DO IT:
THE DESIGN OF INTERACTIVE THINGS

Wendy E. Mackay
2 February 2026

mackay@lisn.fr

Inria
INVENTEURS DU MONDE NUMÉRIQUE

COLLÈGE DE FRANCE
1530

DO IT:
THE DESIGN OF INTERACTIVE THINGS

Course overview

Exercises

Schedule

Monday, 2 February 2026

Lectures

Discover users
Inspire ideas
Design prototypes
Evaluate designs

Key exercises

#1 Story Interview
#2 Video Brainstorm
#3 Video Prototype
#4 Generative Walkthrough

Design project

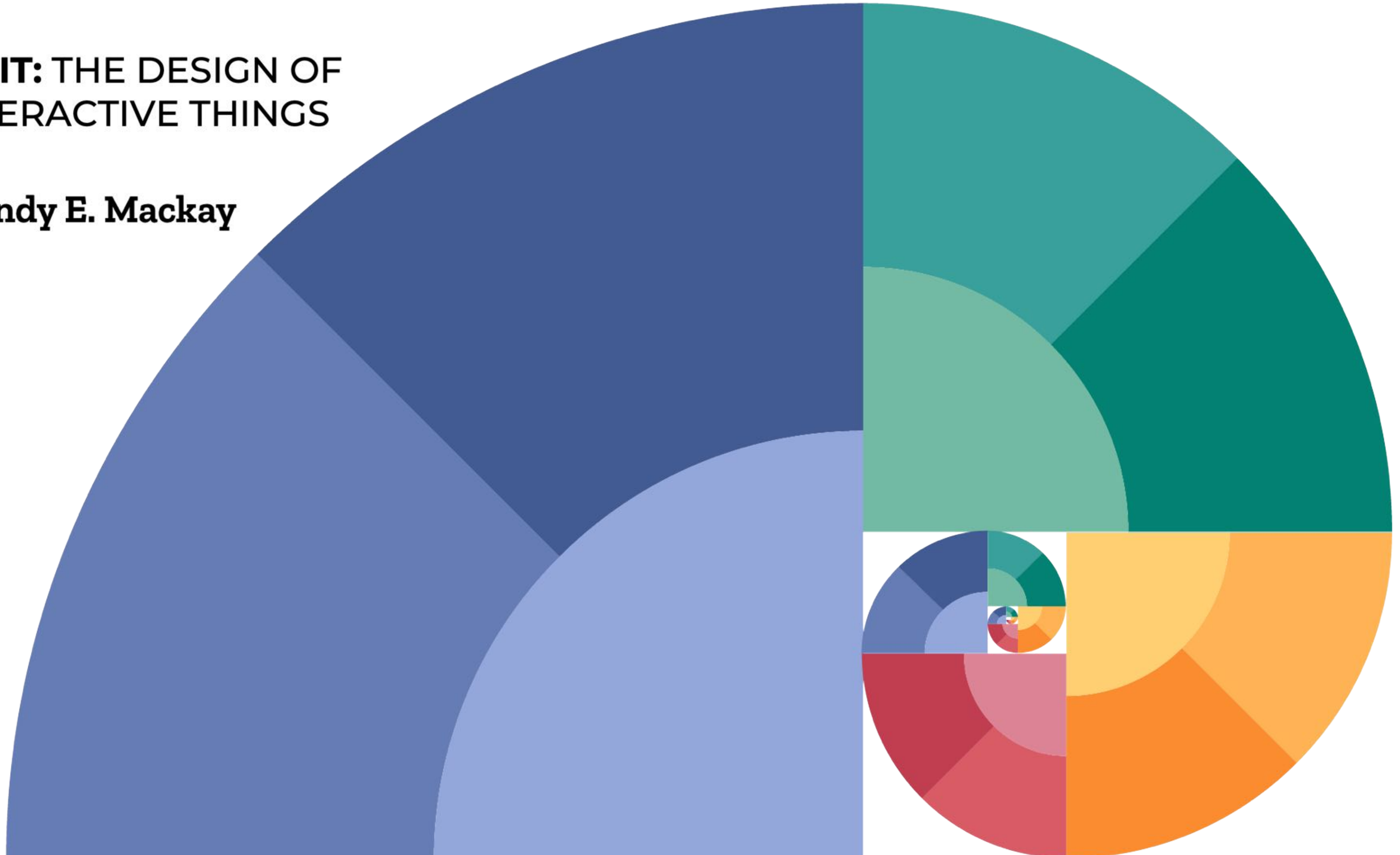
Interaction design

Learn methods that help you to:

- discover user issues
- generate new ideas
- design mockups
- create a video prototype
- assess your design

DO IT: THE DESIGN OF INTERACTIVE THINGS

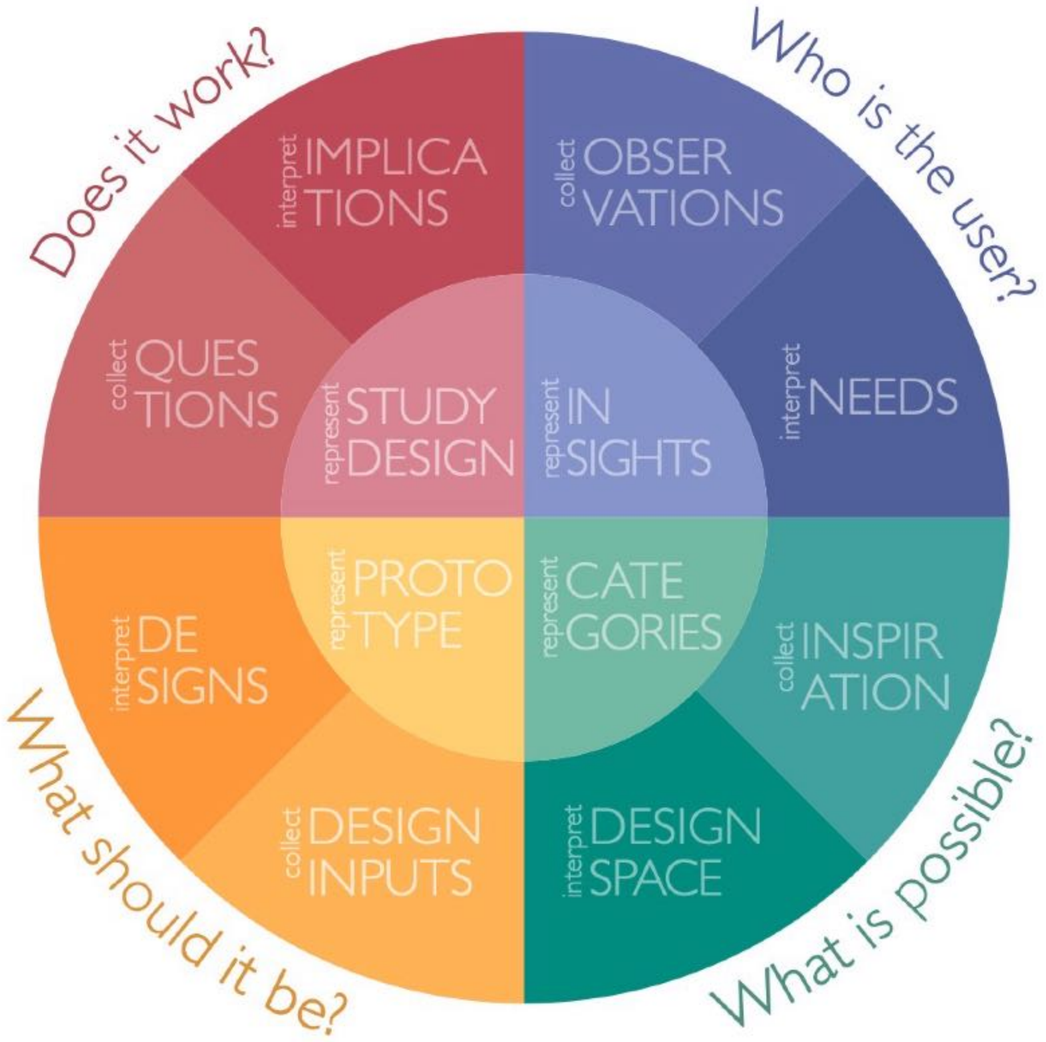
Wendy E. Mackay



https://ex-situ.lri.fr/publications#doit

DO IT: THE DESIGN OF INTERACTIVE THINGS

Wendy E. Mackay
2023



Generative design

Discovery

Who is the user?

Inspiration

What is possible?

Design

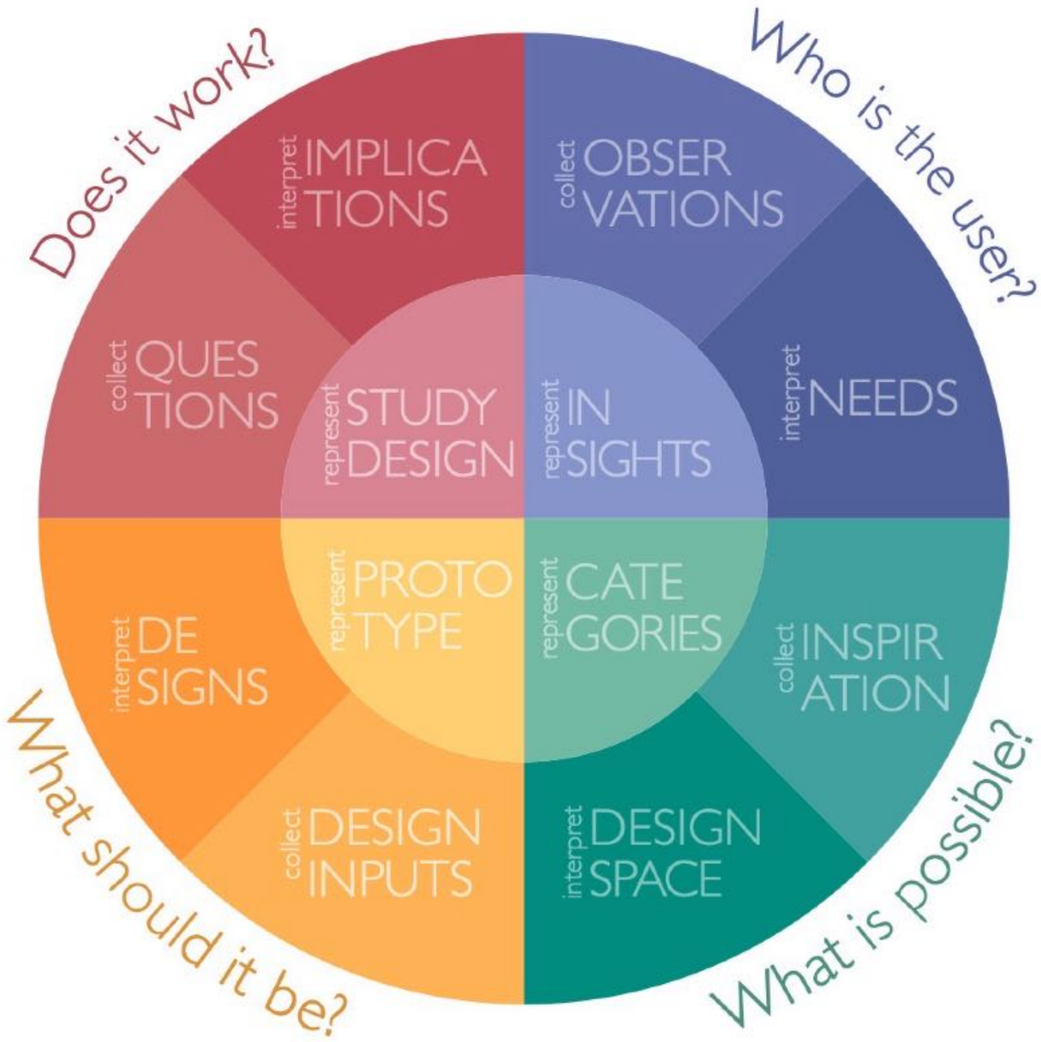
What should it be?

Evaluation

Does it work?

Redesign

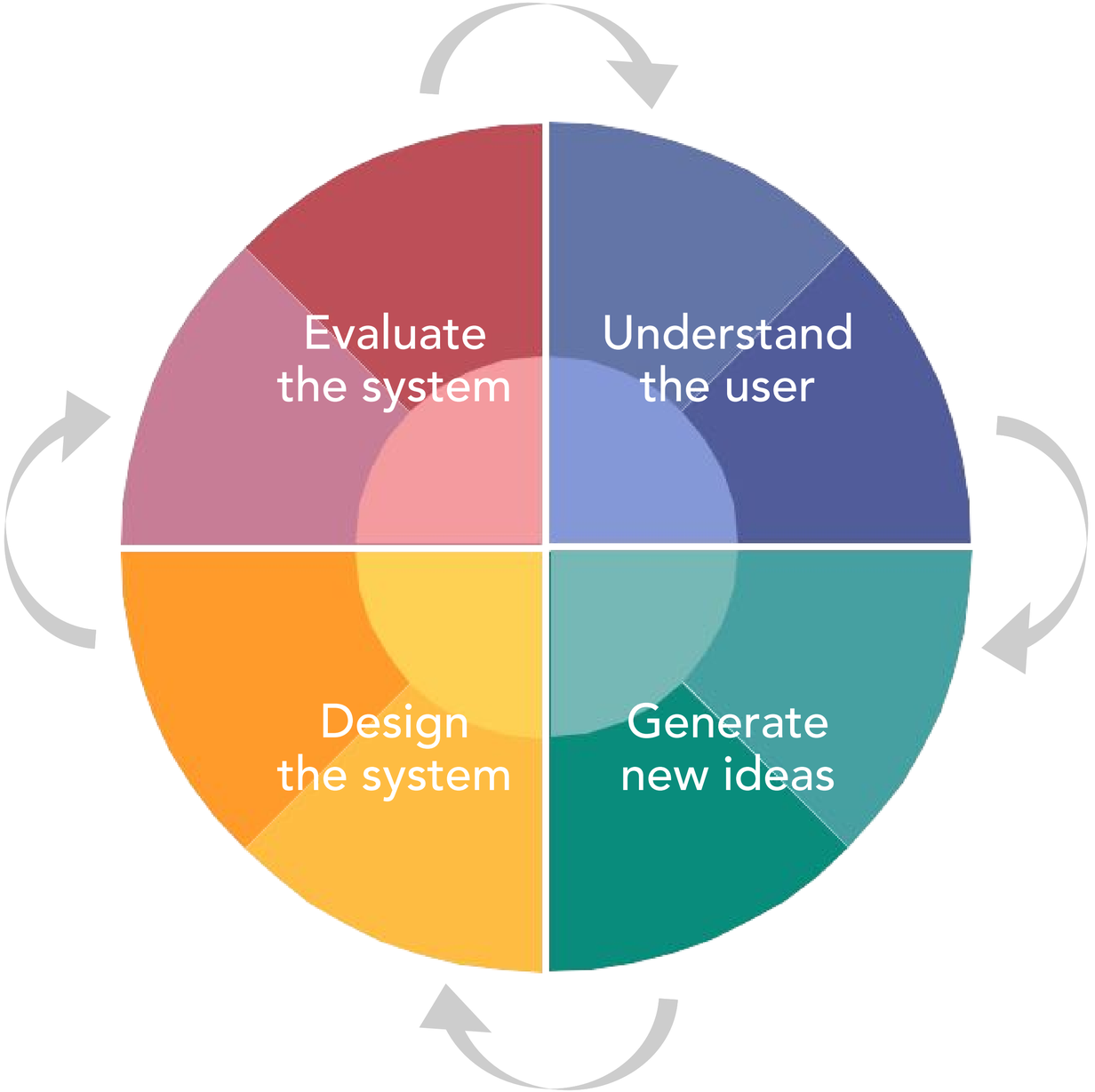
Make it better!



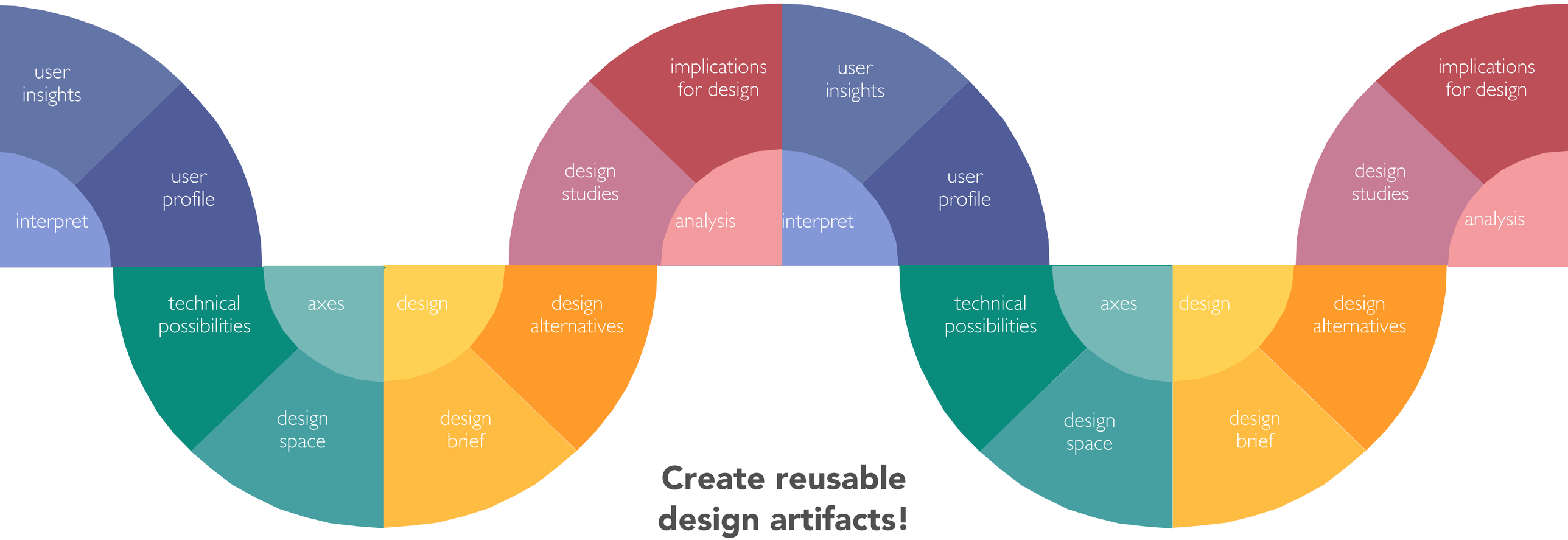
Interconnected design process

Every design phase contributes to every other phase:

Jump from any phase to any other phase as needed



Interaction design is iterative...



Create reusable design artifacts!

