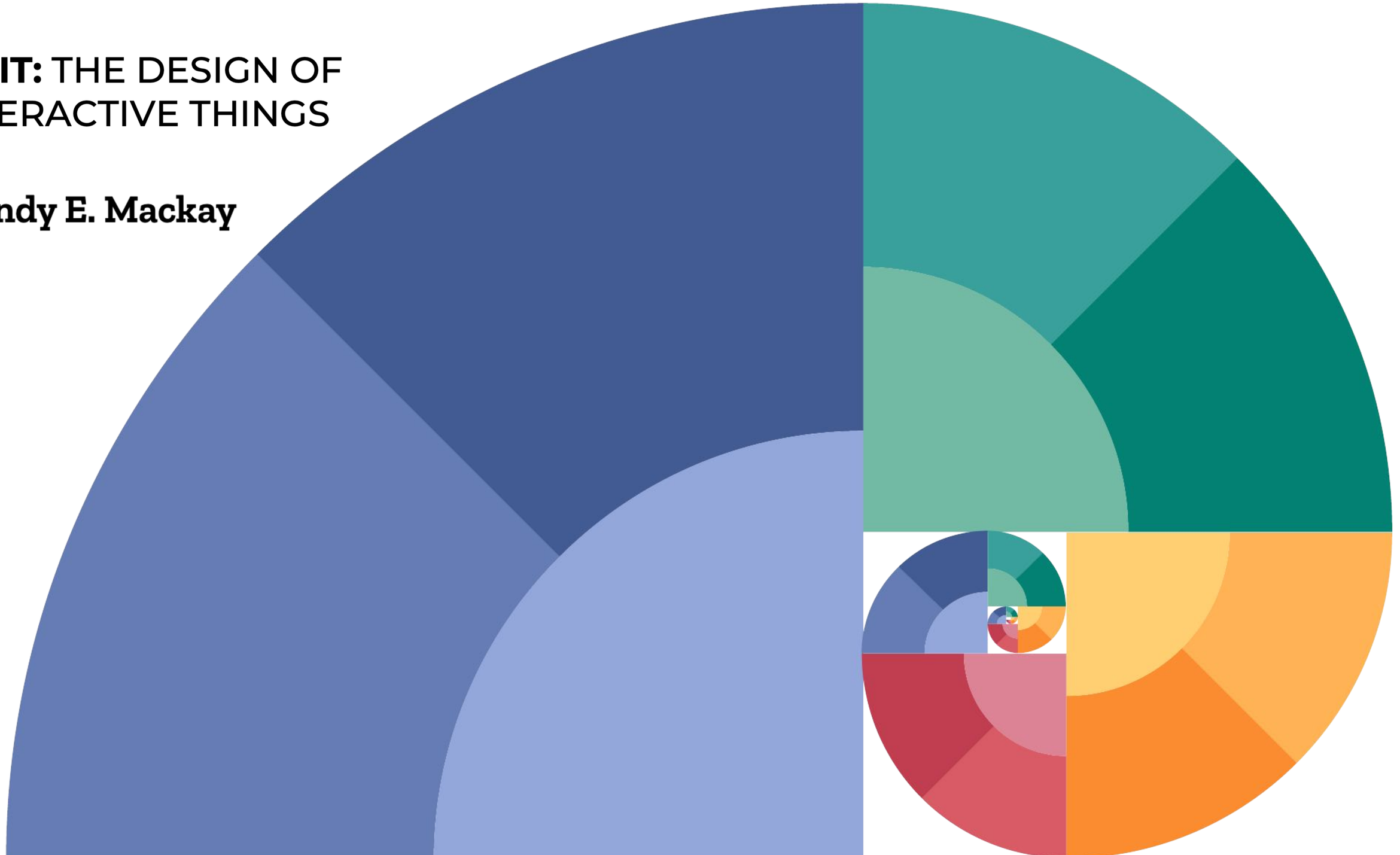
DO IT: THE DESIGN OF INTERACTIVE THINGS

Wendy E. Mackay



DO IT:
THE DESIGN OF INTERACTIVE THINGS

Wendy E. Mackay
25 April 2023

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Inria
INVENTEURS DU MONDE NUMÉRIQUE

COLLÈGE DE FRANCE
1530

DO IT:
THE DESIGN OF INTERACTIVE THINGS

Course overview

Who is who?

Wendy Mackay *mackay@lri.fr*
Research Director
Professor

Alex Battut battut@lri.fr
Ph.D. Student
Video Clipper support

Romane Dubus dubus@lri.fr
Ph.D. Student
Teaching assistant

Junhang Yu yu@lri.fr
Teaching assistant

... and you?

