

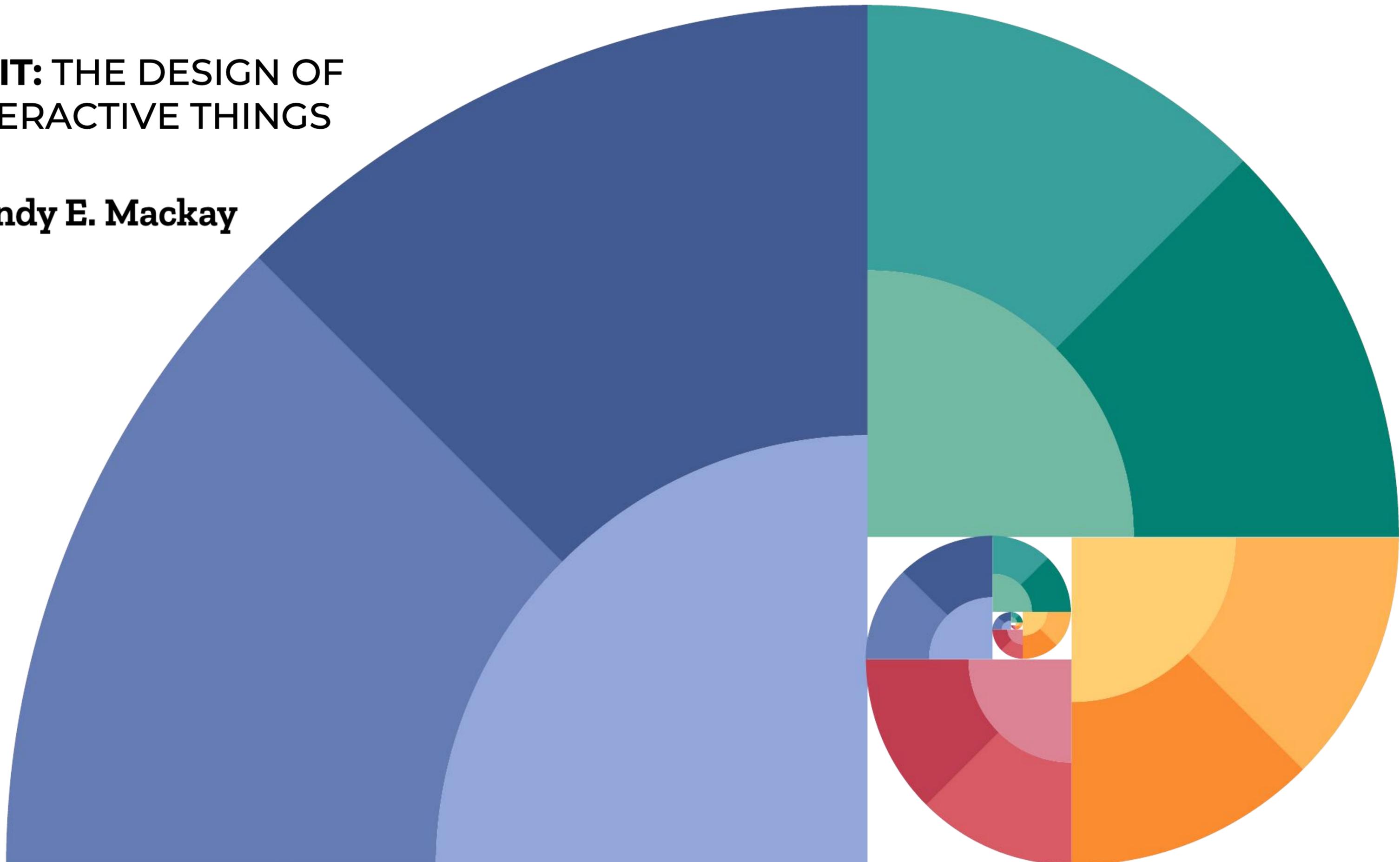
DO IT:
THE DESIGN OF
INTERACTIVE THINGS

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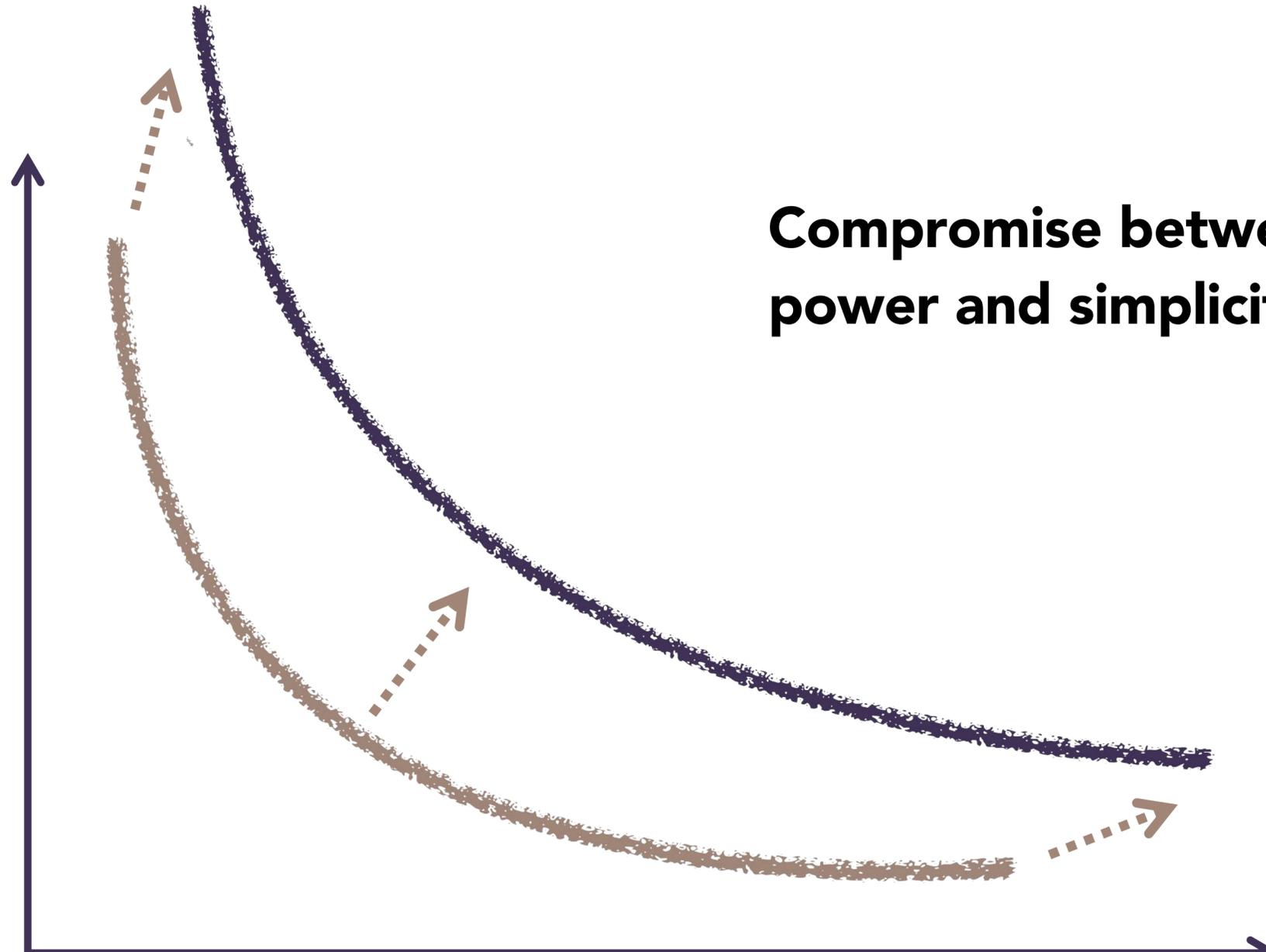
**DO IT: THE DESIGN OF
INTERACTIVE THINGS**