Generative design

Methods may be:

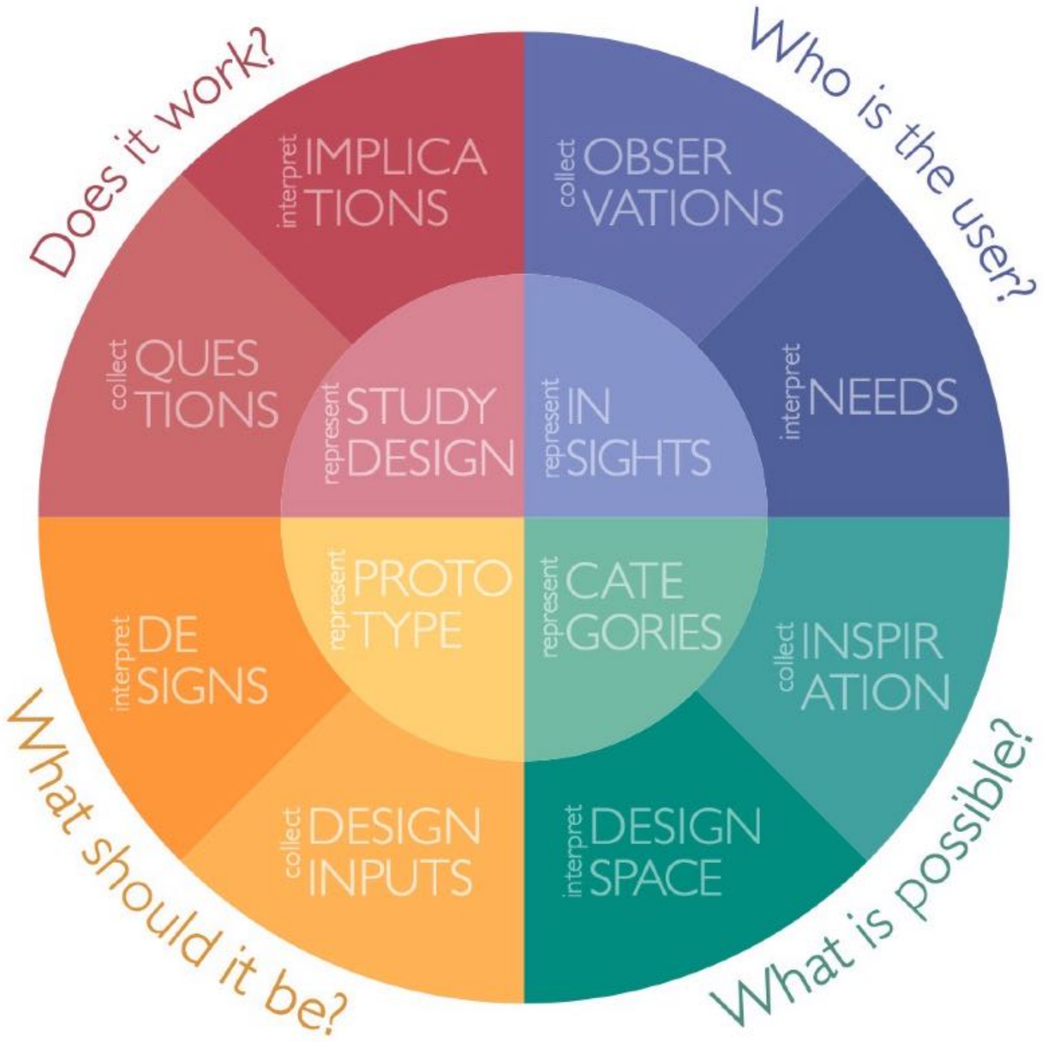
Divergent or convergent

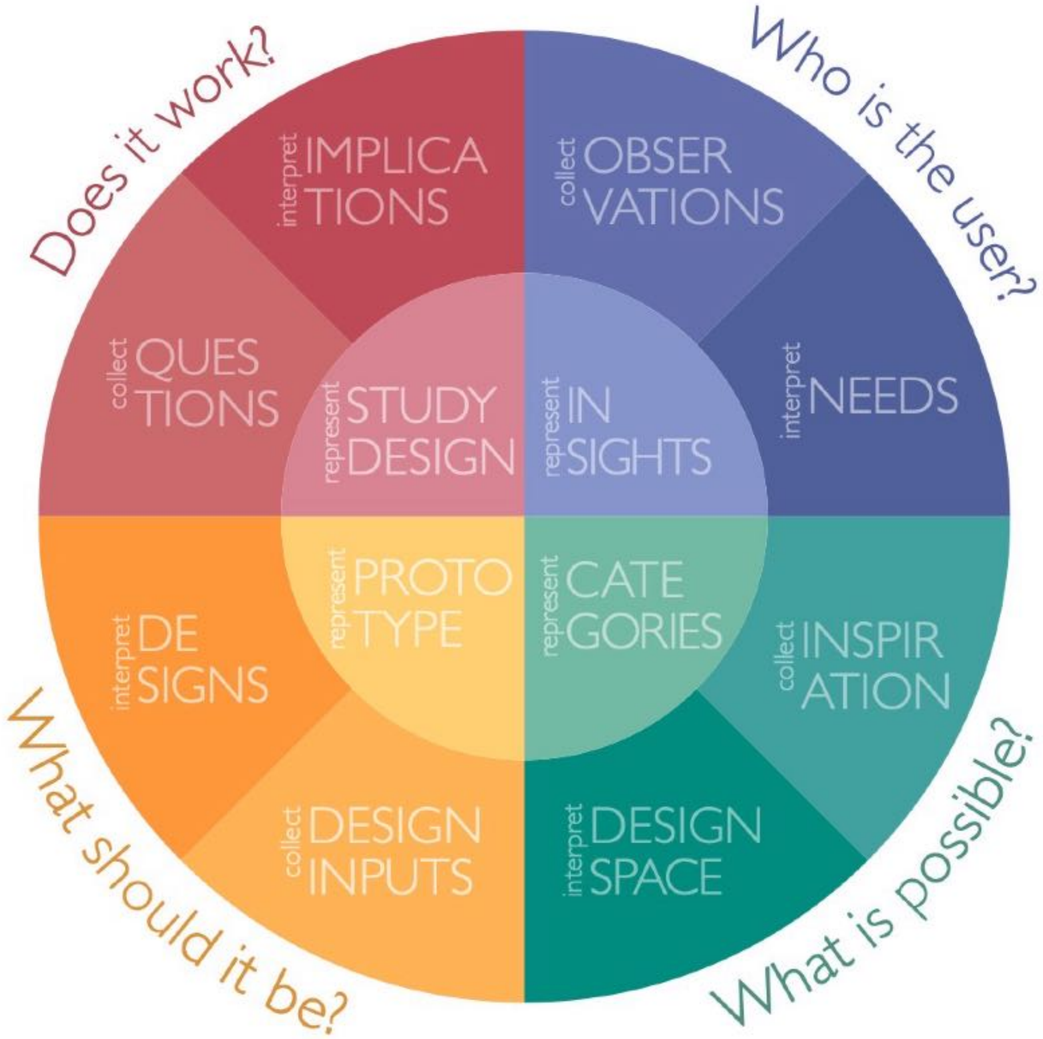
Critical or generative

User focused or system focused

General or specific

Story-based or system-based





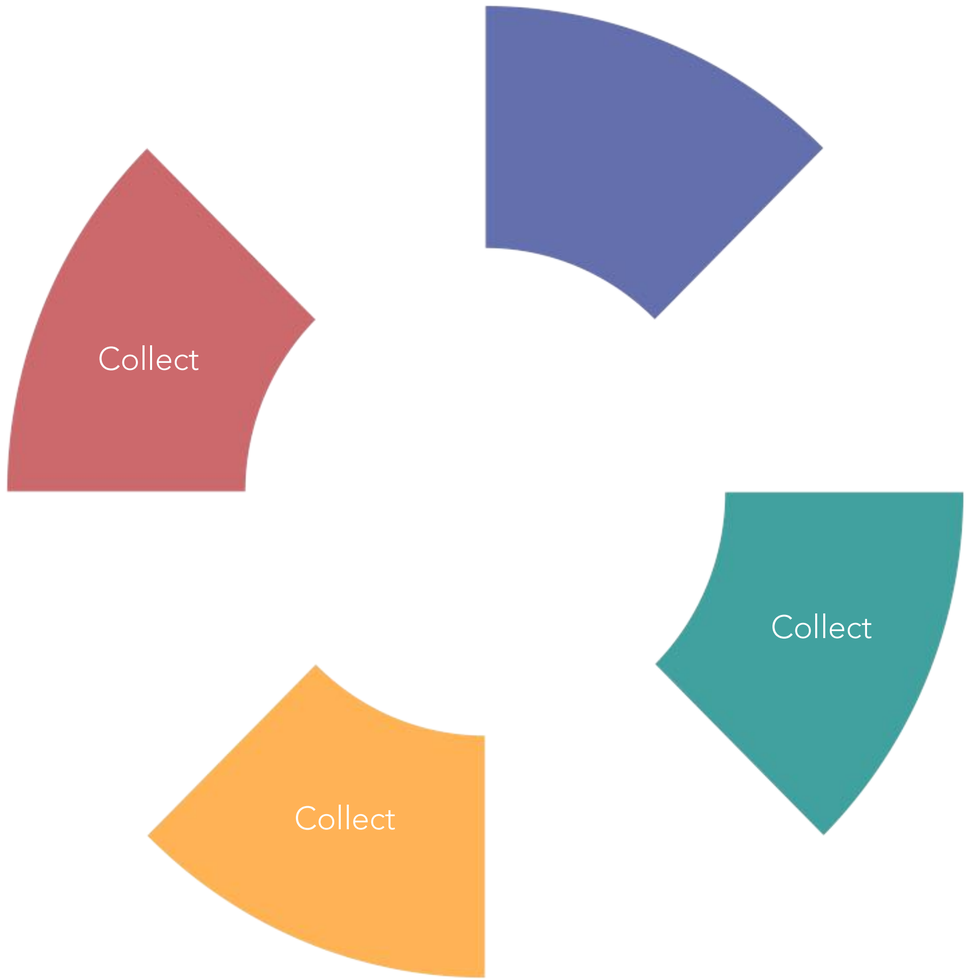
Generative design

Key activities

Collect information

Represent with artifacts

Interpret the results



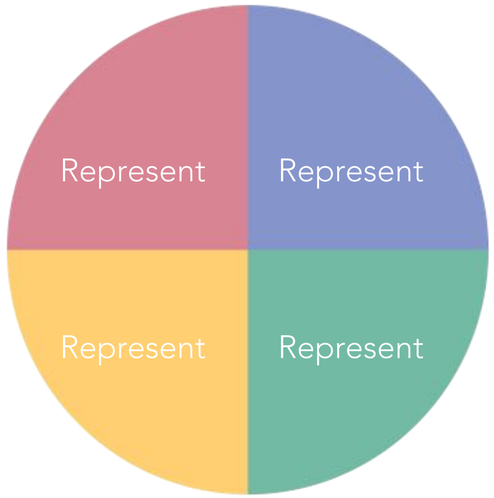
Generative design

Key activities

Collect information

Specific typical and rare stories

Surprises, breakdowns & user innovations



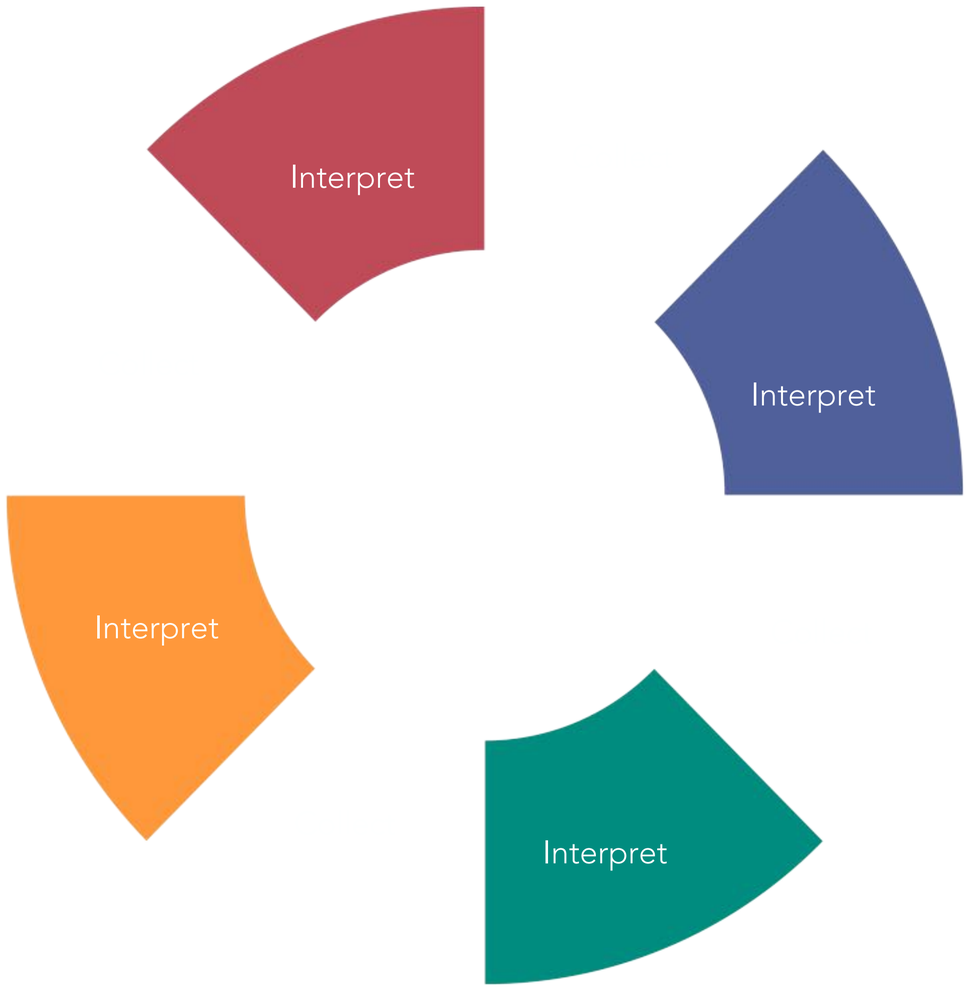
Generative design

Key activities

Collect information

Represent with artifacts

- Scenario, persona, requirements list
- User profile, object table



Generative design

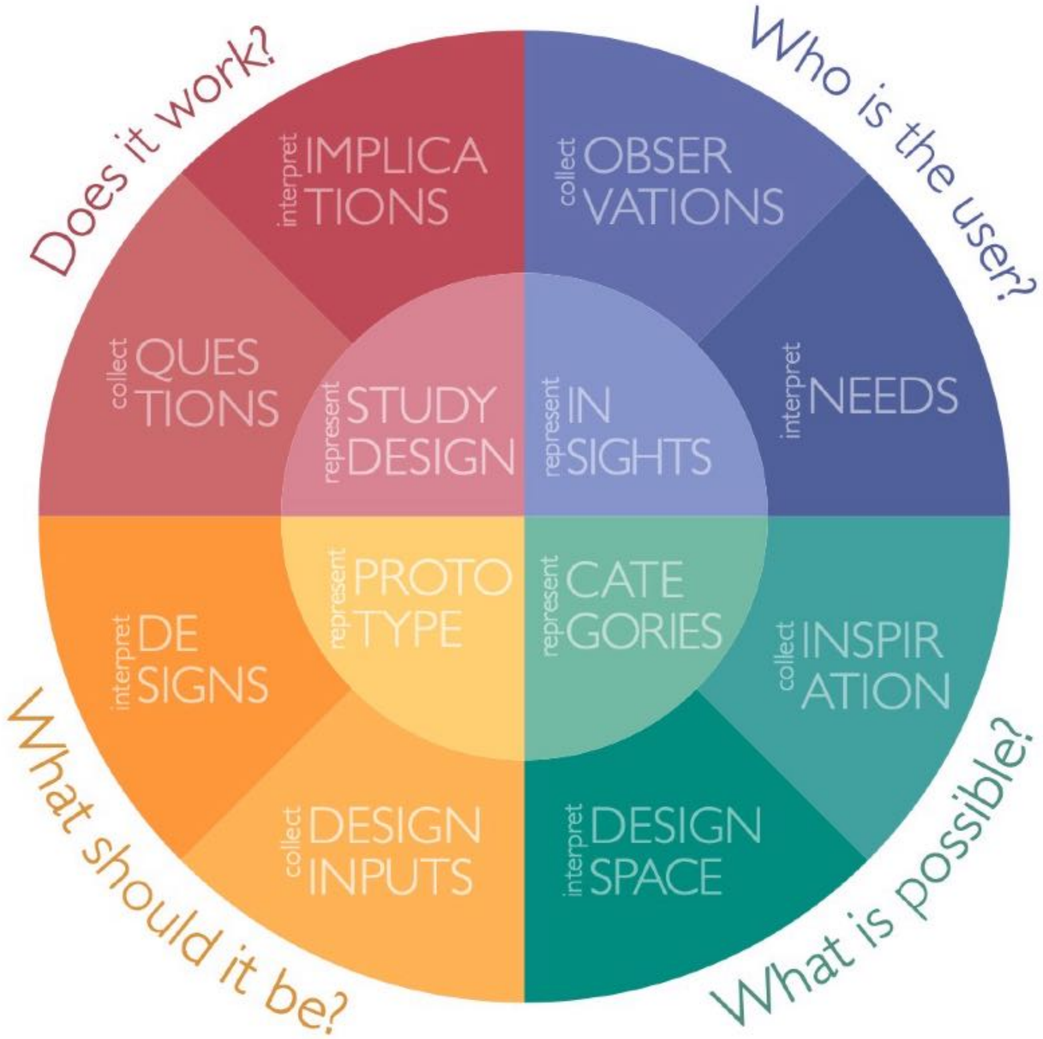
Key activities

Collect information

Represent with artifacts

Interpret the results

- Identify problems, needs, opportunities
- List requirements and critical points



Generative design

Key activities

Collect information

Represent with artifacts

Interpret the results

Design thinking

Good interaction design requires
taking the *user's* perspective

Who is the user?
What do they want to do?
What is the current context?

You cannot "design the user experience"

You can control some—but not all—
of the user's experience

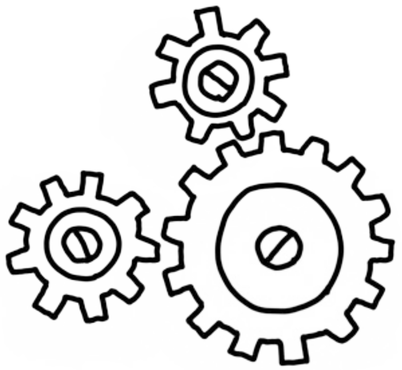
Diverse approaches

Science

Collect data about users
Analyze data
(qualitative, quantitative)
Inform designers
Test user reactions

Engineering

Collect functional
specifications
Implement functionality
Test functionality



Design

Inspire ideas
Consider context
Question the design brief

Multidisciplinary design methods

Discovery Who is the user?	**Inspiration** What is possible?	**Design** What should it do?	**Evaluation** Does it work?	**Redesign** Do it bettter!
Direct observation *Anthropology*	Standard brainstorming *Business*	Paper prototyping *Design*	Task analysis *Ergonomics*	Generative walkthrough *HCI*
Critical incident technique *Psychology*	Video brainstorming *HCI*	Future scenario Theater	Controlled experiment *Psychology*	Culturel probe *Design*
Questionnaire *Sociology*	Idea archive *Design*	Video prototyping Cinema	Design walkthrough *Engineering*	Structured observation *HCI*
Video snippets *HCI*	Bodystorming *Theater*	Interaction table *HCI*	Diary study *Anthropology*	Interactive thread *HCI*
Thematic analysis *Psychology*	Design space *Design*	Wizard of Oz HCI	Field study *Anthropology*	Technology probe *HCI*

Design is about *doing*
not just thinking

Design Brief

LaSuite Numérique

DINUM

Direction Interministérielle du Numérique

France’s Digital strategy

Create *open-source* versions of:

Visio	Video conferencing
Tchap	Instant messaging
Docs	Shared documents
Fichiers	File sharing
Grist	Spreadsheet

They want (and need) our help!

Redesign Visio*

Design project

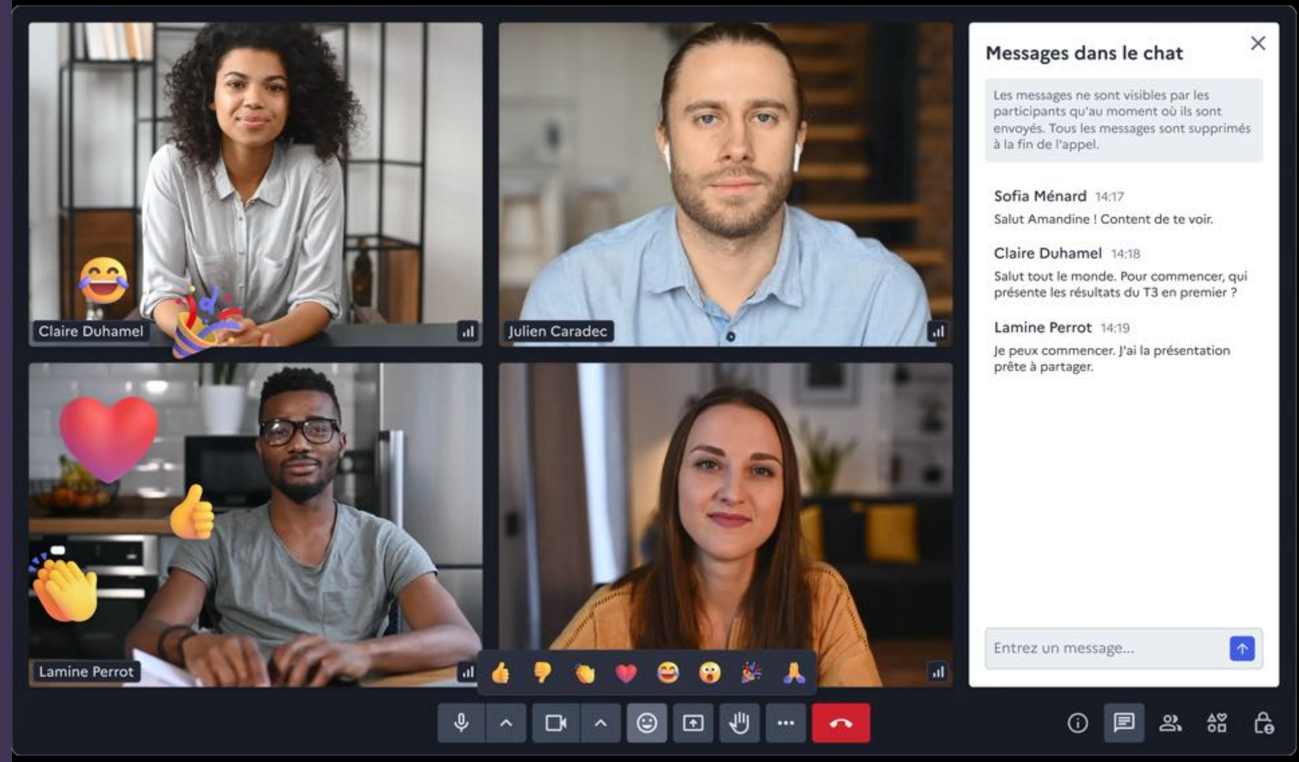
*Video conferencing system
in *LaSuite Numérique*

Work in project teams
~4 members each

Create a video prototype
that improves an aspect of current
video conferencing systems

Prepare for the Hackathon

Redesign Visio*



Advice

Work in teams

Respect your teammates
- Everyone should contribute

Don’t argue
- Stop talking and do it!