Designing interaction

Schedule

Session 1	09:00 – 10:30
Break	
Session 2	11:10 – 12:35
Lunch	*12:35 – 14:30*
Session 3	14:30 – 15:55
Break	
Session 4	16:35 – 18:00

Exercises

Schedule

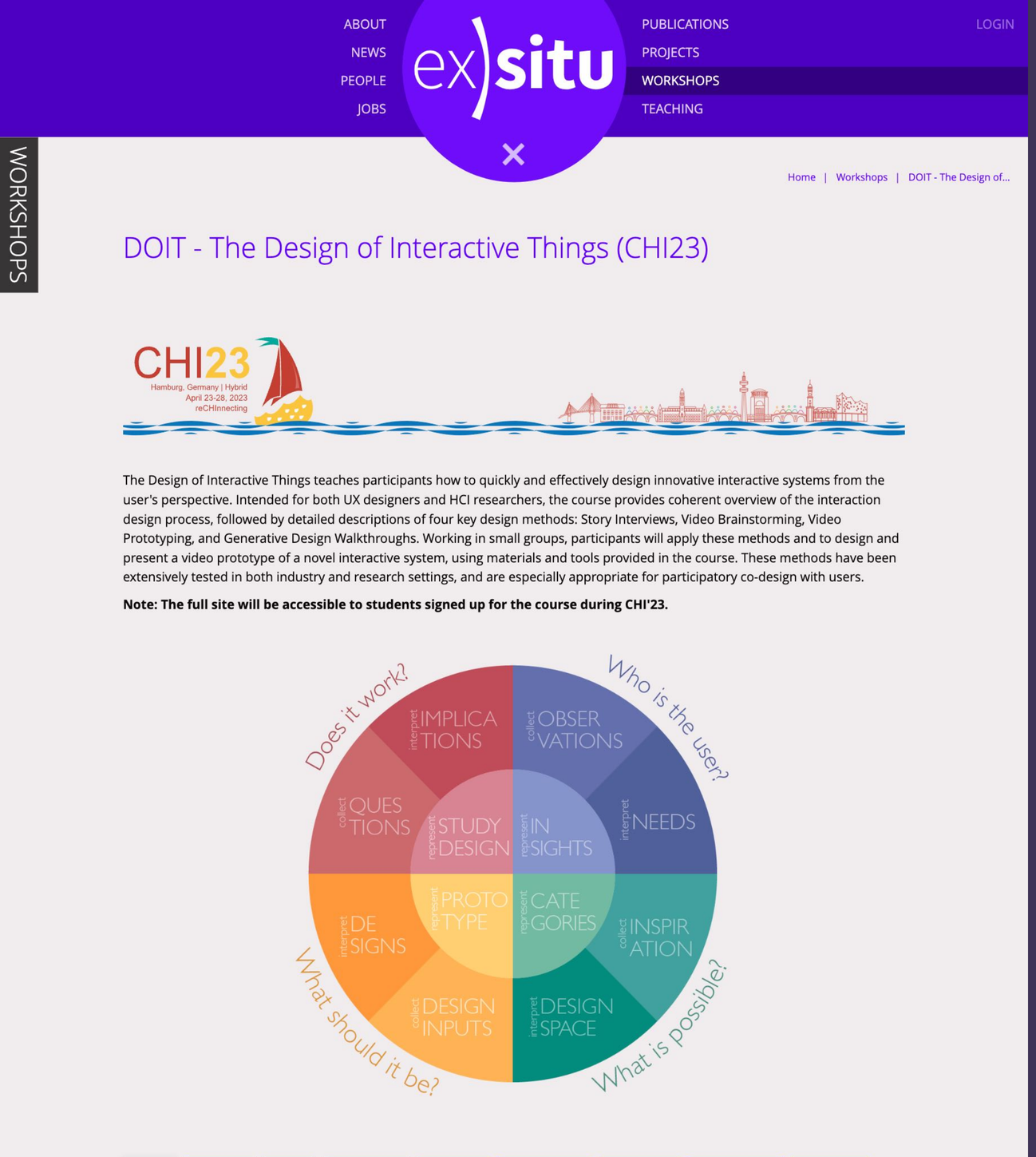
Tuesday, 25 April 2023

Lectures

Introduction
Discover users
Inspire ideas
Design prototypes
Evaluate designs

Key exercises

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



Website

ex-situ.lri.fr/workshops/doit-the-design-of-interactive-things-chi23

Username: chi23-doit-participant
Password: interactive*systems

ex-situ.lri.fr/workshops/doit-the-design-of-interactive-things-chi23

Username: chi23-doit-participant
Password: interactive*systems

Workspace to upload worksheets and videos:

ex-situ.lri.fr/workshops/doit-the-design-of-interactive-things-chi23#workspace

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

Design project

Use course design methods to:

- discover user issues
- generate new ideas
- design mockups
- create a video prototype
- evaluate your design
- redesign for major improvement

Design project

Work in project teams
~4 members each

Advice

Become a successful interaction designer

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

Design brief

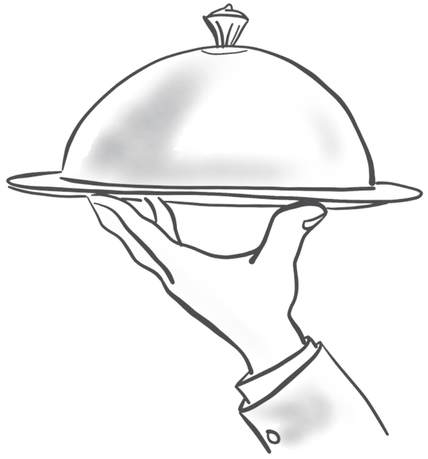
Relationships with computers

Tool

I use it to peform a task
I control the outcome

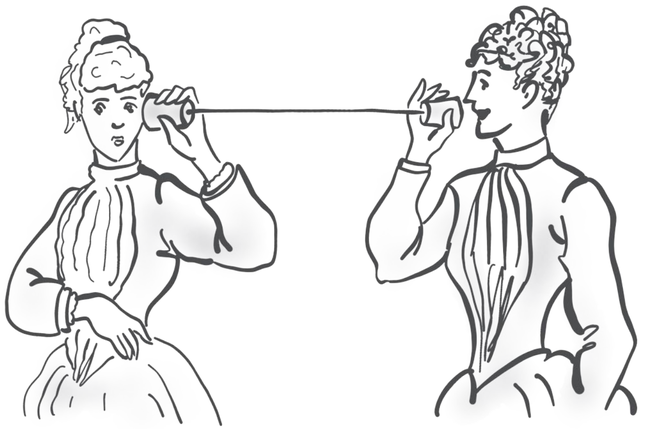
Servant

I delegate a task to you
You control the outcome



Communication medium

We communicate
We share control



Design brief

Create an interactive system that supports navigating through space and time

Rethink navigation

...beyond your smartphone!

Discover problems faced by real users

Identify breakdowns, work arounds,
user innovations and surprises

Design a new interactive tool
Illustrate with realistic story in a real context
…then redesign based based on feedback