Wendy E. Mackay



Design challenge

Power of
expression

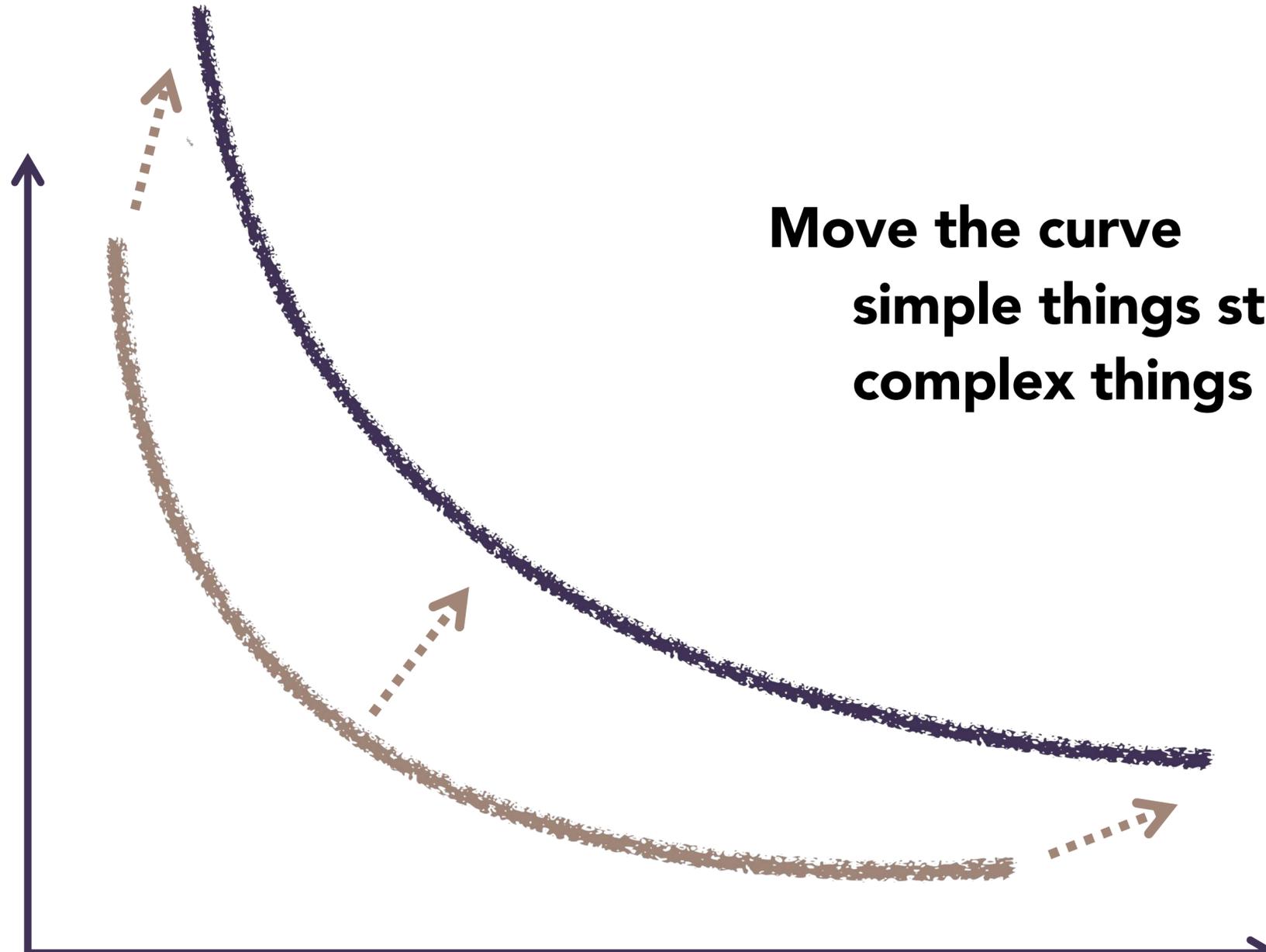


**Compromise between
power and simplicity**

Simplicity of
execution

Design challenge

Power of
expression



Move the curve

simple things stay simple

complex things become possible

Simplicity of
execution

Generative design

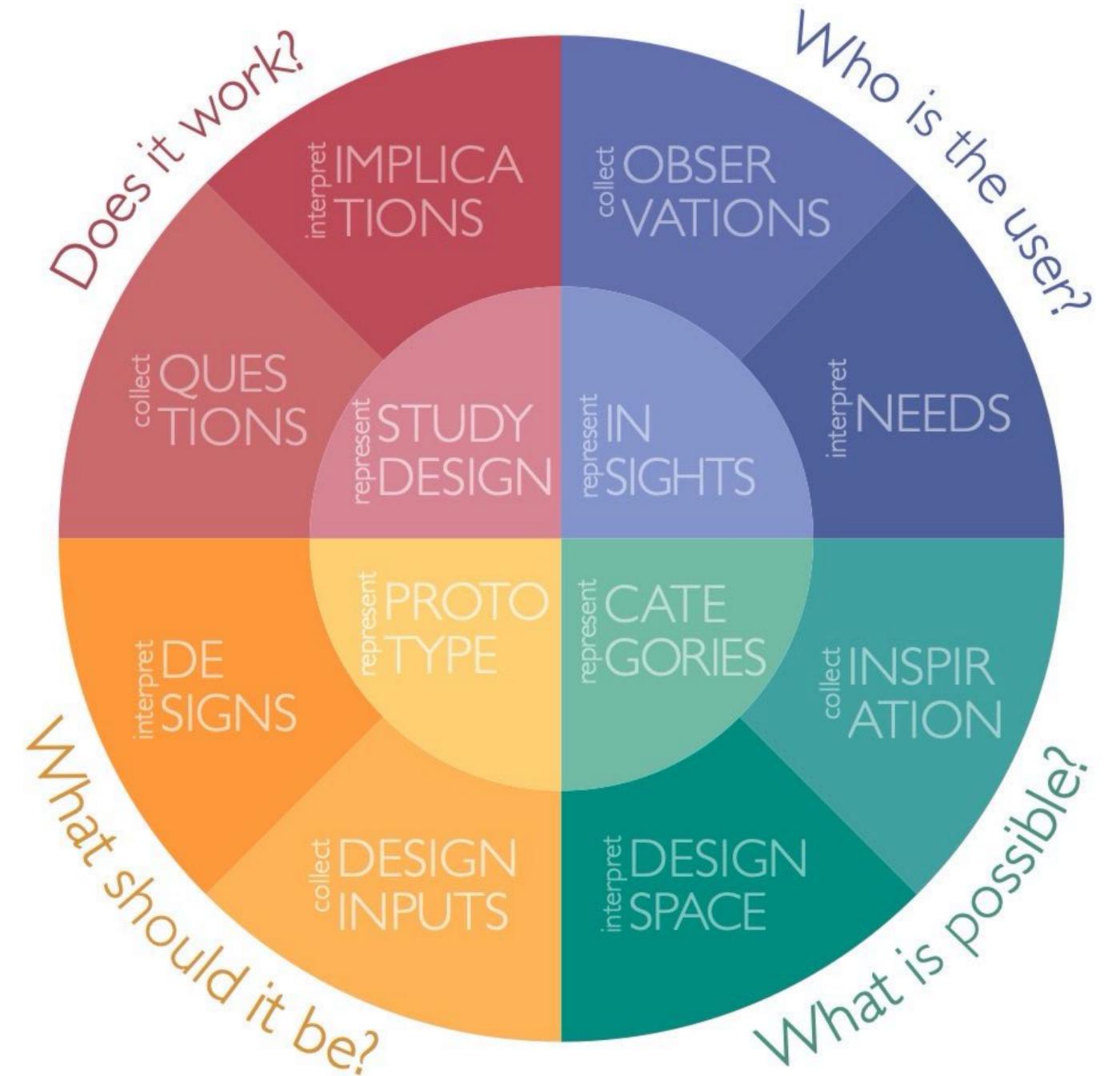
Discovery
Who is the user?