Work fast
- Sketch ideas, avoid perfection

Try at least 3 alternatives
- no more than 5

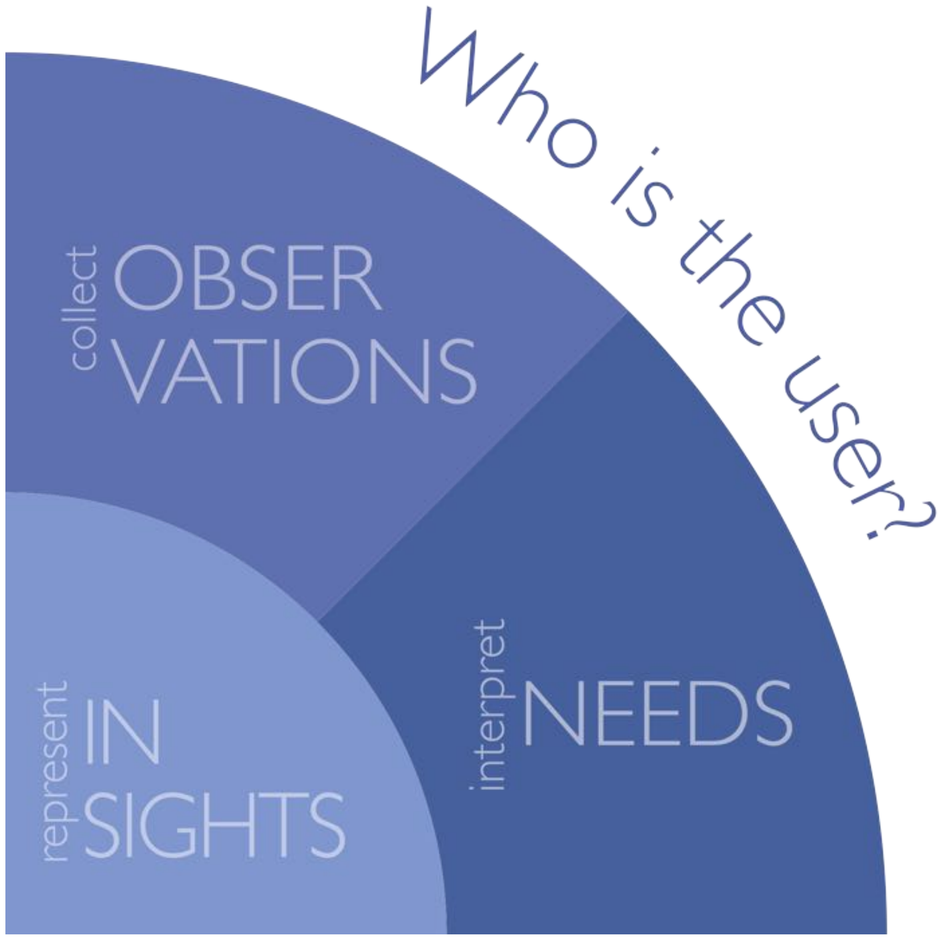
Take the user’s perspective
- not the technology’s

Create, reflect upon and reuse artifacts
- Focus on the interaction

This is a hands-on class...
participate!

Finding out about users

Discovery



Observe interaction

Learn to see interaction!

To play the violin
first learn to **hear** the music

To paint a portrait
first learn to **see** a face

To design interactive systems
first learn to **observe** interaction

Observe interaction

“In situ” means “in context”

Observe how users perform tasks in situ

Remember
Observing ≠ interacting with users

Helps find real-world problems
and avoid stereotypes

Ethics

IRB = Institutional Review Board

Always ask for permission

Accept ‘no’ for an answer!
- Participants may stop at any time without giving a reason

Never distribute personal data

Check with your IRB

Asking questions

How you ask the question matters!

Human memory

Overview

Long-term memory is organized into:

- declarative
- non-declarative

Declarative memory involves:

- semantic memory (facts & figures)
- episodic memory (events & times)

Non-declarative memory involves:

- procedural memory (skills & habits)
- emotional responses (can be primed)

Human memory

Why stories?

Capture **episodic autobiographical** memory
event-specific knowledge related
to past personal experiences

Detailed user stories capture the user's
conceptual objects
desired functionality
interaction with the technology
specific context

Most useful input to inspire design

Asking questions

How you ask the question matters!

The **form of the question**
directs the **form of the response**

To get specific, real answers,
you must ask the questions correctly
If not, you will get vague general answers
that do not help your design

Careful! Avoid marketing surveys!
Understanding users better
leads to better system design

Example: Ask about a recent email message

Poor question

“How do you manage your email?”

Why?

Encourages general statements
and non-grounded opinions
Rarely results in a detailed story

Asking questions

Asking questions

Example: Ask about a recent email message

Good question

“Think of the last time you wanted to find an email message but forgot the sender’s name. Describe, step-by-step, how you found it.”

Why?

Encourages the person to tell a recent, specific story and lets you probe for details

Example: Ask about a recent email message

Probe for details about the interaction

“What did you do first?”
“How did the system respond?"
“Was that what you wanted?”
“What did you do next?”

Probe for more context

“Why did you need that message?”
“Why couldn’t you find it?”

Asking questions

Question order matters!

First **specific**	then **general**
First **concrete**	then **abstract**
First **directed**	then **open-ended**
First **facts**	then **opinions**

Asking questions

You can create abstractions
from detail...

but you cannot discover detail
from abstractions

Types of Interviews

Descriptions

What does this technology look like?

Explanations

How does this technology work?

Stories

What happened to you that specific time?

Opinions

What do you think or feel about it?

Data

How many times did you use it?

Story interview

Tutorial interview

Marketing interview

Types of interviews

Story interviews

Elicit real stories in real contexts
including breakdowns and surprises

Best for design

Tutorial interviews

Describe how it is supposed to work,
not how it actually works

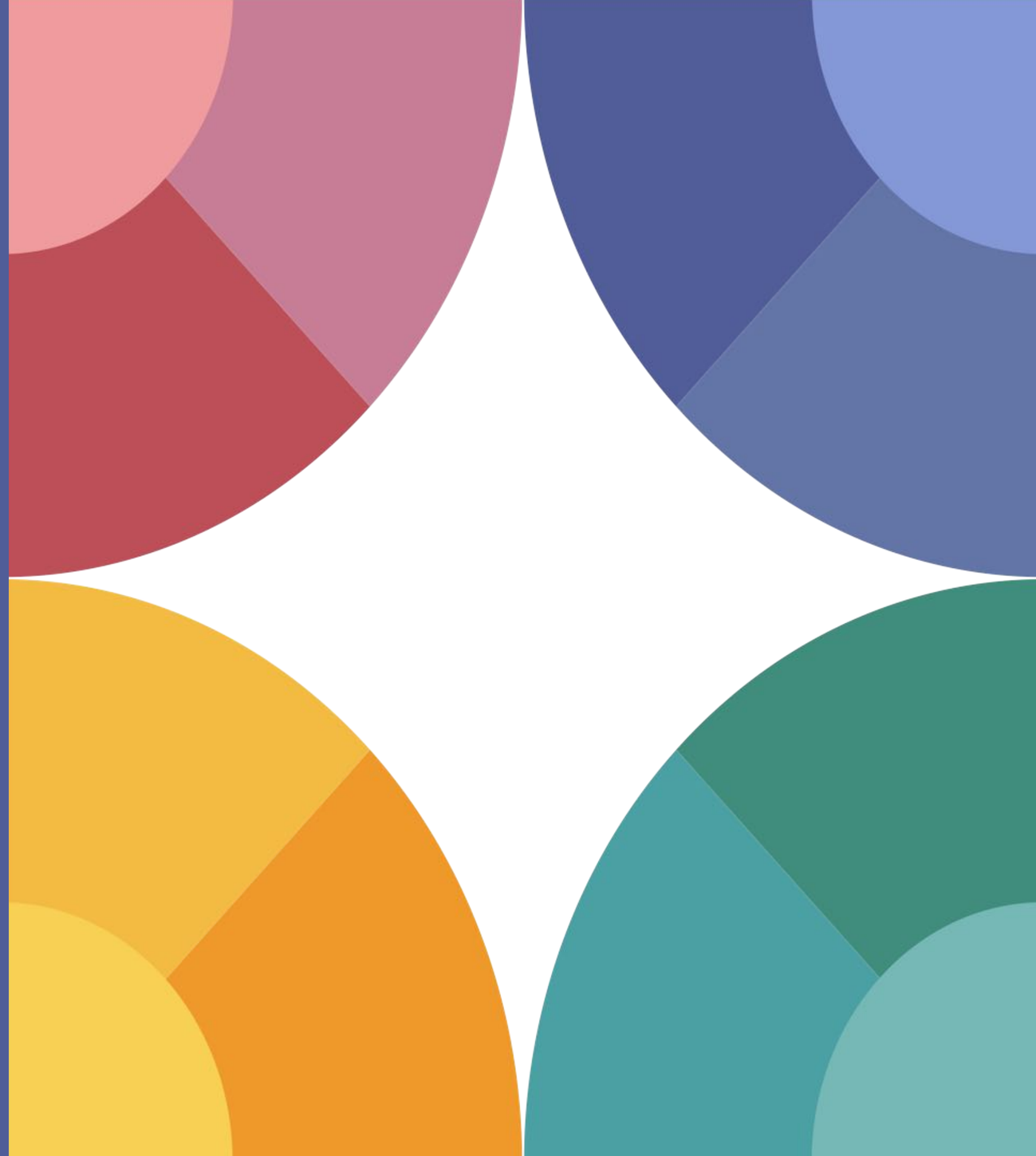
Best for understanding

Opinion interviews

Highlights ‘pain points’
Lack detail, often too general for design

Best for marketing

Story interview



Story interviews

Designing better systems requires
understanding real-world user interactions

Story interviews produce specific stories
unlike tutorials (how it should work)
unlike opinions (good / bad features)

Story interviews
preserve context
identify breakdowns
reveal patterns over time
may uncover user innovations

Explain step by step

Goal: get a detailed story of interaction

Extremely recent event

“Describe what you did at 9:00 am.”

Critical incident

“Tell me what happened <when it all went wrong>?”

Bright spot or positive memory

“Tell me what happened <when it worked exceptionally well>.”

Critical object

“Describe how you made <this object>.”

Story interview questions

Probe for details

Red flags

If you hear these words ...

Usually …
Sometimes …
Normally …
When I do this, …

you know they switched to a tutorial interview

Ask more questions!
probe for a specific story,
NOT how they usually do things

Story interview

Example #1

Example 1. Story Interview

Interview date: 10 March 2023
Location: Café du Théâtre, Paris
Interviewer: Wendy Mackay
Interviewee: Participant 3

Initial question: *"Can you remember the last time you had a problem with a map application? Can you tell me what happened?"*
Answer: *"Last Thursday, my son asked me to help him deliver a table to a friend's house. He texted me the address and I copy-pasted the address from the text into Apple Maps to get a sense of how far away it was and generally how to get there. When it was time to leave on Saturday, I opened Apple Maps but the address had disappeared. So I had to go back to my son's text, scroll until I found the address, and then re-enter it. Since I took the car, I then had to manually re-enter the address from my phone, and kept both open, since they often show things differently."*

Probe question: Did you use the GPS and the phone at the same time?
Answer: *"Yes, since they show different things. Unfortunately, the phone was in "dark mode", which made it hard really hard to read in the daylight. It also showed lots of irrelevant information, such as local restaurants that I didn't care about, but sometimes a landmark was useful, especially since some of the physical street names are hard to see. In one case, I couldn't see the street name and wasn't sure I was in the right place. I zoomed in, but the landmark disappeared, so that didn't help. It wasn't clear which ones would stay and which would go away. I had to wait to get to the next marked intersection to be sure I was on the right track."*

Probe question: Did you have any trouble finding the address?
Answer: *"Yes. I missed the turn at a complex intersection that was really confusing with several branching streets. I'm still not sure if the car was wrong because it messed up the tracking, since the map did not turn as quickly as the car. Was it out of date and didn't know that one street was one-way? I've noticed that the accuracy within the city isn't great. Anyway, I went down the wrong street to avoid the one-way street, and had to loop around to get to the right address."*

Probe question: Do you have an example of something innovative you did?
Answer: *"Not sure if it's innovative, but I took a photo of the car's GPS display because it isn't cluttered with irrelevant restaurants and sent it to myself. I then overlaid written directions and mailed it to [name] so they could see the most direct route without lots of extra stuff."*

Story interview

Exercise #1

Interviewer

Interviewer

Record type of phone, language(s),
Typing style (thumbs? gesture-typing?)
Record every step of what happened
(ask them to slow down, if needed)

Interviewee

Reenact a recent transportation problem
Use a talk aloud protocol to describe:
what you did
how the system responded
Did the app do what you wanted it to do?

Advice

Focus on real users with a real problem

Collect specific stories of current interaction
- What went wrong?
- What worked well?
- What surprised you?

Consider the context of interaction
- How does that change the user experience?

Start as specific as possible — generalize later

Remember

The form of the question directs
the form of the response

For specific, detailed answers,
always start with a recent, specific question
never start with a general question

Avoid yes/no questions or short answers

Probe for details
What happened next?
Get them to tell you a story

Story interview

Advice

Ask permission
Set realistic expectations

Begin by asking for a real, recent story,
then probe for additional details

Caution!

If you hear "usually I ..."
it’s no longer a story, it’s a tutorial..

Remember to ...

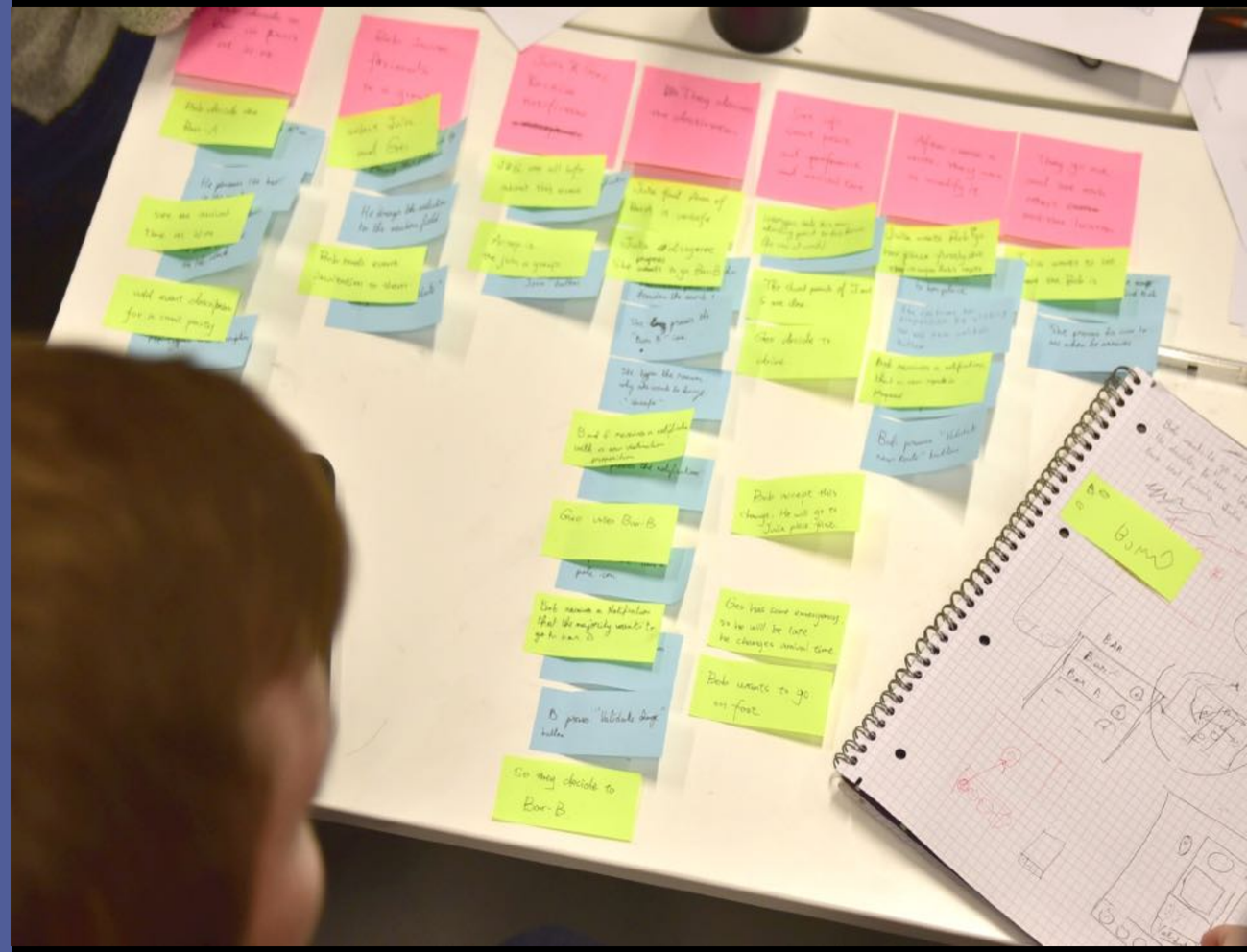
focus on recent or highly memorable stories

Start by asking for a specific story, not opinions

Avoid asking 'obvious' questions?

Ask open-ended questions, but only at the end

Breakdown analysis



Thematic analysis

Braun & Clark (2006)

Qualtiative data analysis technique
Emphasizes external validity (based on reality)

Coding	Identify key interview points
Concepts	Group codes with similar content
Categories	Create groups of similar concepts

Breakdown analysis focuses on identifying breakdowns, work arounds and user innovations

Goal: identify opportunities for design

Breakdown analysis

Goal: Identify opportunities for design

Fastest qualitative analysis method

Focus on:

- Breakdowns or problems in context
- Workarounds or alternative solutions that reveal the problem
- User innovations or clever ideas that suggest novel design solutions

Breakdown analysis

Roles	Moderator	Scribe
Resources	Interviews	Observation
	Questionnaires	Design Brief

Procedure

Reread user data and interaction snippets

Highlight all surprises plus
breakdowns, workarounds, user innovations

Organize items into categories

Give each category a 1-3 word code name

Definitions

Breakdown
User cannot solve problem at all

Workaround
User finds an imperfect solution

User innovation*
great solution to a breakdown, or
something completely new

* User is proud of it and may want to share it

Breakdowns, workarounds, & user innovations

Breakdown analysis

Example #2

Breakdowns, workarounds & innovations

Example 2. Breakdown Analysis

Breakdowns:

- The map didn't remember the address that was put in two days earlier, so had to re-find it and re-enter it.
- The phone was in "dark mode" so it was hard to see in the daylight.
- The map display updates more slowly than the physical movement of the car, so it was not clear which street was correct.
- Address appeared as a single point, but really spanned a whole block, so it was hard to figure out where to meet.

Workaround:

- Took both Apple Maps and the car GPS map sine they have different info.

User innovation:

- Took a snapshot of uncluttered GPS map in the car and added written directions.

Implications for design

Example #3

List of implications

Example 3. Implications for Design

- Make it possible to remember previous addresses.
- Make it possible to change the visual display to accommodate different lighting conditions.
- Account for inherent errors, such as the map being out of date or updating too slowly.
- Show addresses that cover more than a single location.
- Allow users to coordinate maps, so that they can see when each will arrive.
- Let different apps communicate with each other, such as from Apple Maps and car GPS.
- Allow users to easily annotate and share maps.

Break

Generative design

Discovery

Who is the user?

Inspiration

What is possible?