Design brief

Rethink navigation

Strategies

Augment the environment

Augment the user’s body

Augment an object

Design brief

Embed interaction

Beyond the smartphone

Wearables

Augment an item of clothing

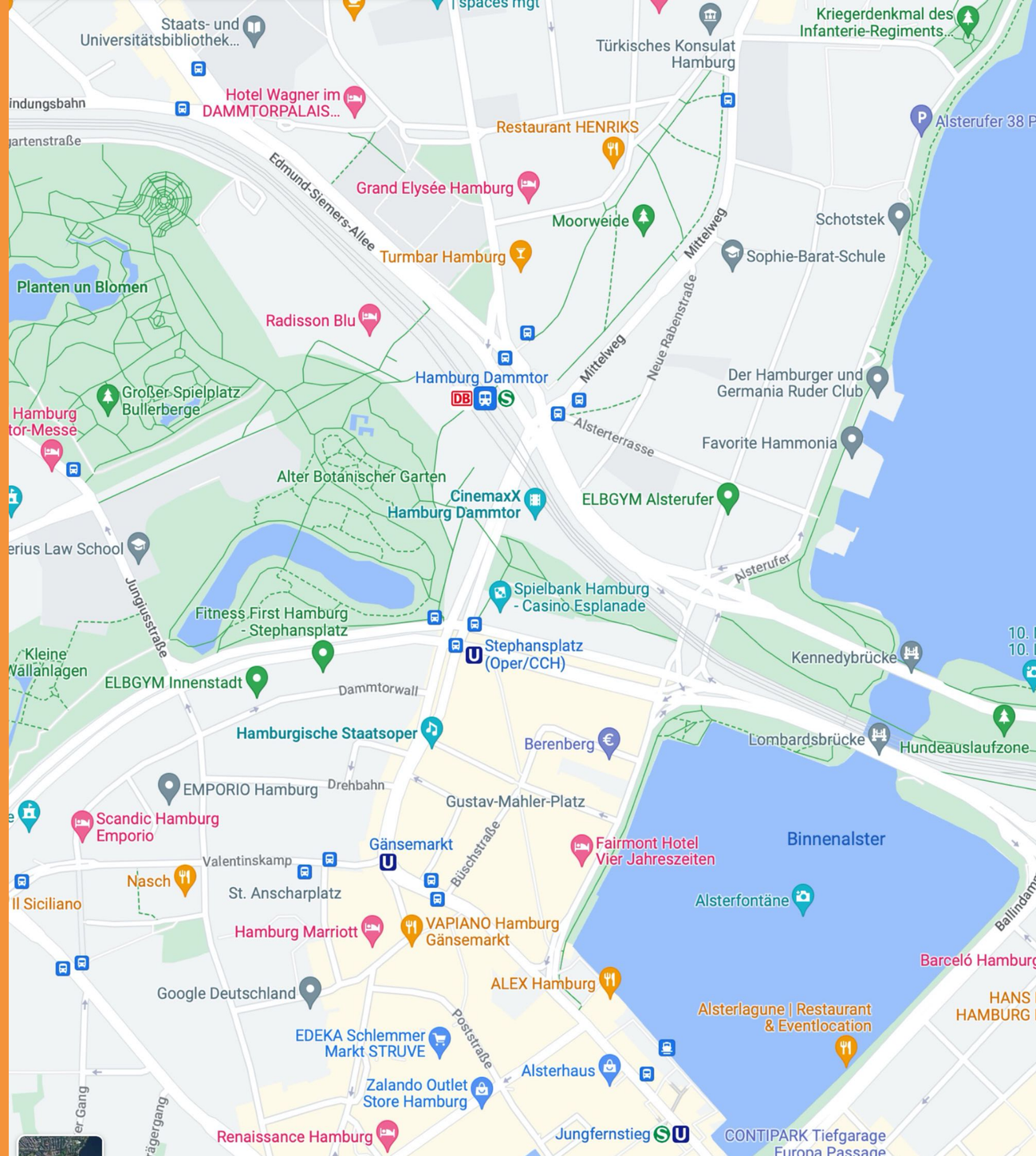
Interactive objects

Augment an object

Interactive environments

Augment the space

Hamburg map


Staats- und Universitätsbibliothek...
Türkisches Konsulat Hamburg
Kriegerdenkmal des Infanterie-Regiments...
Hotel Wagner im DAMMTORPALAIS...
Restaurant HENRIKS
Alsterufer 38
Grand Elysée Hamburg
Edmund-Siemers-Allee
Moorweide
Schotstek
Mittelweg
Turmbar Hamburg
Sophie-Barat-Schule
Planten un Blomen
Radisson Blu
Hamburg Dammtor
Großer Spielplatz Bullerberge
Neue Rabenstraße
Der Hamburger und Germania Ruder Club
Alsterterrasse
Favorite Hammonia
Alter Botanischer Garten
CinemaxX Hamburg Dammtor
ELBGYM Alsterufer
Jungiusstraße
Spielbank Hamburg - Casino Esplanade
Alsterufer
Fitness First Hamburg - Stephansplatz
Stephansplatz (Oper/CCH)
Kennedybrücke
Kleine Wallanlagen
ELBGYM Innenstadt
Dammtorwall
Hamburgische Staatsoper
Berenberg
Lombardsbrücke
Hundeauslaufzone
EMPORIO Hamburg
Drehbahn
Gustav-Mahler-Platz
Scandic Hamburg Emporio
Gänsemarkt
Fairmont Hotel Vier Jahreszeiten
Binnenalster
Valentinskamp
Büschstraße
Nasch
St. Anscharplatz
Alsterfontäne
Il Siciliano
Hamburg Marriott
VAPIANO Hamburg Gänsemarkt
Barceló Hamburg
Google Deutschland
ALEX Hamburg
Alsterlagune | Restaurant & Eventlocation
EDEKA Schlemmer Markt STRUVE
Poststraße
Alsterhaus
Zalando Outlet Store Hamburg
Renaissance Hamburg
Jungfernstieg
CONTIPARK Tiefgarage Europa Passage