Inspiration
What is possible?

Design
What should it be?

Evaluation
Does it work?

Redesign
Make it better!



Designing Prototypes

System

Action

Story

Collect

Design brief
Design requirements

GATHER
GENERATE

Persona
Current scenario

Represent

Functional specification
Paper prototype
Tutorial video
Wizard of Oz (tasks)
Functional prototype

WRITE
SKETCH
SHOOT
SIMULATE
CODE

Future scenario
Storyboard
Video prototype (story)
Wizard of Oz (scenario)
Fixed-path prototype

Interpret

Interaction table
Design diagram

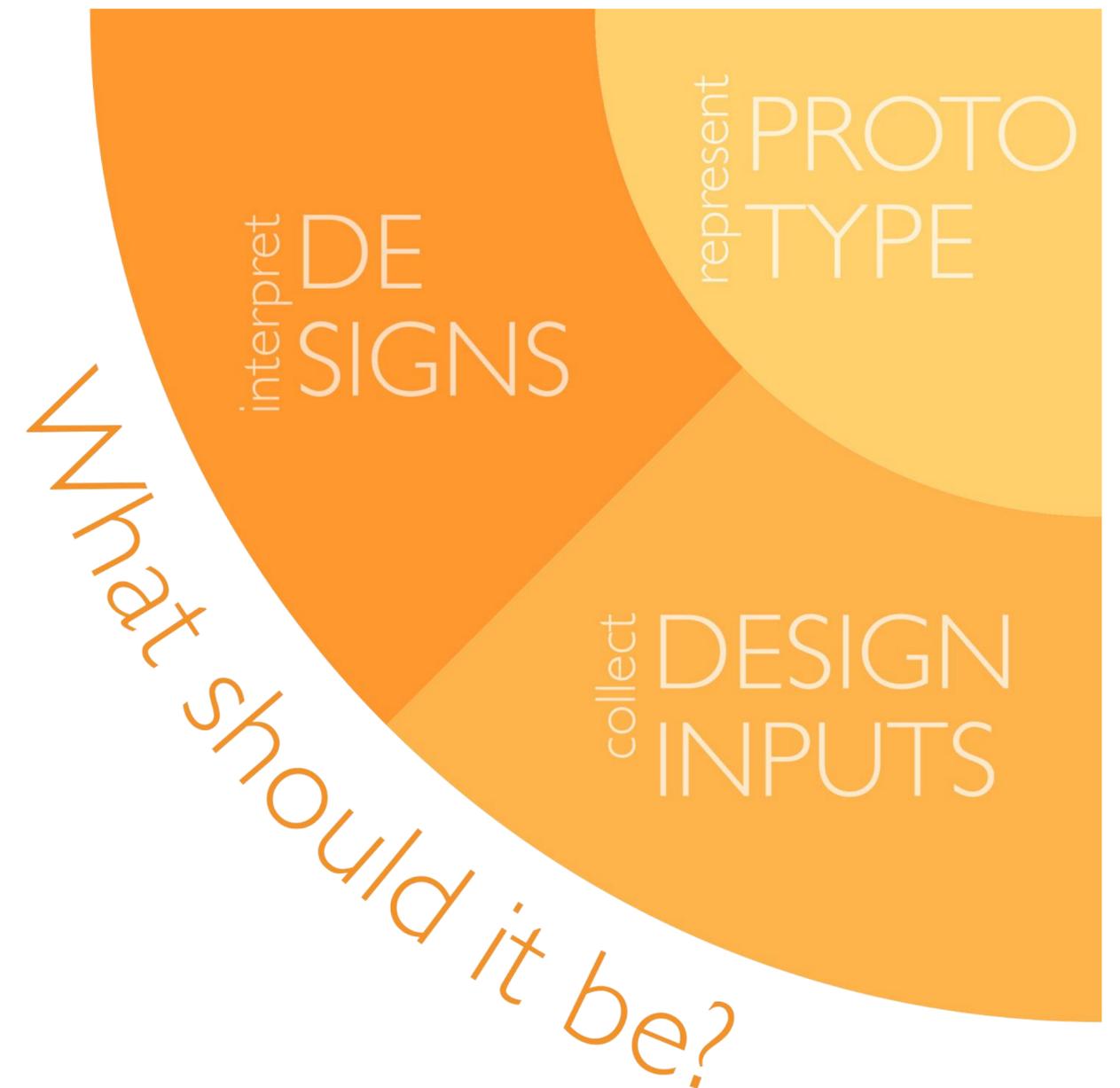
DESCRIBE
SKETCH

Concept description
Flow diagram

Table 3. Design Methods

Represent prototypes

Design



Focus on quality over quantity

Prototypes help express specific concepts
at different levels of representation

Careful!

Each design choice limits your options
also poses new questions
and suggests new possibilities

Make
choices

Represent the design

Future scenario

Imagine the system from the user's perspective

Video Prototype

Illustrate the use of the system in context
“sketch” dynamic, interactive user experiences

Wizard of Oz

Simulate the system live
with a human operator ‘behind the curtain’

Simulation

Create a working subset of the system

Prototype interaction!

What makes a good prototype?

