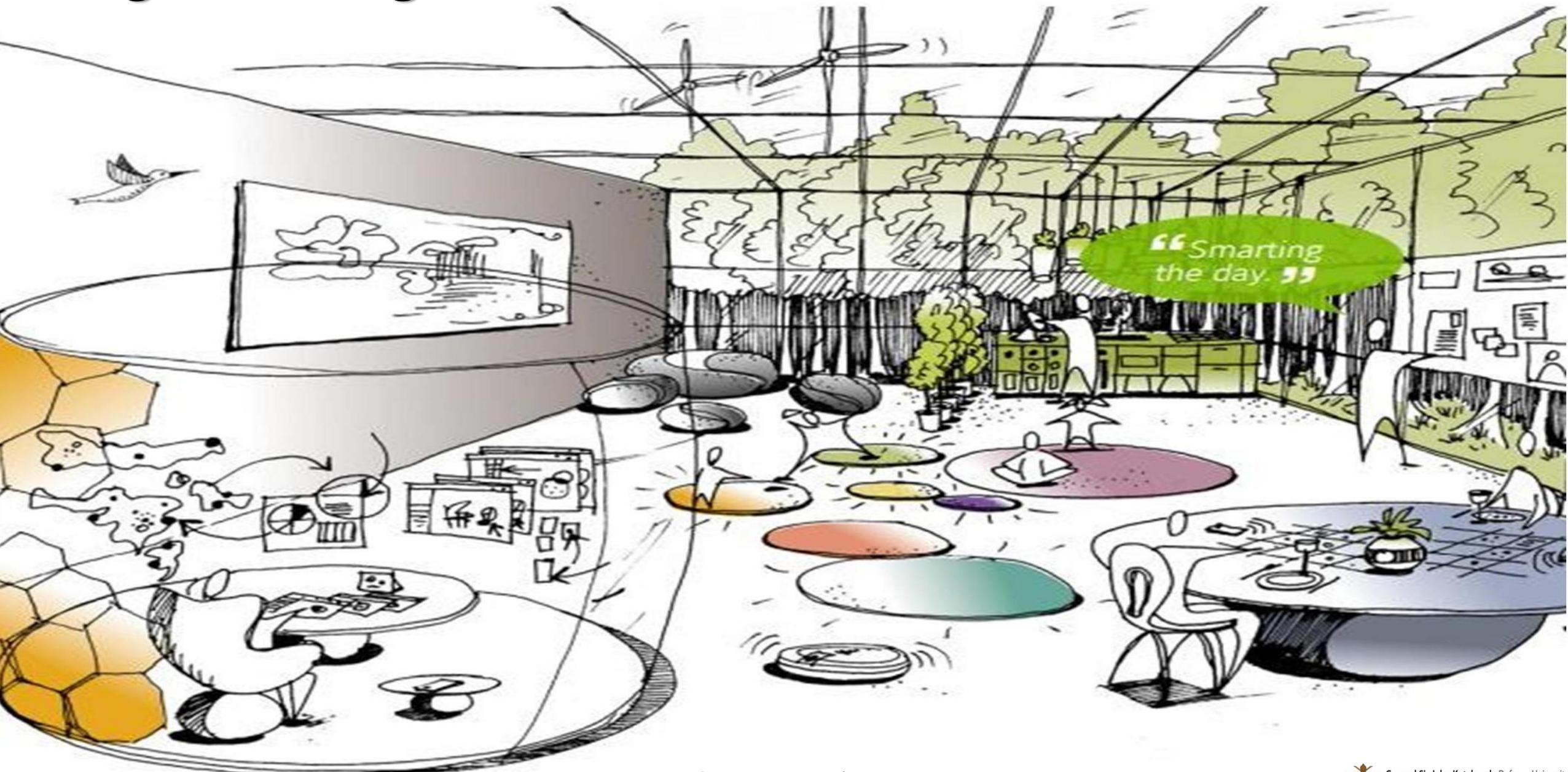


# Design Thinking

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# Design Thinking and Workforce of the Future



# Design Thinking, Why ?

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21<sup>st</sup>  
Century  
Skills

## Foundational Literacies

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## Competencies

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## Character Qualities

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Literacy

Numeracy

Scientific literacy

ICT literacy

Financial literacy

Cultural & Civic literacy

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Critical Thinking/Problem Solving

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Creativity

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Communication

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Collaboration

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Curiosity

---

Initiative

---

Persistence /grit

---

Adaptability

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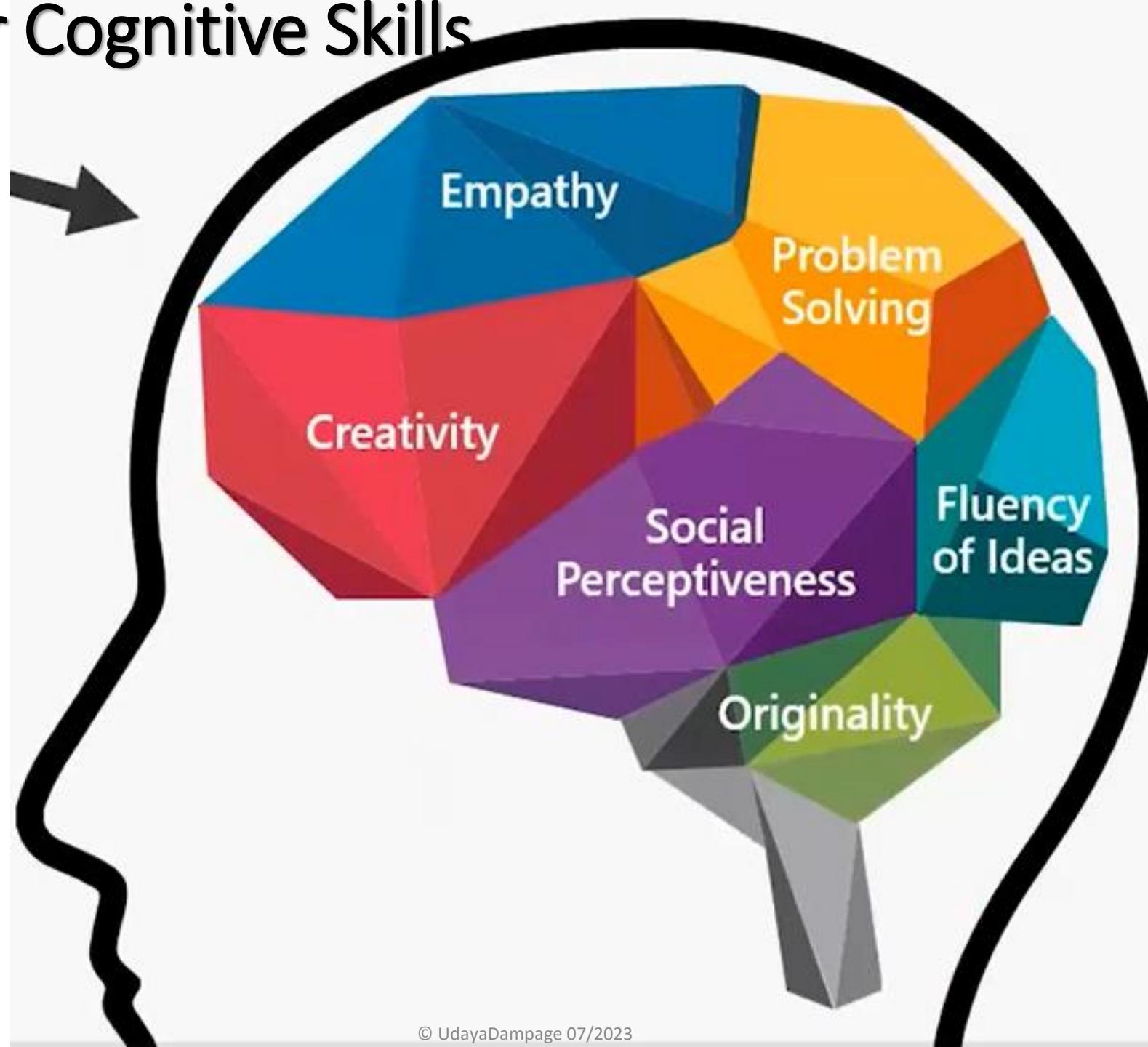
Leadership

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Social and cultural Awareness

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# Higher Order Cognitive Skills



# Design Thinking Process, Why ?

- Three possible factors lead to innovation:



- Failure !

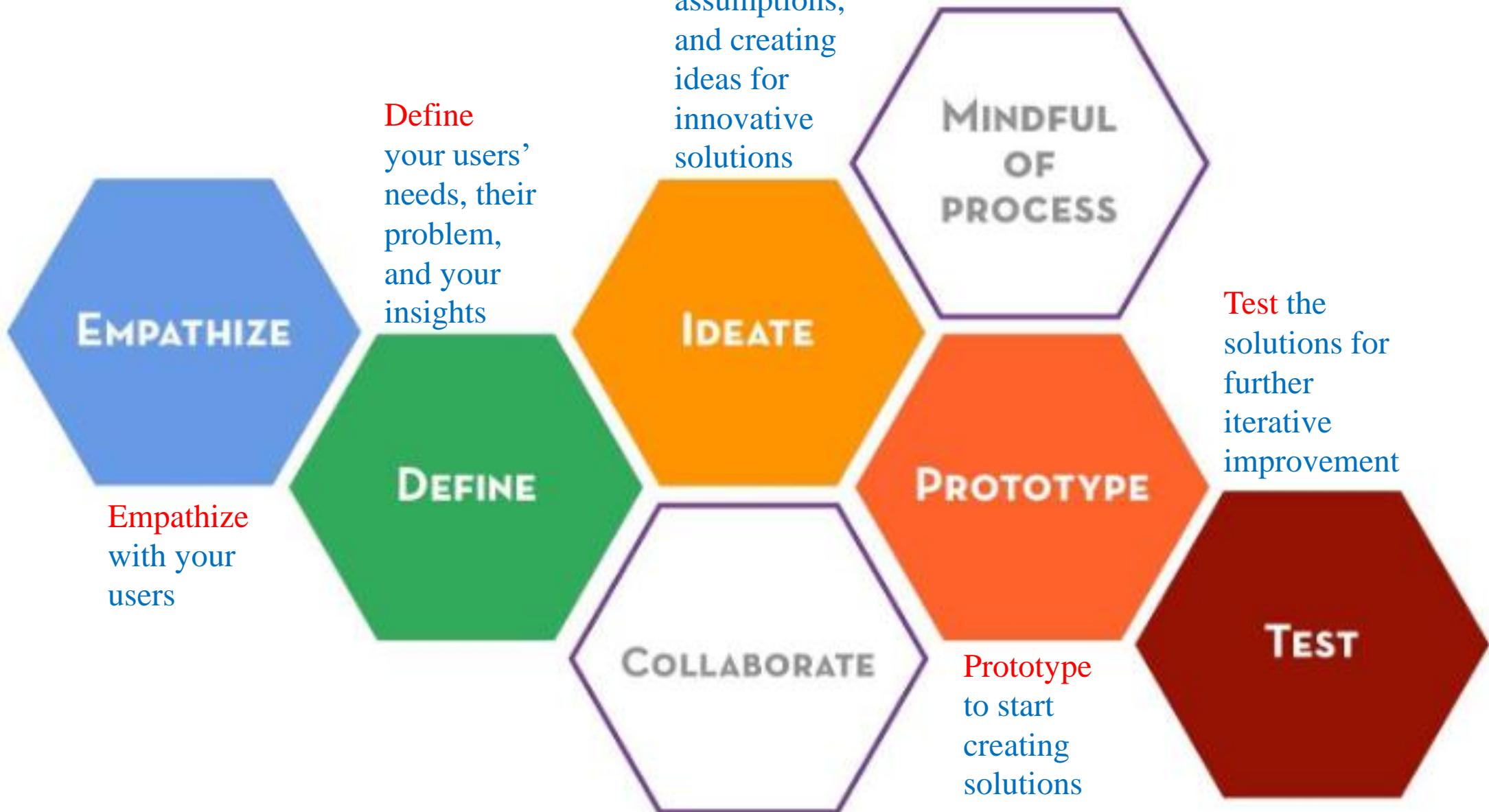


- Vision



- Process

# Design Thinking Process







How does one company go from controlling  
**50% of the world's smartphone market to less than 1%?**



*"We believed we knew better what customers needed than they did."*

- BlackBerry Executive



*"We focus on People's needs  
and desires, rather than only  
the needs of the business."*