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

Design process

Though this be madness
Yet there is method in it …

Hamlet, by William Shakespeare

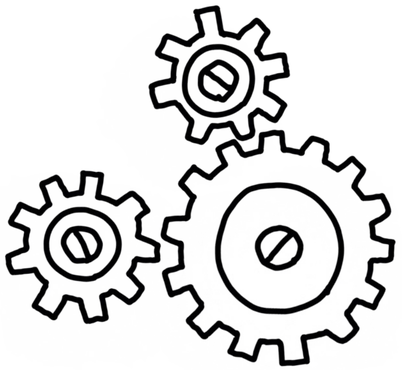
Diverse approaches

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 thinking

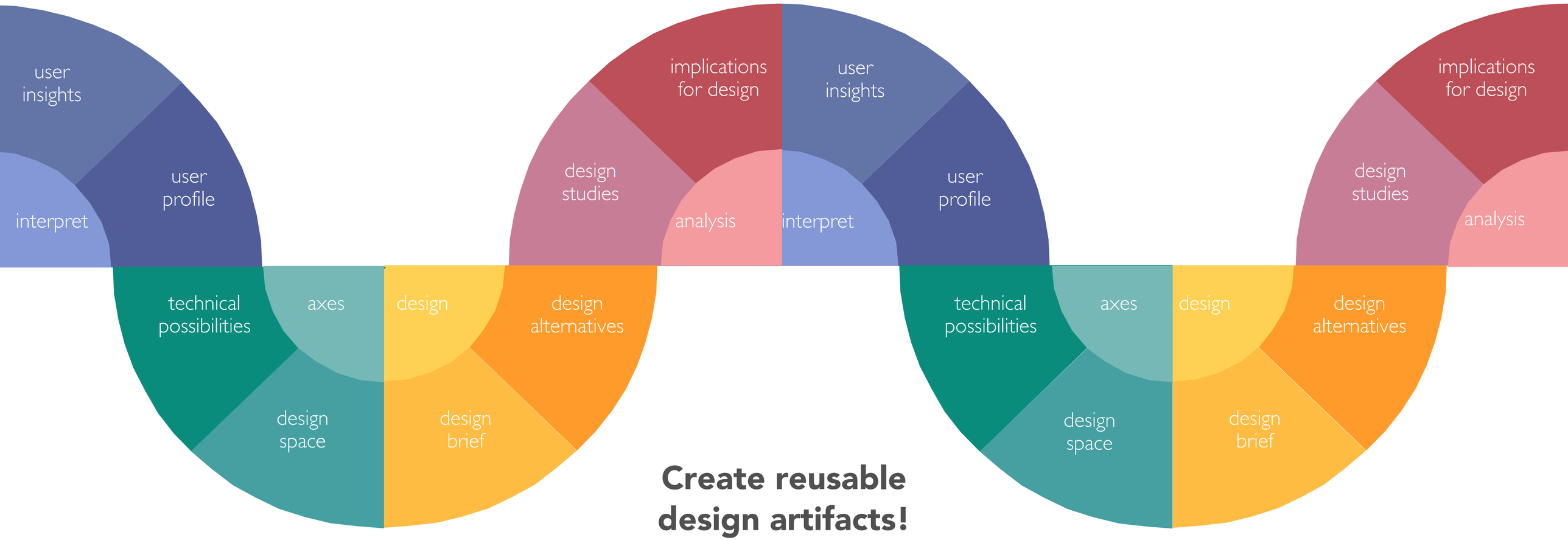
Good interaction design requires
taking the *user's* perspective

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

Design is about *doing*
not just thinking

Interaction design is iterative...



Create reusable design artifacts!

Reuse design artifacts!