Design

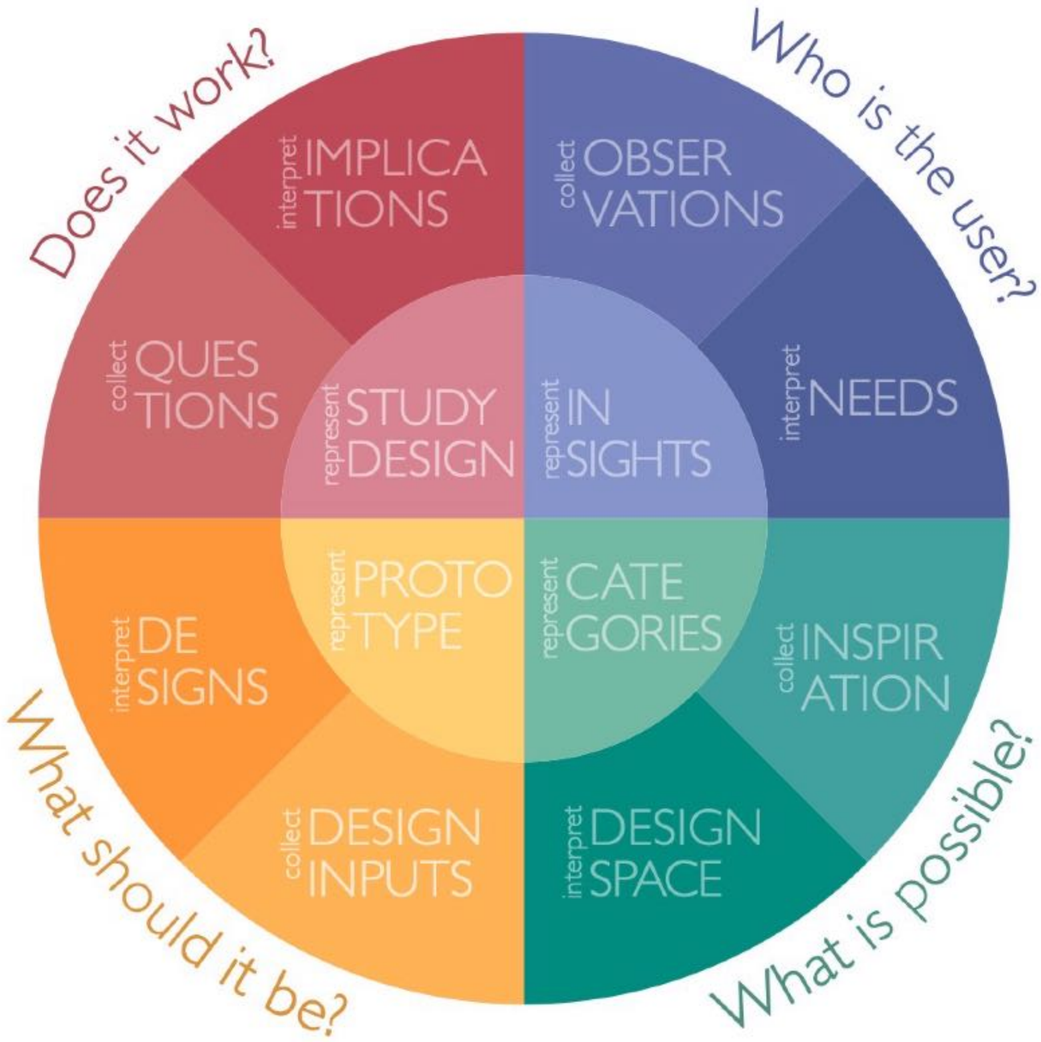
What should it be?

Evaluation

Does it work?

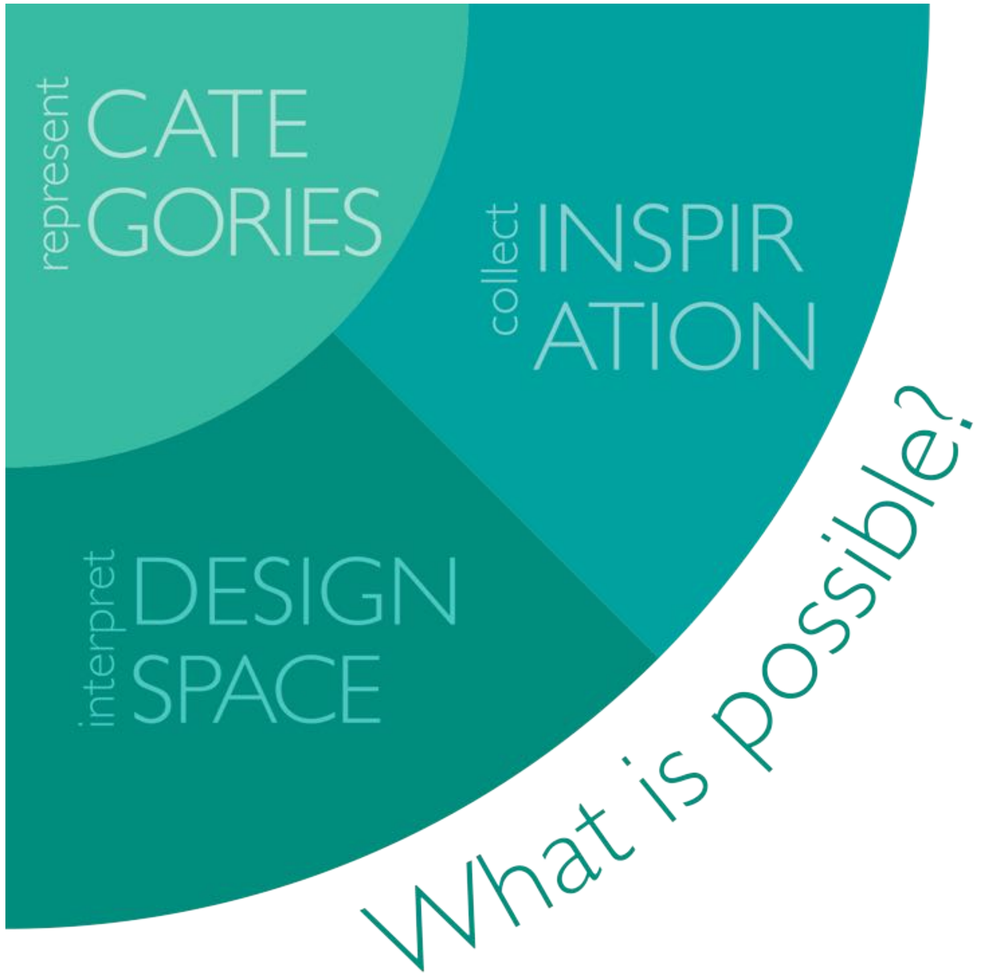
Redesign

Make it better!



Collect ideas

Inspiration



Generating ideas

Find a concept

Gather ideas from diverse sources
- Existing systems
- Other designers
- Web resources, e.g. Pinterest

Generate your own ideas
- Brainstorming
- Video brainstorming

Focus on user needs to inspire solutions
- Consider what surprised you
- Look for user innovations

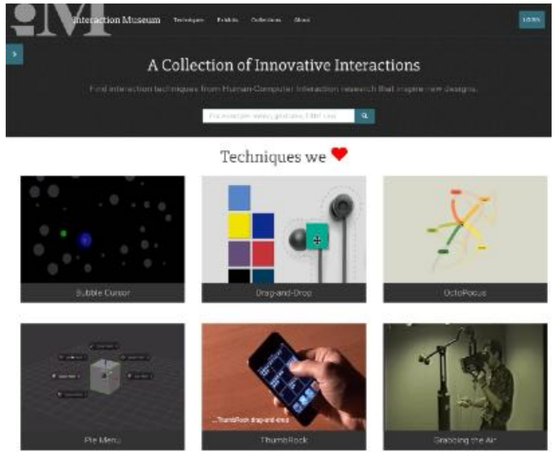
Finding inspiration

Sources of inspiration

Online Design Resources

Websites that demonstrate interaction ideas

datavizproject.com



hci-museum.lri.fr

Finding inspiration

First, a bit of theory…

Objects of interest

the conceptual objects that users manipulate
in order to achieve their goals

We focus on objects

Substrates

create spaces for interaction

Substrates

create spaces for interaction

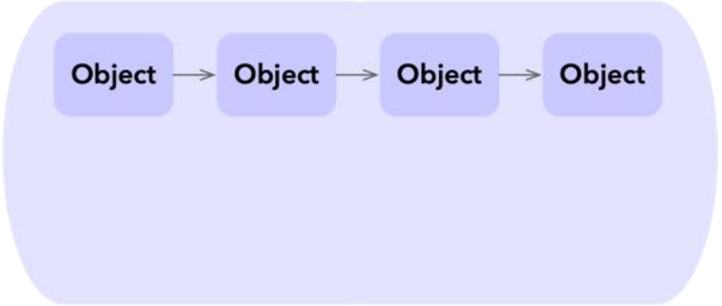
Substrates

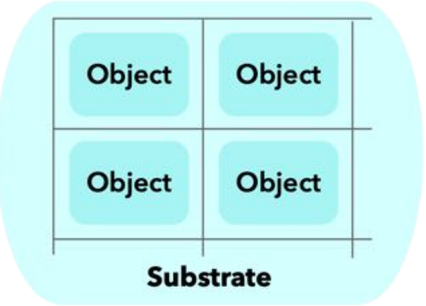
contain and structure objects of interest
and manage constraints and dependencies

Definition

A **substrate:**

structures the objects of interest it **contains**,



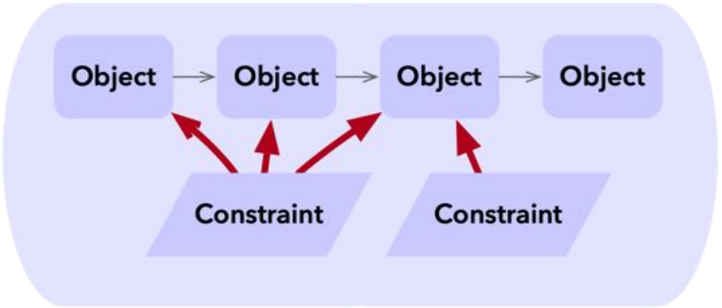


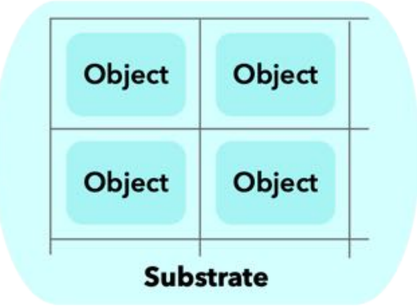
Definition

A **substrate:**

structures the objects of interest it **contains**,

manages **constraints** among **internal** objects,





Definition

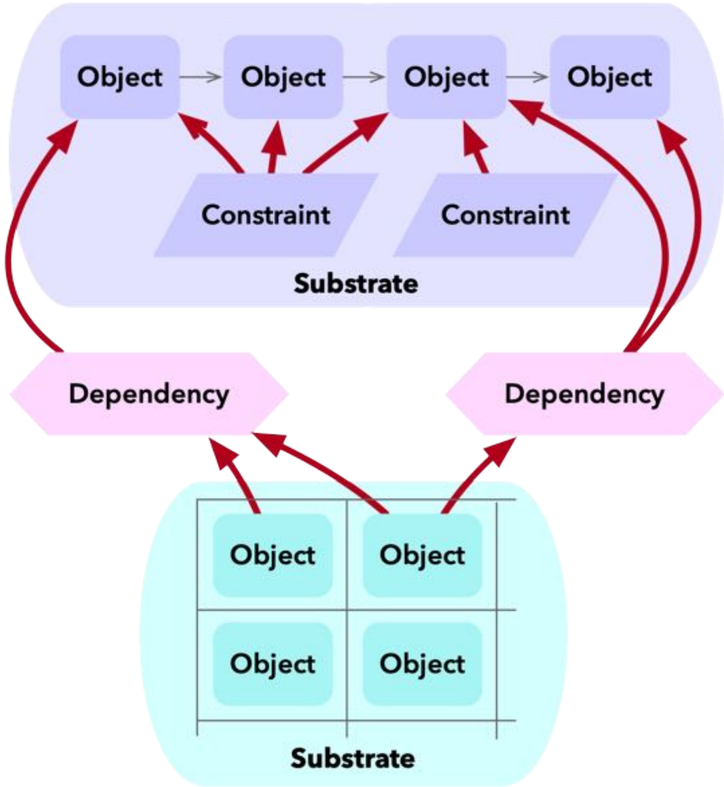
A **substrate:**

structures the objects of interest it **contains**,

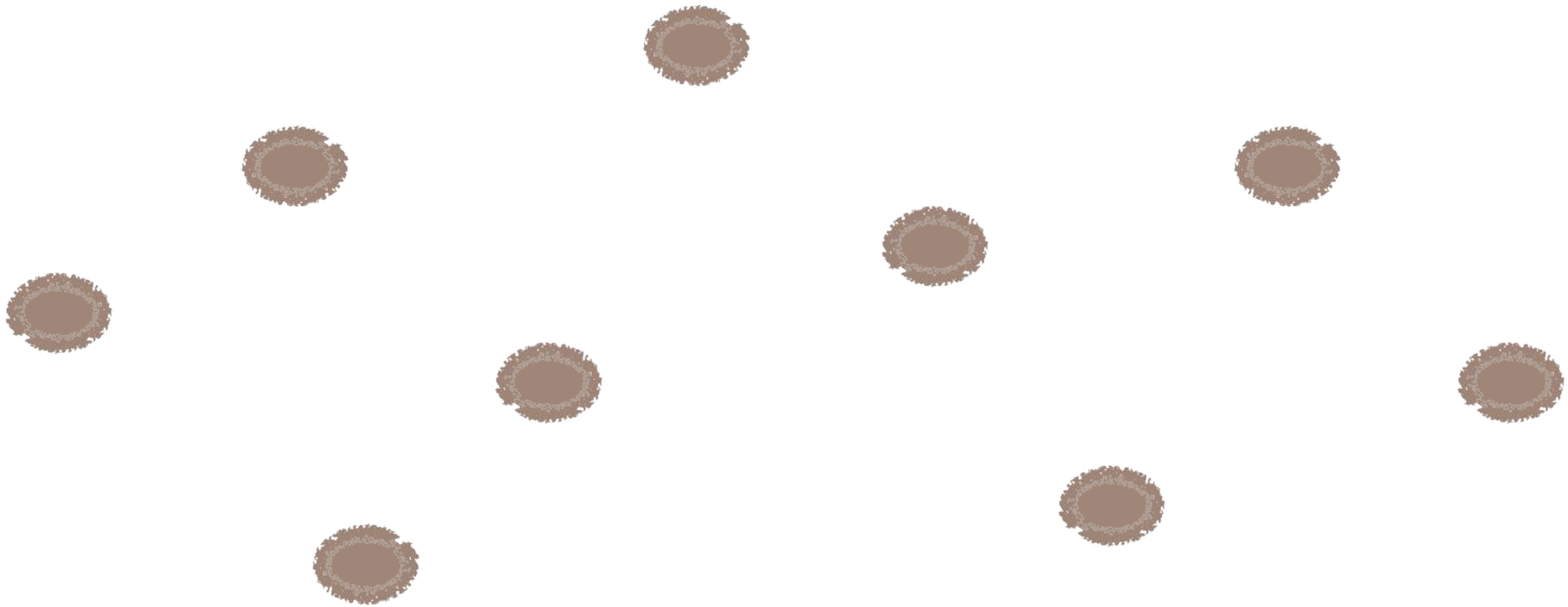
manages **constraints** among **internal** objects,