- Steve Jobs

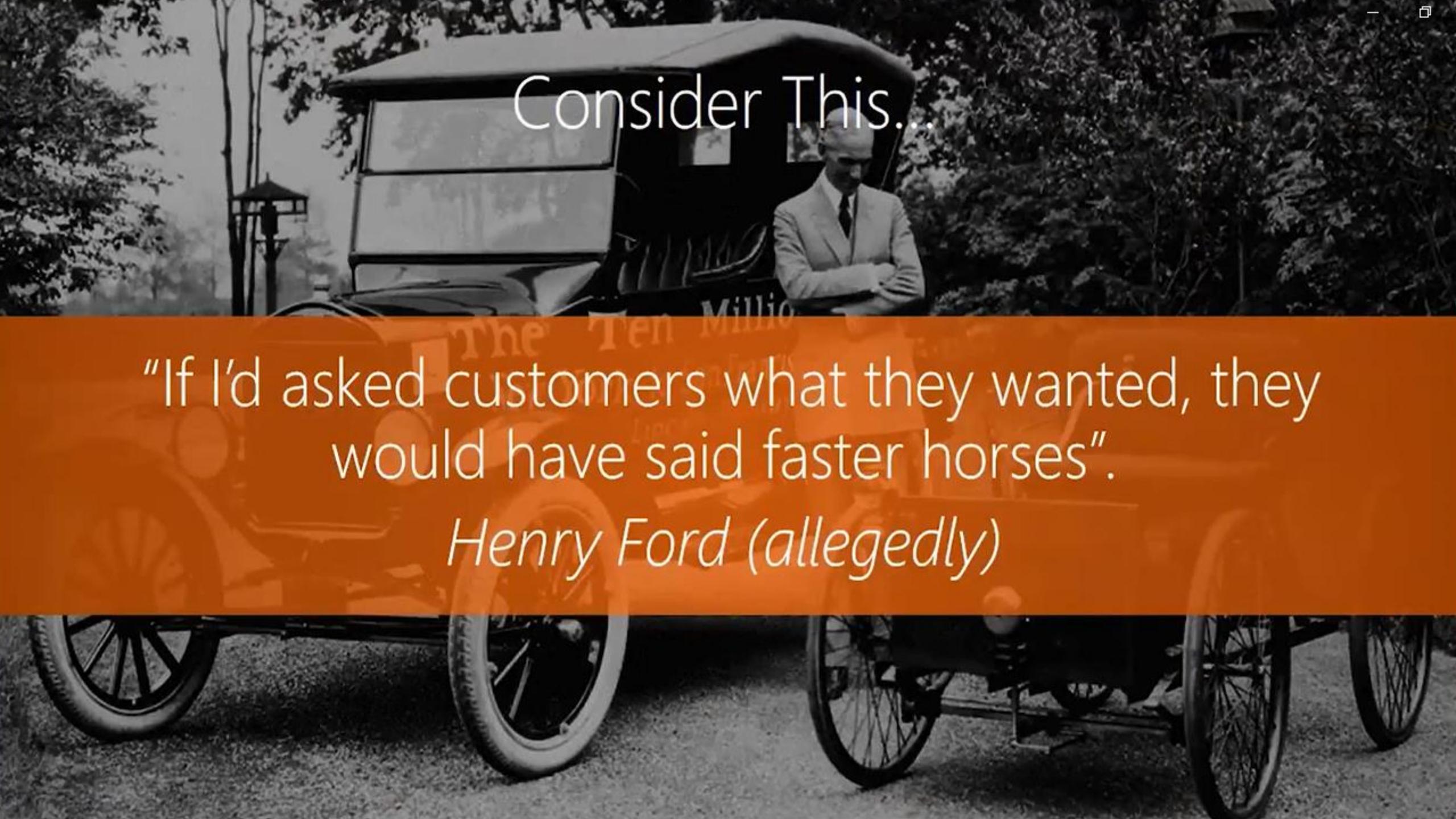
*Focus on Needs and Desires...*

# What is Design Thinking

Leads to  
human-centered  
products, services,  
and internal  
processes

Set of principles for  
creative problem-  
solving

Unlocks needs  
and problems,  
even when the  
users don't know  
what they are

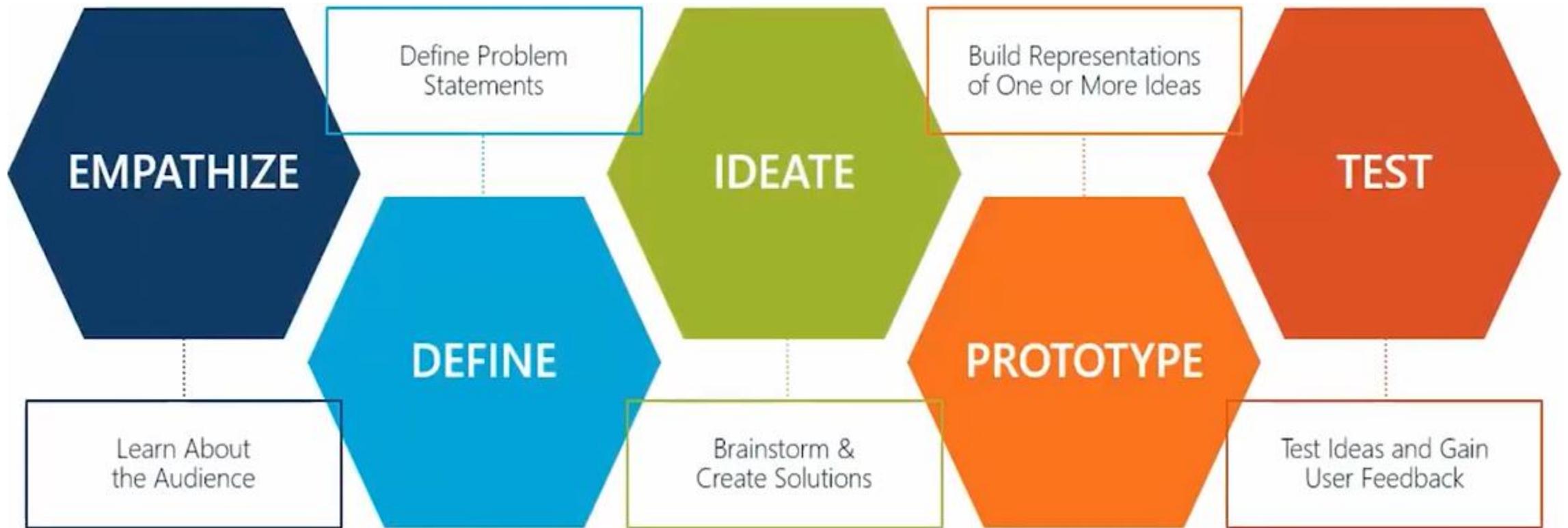


# Consider This...

"If I'd asked customers what they wanted, they would have said faster horses".

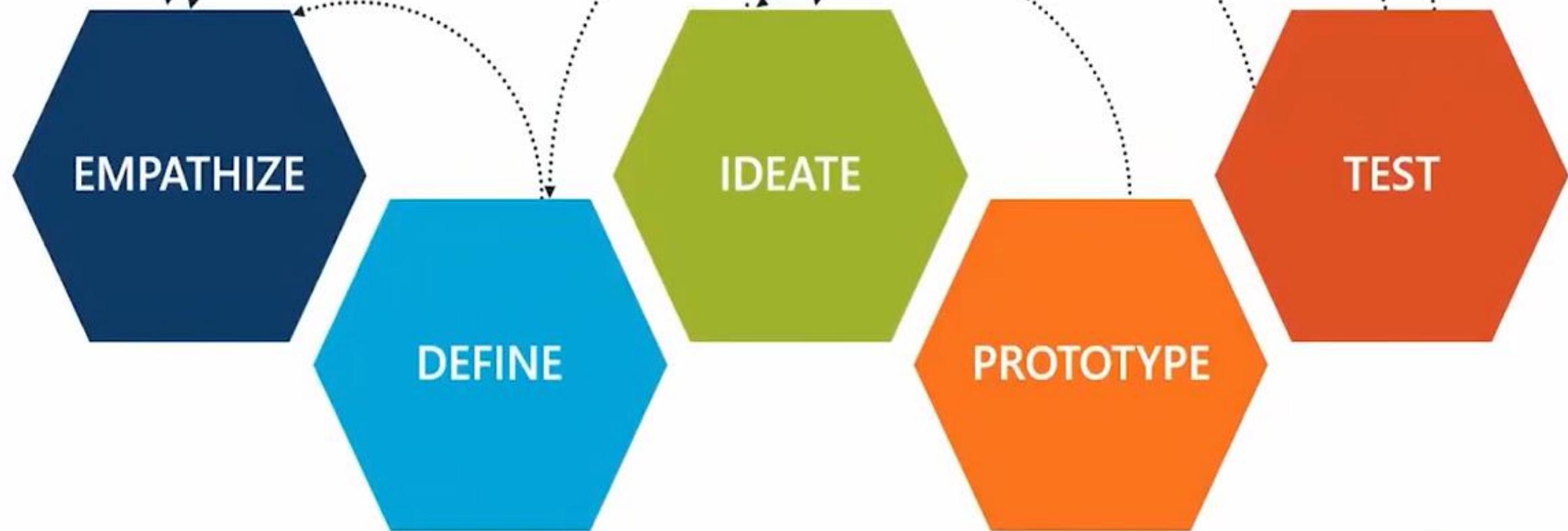
*Henry Ford (allegedly)*

# Five Phases of Design Thinking

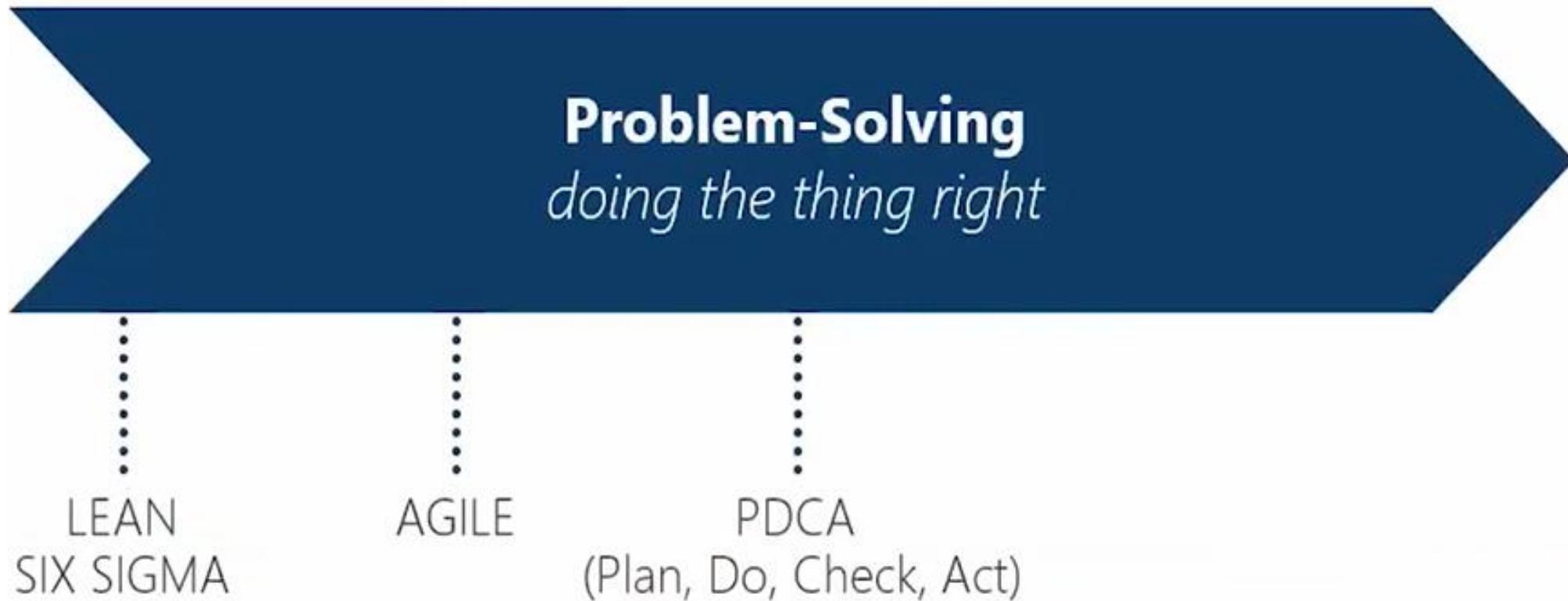


# Design Thinking

A Nonlinear Process



# Problem Solving vs. Problem Finding



# Problem Solving vs. Problem Finding

**Problem-Finding**  
*doing the right thing*

DESIGN  
THINKING

LEAN  
SIX SIGMA

AGILE

**Problem-Solving**  
*doing the thing right*

PDCA  
(Plan, Do, Check, Act)

# Design Thinking vs. Other Methodologies

LEAN SIX SIGMA (DMAIC)	DESIGN THINKING	PDCA CYCLE
	Empathy (Understand)	
Define	Define	
Measure		Plan
Analyze	<i>(Not much focus on Data Analysis)</i>	
Improve	Ideate and Prototype	Do
Control	Test	Check
		Act



# Design Thinking – is it a Trend?

# When to Apply Design Thinking

Design Thinking may  
be the answer if...