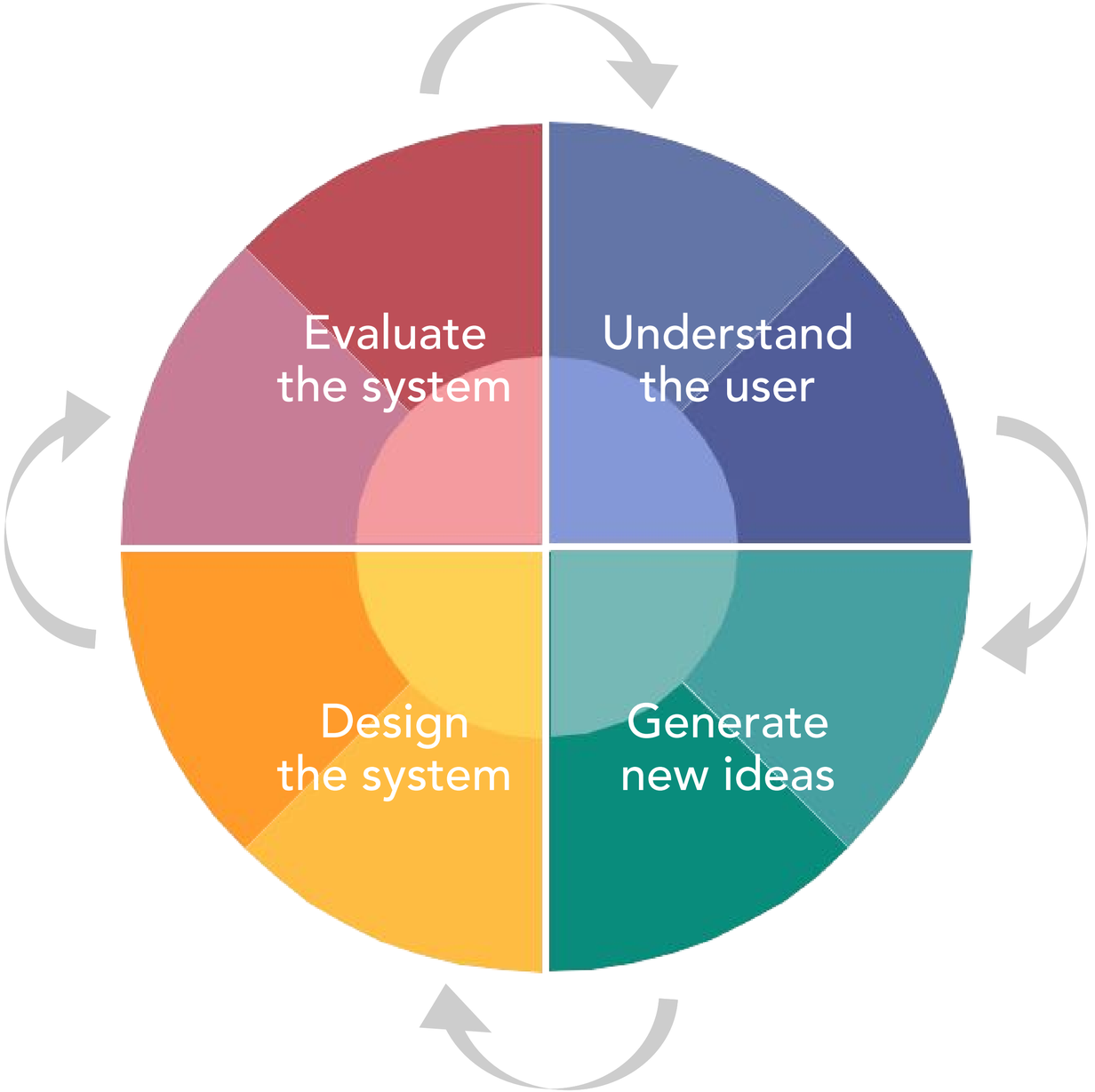
Every design activity should generate a reusuable result

Interconnected design process

Design is iterative

Every design phase contributes to every other phase:

Jump from any phase to any other phase as needed



Generative design

Discovery

Who is the user?

Inspiration

What is possible?

Design

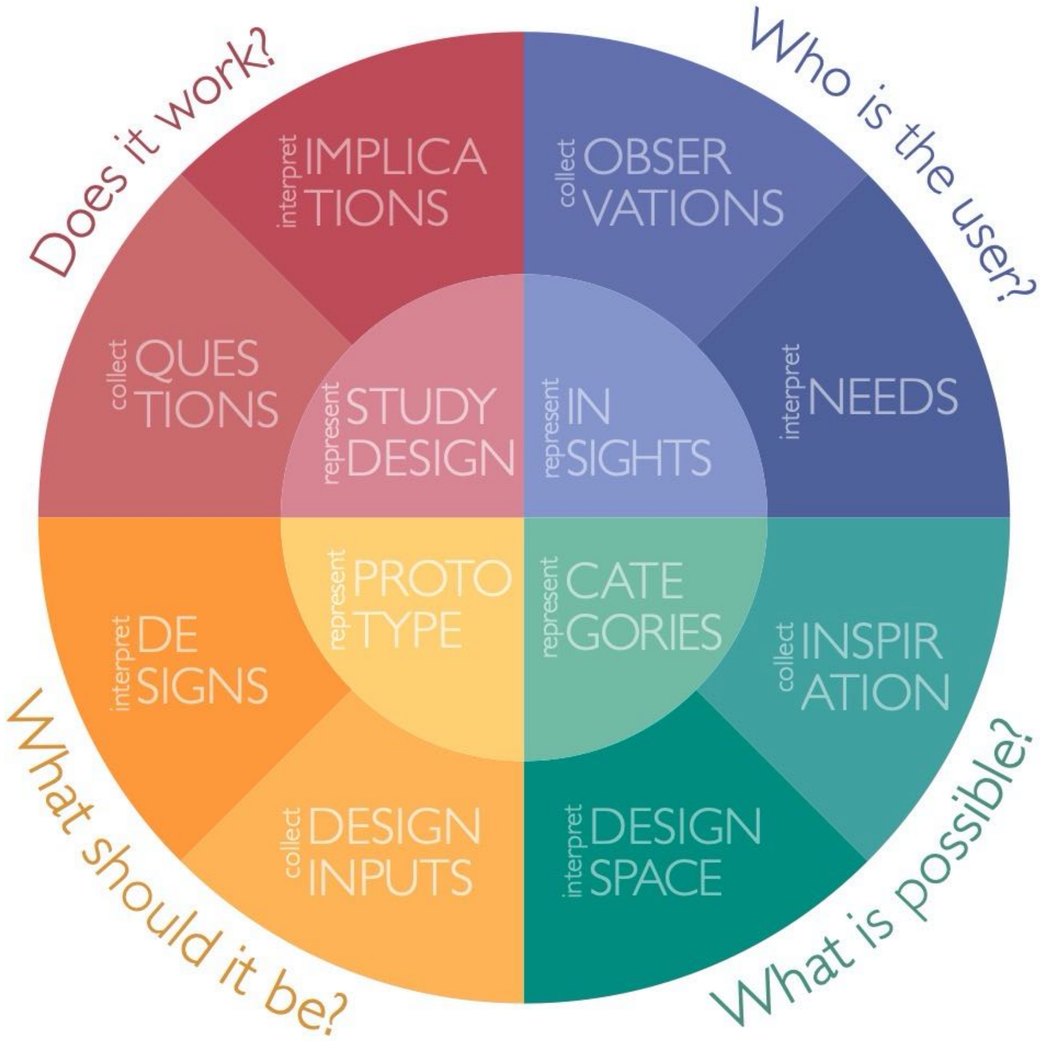
What should it be?