manages **dependencies** with **external** objects,

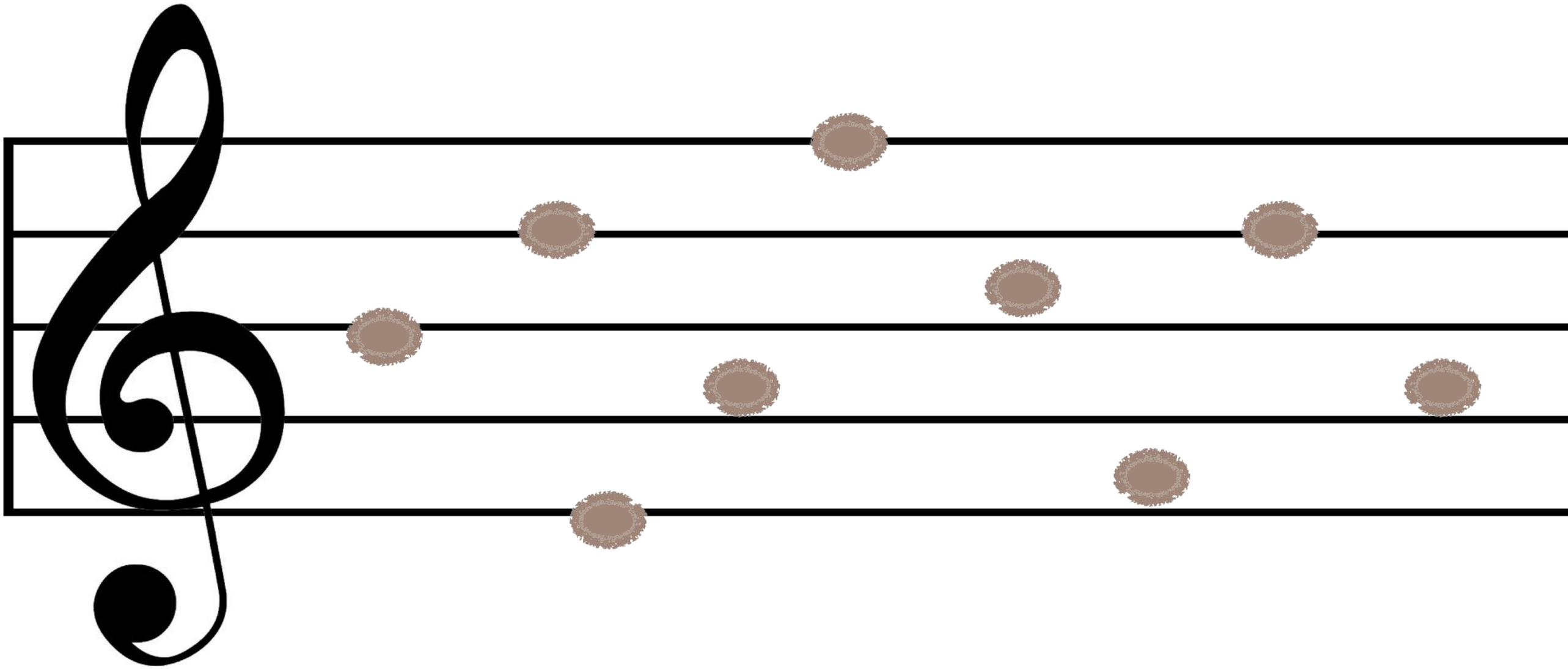
including other substrates



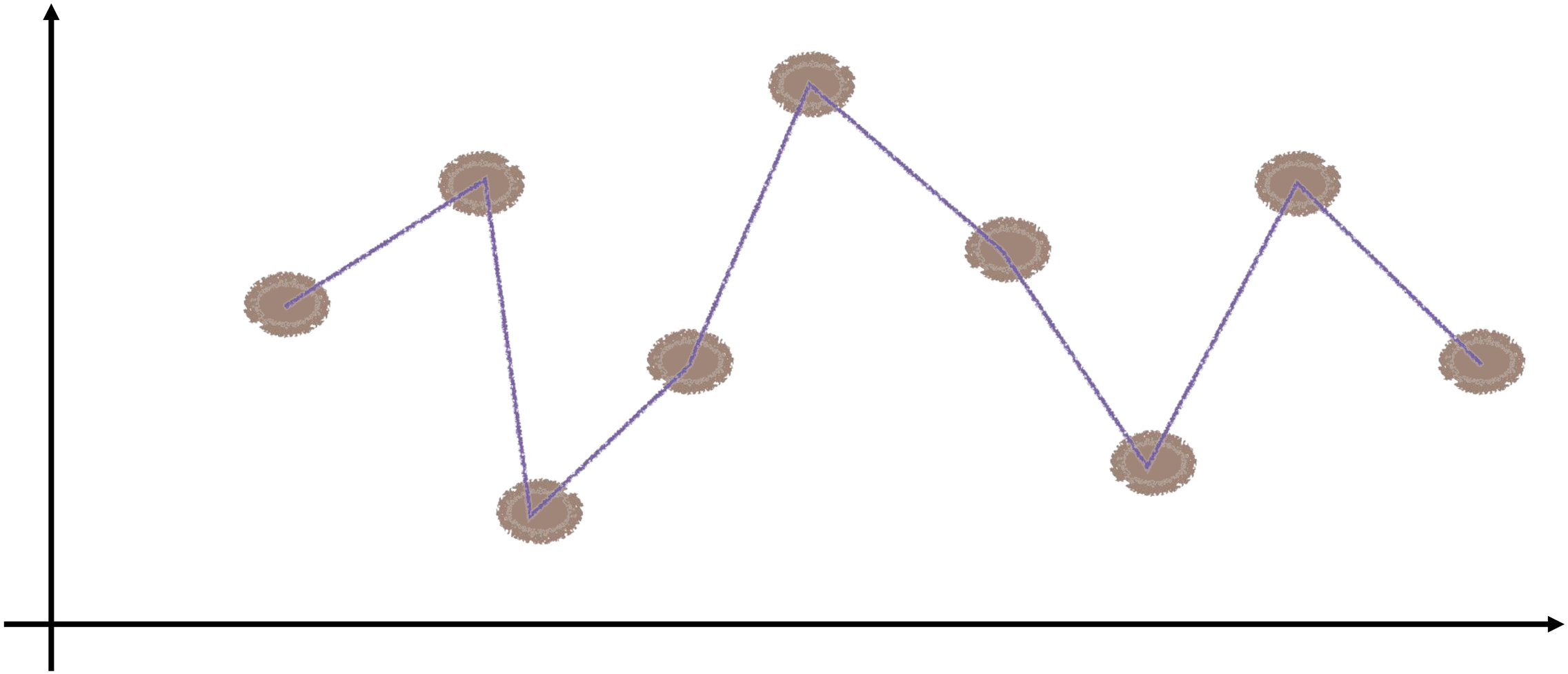
Substrates give meaning



Substrates give meaning



Substrates give meaning

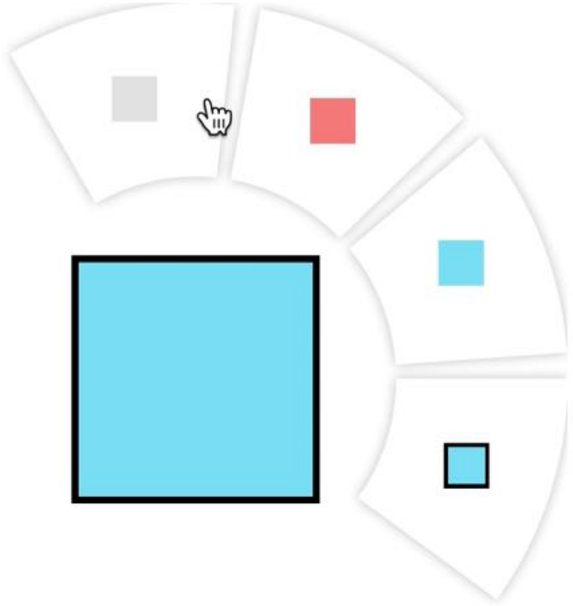


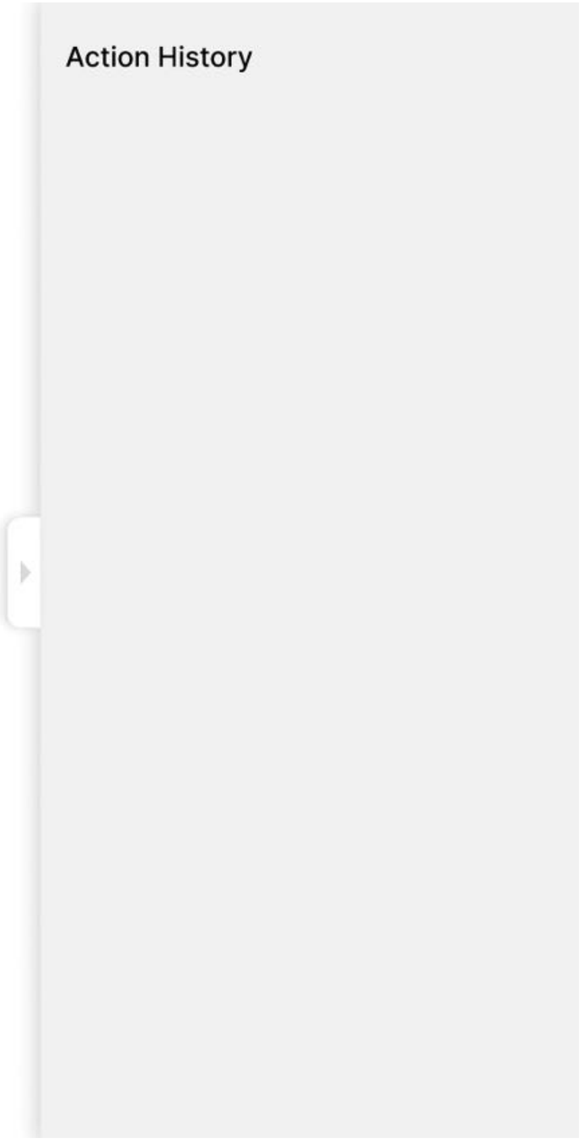
Substrates give meaning

Reifying a substrate

Turn an object's history into a substrate

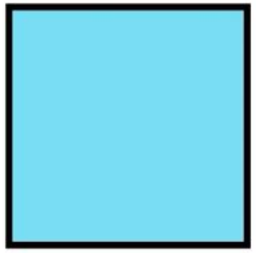
Turn an object's history into a substrate

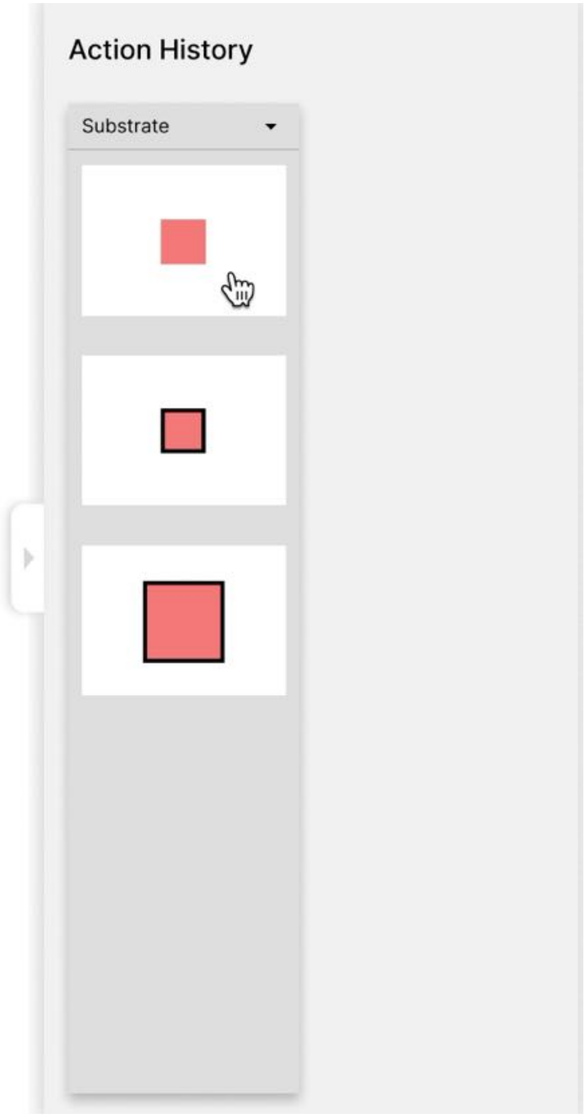




Apply a **command** from the history …

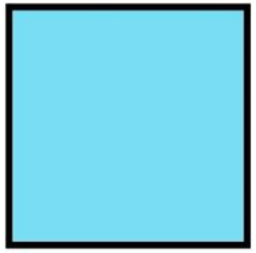
Lorem Ipsum

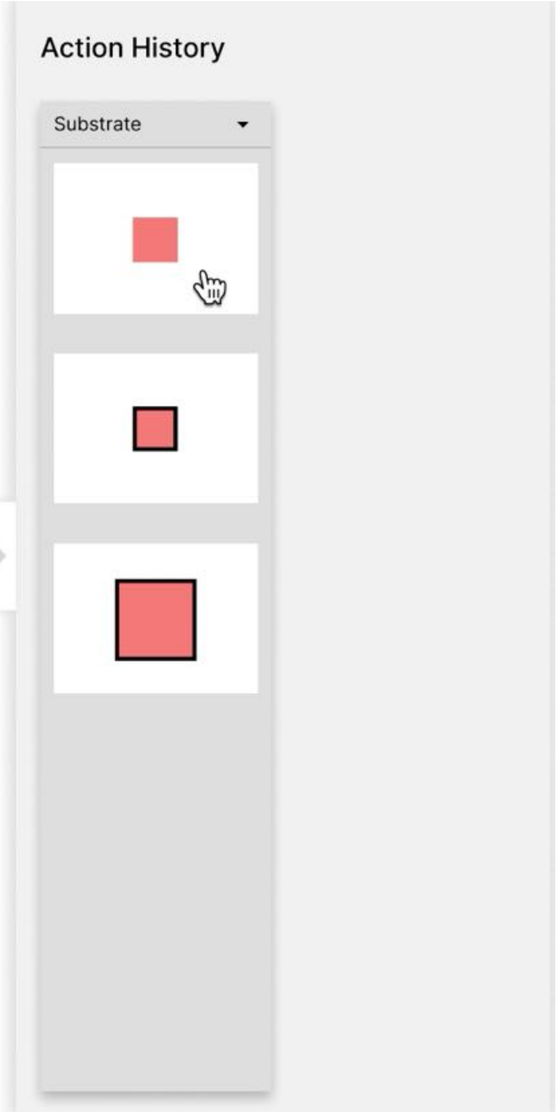




or a set of commands

Lorem Ipsum



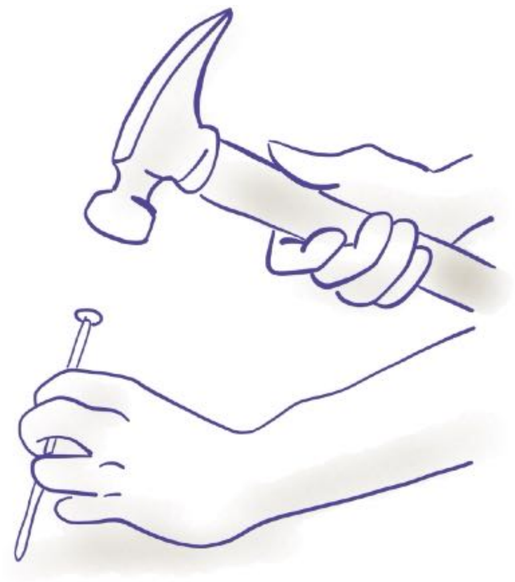


Instruments

mediate digital interactions
with the objects of interest

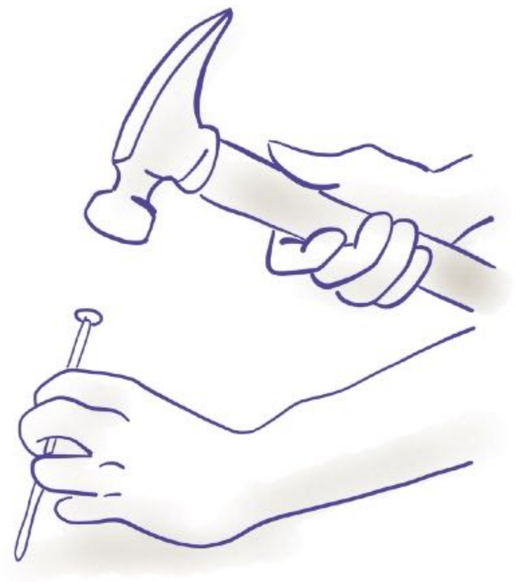
Instruments let us modify objects

We can use tools as they were designed



Instruments let us modify objects

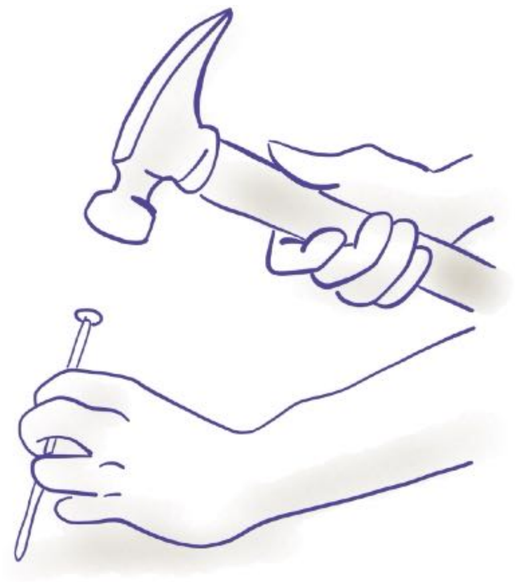
We can use tools as they were designed



We can also innovate by using an object's properties to accomplish a task

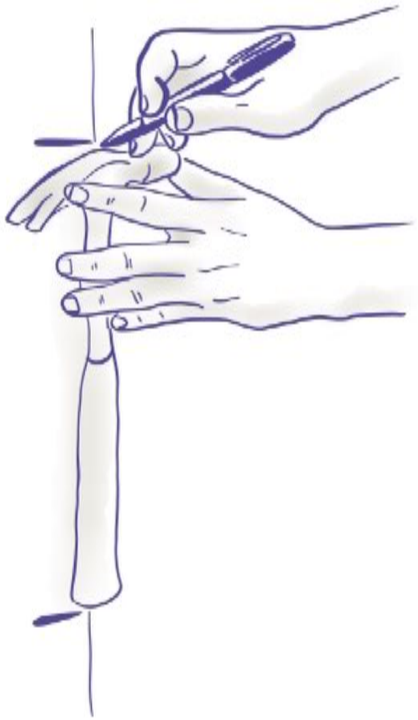
Instruments let us modify objects

We can use tools as they were designed



We can also innovate by using an object's properties to accomplish a task

We can also re-use tools for other purposes



Alignment example

Menu-based alignment is cumbersome…

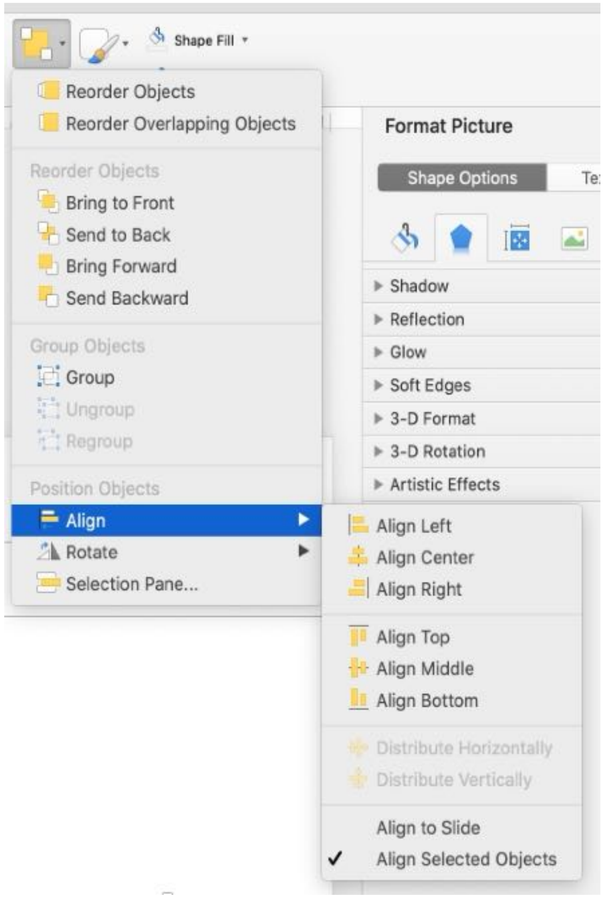
Hierarchical menu

Hard to find correct alignment

Fitts' law issue

Tricky to click on the correct item

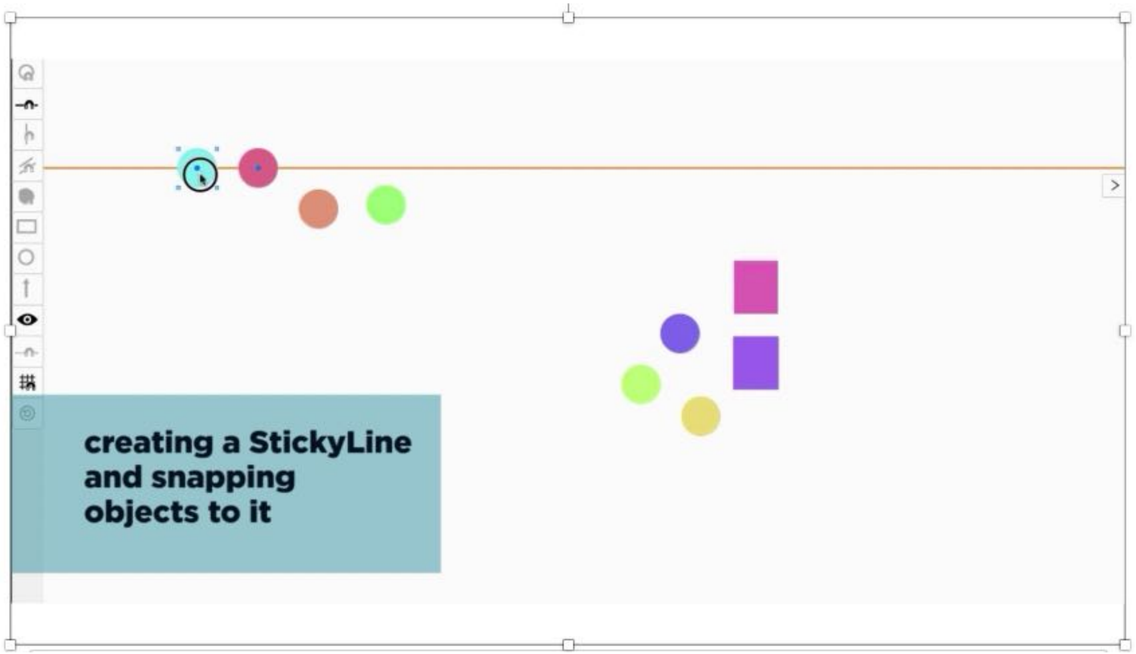
Every new aligment requires navigating the menus again



Stickylines

Ciolfi et al. (2016)

What if the aligment command is reified into an interactive alignment tool?



Instrumental interaction

Key principles

Reification

Transforms commands that disappear into interactive tools

Polymorphism

Applies tools to multiple types of conceptual objects

Reuse

Takes advantage of previous actions and past results

Beaudouin-Lafon (2000), Beaudouin-Lafon & Mackay (2000)

Generative design strategy

Reification

First:
Identify a command that disappears after being used once

Then: Make it persist
Make it interactive
Make it a tool

Example:
StickyLines reifies the alignment command

Instrumental interaction

Beyond Snapping

Persistent, Tweakable Alignment and Distribution with StickyLines

Marianela Ciolfi Felice Nolwenn Maudet Wendy Mackay Michel Beaudouin-Lafon

LRI, Université Paris-Sud, CNRS, Inria, Université Paris-Saclay
Orsay, France

Example: Create a route

Command

“Show me how to go to the C.S. building”

Result

The route appears on the map

But if I use another command, it disappears

Reify a route on a map

Example: Create a route

Reified command

“Show me how to go to the C.S. building”

Result

The route persists as an **interactive object**

Modify it, Copy it, Share it, Reuse it…

Reify a route on a map

Brainstorm ideas for:

a better video conferencing system

Generate new ideas

Consider your interviews and observations

Imagine different situations
    where users will interact in a new way
    to meet their needs

Focus on interaction **in context**
    not just a list of functions

Classic brainstorming

Classic brainstorming

Common alternatives

Solo brainstorming

More ideas	Less group cohesion

Sticky notes on the wall

Visual overview	Expensive (Post-it™)
Many parallel ideas	Can miss other ideas
Supports sketching	Harder to vote

Scribe takes notes

Temporal overview	Requires a good scribe
More interaction	Inexpensive
Helps later voting	

Best: Solo first, then group

Generate new ideas

Roles Moderator Scribe

Resources Design brief

Phase 1 Generate maximum ideas

- Everyone participates
- Record every idea
- Everyone add at least one stupid idea

Phase 2 Reread all ideas

- Everyone votes for three favorite ideas
- Rank ideas based on number of votes
- Discuss ideas related to the design concept
- Don’t forget weird or unusual ideas!