The problem is  
human-centered

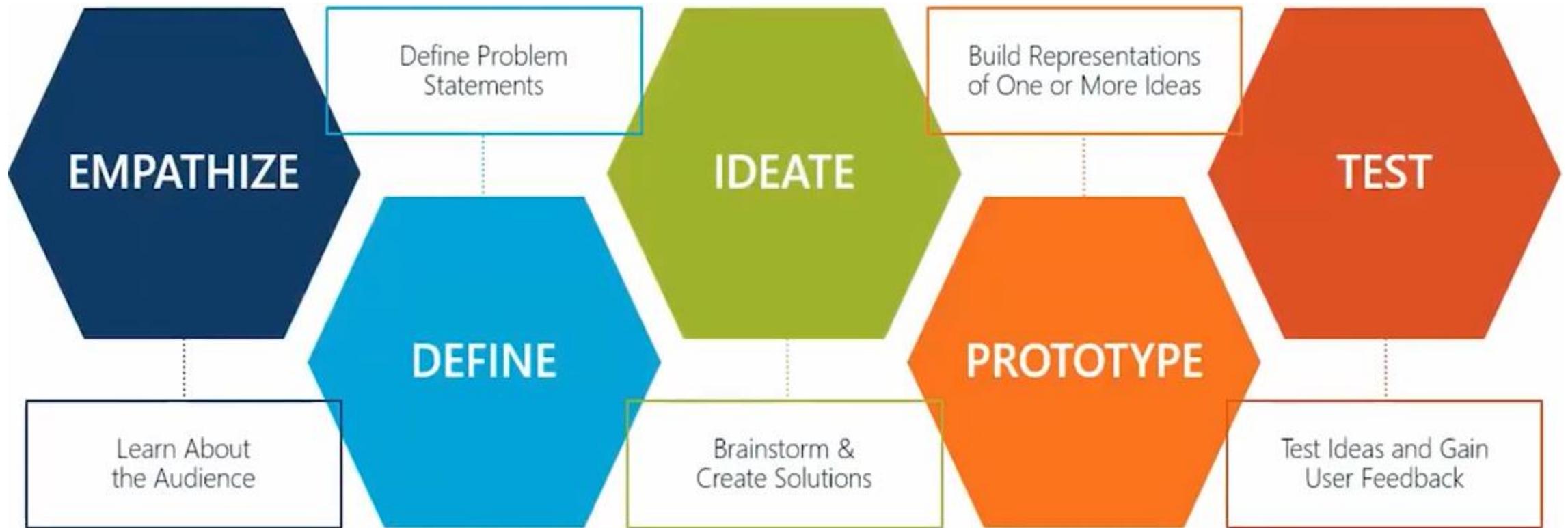
You don't clearly  
understand the problem  
or have alignment

The problem is fairly  
complex

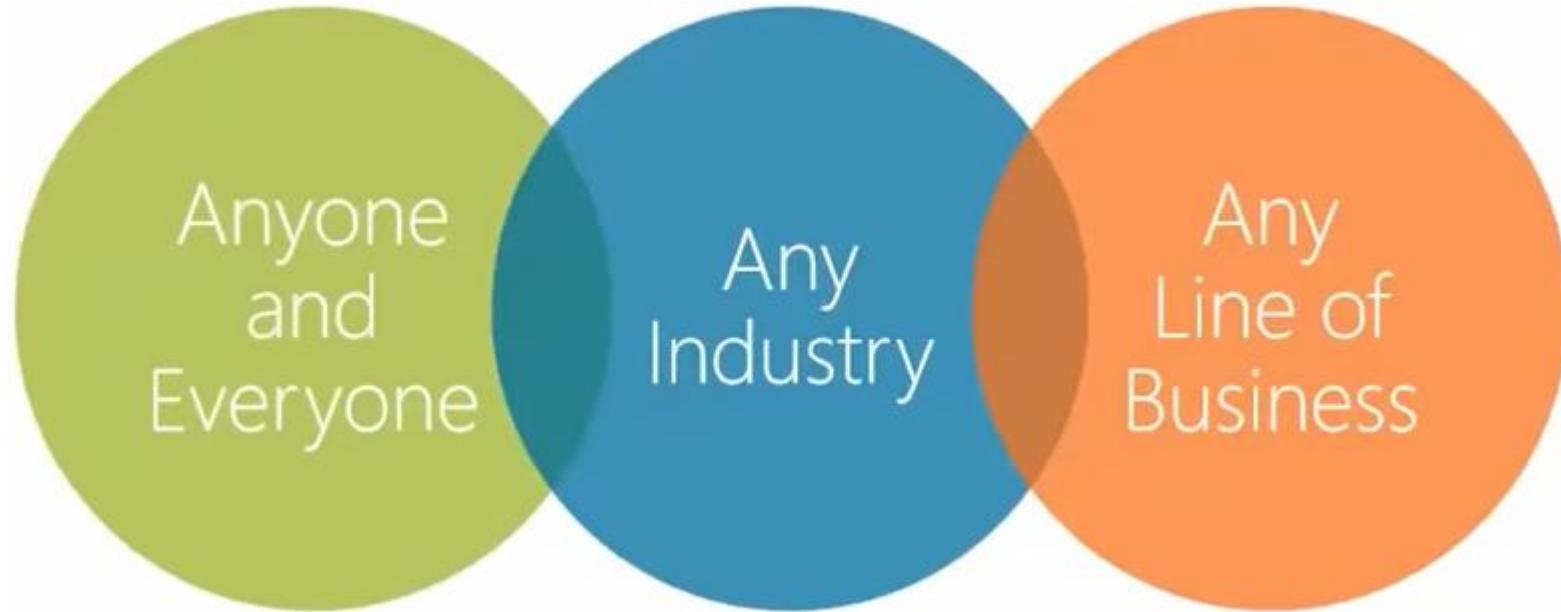
You need fresh ideas or a  
fresh approach



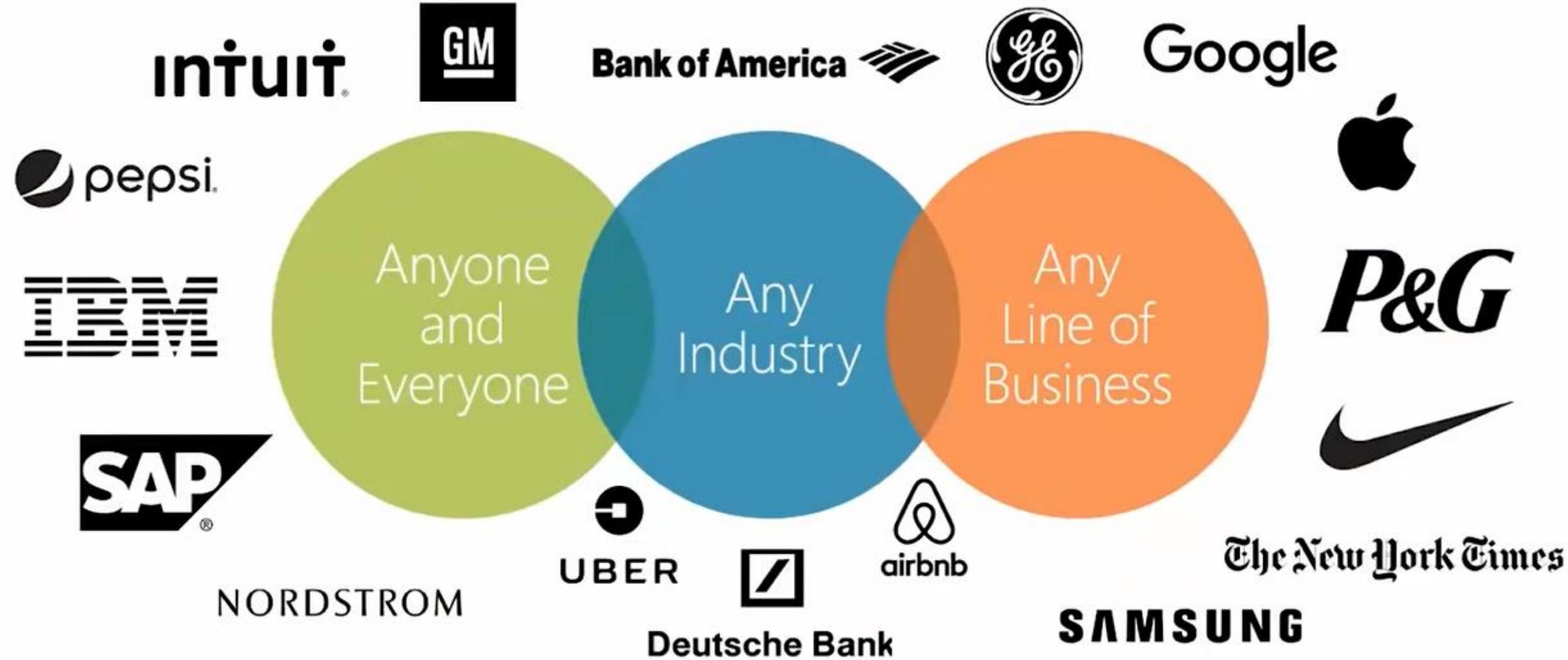
# Five Phases of Design Thinking



# Who Can Use Design Thinking



# Who Can Use Design Thinking



# Design Thinking in Practice



- Airbnb founders attribute their initial success to Design Thinking.
- Airbnb has changed the *Chief HR Officer* function into the *Chief Employee Experience Officer* function, recognizing that "experience" is the essence of a workplace, especially among millennials.



- LinkedIn organized a 6-week program with 1,000 participants from LinkedIn, Facebook, Google, and other Silicon Valley companies.
- Purpose: Find solutions for specific issues around low employee engagement.



- Telstra applied Design Thinking to significantly enhance their new employee onboarding experience.
- Approach: Adopt a design-based approach to simplify and minimize information complexity and improve the efficacy of its onboarding experience.

# Design Thinking in Practice



## Keep the Change® Savings Program

### CHALLENGE

Find ways to help customers save money

### SOLUTION

*Keep the Change:*  
Round up on every purchase and automatically put it into a savings account

### VALUE

12.3 million customers have enrolled, saving a total of more than 2 billion dollars.  
60% of new customers enroll in the program

# Design Thinking in Practice

General Electric  
Building a Better MR Scanner



# Design Thinking in Practice

General Electric  
Building a Better MR Scanner



# Design Thinking in Practice

General Electric  
Building a Better MR Scanner



80%  
Child Sedation  
Rate

# Design Thinking in Practice

General Electric  
Building a Better MR Scanner

<8%  
Child Sedation  
Rate



# Value of Design Thinking

Puts people first

Helps work through ambiguity

Drives innovation and creative problem-solving

Reframes business problems

Transforms us from “order takers” to Trusted Advisors

# Why Design Thinking isn't used much

Risky, disruptive to process, many unknowns

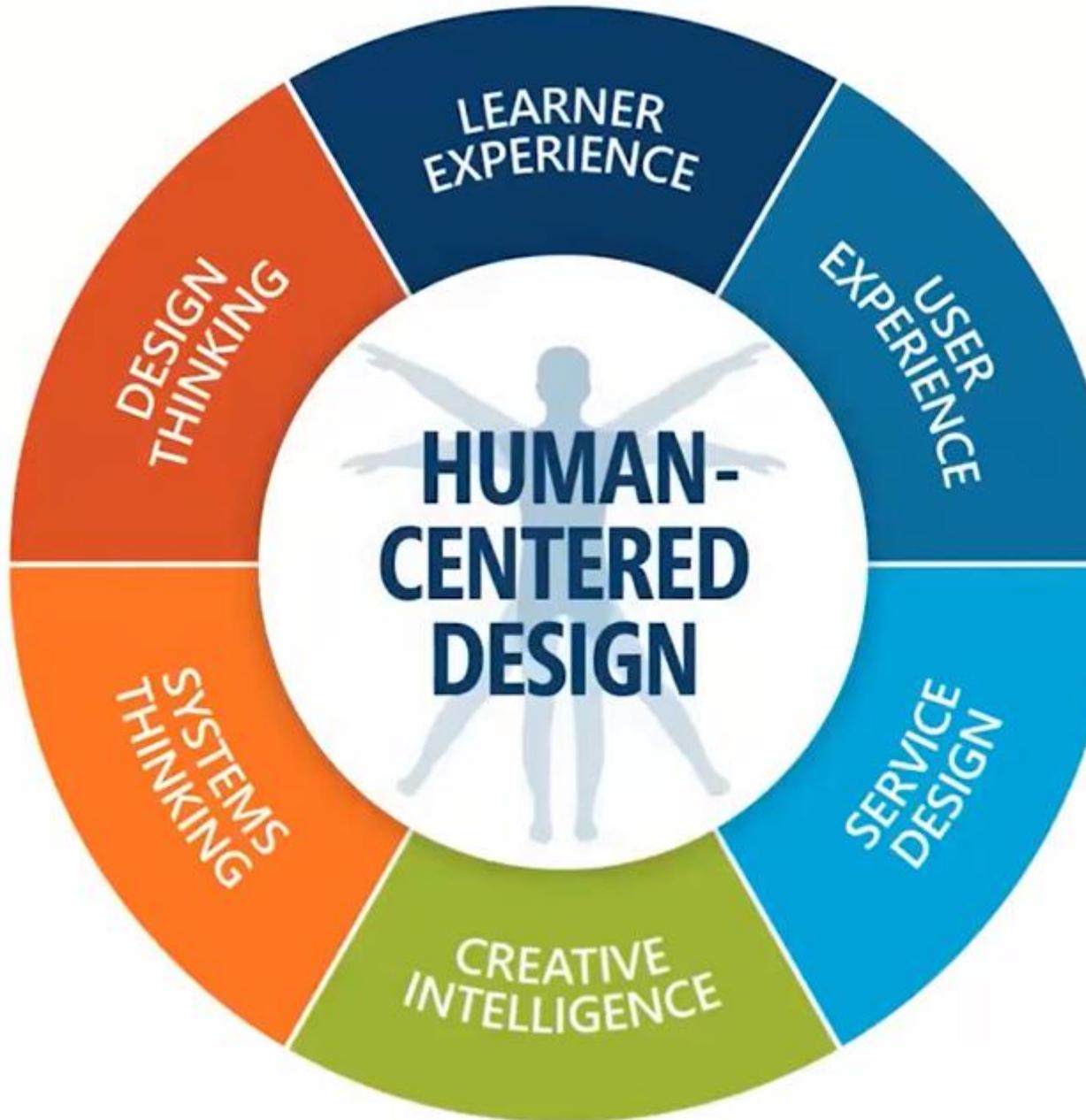
Lack of leadership "buy-in"

Stops at theory (*I get it. I read an article.*)