Some designs look good but are unusable
due to seemingly minor interaction flaws

Good prototypes help

designers focus on different sets of details,
omit irrelevant or undecided elements

users envision the final system but also
feel comfortable suggesting changes

About Prototypes

Consider design alternatives

Concrete representations of interactive systems

Help stakeholders imagine the interface

Ensure usability under diverse conditions

Focus on problematic parts of the interface

Choice of prototype depends on
specific designer needs
phase of the design process

Dimension			
Representation	Physical	Non-functional	Functional
Precision	Low-fidelity	Mixed fidelity	High fidelity
Interactivity	Non-interactive	Fixed-path	Open
Lifecycle	Rapid	Iterative	Evolutionary
Scope	Horizontal	Vertical	Path-based

Types of Prototypes

Taxonomy

Mackay & Beaudouin-Lafon (2023)

Representation Physical form
from rough sketches to complete simulations

Precision Level of detail
from informal to highly polished

Interactivity Level of interaction
from non-interactive to fully interactive

Lifecycle Phase of project
from throw-away to components of final system

Scope Coverage
horizontal, vertical, matrix, path-based

Types of Prototypes

Physical form

Paper/Junk Create rough, quick sketches of the design

Example Use paper and other materials to simulate interaction

Online Create detailed, computer-based screen images

Example Create Figma or Powerpoint wireframes

Functional Develop working hardware and/or software

Example Create interactive animations with Principle or working code

Representation

Level of detail

Lo-fidelity

Focus on overall design, omit most detail

Example

Hand-drawn paper sketches and hand-crafted mockups

Mixed-fidelity

Focus detail on current design issue, rest is rough

Example

Dialog box layout includes key elements, sketches others

High-fidelity

Include all key visual and interaction details

Example

Detailed version of final look & interaction characteristics

Precision

Wireframes

What's wrong with wireframes?

Graphic designers create wireframes

Focus on screen layout, not interaction

Static, not dynamic

Encourages procedural interaction

Assumes buttons, sliders and menus

(least efficient forms of interaction)

Interaction designers

should focus on interaction

Create simple, but powerful interfaces

Detailed representations may not be precise

Example: High-fidelity *Figma* prototype may misrepresent or ignore key interaction

Level of interaction

Non-interactive Fixed path
Show what interaction looks like

Example *Video of user touching device*

Low interaction Pre-determined path
Test alternative interactions

Example *Designer shows screen*
User performs action
Designer shows system reaction

High interaction Open path
Try any interaction

Example *Wizard of Oz or limited functional prototype*

Interactivity

Wizard of Oz

Simulate interaction with a new interface



Wizard of Oz

Simulate interaction with a new interface

Designer (wizard)

- interprets user actions

- controls system responses

User experiences what the

- 'real' system might be like

Useful for creating video prototypes
but also for creating live experiences
that rapidly explore different design
alternatives

Wizard of Oz

System may be:
non-existent
partially built
completely functional

Best for certain types of
interaction (based on
wizard's reaction time)



Phase of the project

Rapid

Explore alternatives

Example

Create paper prototypes

Iterative

Refine modules over time

Example

Successively add detail and functionality over time

Evolutionary

Transform prototype modules into the final product

Example

Add new functions to software prototype (Agile approach)

Lifecycle

Coverage

Horizontal Add layers of functionality

*Example Start with user interface, later
add the underlying database*

Vertical Fully develop part of system

*Example Develop the spelling checker
interface and algorithms together*

Scenario Develop the functionality relevant
to a particular scenario

Example Edit only three images

Scope

Create an interactive system
that supports navigating
through space and time

Design
brief

Finding the design concept

What will the user be able to do?

What are the conceptual objects?

How will users interact with them?

What can the system do?

How will the user learn it?

Justification

What are the alternatives?

What are the advantages and disadvantages of this solution?

Concept

Finding the design concept

Instrumental Interaction approach

Find a key command for the user

- Make it persist

- Make it interactive

Map example:

- Search for a route on the map

- Create a 'route' object

- Create an interactive route object

 - modify, extend, transform

 - share, compare . . .

Concept

Avoid
“analysis paralysis”!

**Choose
something !!**

First ideas are **never** perfect
Reevaluate, redesign, & refine

Choose
something !!



Video prototype

Future scenario → Video prototype

Scenario *describes the interaction*

Each paragraph explores one design issue with one or more interaction snippets

Storyboard *sketches the interaction*

Break up the story into a series of titlecards followed by 1-3 interaction snippets

Video prototype *shows the interaction*

Use the storyboard to guide shooting. Intersperse titlecards to tell the story with video clips that show the interaction between realistic users in realistic situations

Video prototype



1. Create your **design concept**
influenced by findings from users
and favorite brainstormed ideas
2. Create a **future scenario** with key events
Fit your ideas into the scenario...
or change the scenario to fit your ideas
3. Draw a **storyboard** with titlecards,
sketches and descriptions
Animate personas to illustrate the interaction
4. Shoot a **video prototype**
Tell the story as a series of titlecards
and interaction snippets,
using the storyboard as a shooting guide

Video prototype

Current scenario

Example #7

Scenario

Example 7. Current Scenario

Personas

Lola is a 25-year old Masters student in HCI who is moving to Paris.

Bob is a 28-year old student in Lola's class who lives in Paris and goes everywhere by bike.

Carl is Bob's father. He lives in a different part of Paris and deliver a table with his car.

Situation: Last Thursday, Lola texted Bob her new address and asked him to arrive at 10:00. Bob emailed the address to Carl and asked him to bring the old dining table from the garage. Carl retyped the address from Bob's text into *Google maps* on his laptop. He saw that it should only take about 20 minutes by car, so he decided he should plan to leave at 9:40.

Breakdown: On Saturday morning, Carl relicks on *Google maps* where he had entered the address, but it is gone. He spends several minutes trying to refind Bob's mail message to get the address, and then has to re-enter it into *Google maps*.

Next he enters the address in *Google maps* on the phone. When he gets in the car, he looks up the address on his phone and types it into the car's GPS system.

Breakdown: Carl arrives at a complex intersection and is not sure which direction to take. He double checks his phone and sees that the GPS is suggesting a different route. Worse, he realizes that the middle branch he was planning to take is a one-way street. He passes the "correct" branch and takes a "wrong" branch that is at least going the right way. He then has to figure out how to navigate back to the right route.

Correspond to real users

Personal details:

Name, age, gender

Physical description

Occupation, relevant activities

Representative or Extreme user?

Personality:

Design-relevant details only!

Likes, dislikes?

Capabilities, weaknesses?

Unusual characteristics?

Activities:

Typical, breakdowns, user innovations

Personas

Extreme relative to the design problem

Based on **personal** characteristics

Adult	➔	Child
Normal hands	➔	Arthritic hands
Takes vitamins	➔	Cancer patient
Exercises regularly	➔	Olympic athlete

Extreme characters

Extreme relative to the design problem

Based on **personal** characteristics

Adult	➡	Child
Normal hands	➡	Arthritic hands
Takes vitamins	➡	Cancer patient
Exercises regularly	➡	Olympic athlete

Based on **context** — extreme due to situation

Copy two pages	➡	Copy a book
Lots of time	➡	Tight deadline
Simple task	➡	Complex task

Always ask what will turn ordinary users
into extreme characters

Extreme characters

Current scenario

Short one-act play

Goal: Highlight problems & opportunities
not to “sell” your idea

Draw from **real**, grounded observations,
interviews and introspection

Capture the details of how users
currently interact with the technology

Current scenario

Procedure

Assemble a series of one-paragraph scenes
each describing an interaction snippet
into a single coherent story

Include:

Realistic setting(s):

date, time, place, context

Personas and extreme characters:

name, age, gender, motivation

profession, level of expertise

goals or motivation

Current scenario

Procedure

Tell the story, step-by-step:

How does each user interact with the technology?