Classic brainstorming

Do not …	Instead …
Discuss ideas	State each idea
Criticize ideas	Ask for clarification
Argue about merits	Move to next idea
Ignore others' ideas	Build on them
Shift topics	Stick to key topic
Jump to abstractions	Keep it specific
Get stuck	Think orthogonally

Classic brainstorming

Opposites technique

Take each idea to an extreme

cheap	expensive
funny	serious
simple	complex
happy	sad
good	bad
text	graphics
audio	touch
process	object
begin	end
single	sequence

Classic brainstorming

Example #4

List of ideas

Example 4. Classic Brainstormed Ideas

- Show overall path with a focus circle around current location
- Above idea, but allow multiple waypoints, with close-up circles for each
- Send locations of multiple people to show up on everyone's map
- Highlight confusing intersections and show closeup circle to show where to go
- If street name isn't visible, show a local landmark
- Show different landmarks for people who are walking, biking or driving
- Snap a photo of directions on a laptop and upload as a map to the phone
- Do the opposite: send a map from the phone to a laptop
- Navigation arrows from phone onto smart watch
- Communicate from phone to a drone to show navigation

Classic brainstorming

Exercise

Team

Choose a moderator and a scribe
Generate as many ideas as possible
    Quantity is more important than quality
Everyone must participate
    and say at least one “stupid” idea!
Record all ideas

Phase 1: Generate at least 20 ideas
Phase 2: Scribe rereads ideas
              Everyone votes for 3 favorite ideas

Represent ideas

Increasing levels of depth

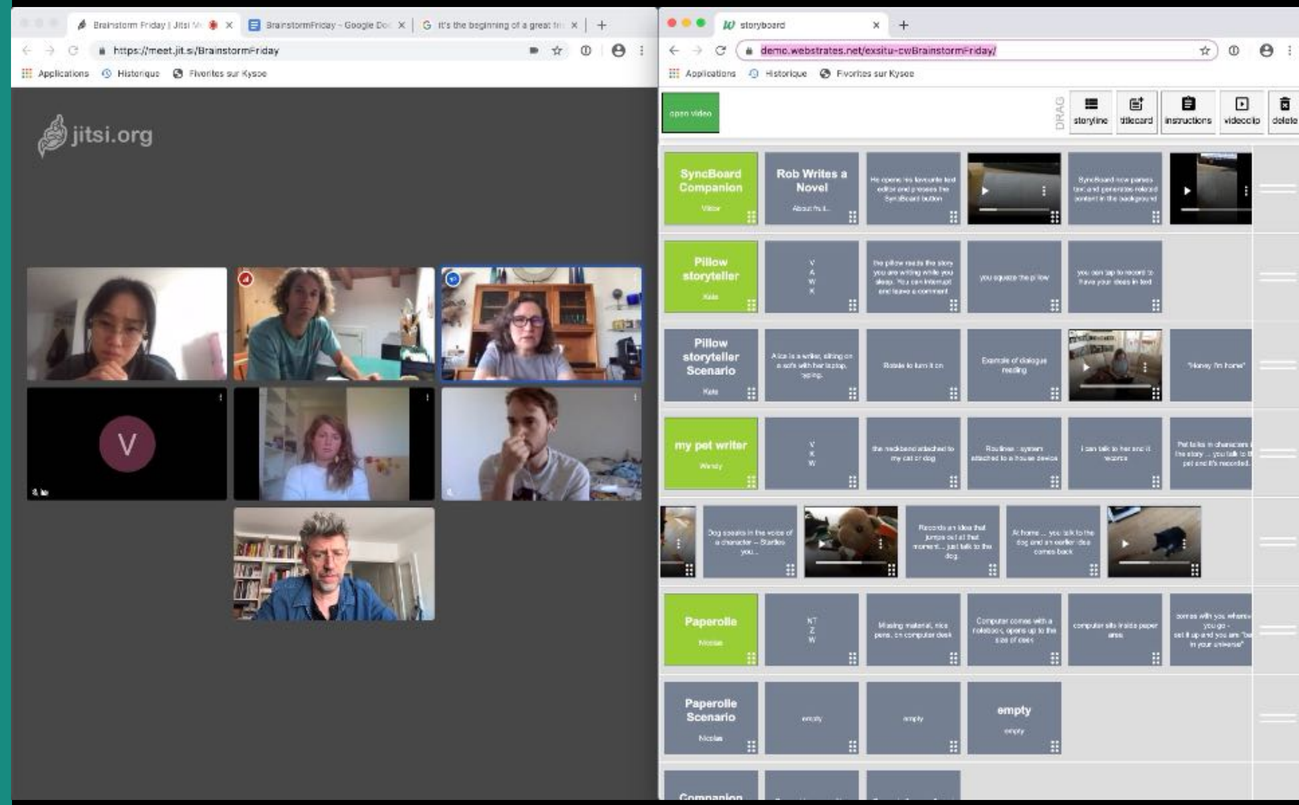
Text	Explain an idea in words Standard brainstorming
Sketch	Draw to illustrate an idea Standard brainstorming
Mockup	Interact with paper prototypes Rapid prototyping
Theater	Act out the idea Rehearse brainstorming
Video	Capture interaction details Video brainstorming

Video brainstorm

Video brainstorming

Video brainstorming

Remote brainstorming



Story-based design focuses on
interaction in context

Interaction snippets capture details about
how the user interacts with the system

Easy-to-use format
highlights interaction
supports later design activities

Generate ideas from user data

Miniature storyboards

Describe interaction between user and system

Title: What does the user want to accomplish?

Sketches and descriptions

What did user do?	What did system do?
How did system react?	How did user react?
How did user react?	How did system react?

Focus on surprises:
breakdowns, workarounds, user innovations

Interaction snippets

Miniature storyboards

Title: Summarizes the interaction

Identify the sequence of events:
- User acts – System reacts – User reacts
- System acts – User reacts – System reacts

Each panel:
- Sketch what happened
- Describe what happened

What does the user want to accomplish?
Does it work?

Interaction snippets

Title

a

b

c

Author: _____

Interaction snippets

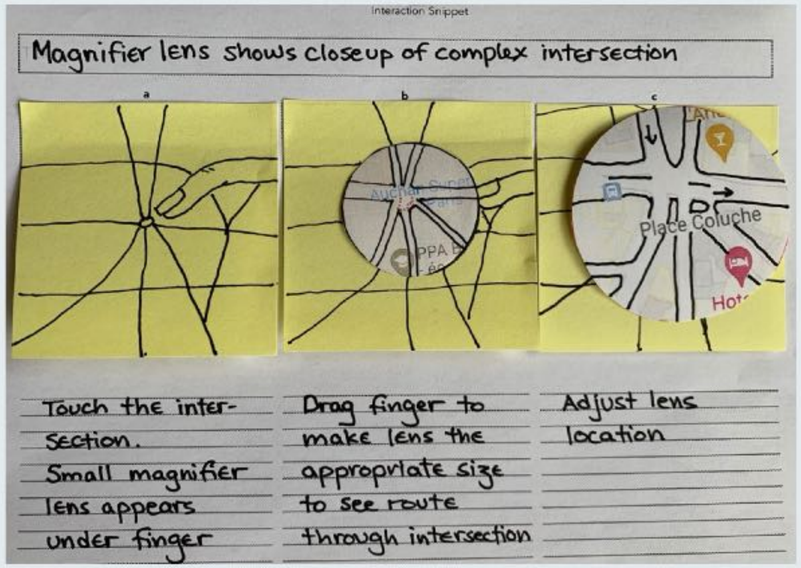
Interaction snippet

Example #5

Idea

Example 5. Interaction Snippet

Figure 10. Interaction snippet shows how to create and enlarge a magnifing lens.



Video brainstorming

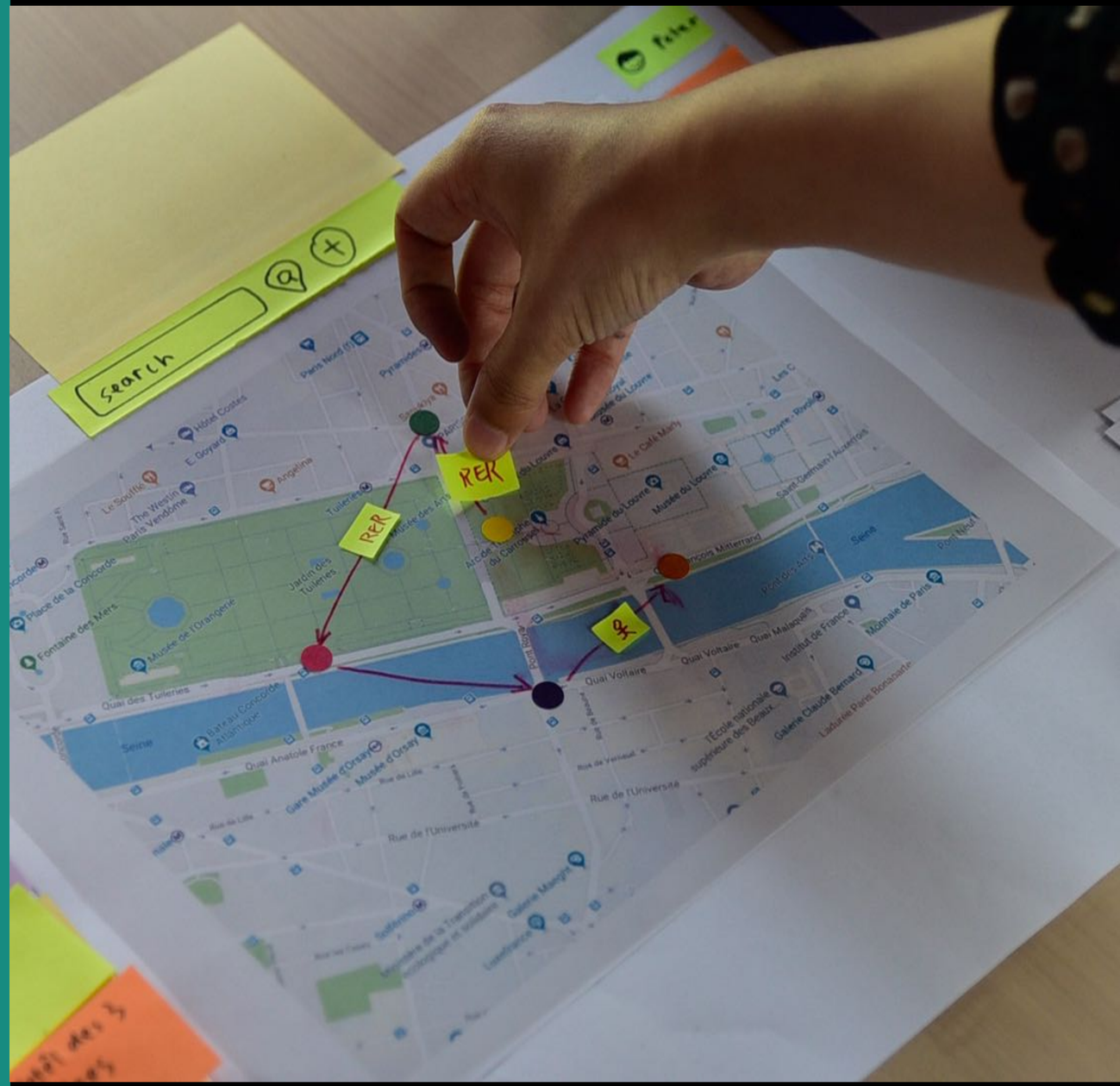
Video brainstorming

One director per idea

Every director controls:
- Choice of the idea
- Presentation of the idea
- Recording the idea
- Assigning roles:

Scribe	complete title card
Makers	create paper prototypes
Camera	shoot the action
Talent	perform interaction
	record voice-overs

Paper prototyping



Video brainstorming

Wizard of Oz

Video Clipper

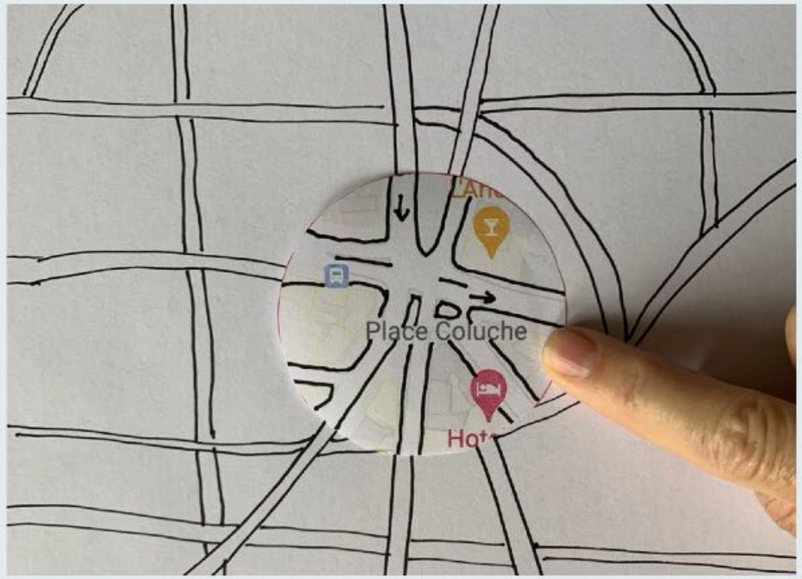
Video Brainstorming

Example #6

Idea

Example 6. Video Brainstormed Idea

Figure 11. User drags the edge of the magnifing lens to make it bigger.



Video brainstorming

Exercise

Team

Everyone shoot at least one idea

Choose a team scribe to summarize all ideas
Each team member chooses 2+ ideas to direct

Roles

Director	Choose idea, roles, presentation
Makers	Create paper prototypes
Talent	Manipulate prototype, act as user
Camera	Shoot 30”-60” sequences

Stop talking & start shooting!

Video brainstorming

Advantages

Generates reusable videos that explore the details of interaction

Trade-offs

Disadvantages

Generates fewer ideas

Video brainstorming

Advice

Select brainstormed ideas
create paper prototypes
shoot the interaction

Caution!
Keep ideas short
avoid creating future scenarios!
shoot variations if you disagree.

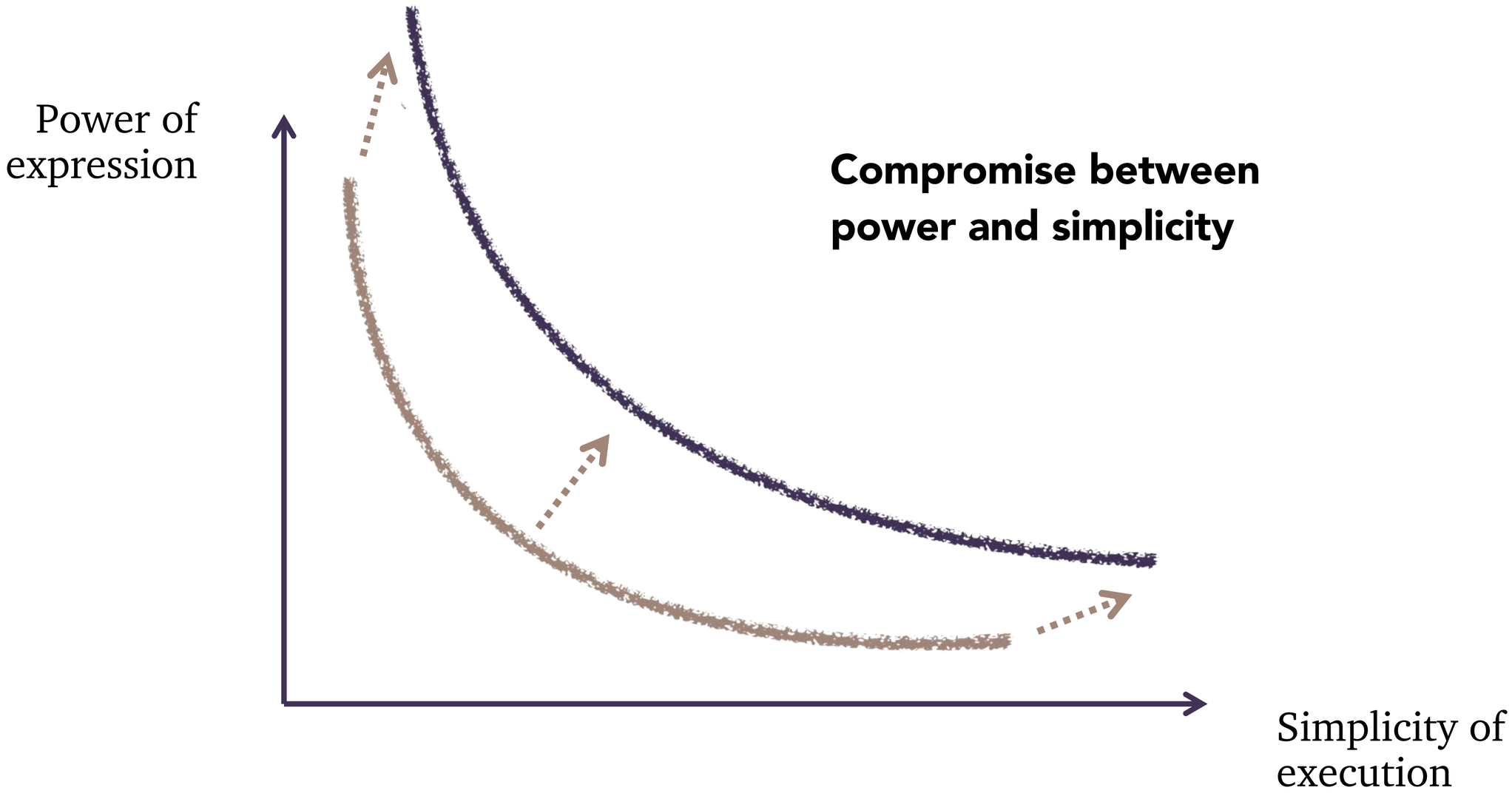
Remember to ...

choose one director for each idea
avoid arguing, and follow the director's lead
shoot variations to capture disagreements

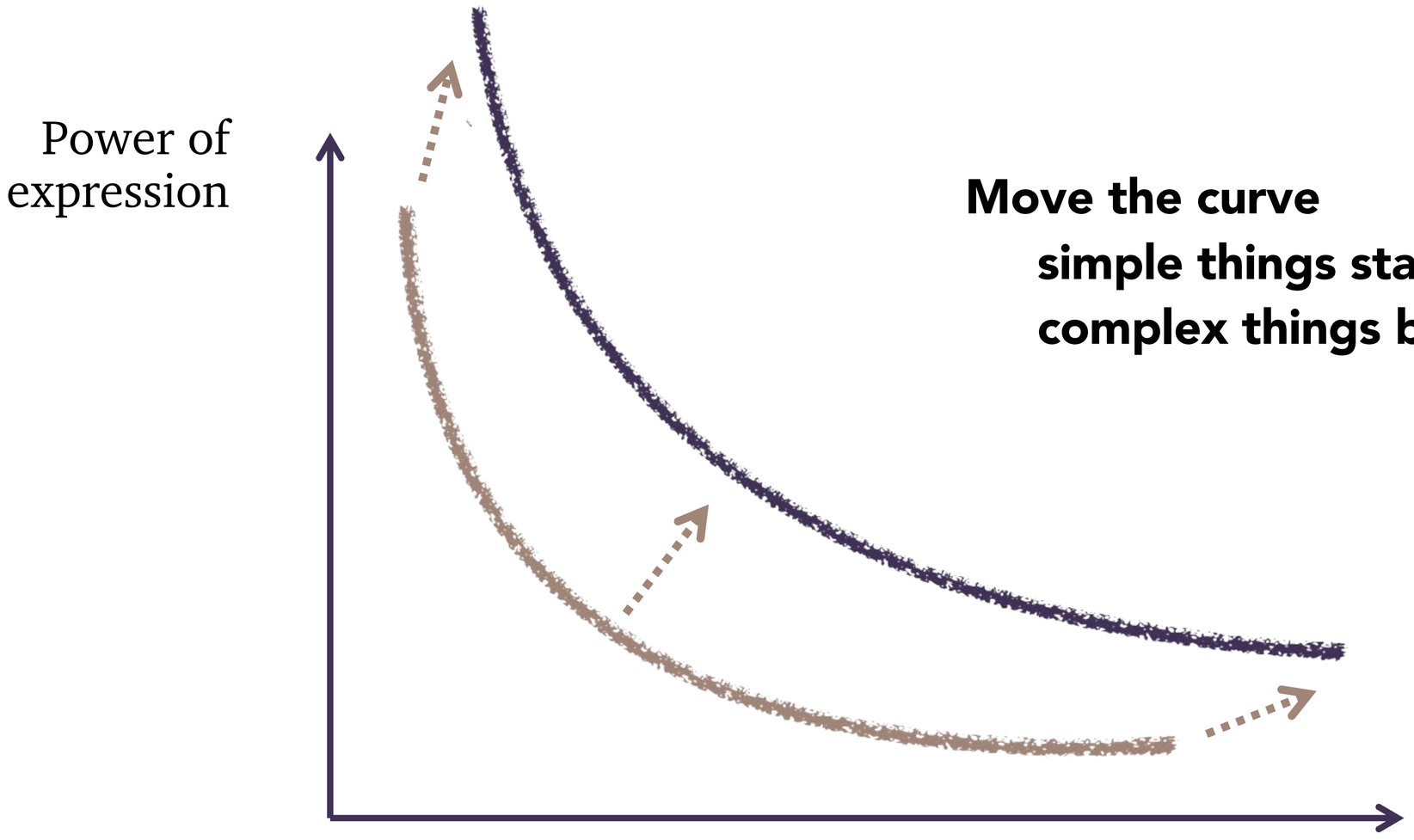
Session 3

14:30 – 15:55

Design challenge



Design challenge



Move the curve

simple things stay simple

complex things become possible

Generative design

Discovery

Who is the user?

Inspiration

What is possible?