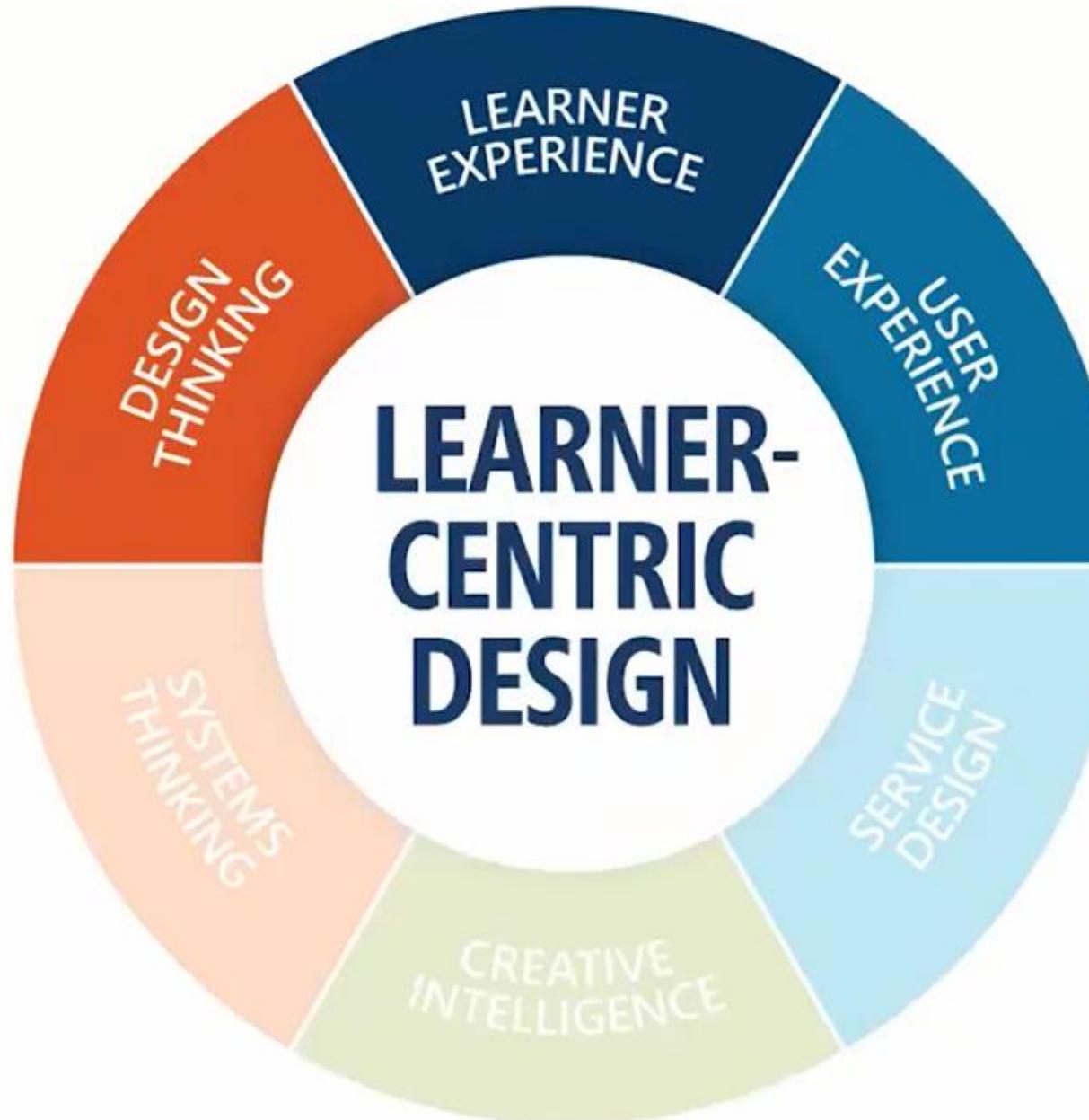
One-time event vs. culture change

The name

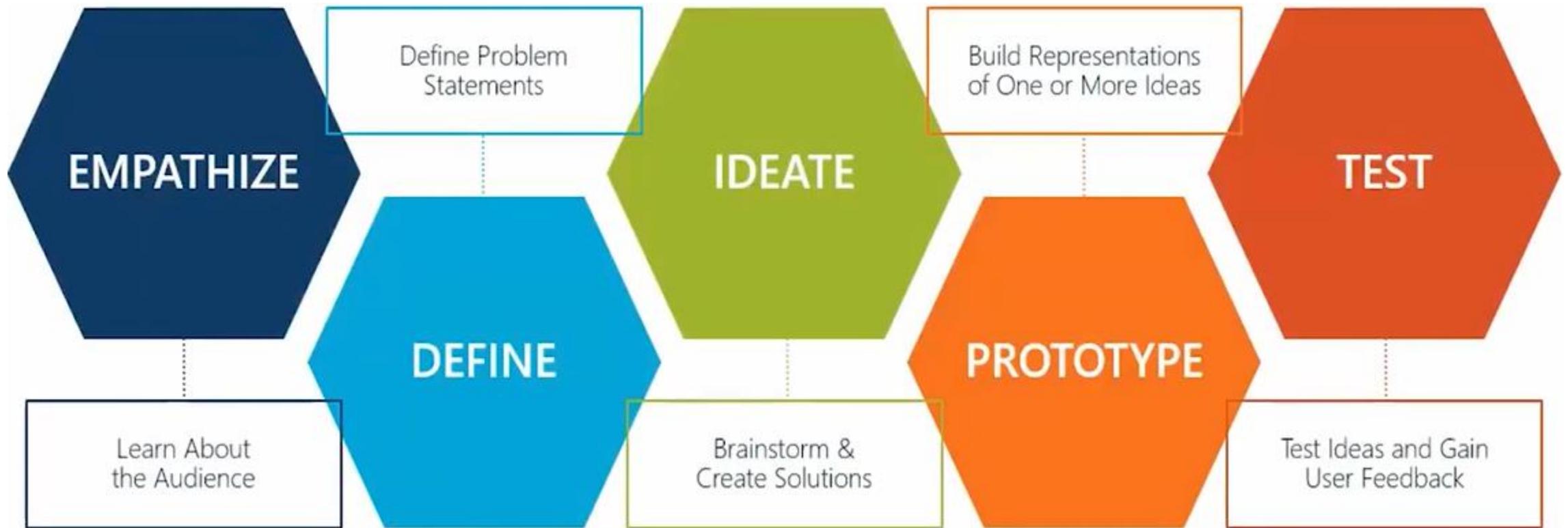
# Design Thinking



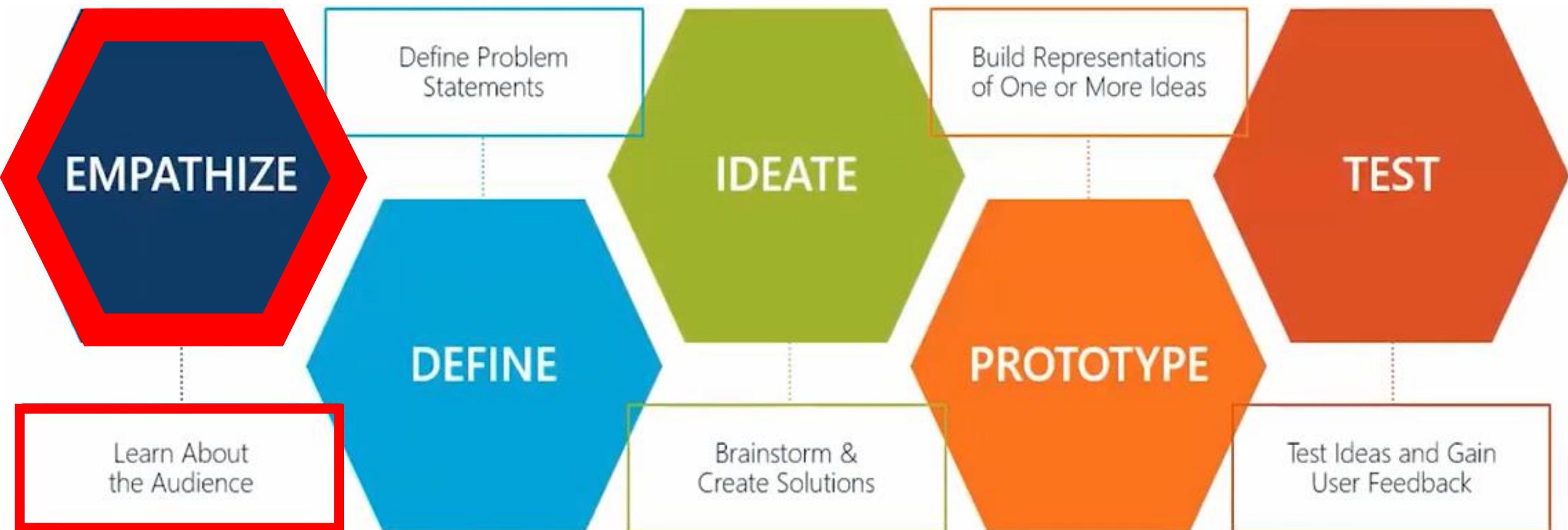
# Design Thinking



# Five Phases of Design Thinking



# Empathizing Phase

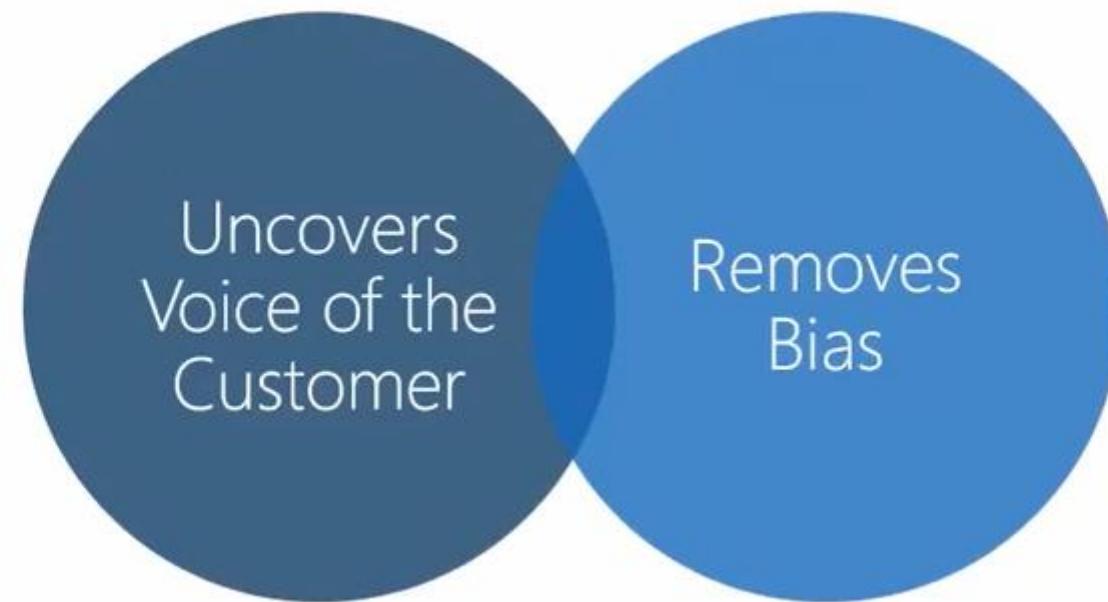


# Empathy

Capacity to understand or feel what another person is experiencing

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Capacity to understand or feel what another person is experiencing



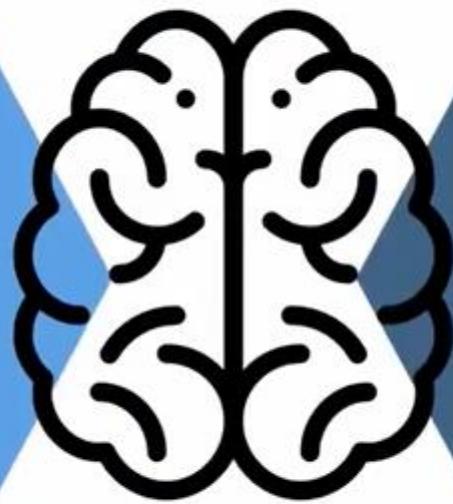
# Human Nature Naturally Working Against the Empathy

## Confirmation Bias

- Looking for validation of beliefs you already hold

## False Consensus Effect

- Believing what you believe is what most others believe
- "Filling in the wholes" in conversation with your assumptions