Focus on breakdowns, work arounds and user innovations to highlight opportunities for design

From concept to video prototype

Current scenario

Draws from real-world observation of people who face challenges that a new technology might address

Future scenario

Builds upon a current scenarios and imagines how these people would interact with new technology, in this setting

Remember:

You change the scenario
if it helps you explore alternatives

Scenario

Revise current scenario

Revisit your personas

Can you target the users better?

“Animate” the personas in the current scenario

How does applying the concept help?

Push the limits to create something new

Transform scenario into a future scenario

Revisit every interaction snippet

Apply video brainstormed or new ideas

Create a storyboard and a video prototype
to illustrate the concept in context

Future scenario

Choosing informative persona names

Choose **short names**:

Easy-to-pronounce, one syllable

Alphabetize names:

Ann, Bob, Chuck, Dave, Eli

Link names to **functions**:

Pat is a patient

Sue is a surgeon

Tips

Reminder

Create a theme ... and variations

Balance 'normal' and unusual situations

- include breakdowns and errors

Consider external events that affect interaction

Include patterns of interaction over time

- including repetitions and wasted effort

Highlight surprises

Scenario

Compare Future vs. Concept scenarios

Future scenario

Help interaction designers explore possibilities

Value: realism, grounded, challenges ideas

Concept and marketing video

Help 'sell' the concept

Value: idealized use, market potential

Concept
scenario

Avoid...

What NOT to do

'over-selling' the technology

Explore options rather than one solution

irrelevant detail

Focus on interaction, not users' personal lives

superfluous description

Stick to the facts

humor, at least for now

Difficult to do well

Often distracting

Paper prototypes are amusing anyway

Future scenario

Basic structure

Title	Event or technology to design
Who?	Name, sex, age, job ...
What?	Event that sparks the story
Where?	Location
When?	Date, time
Motivation	Why is this happening?
Situation	Relevant detail to aid understanding
Story	Paragraph-by-paragraph description of who does what and why

Design concept

Example #8

Illustration

Example 8. Design Concept

DynaRoute is a persistent, interactive route that users can save, manipulate and share.

Figure 18. The user can manipulate the *DynaRoute* directly.



Breakdown analysis

Example #9

Scenario

Example 9. Future Scenario breakdown analysis

Breakdown solution: Lola has sent Carl and Bob each a customized *DynaRoute*, with "car" and "bike" routes marked accordingly. She used the magnifier feature to warn Carl about one of the complex intersections. When Carl approaches the intersection, *DynaRoute* shows that that the first branch is the optimal route.

Problems with the solution: The system has to figure out in advance where the "bad" intersections are. Carl will have trouble using the magnifier (although a passenger could do it easily).

Possible fixes: Since *DynaRoute* is an interactive object, Lola could send it to Bob and Carl, with "bike" and "car" variations, and highlight complex way points that she knows will be tricky. They could adjust the starting point to their separate addresses, or move *DynaRoute* to follow a better path. For example, Bob might prefer to bike through a local park.