Design

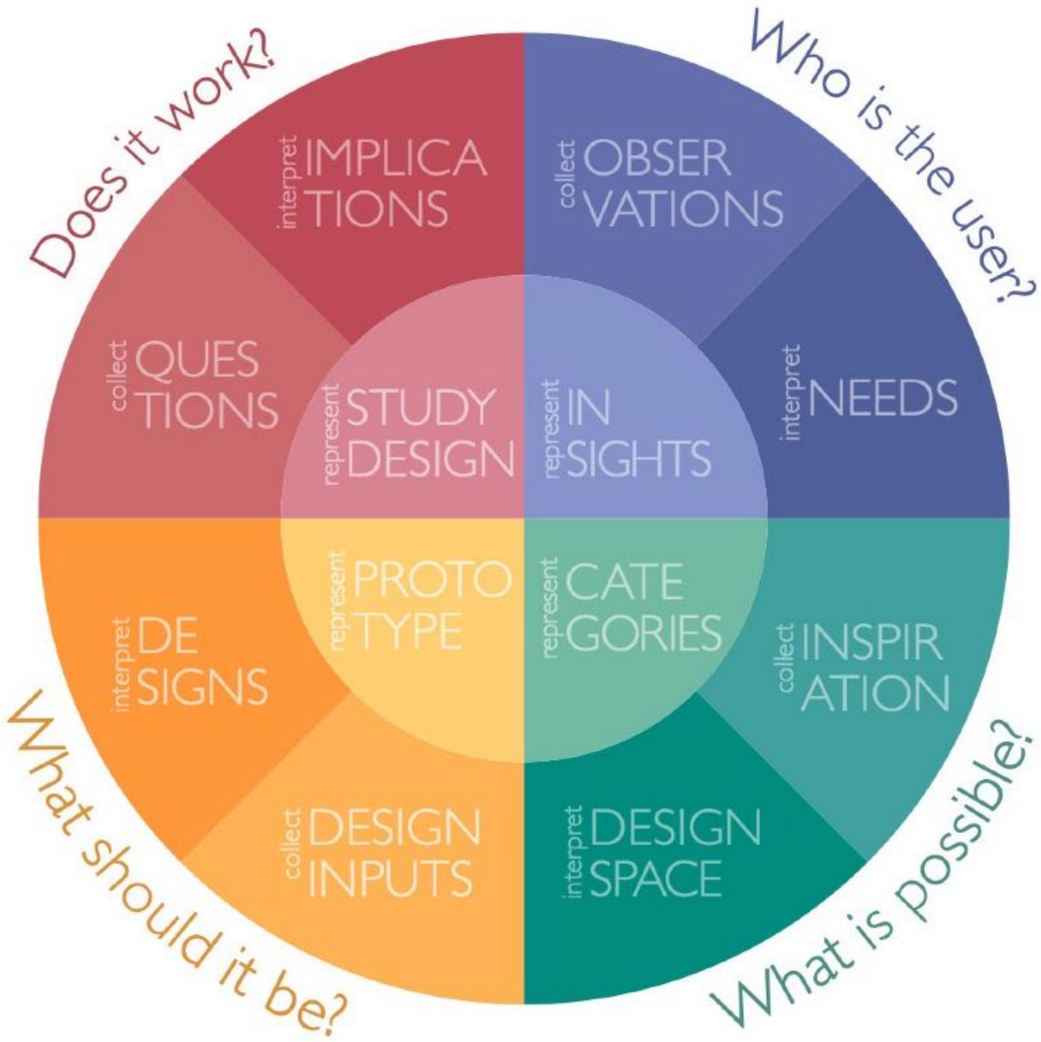
What should it be?

Evaluation

Does it work?

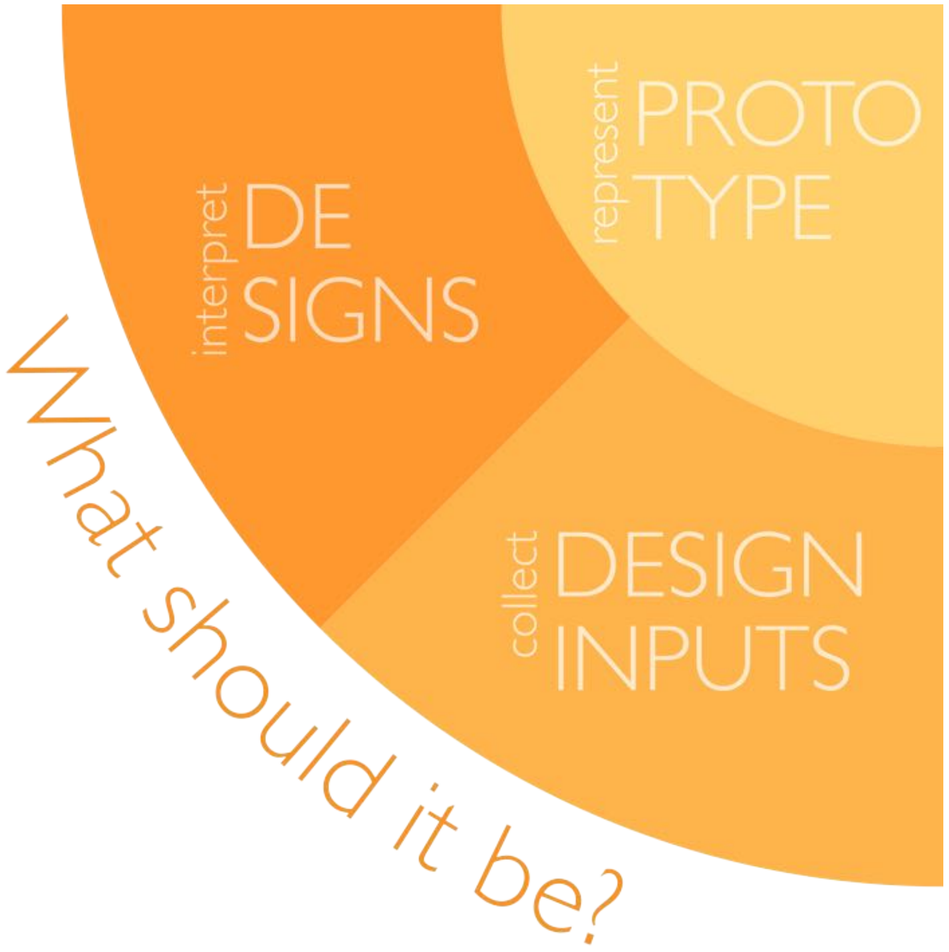
Redesign

Make it better!



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

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

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)

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

future scenario → **storyboard** → **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 reclicks 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 characterstics?

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 athelete

Extreme characters

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 athelete

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

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

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

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

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

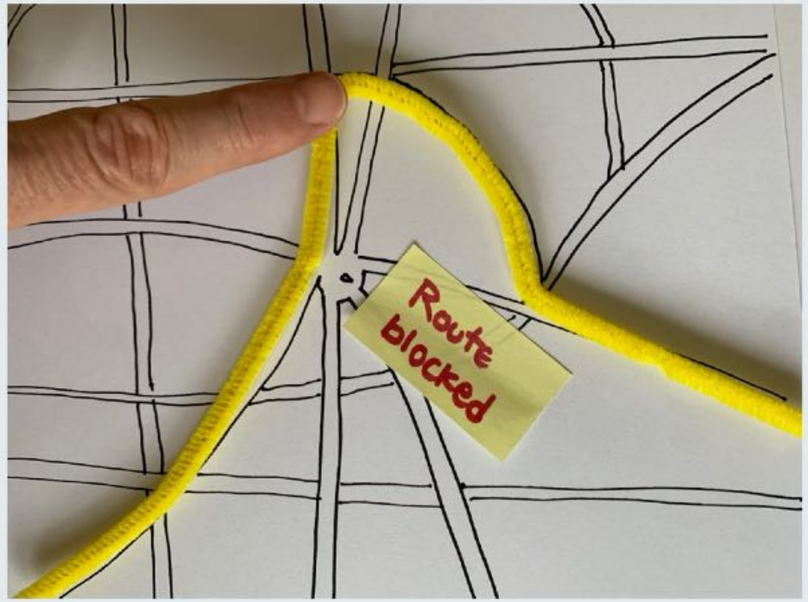
Example #8

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.

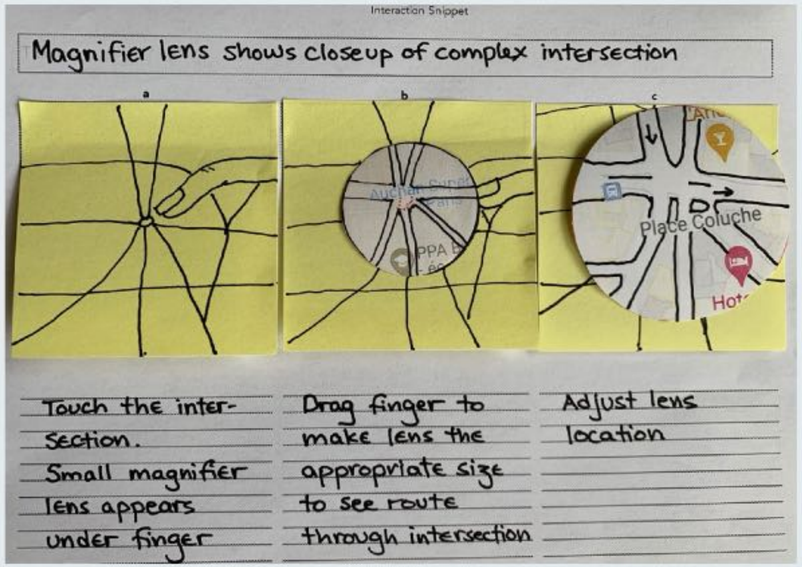
Interaction snippet

Example #10

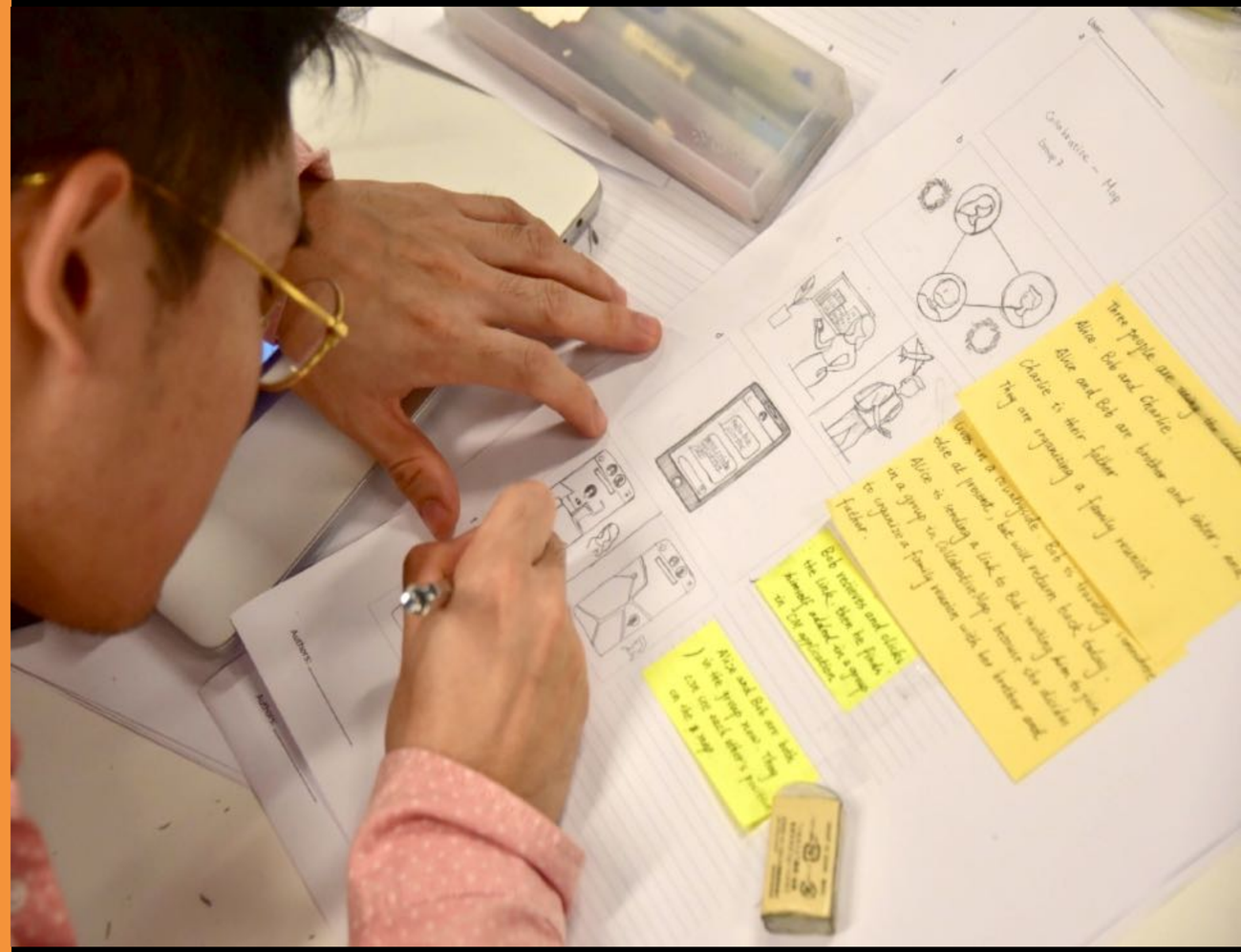
Storyboard element

Example 10. Interaction Snippet

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



Storyboard


Three people
Alice, Bob and Charlie
Alice and Bob are brother and sister
Charlie is their father
They are organising a family reunion.
Alice is texting a link to Bob, inviting him to join
on a group to collaboratively organise the reunion
Bob receives and clicks
the link, then he finds
himself added on a group
on the application.
Alice and Bob are both
in the group now. They
can see what Charlie's
on the

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

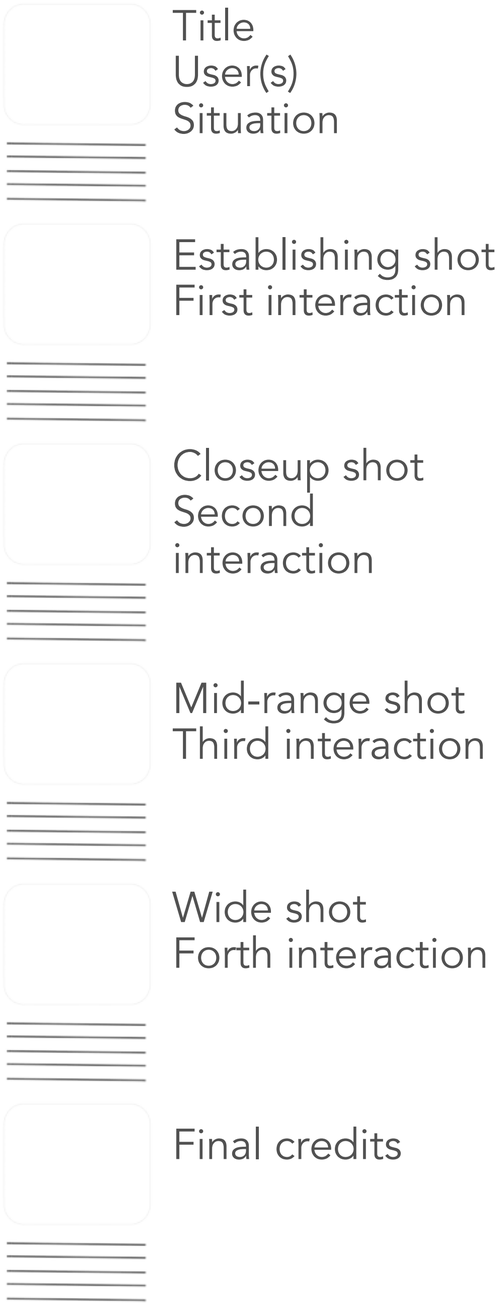
Storyboard

Create a scenario with interaction snippets

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

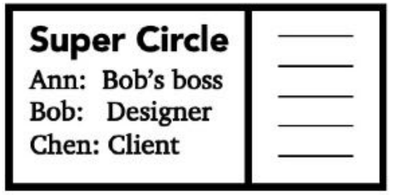
Tell the story with titlecards

Describe issues and guide video shoot

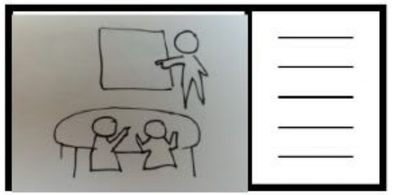


Standard storyboard structure

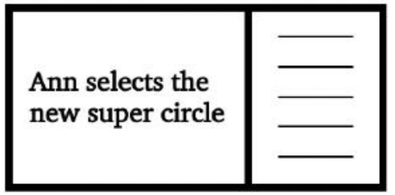
Identify key interaction snippets
in the scenario
Examine the key ideas from
the design space
(brainstormed ideas)
Illustrate the interaction
between user and
novel system
Describe key issues
on the right



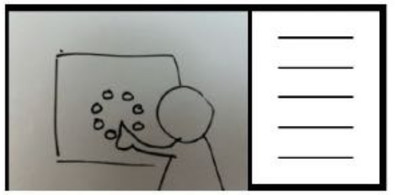
Title
Personas
Situation



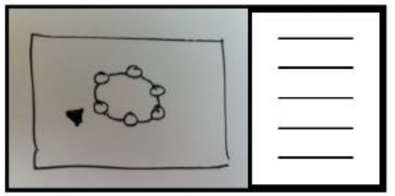
Establishing shot
First interaction



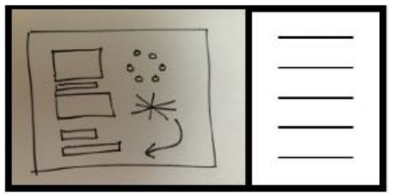
Title card



Mid-range shot
Second interaction



Close-up shot
Third interaction



Close-up shot
Forth interaction

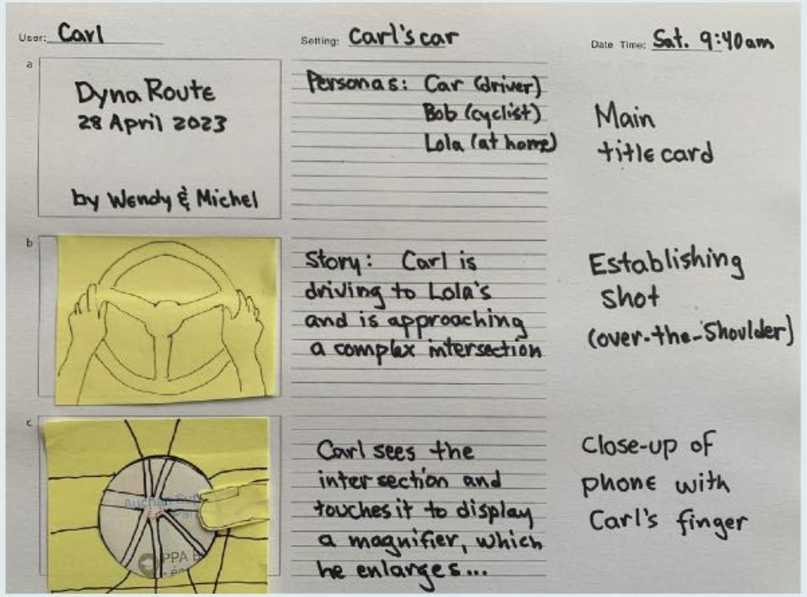
Storyboard

Example #11

Illustration

Example 11. Storyboard

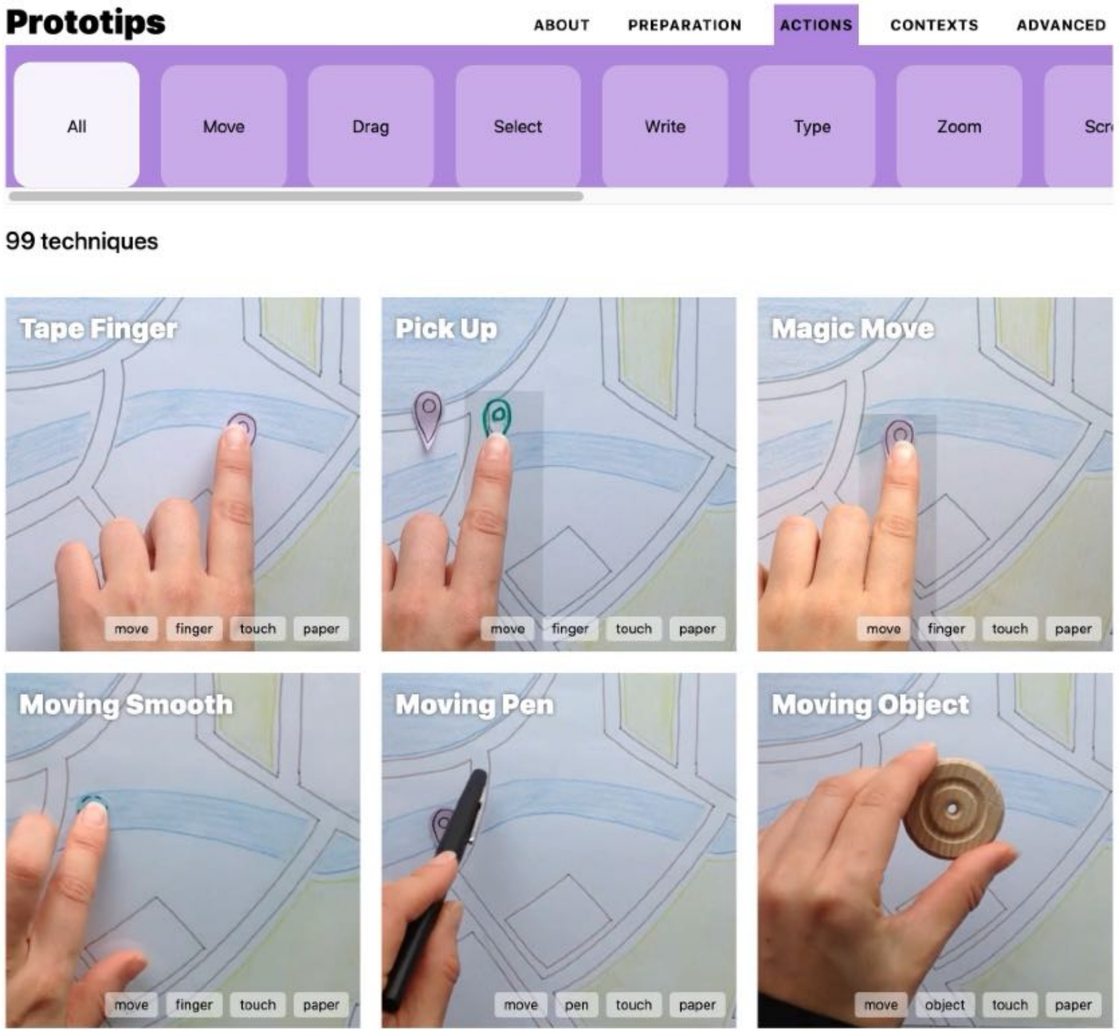
Figure 20. The *storyboard* guides how to shoot the *video prototype.*