# Empathy Research Methods

**TRY**

Immersion



Immerse yourself in the  
experience of others

**LOOK**

Observation



Observe what people do

**ASK**

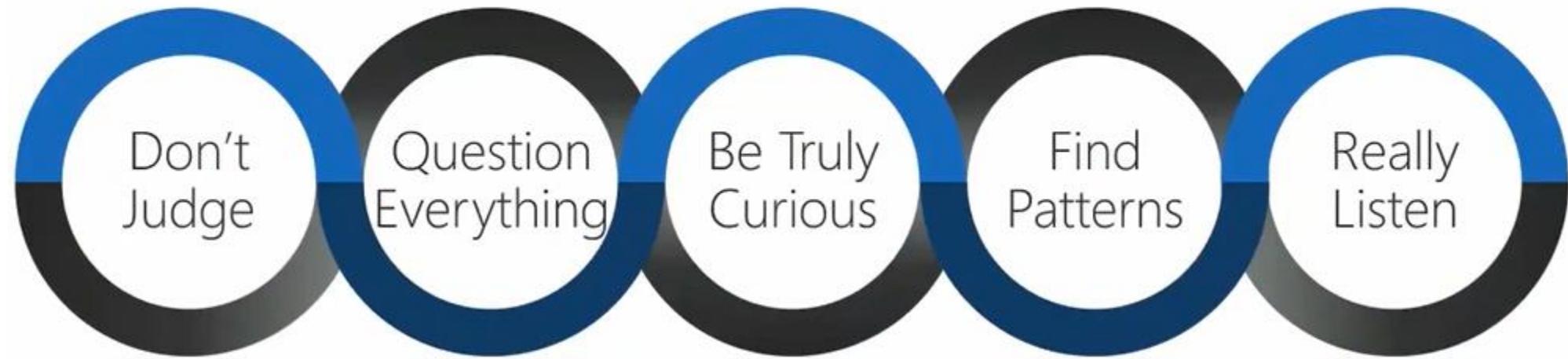
Engagement



Capture what people  
say they do

# Empathy – Guiding Principles

*Assume a beginner's mindset*



# Empathy – Interview Preparation

Brainstorm  
Questions

Identify &  
Order  
Themes

Refine  
Questions

Create  
Interview  
Protocol

# Empathy – Best Practices

90%  
Listening /  
10% Asking

Ask to  
Understand,  
Not Validate

Encourage  
Stories and  
Follow  
Tangents

Take Copious  
Notes

Pay  
Attention to  
Nonverbal  
Cues

Don't Be  
Afraid  
of Silence

Ask Questions  
Neutrally and  
Don't Suggest  
Answers

Use Open &  
"Unpacking"  
Questions

# Empathy – Unpacking Questions for Interviews



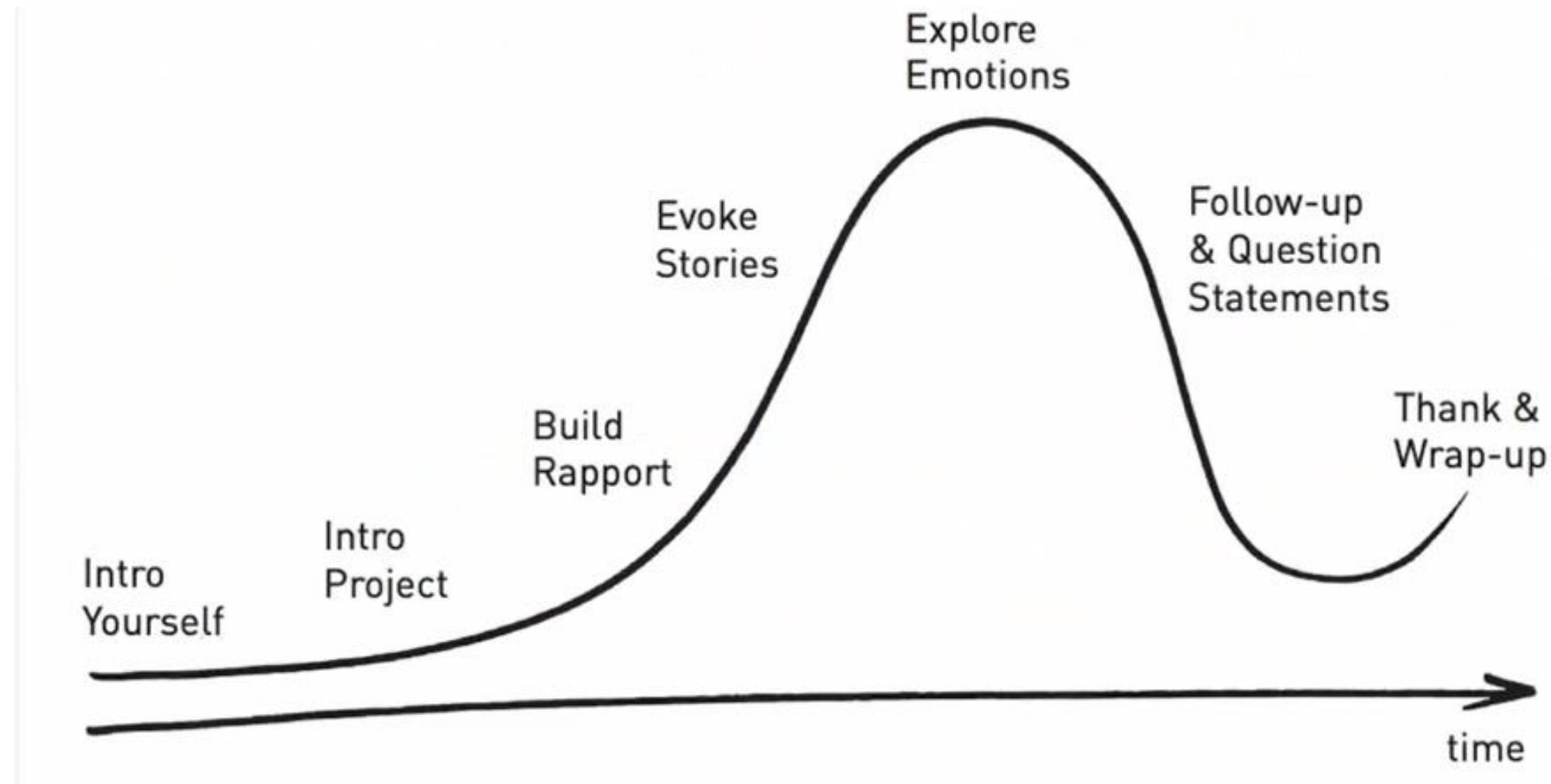
- Why do you say that?
- Why? (even if you think you already know)
- Tell me more about that.
- What were you thinking when you did that?
- Can you walk me through what led you to that decision?
- How did you feel about that?
- What did you think about that?

# Mechanics of Empathy Research

- Not a focus group
- Consist of one end-user, one interviewer, and one note-taker
- Preferably in person to capture body language and nuances
- Open ended, non-leading, and probing questions



# Empathy – Anatomy of an Interview



## Exercise Two

## Reimagine a wallet

- The Wallet Project is an immersive activity meant to give participants a full cycle through the design thinking process in as short a time as possible.
- The project itself gives facilitators the opportunity to touch on the fundamental values—human-centered design, a bias towards action, and a culture of iteration and rapid prototyping—without attempting to communicate all of the methods and activities that the term “design thinking” encompasses.
- Why did we choose a wallet as the starting point for the introductory design challenge?
  - everyone has experience with a wallet, or another way to carry cash, cards, and ID.
  - the wallet and its contents have the potential to evoke a range of meaning and the larger context of a person’s life.
  - wallet as a starting point enables a wide range of potential innovation outcomes (we’ve seen objects, experiences, services, systems, and spaces!).
  - having a physical artifact in-hand allows for immediate recall of experiences (participants can gain empathy for one another in the room).

# Empathy – Exercise

Your NEW mission: **Design something useful and meaningful for your partner.**  
**Start by gaining empathy.**

## 1 Interview

8min (2 sessions x 4 minutes each)

Notes from your first interview



Switch roles & repeat Interview

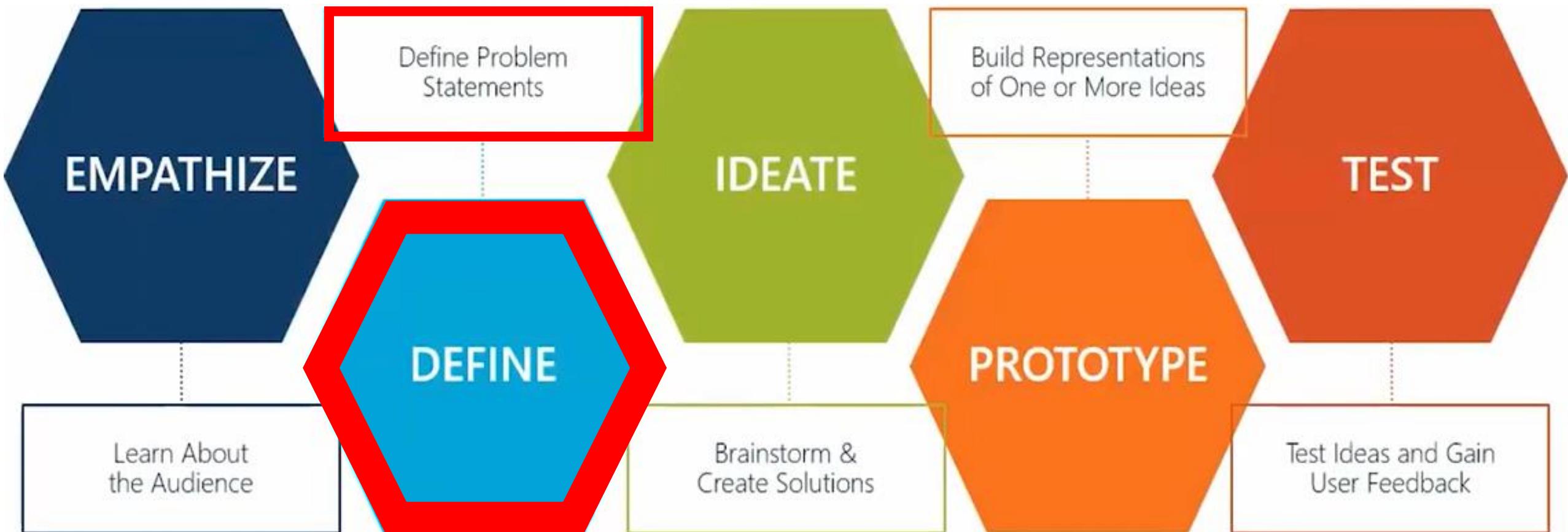
## 2 Dig Deeper

6min (2 sessions x 3 minutes each)

Notes from your second interview

Switch roles & repeat Interview

# Defining Phase



# Define

Analyze data to reveal users needs and insights

Unpack  
Your Empathy  
Findings

Use Empathy  
Findings to Scope  
a Meaningful  
Problem/Needs  
Statement

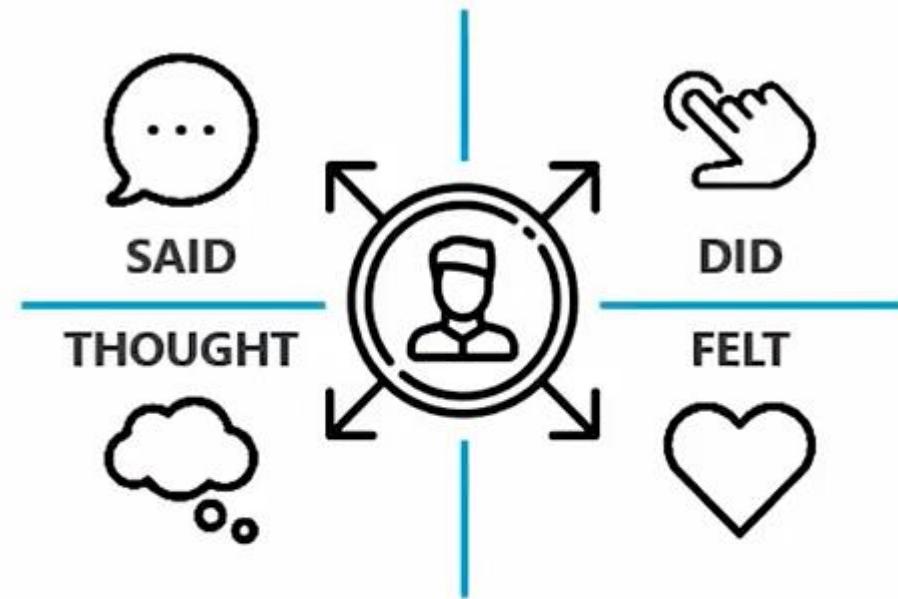
Develop a  
Point of View  
for the User

# Data Synthesis



# Define – Clarifying the Point of View

How Might We...



**Reframe it so it's meaningful and actionable. (*It'll drive your design.*)**

**Record your insights and pinpoint the need.**

# Define – Writing a Needs Assessment

- Be specific
- Positive statements not negative
- Describe an attribute of the product/process/experience
- Avoid “must” and “should”



# Define – Need Assessment Example

**Take what the user has said and extract a need from it**

USER STATEMENT	NEEDS STATEMENT	HOW MIGHT WE...
"I work in the field and don't have a computer or office. My routine changes day-to-day."	User needs ability to access information in the moment of need.	How might we provide learning in the moment of need?
"I don't learn by watching an online course, I learn by doing it myself."	User needs to learn from experience.	How might we give learners experiential ways to learn on their own?

# Define – User Personas

User personas are **fictitious characters that represents the different user types** of a service or a product

- Created using the data from **user** research (e.g. interviews, observations)
- Help you to imagine the various needs of each user type
- Inspired and built from real customers

# Define – User Persona Worksheet

Name:

## WORK ENVIRONMENT

Age/Gender:

## DEVICE/TECHNOLOGY USAGE

Role:

WHAT DID I SAY?

HOW DO I USE A  
WALLET?

Financial Situation:

Something I  
*Would Say...*

Education:

WHAT ARE MY THOUGHTS  
ABOUT A WALLET?

WHAT DO I FEEL ABOUT  
USING A WALLET

My Personal Life:



# User Persona: Customer Service Representative/Call Center



Sarah Burns

Location: Tulsa OK

Age: 42

Tenure with "Insurance Company": 8 years

Education: Working on BA at Night

Career Goal: Team lead or management



## SAID

*My team is overwhelmed by the large volume of work.*

*I just don't have time to learn new skills at work*

*I need a more flexible schedule. My children are my priority right now.*



## DID

Focuses on tasks and keeping performance statistics high

Enjoys rote tasks as its "easy" and helps her productivity numbers

Cross trained on multiple products

Valued member of team

Registers for online classes, but rarely finishes them



## FELT

Overwhelmed by trying to keep up with production quotas.