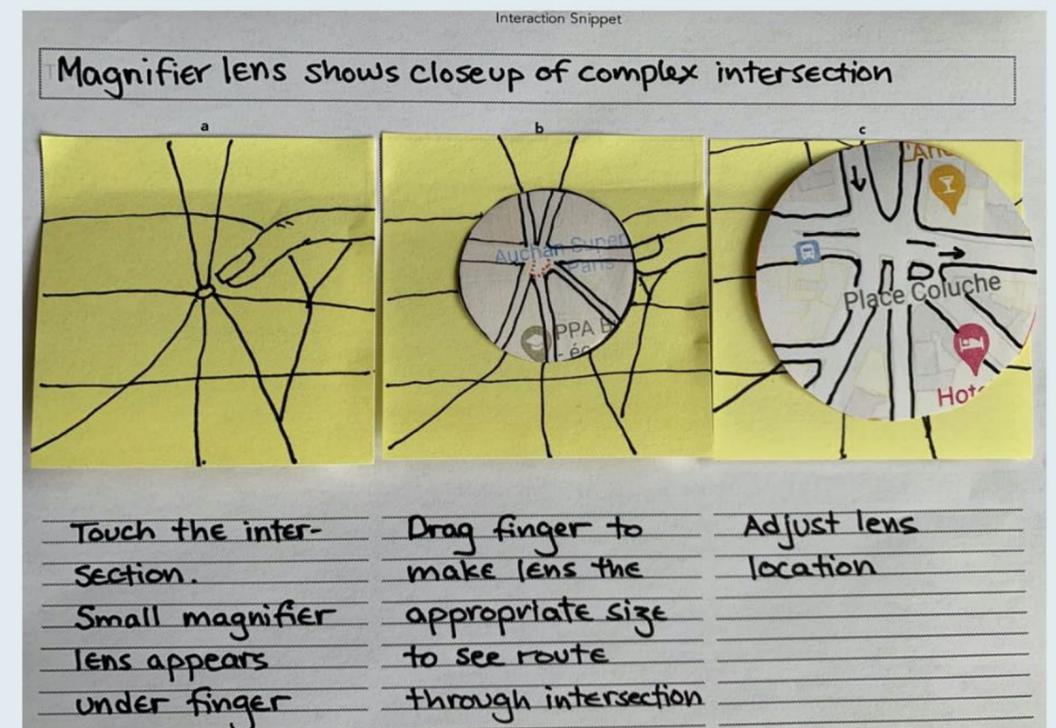
Interaction snippet

Example #10

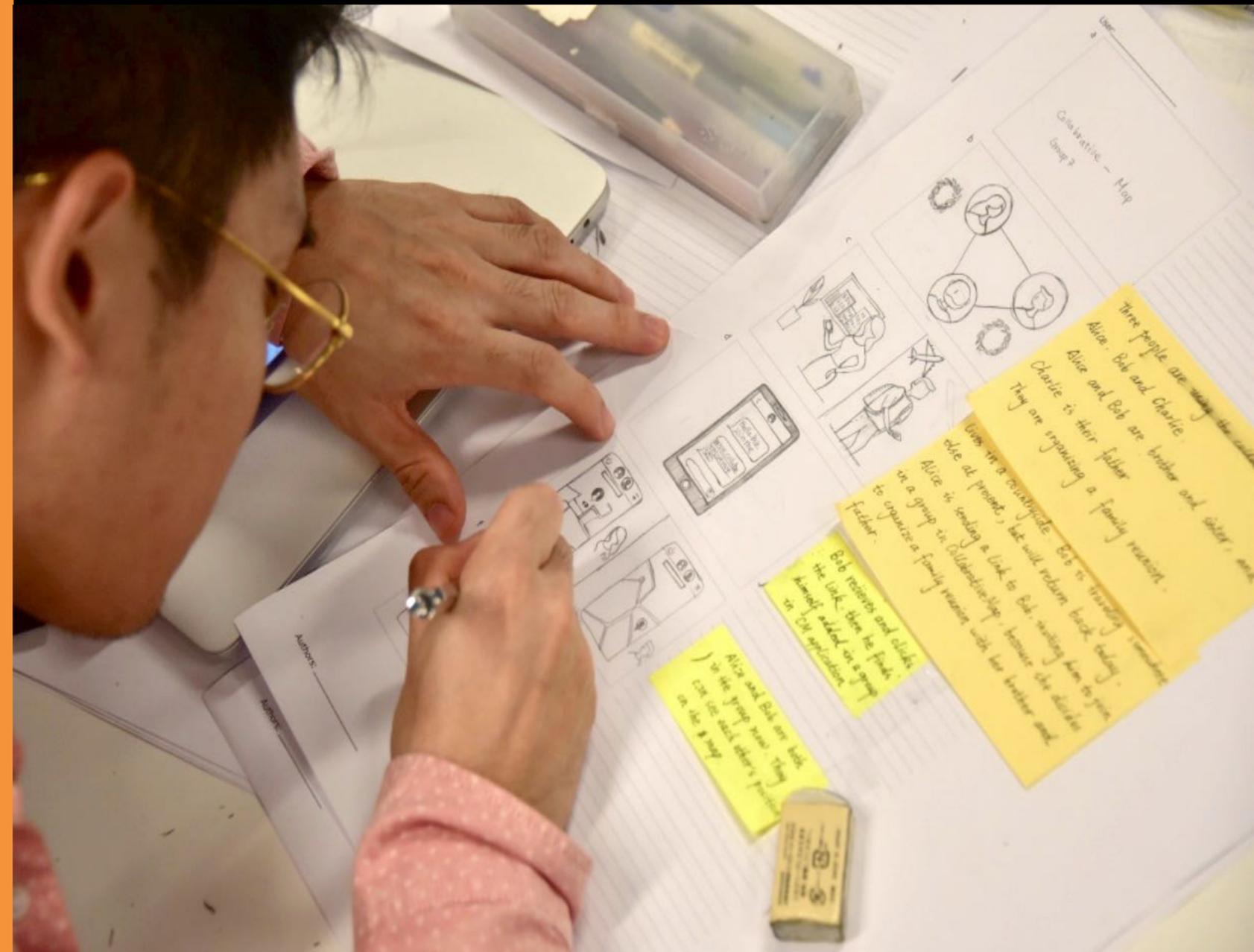
Storyboard element

Example 10. Interaction Snippet

Figure 19.
Interaction snippets combine sketches and text to show a user interacting with the new design.



Storyboard



Procedure

Divide future scenario into
a series of interaction events

Alternative between:

Title cards Tell the story (silent movie)

Interaction(s) Sketch the user's actions

Each interaction includes:

Sketch Show user/system action

Text Describe what happens
(Also) shooting instructions

Storyboard

Create a scenario with interaction snippets

Illustrate the interaction between the user(s) and the system

Tell the story with titlecards

Describe issues and guide video shoot

Title
User(s)
Situation

Establishing shot
First interaction

Closeup shot
Second interaction

Mid-range shot
Third interaction

Wide shot
Forth interaction

Final credits

Storyboard

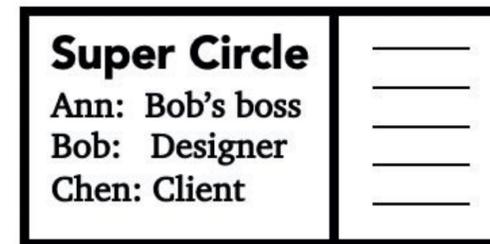
Standard storyboard structure

Identify key interaction snippets
in the scenario

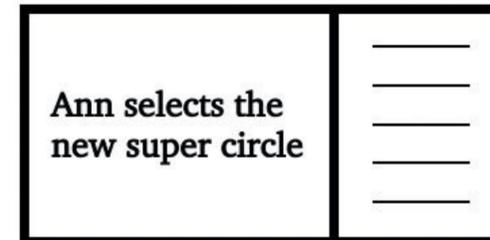
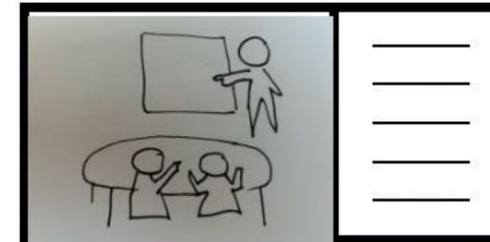
Examine the key ideas from
the design space
(brainstormed ideas)

Illustrate the interaction
between user and
novel system

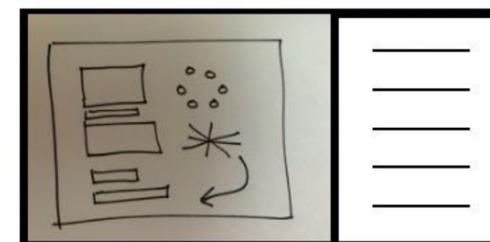
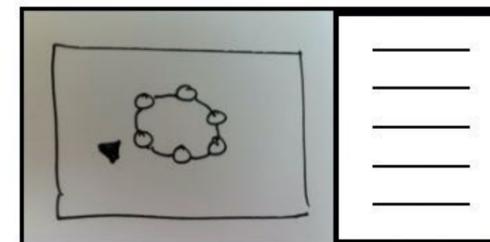
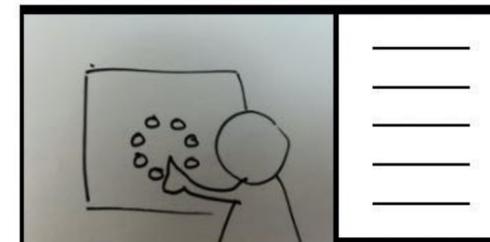
Describe key issues
on the right