Video prototyping

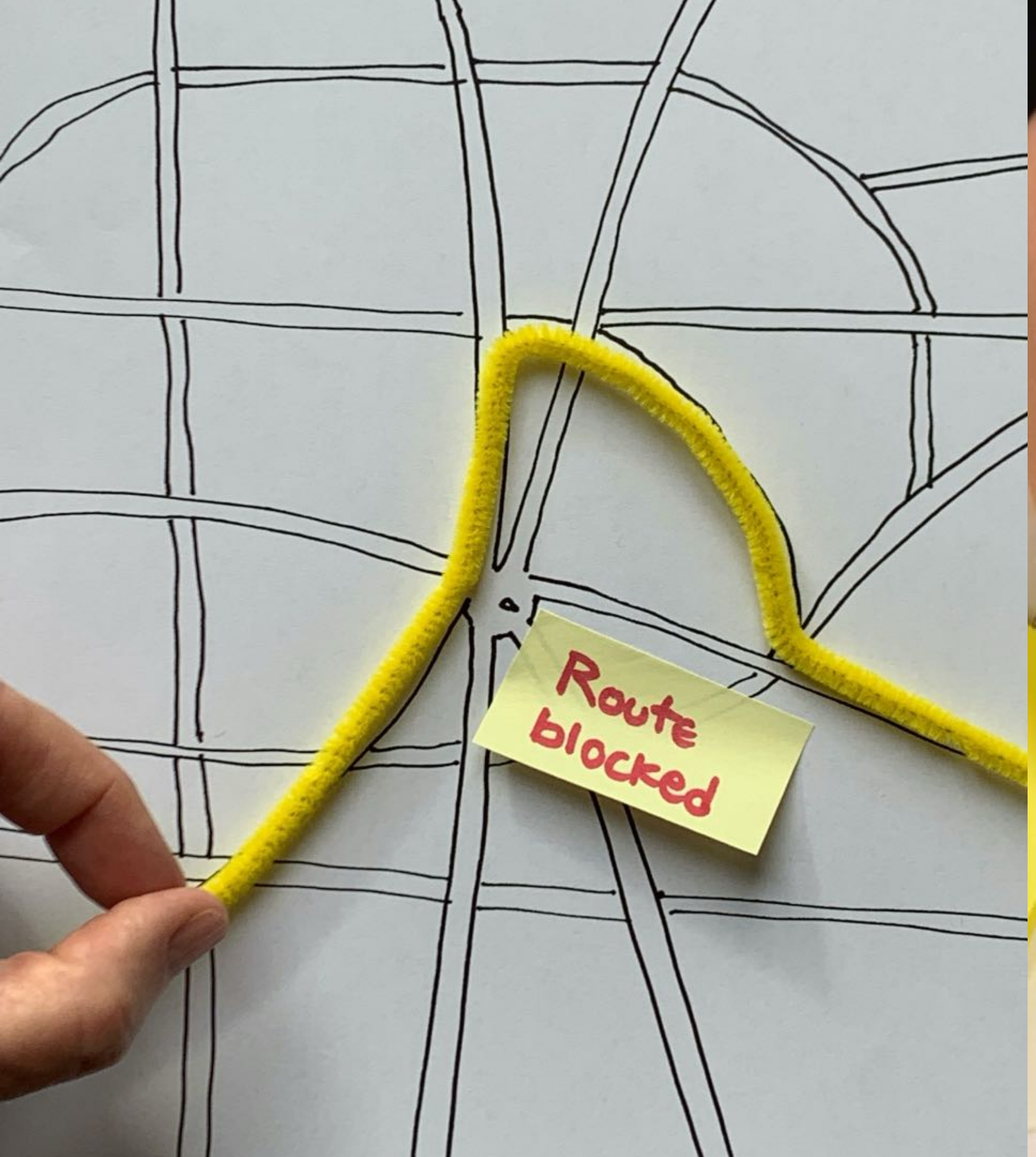
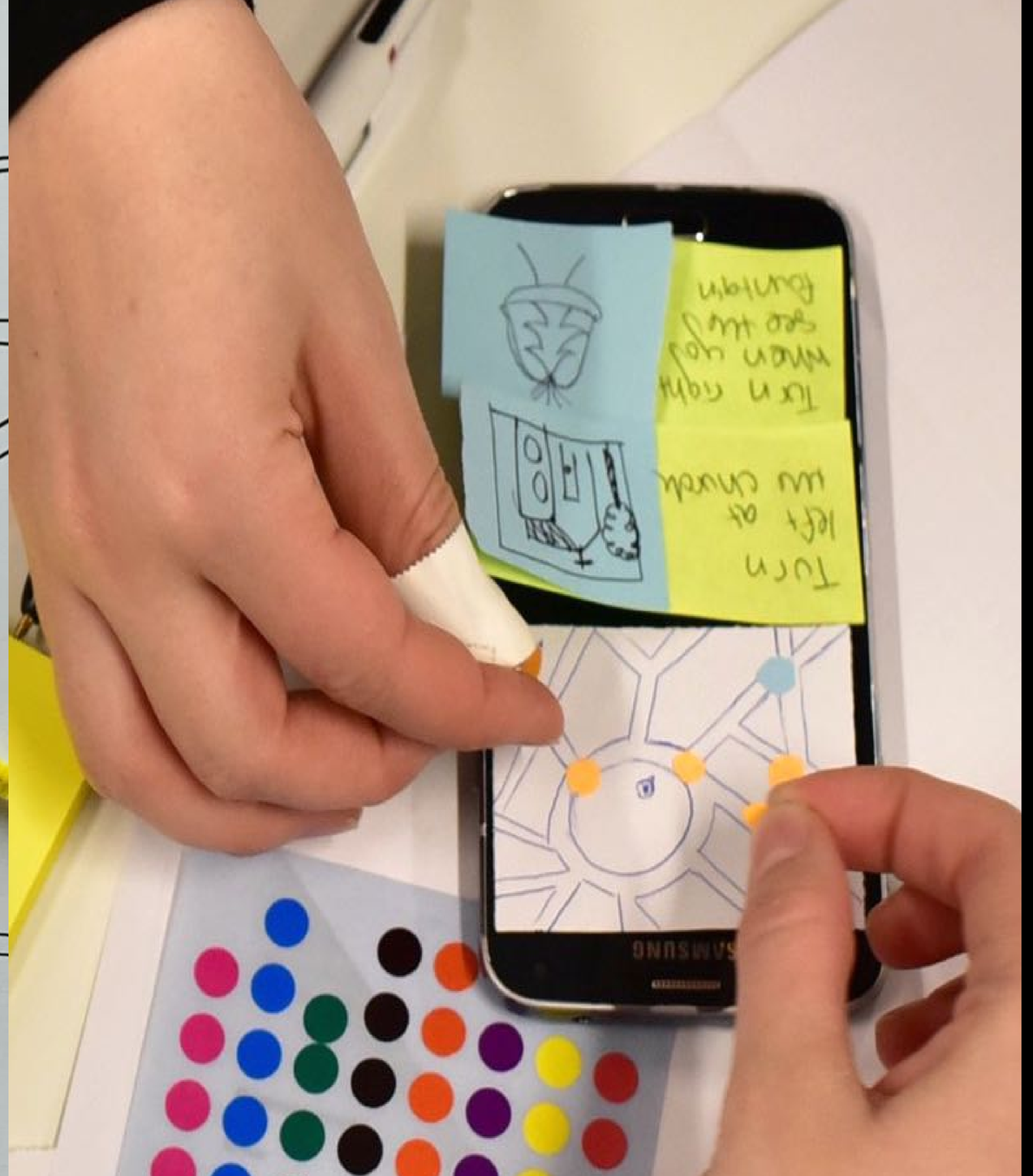
Prototips

https://prototips.lri.fr



Video prototype

Video prototyping


Route
blocked


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

Socio-technical principles

Social scientists conduct studies of users
and provide deep insights

as **socio-technical principles**

that describe how people interact with
technology in context

But ...
abstract principles are hard to translate
into specific designs

Socio-technical principles

Socio-technical principles

Situated Action	Beyond planning
Rhythms & Routines	Identify use patterns
Selective Attention	Consider the periphery
Reciprocal Co-adaptation	Re-interpret use
Distributed Cognition	Reduce cognitive load

Users modify their planned activities in new, unforeseen circumstances

Users establish routines and spatial patterns based circadian and external influences

Users vary their attention and shift between focus and the periphery

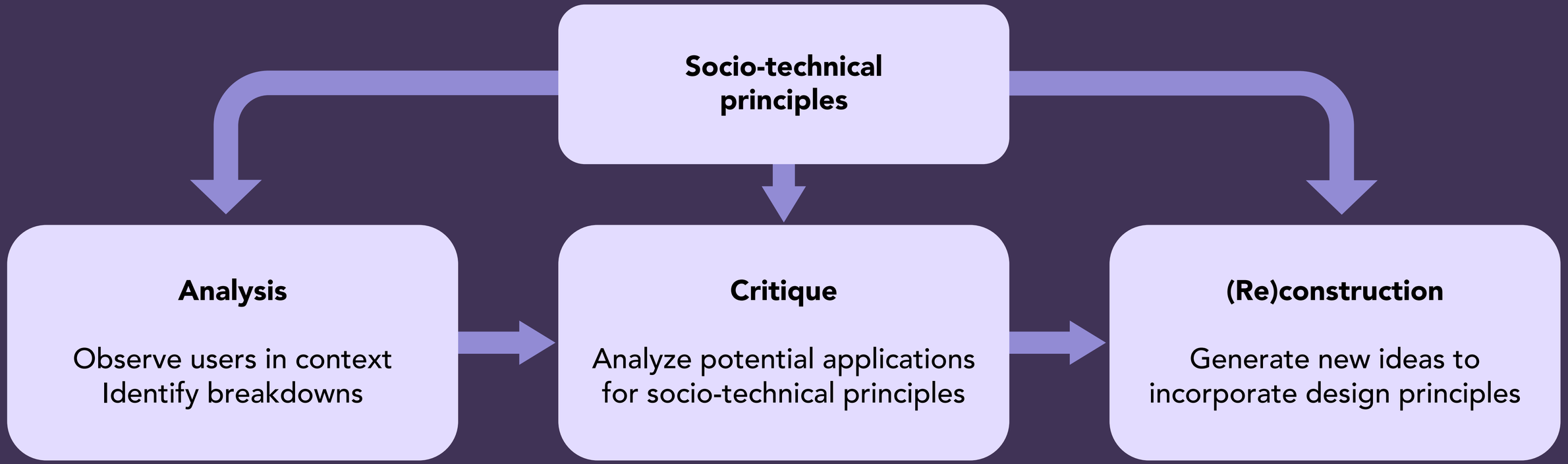
Users both learn and customize systems, while systems adapt to their behavior

Users rely on other people and objects “outside the head” to remember or communicate

How do we incorporate
socio-technical principles
into the design process?

Generative deconstruction

Apply socio-technical principles to generate grounded designs



Generative walkthroughs

Generative walkthrough

Generative walkthrough

Design walkthrough

Systematic critique
of a design artifact

Generative walkthrough

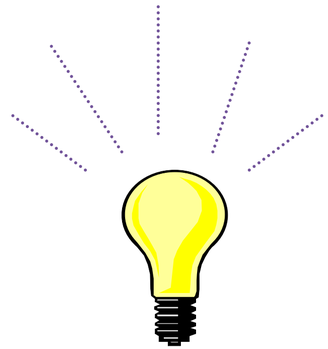
Design walkthrough

Systematic critique
of a design artifact

plus

Targeted brainstorming

Generate new ideas
based on a specific principle



Generative walkthrough

Generative Deconstruction

First **deconstruct** what users do:

- Who is the user?
- What is the technology?
- What is the user's context?
- What is the interaction like?

Then **reconstruct** the design:

- to design a new technology or
- to fix an existing one

Generative walkthrough

Play the full video prototype through once

Then, for each interaction snippet:

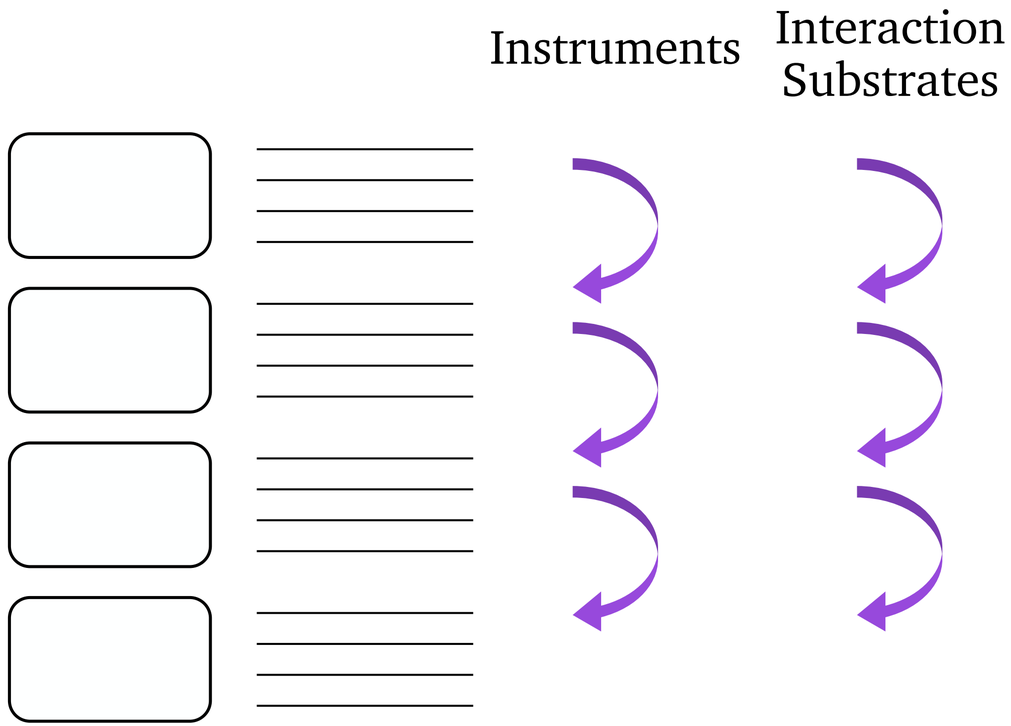
- Analyze it
  - Do the principles exist?
- Critique it:
  - What works well? What does not?
- Generate it:
  - Brainstorm new ways to apply the principle to the current interaction snippet

Generative walkthrough

Generative walkthrough

Analyze your video prototype

First, play the full video
Next, analyze each interaction snippet



Generative walkthrough

Example #12

Generative walkthrough comments

Example 12. Generative Walkthrough Comments

Event 1: Using the magnifier lens
Analysis: No evidence of distributed cognition.
Critique: The magnifier does not really help remember anything, nor does it act differently for different users.
Ideas: Let the user leave a trace of past uses of the magnifier, so they all pop up as needed. Consider sharing magnifiers associated with problem intersections with people who are unfamiliar with the area. (Locals will already know and will not need them.)

Generative walkthrough

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

Just do it!

Value diverse perspectives

Swap roles

Prepare activities in advance

Ensure everyone participates

Avoid “analysis paralysis”!

Stop arguing and sketch something

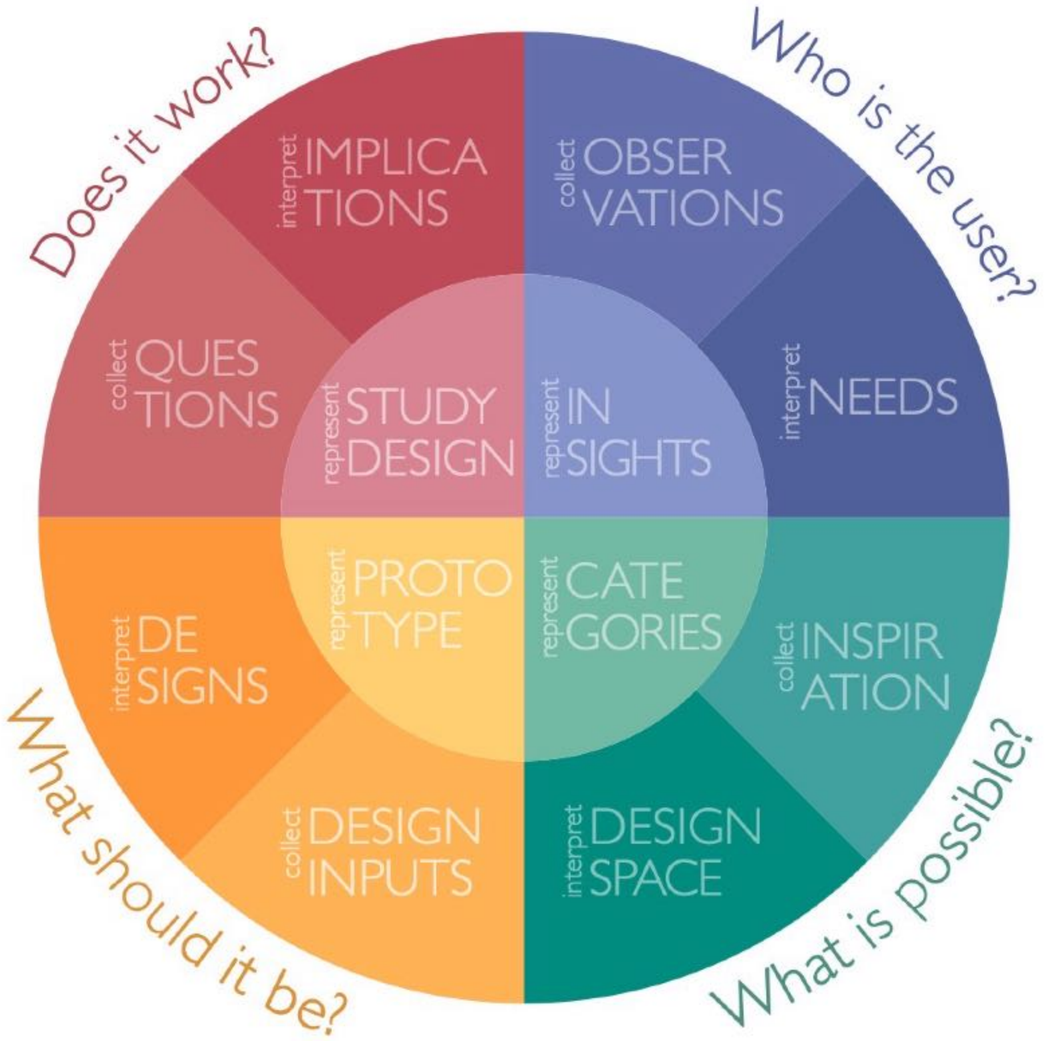
Avoid post-hoc video editing

Debrief at the end of every session

Schedule reflection time

Reuse your design artifacts

Design Interactive Things!



Thank you!