Frustrated by the training she has gotten because she doesn't understand how it relates to her role or future roles.

Discouraged by her lack of control in her current role and her future with the company.



## THOUGHT

*I don't know what opportunities there are here how to find out what's even available.*

*I wish I there was some way to explore development opportunities without my supervisor thinking I'm slacking off.*

What Sarah feels about emotional intelligence:

*I don't mind being busy, but I feel constantly under water. When big changes are announced, I can't even deal with them. I just put my nose down and try to do my best. I wish I felt I had more influence or control over what's going on.*

# Define – Exercise

## Reframe the problem.

### 3 Capture findings 3min

#### Goals and Wishes:

What is your partner trying to achieve?

\*use verbs

**Insights:** New learnings about your partner's feelings and motivations. What's something you see about your partner's experience that maybe s/he doesn't see?\*

\*make inferences from what you heard



### 4 Take a stand with a point-of-view 3min



partner's name/description

needs a way to

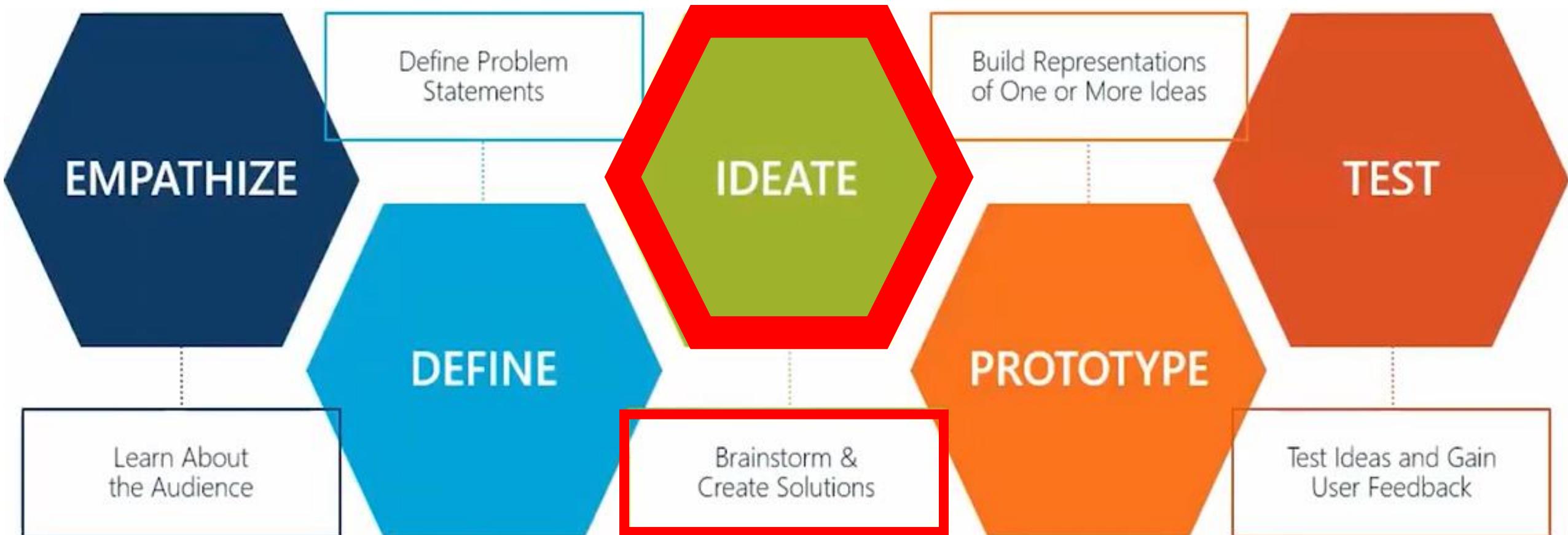
user's need

because (or "but ..." or "Surprisingly ...")

[circle one]

insight

# Ideating Phase



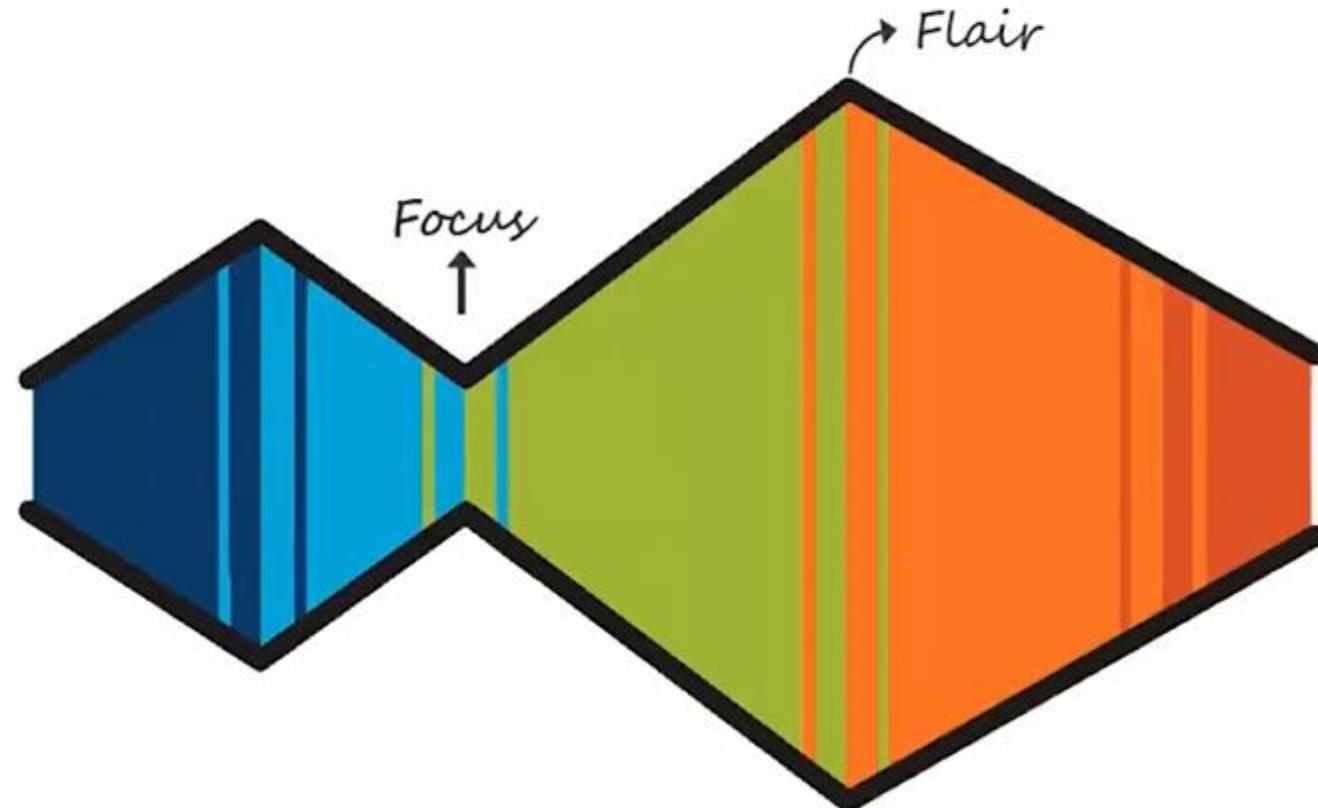
## The Art of Possible

*"It's not about coming up with the 'right' idea, it's about generating the broadest range of possibilities."\**

\*Stanford d.School

## The Art of Possible

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# Ideate – Best Practices

Set a Time Limit

Stay on Topic

Defer Judgement or Criticism

Encourage Weird, Wacky & Wild Ideas

Include People Outside the Team and Initiative

Build on Each Others' Ideas

Be Visual

Provide Different "Constraints"

# Ideation Methods



- Brainstorming
- Storyboarding
- Sketching
- Mind mapping



# Ideation Process

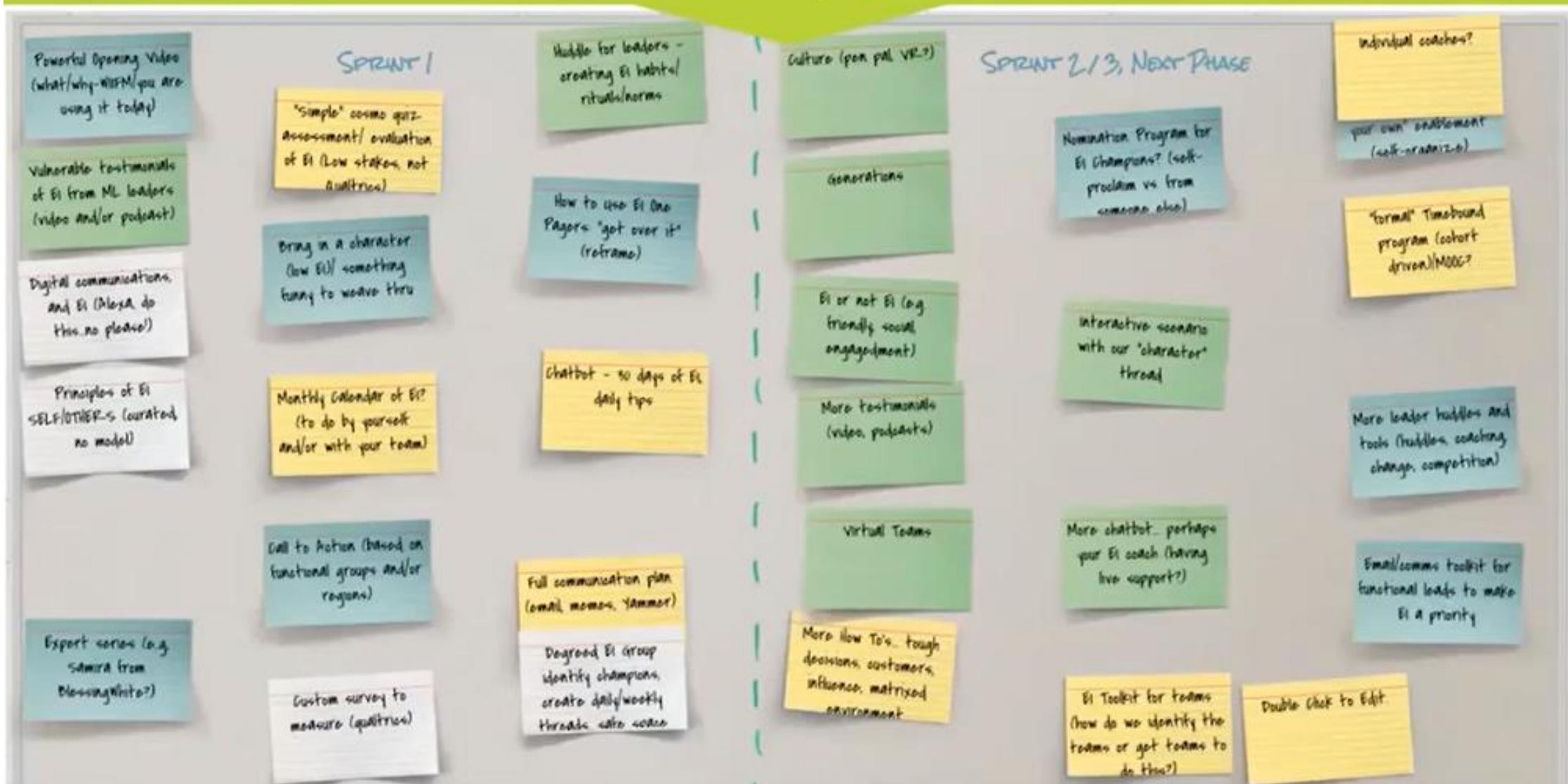
Idea Share

Sketch/Storyboard

Vote

Impact/Feasibility Prioritization Matrix

# Idea/Story Share



## Sketch/Storyboard



## Vote



- Doable
- Wild Card
- Disruptive

#1  
Col  
Problem "I need to learn from experience, so I can apply as I work."