Title
Personas
Situation



Title card



Close-up shot
Forth interaction

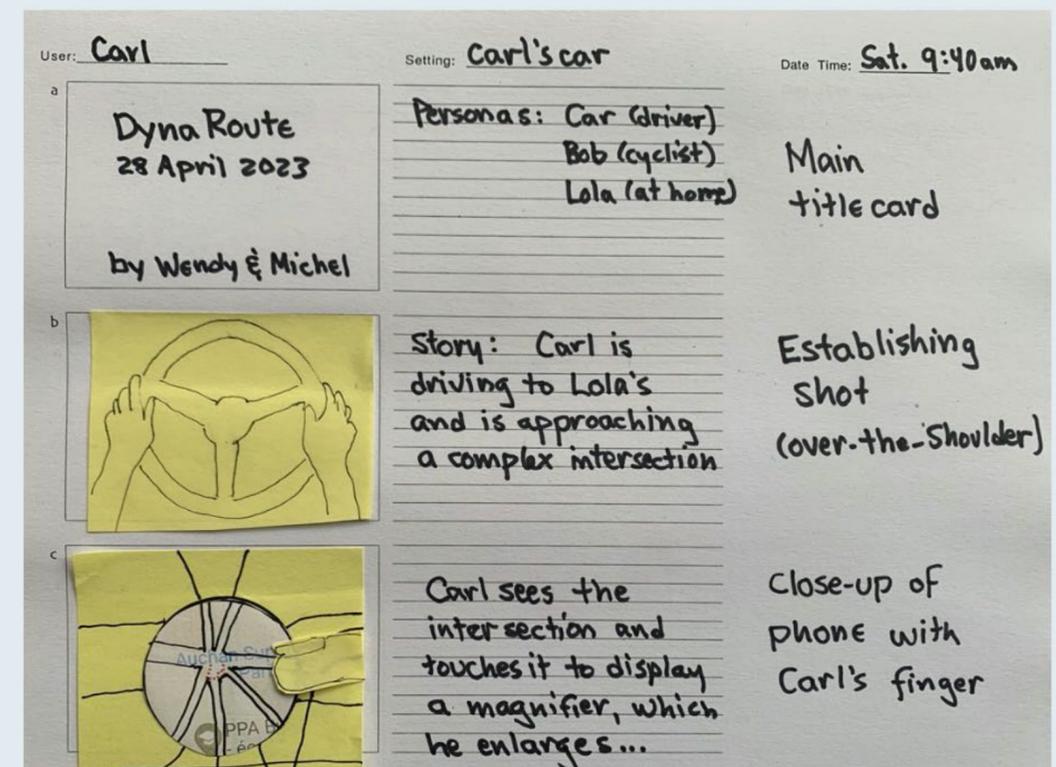
Storyboard

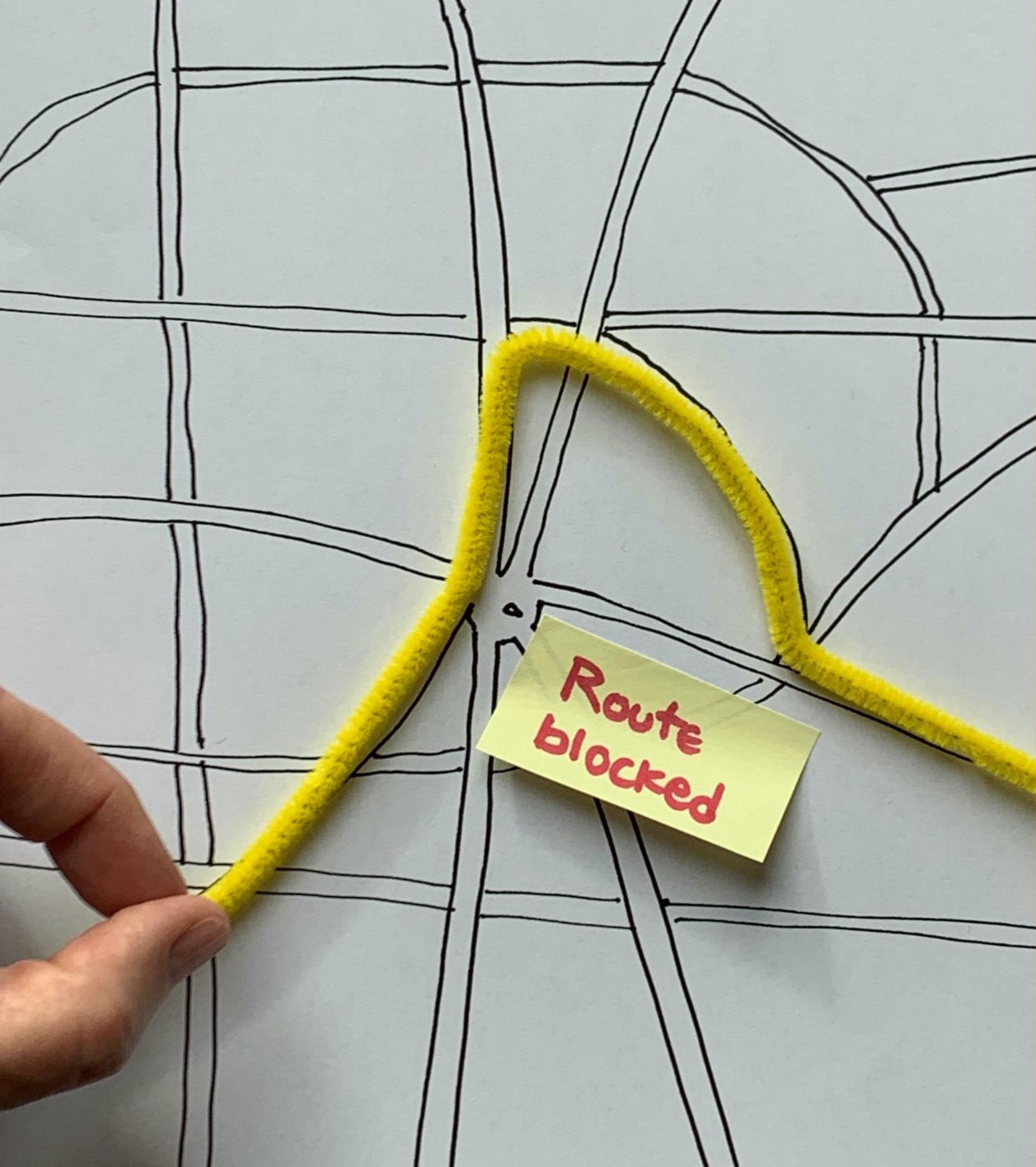
Example #11

Illustration

Example 11. Storyboard

Figure 20. The storyboard guides how to shoot the video prototype.