LX:  $Y=2$   $B=2$   $G=\emptyset$

Sell Like We Do:  $Y=10$   $B=7$   $G=1$

Mobile Molly:  $Y=\emptyset$   $B=\emptyset$   $G=8$

Video Vince:  $Y=\emptyset$   $B=1$   $G=3$

Shoeless Joe:  $Y=3$   $B=4$   $G=3$

# Ideate – Exercise

**Ideate: generate alternatives to test.**

**5 Sketch at least 5 *radical* ways to meet your user's needs.** 5min



write your problem statement above

**6 Share your solutions & capture feedback.** 10min (2 sessions x 5 minutes each)

Notes

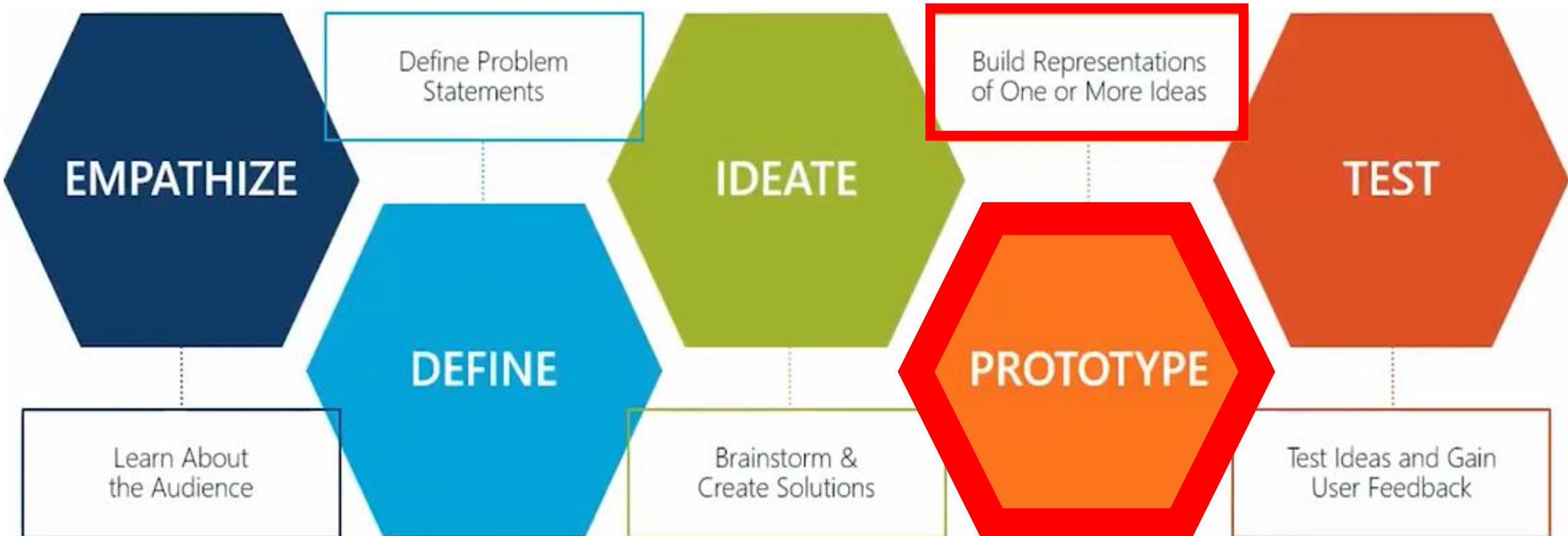


# Selection of Best Ideas

## Prioritization Matrix

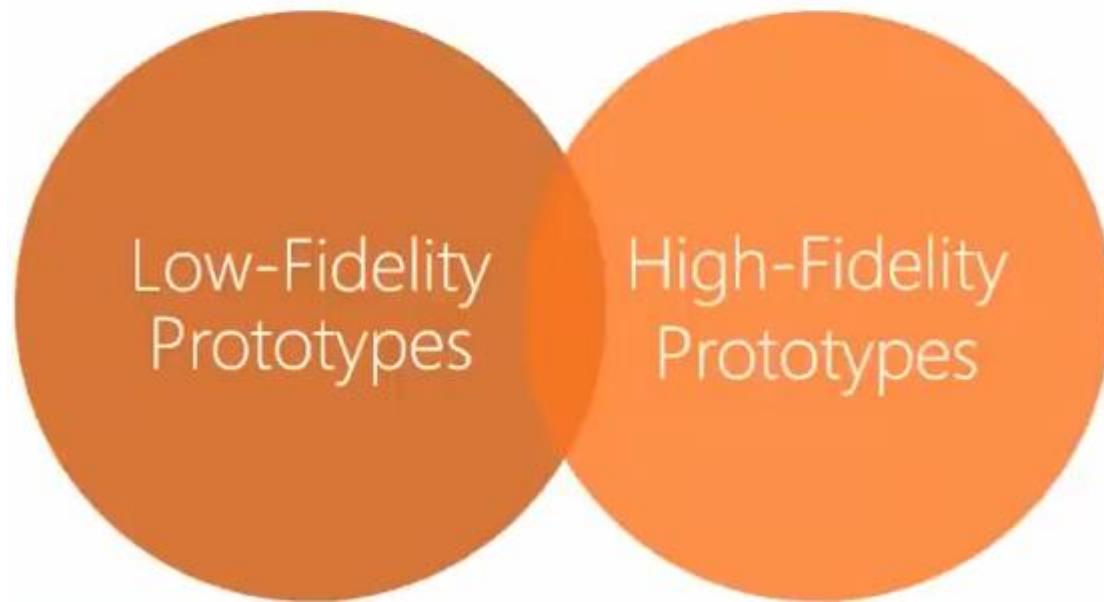


# Prototyping Phase

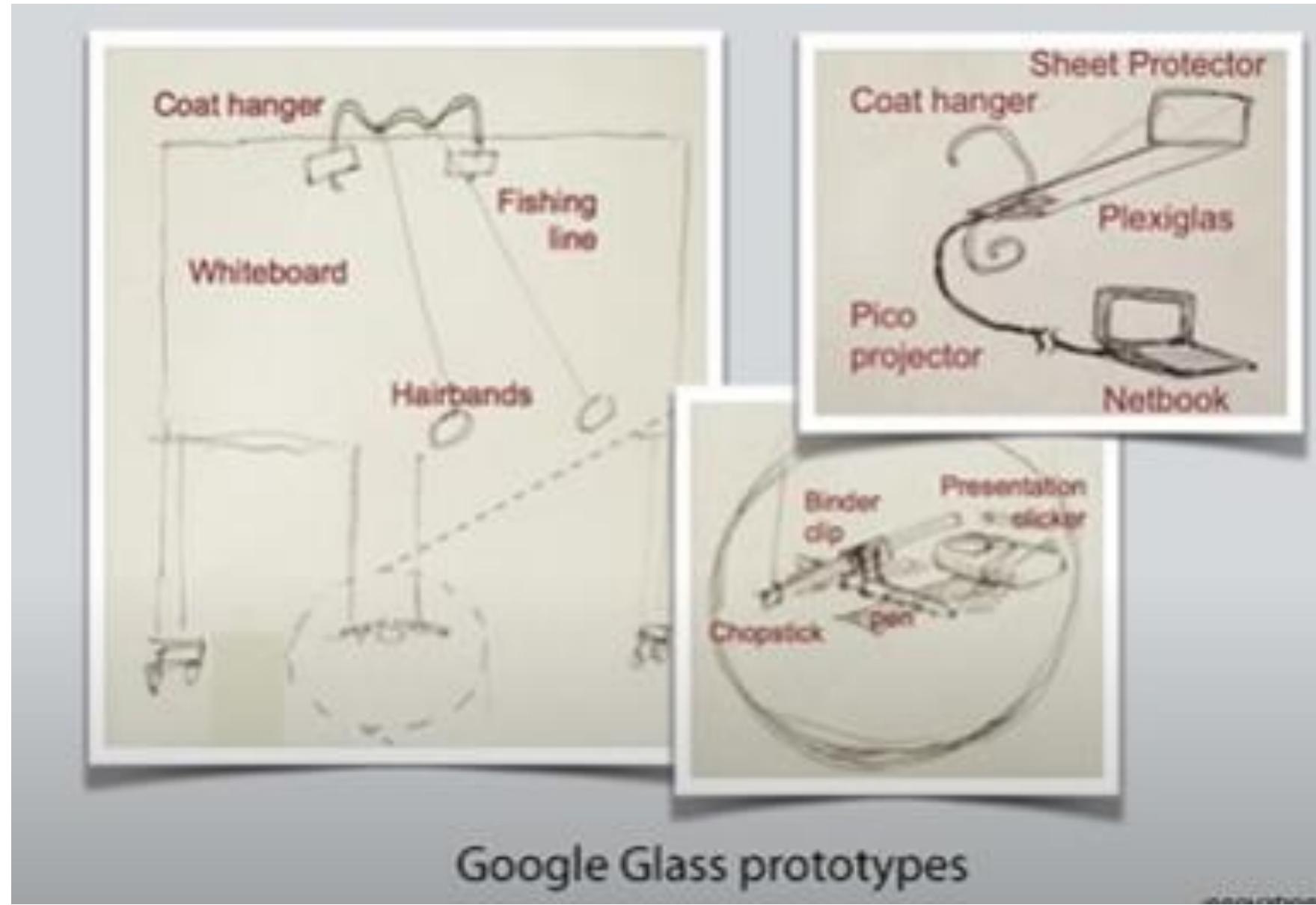


# Prototype

Build Representation of Your Ideas



# Prototype

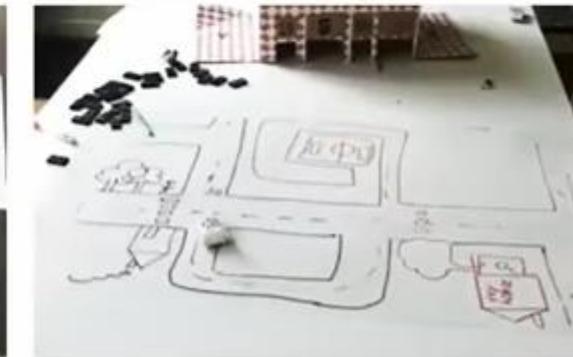
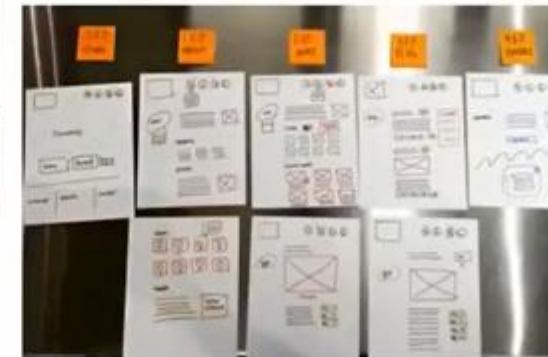


# Prototype



# Prototype

## Low-Fidelity



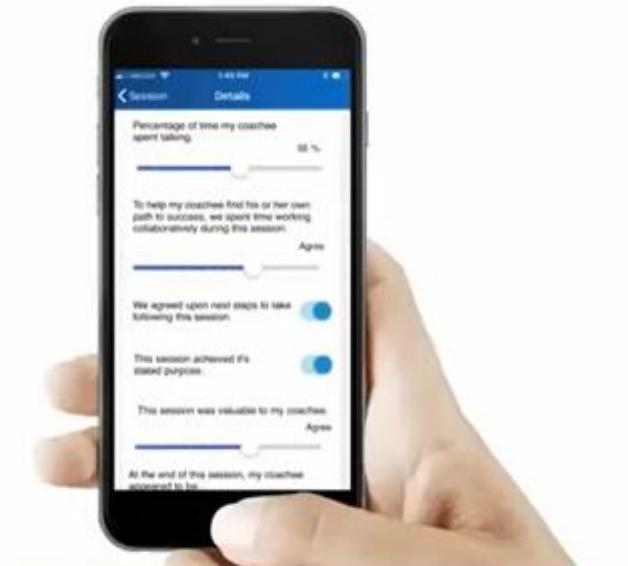
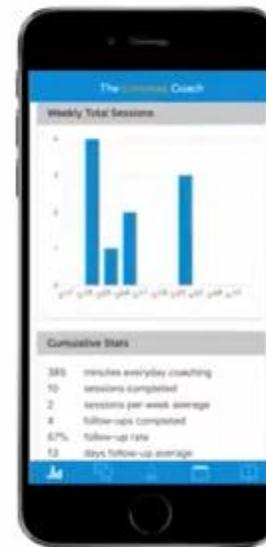
# Prototype

Low-Fidelity



# Prototype

## High-Fidelity



From a Map & PowerPoint Sketch

To a Functional Prototype

To a Live App

# Prototype – Minimum Viable Product (MVP)

Just enough features / functionality to provide feedback

## HOW TO BUILD A MINIMUM VIABLE PRODUCT

Not like this



1



2



3



4

Like this



1



2



3



4



5



# Prototype – Guiding Principles



# Prototype – Exercise

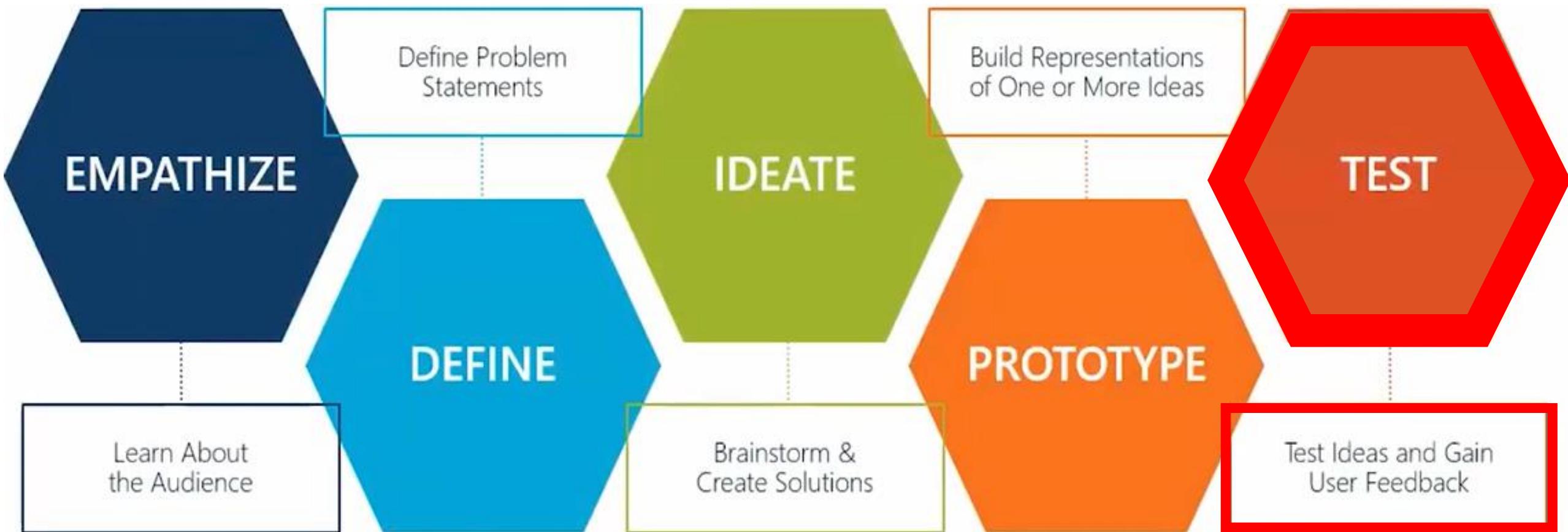
**Iterate based on feedback.**

**7 Reflect & generate a new solution. 3min**

Sketch your big idea, note details if necessary!

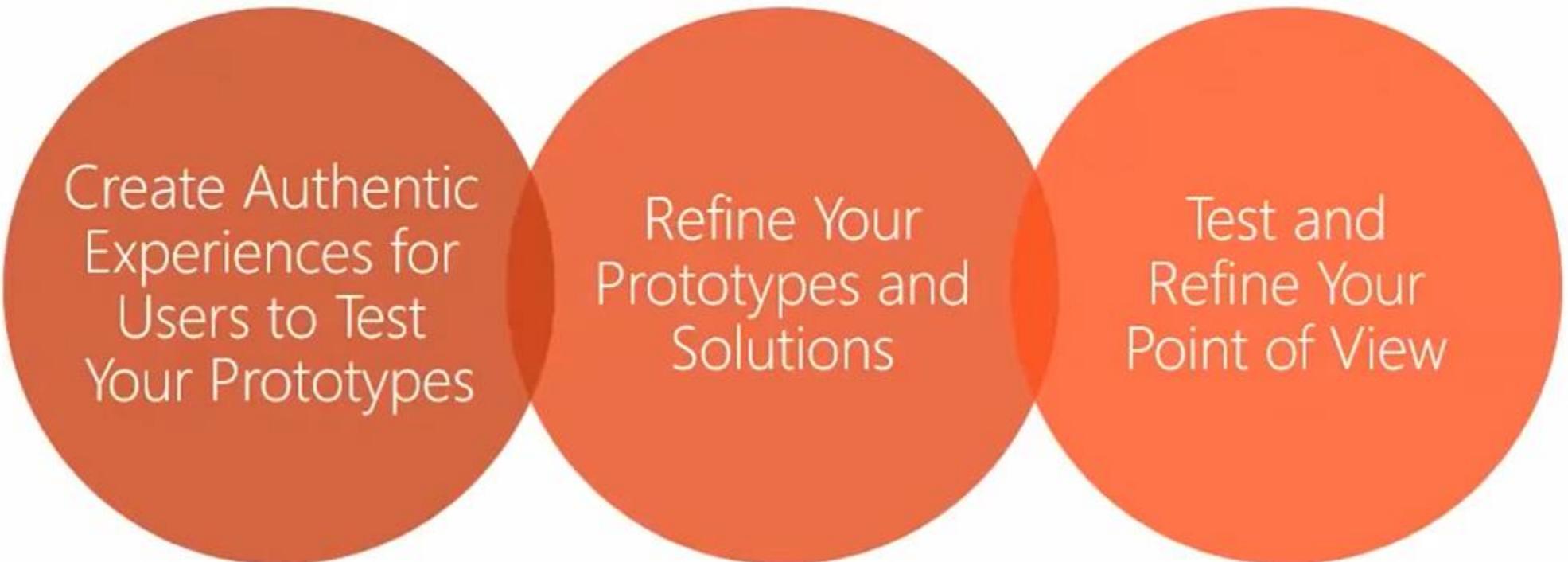


# Testing Phase



# Test

Prototype as if you know you're right, but test as if you know you're wrong

Three overlapping circles in shades of orange, arranged horizontally. The leftmost circle is a darker orange, the middle one is medium orange, and the rightmost one is a lighter orange. They overlap each other.

Create Authentic  
Experiences for  
Users to Test  
Your Prototypes

Refine Your  
Prototypes and  
Solutions

Test and  
Refine Your  
Point of View

## Test with Users

Let Your User  
Experience  
the  
Prototype

Have Them  
Talk Through  
Their  
Experience

Actively  
Observe

Don't  
Immediately  
"Correct"  
Your User

Watch How  
They Use  
(and Misuse)  
Your  
Prototype

Follow Up  
With  
Questions



# Test – Exercise

## Build and test.

### 8 Build your solution.

Make something your partner can interact with!

[not here]

7min



### 9 Share your solution and get feedback.

✚ What worked...

▬ What could be improved...

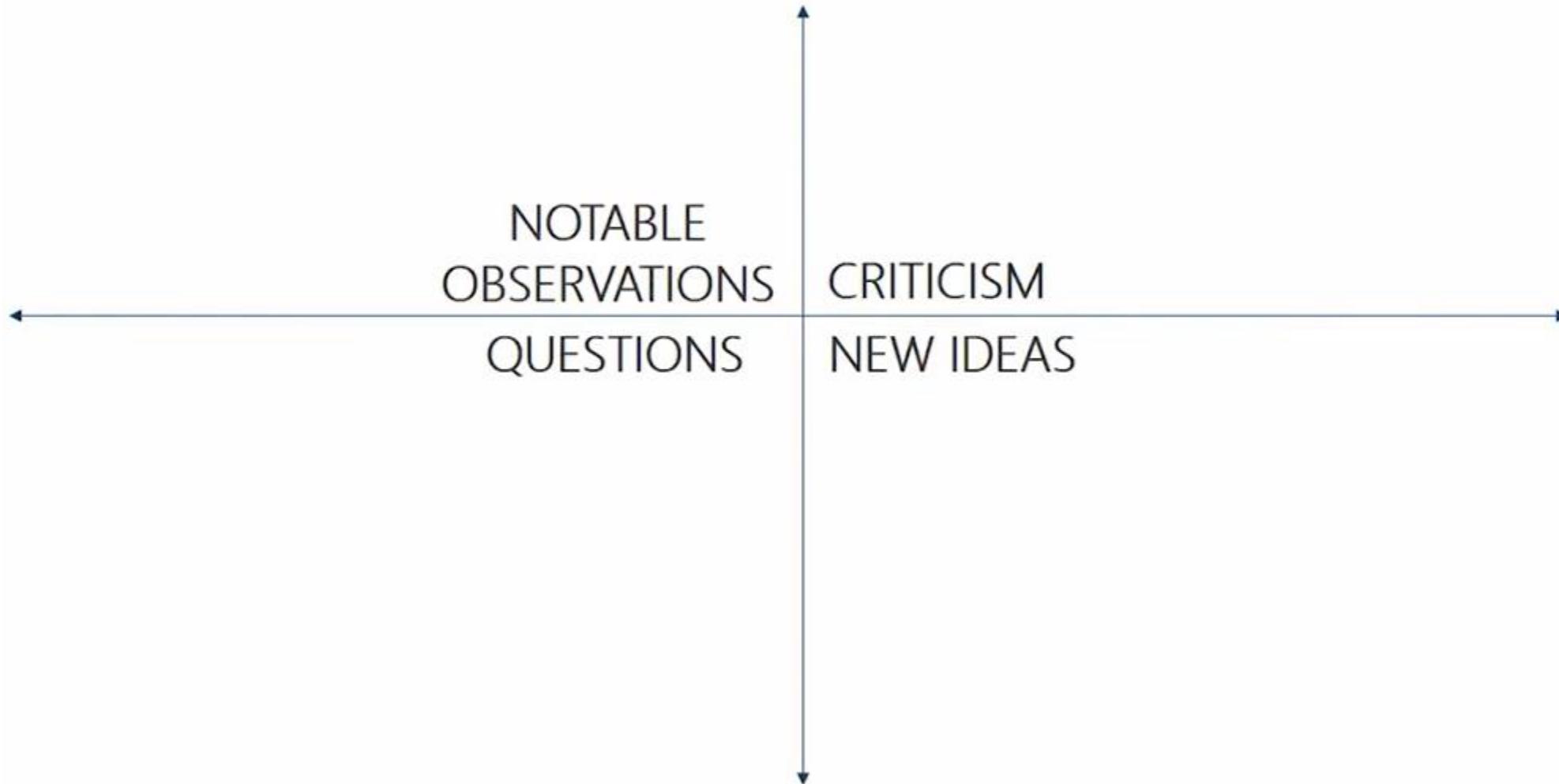
? Questions...

! Ideas...

8min (2 sessions x 4 minutes each)

# Test and Reflect

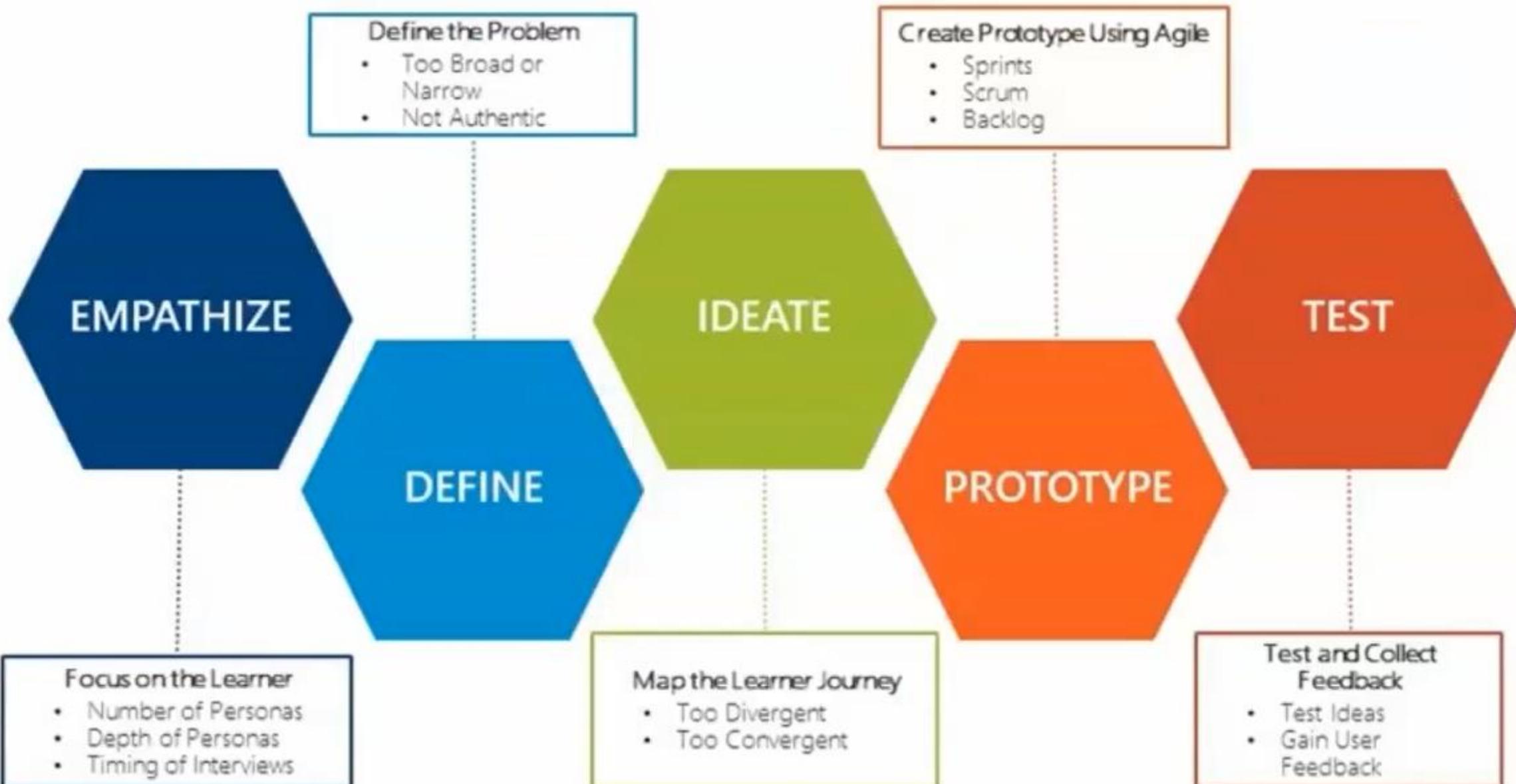
## Capture Matrix



# Lessons Learnt during the Design Thinking Process

	Take Notes on the Experience of the Interviews	Empathy/Customer Interviews Takes Significant Planning	Dedicated Resources	Create a Place to Continue Fostering Design Thinking
	Avoid Yes/No Questions	Bias/Negative Voice	Design Thinking Initiatives are Quick!	Design Thinking is not a Solution for Every Problem

# Common Challenges





# Exercise One

# Personas



# Empathize

is in her twenties and lives with parents.

works in a bank

is an **avid coffee drinker** and seen talking to someone on phone or browsing on phone while drinking coffee

is very **particular about cleanliness**

is an emotional and soft-spoken person

is an **environment friendly person**

spends her leisure time watching movies, listening to music and taking care of pet

is very fond of taking selfies

is fond of dark colours.

# Define

Define the problem clearly

Gift for your neighbor

# Define

Define the problem clearly

Gift for neighbour who is:

an avid coffee drinker,

particular about cleanliness, and

an environment friendly person