Mockup

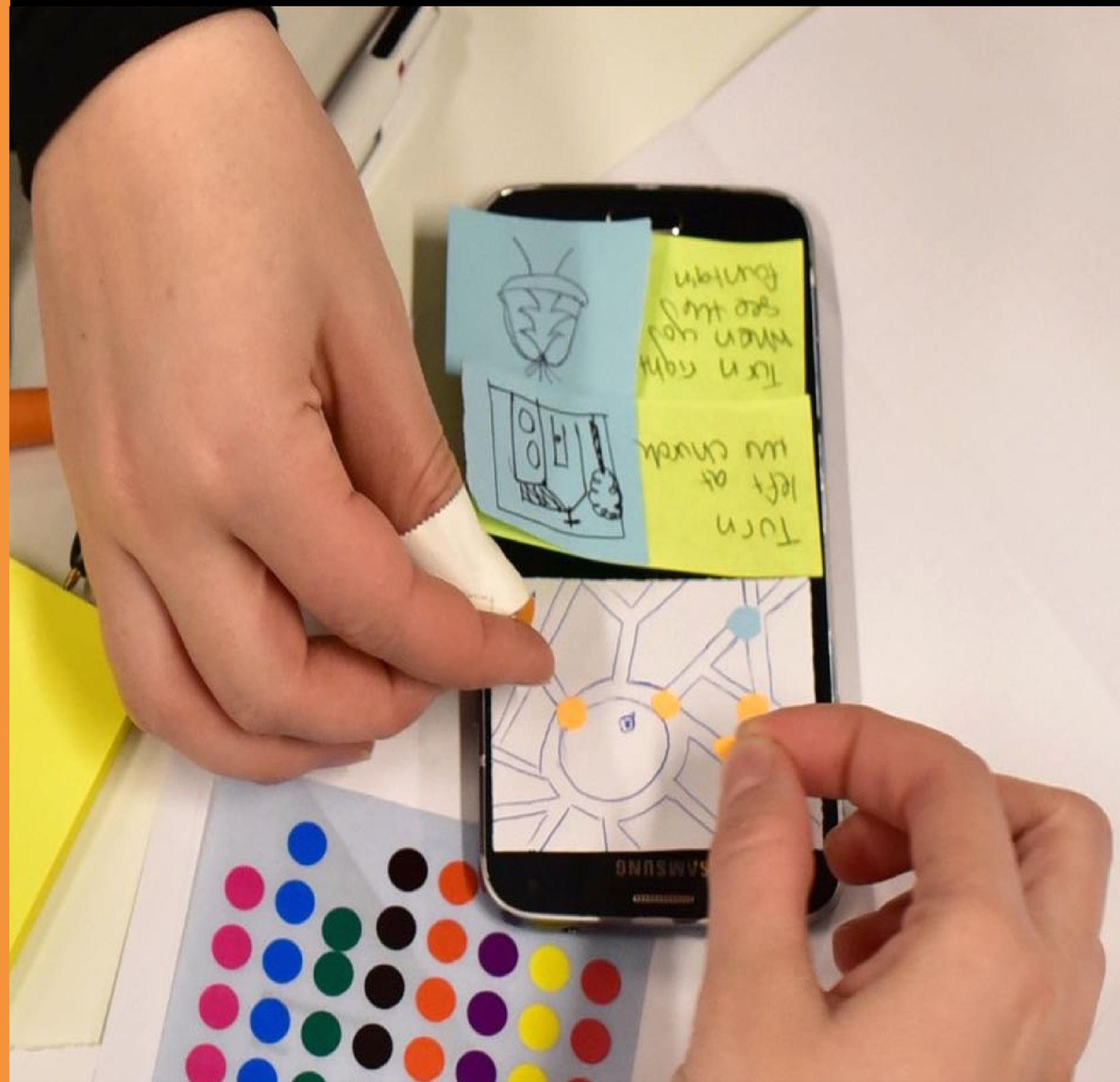


Video prototyping



Video prototype

Mockup



Video prototyping



Prototips

<https://prototips.lri.fr>

Prototips

ABOUT

PREPARATION

ACTIONS

CONTEXTS

ADVANCED

All

Move

Drag

Select

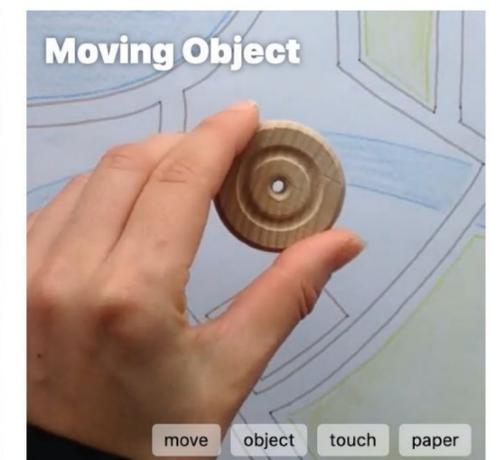
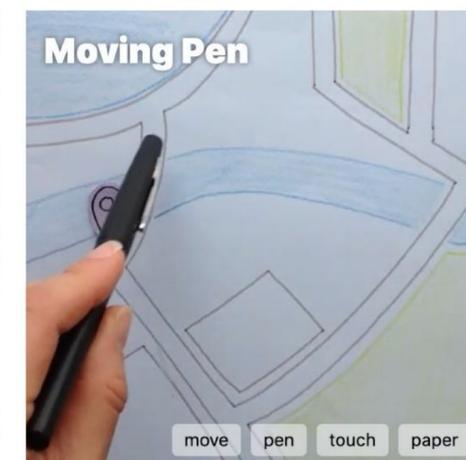
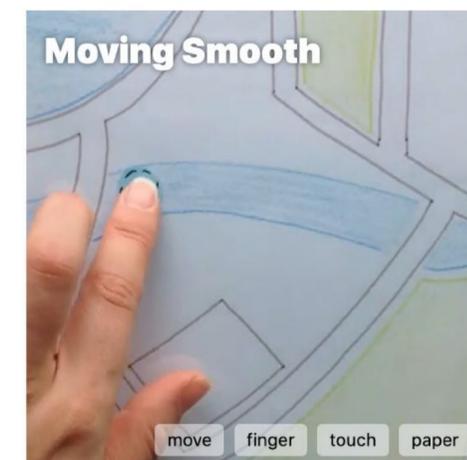
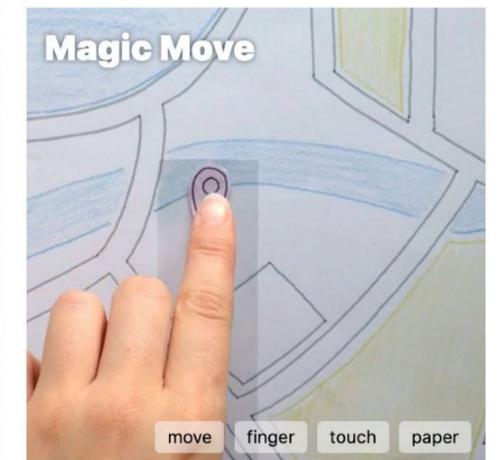
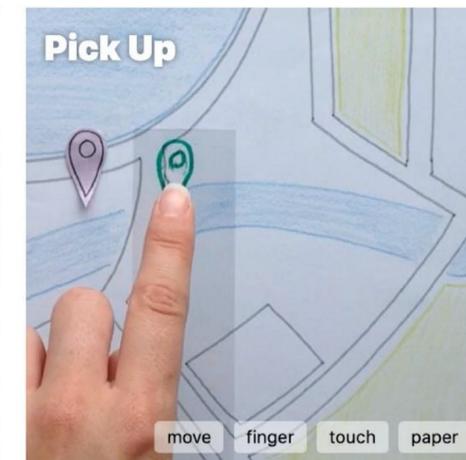
Write

Type

Zoom

Scr

99 techniques



Remember

Video prototype

Explanatory intertitle cards

Time-lapse effect

Transparencies & post-its for dynamic effects

Stabilize the background

Post-it notes or tape

Stabilize the camera:

tripod, chair, body, support

Ensure pen strokes are visible

Camera focus:

Zoom in, zoom out, then shoot zooming in

Remember

Video prototype

Limit background noise
Find an empty room!

Director technique:

Say “Three” “Two” “ ” “ ”

Choose between:

voice-over or live audio

First		Last		Team		Due	
Grade		Comment					
Page		of					

Video prototype

Design Prototypes Worksheet

Activity Record a video scenario of how users would interact with the new design in a realistic setting.

	Sketch or titlecard	Story description	Shooting instructions
Main title			
Personas			
Establishing shot			
Interaction			
Interaction			

Video prototype

Video prototyping

Advantages

Provides an easy-to-evaluate, reusable video story of context-specific user interaction

Trade-offs

Disadvantages

Takes more time to produce

Video prototyping

Advice

Shoot video of a storyboard that shows how users would interact with the new system.

Caution!

Do not be afraid to shoot breakdowns, they can inspire new ideas and solutions!

Remember to ...

shoot based on the storyboard
distinguish user interaction from pointing
include situations that push the limits of your design