Evaluation

Does it work?

Redesign

Make it better!



Generative design

Methods may be:

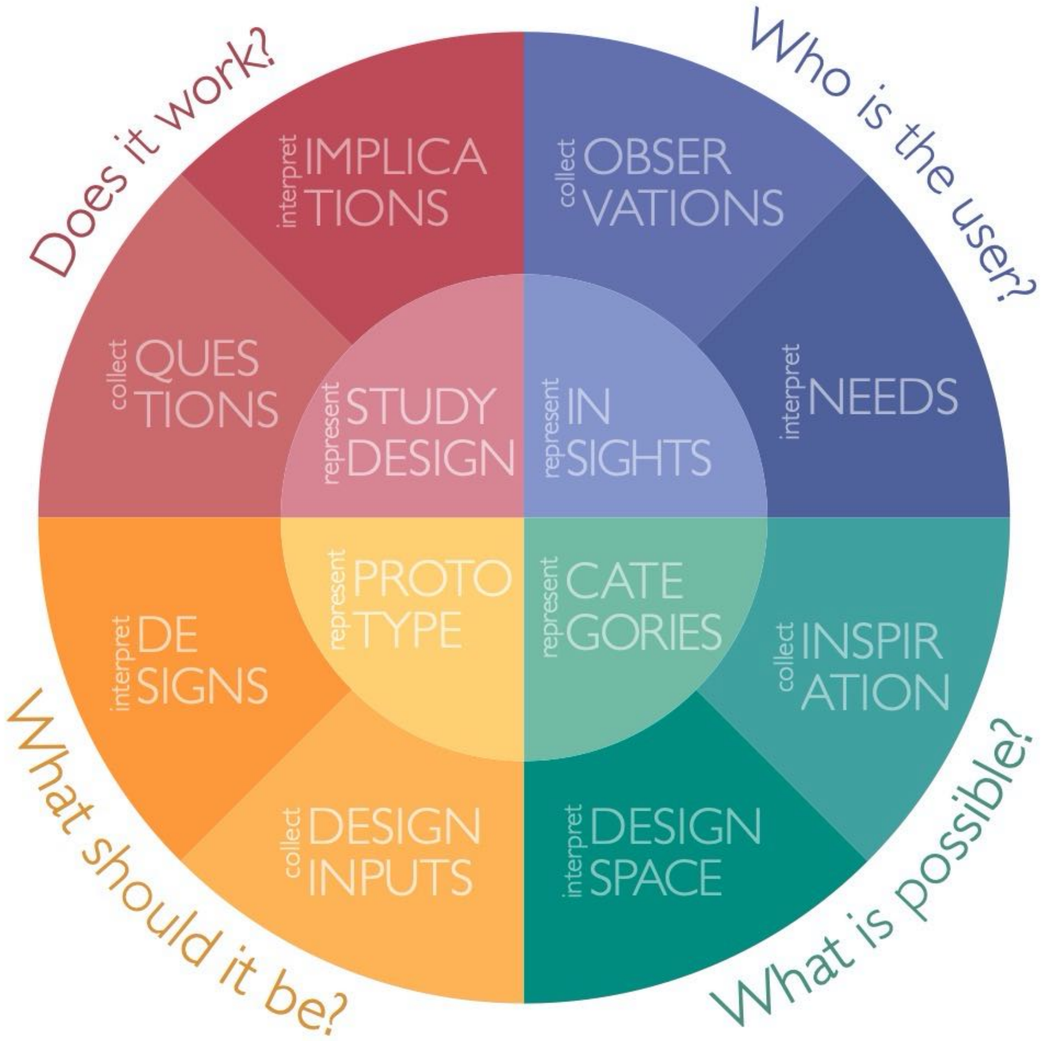
Divergent or convergent

Critical or generative

User focused or system focused

General or specific

Story-based or system-based



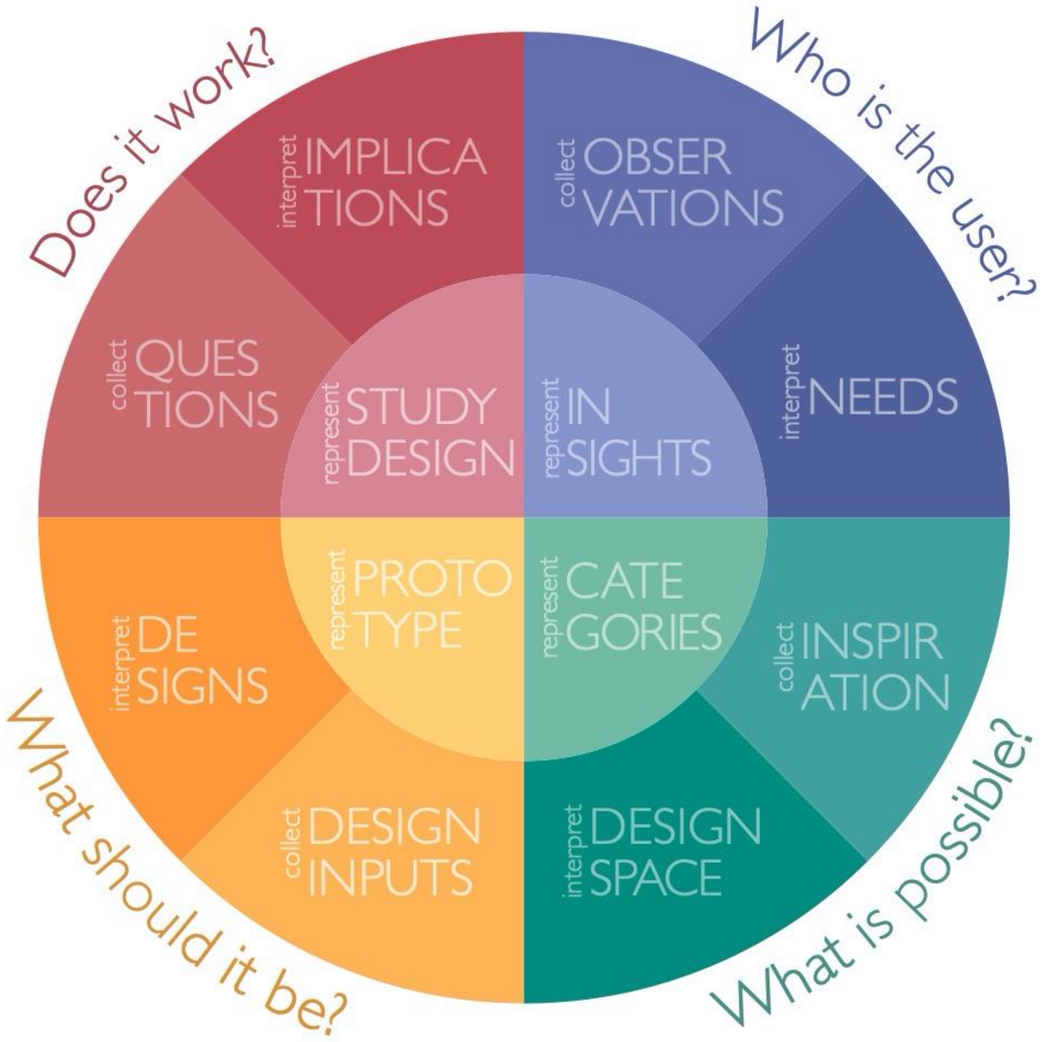
Generative design

Design methods involve:

Collecting information

Representating information

Interpretating information



Understanding users	System	Action	Story
Collect	Literature review Introspection Questionnaire	READ OBSERVE ASK	Novels, films Observation Story interviews
Represent	User requirements Interaction snippets Cultural probes	LIST SKETCH ENGAGE	Persona Journey map Interactive thread
Interpret	User profile Themed video Descriptive statistics	DESCRIBE SHOOT ANALYSE	Current scenario Current video Thematic analysis

Table 1. Discovery Methods

Design methods involve

Before

Prepare activity
set up workspace
select materials & tools
reuse design artifacts

During

Collect data
Sample or generate
Represent data
Transform, condense or expand
Interpret data
analyse, make sense

After

Produce take aways
Make reusable artifacts for (re)design

DO IT:
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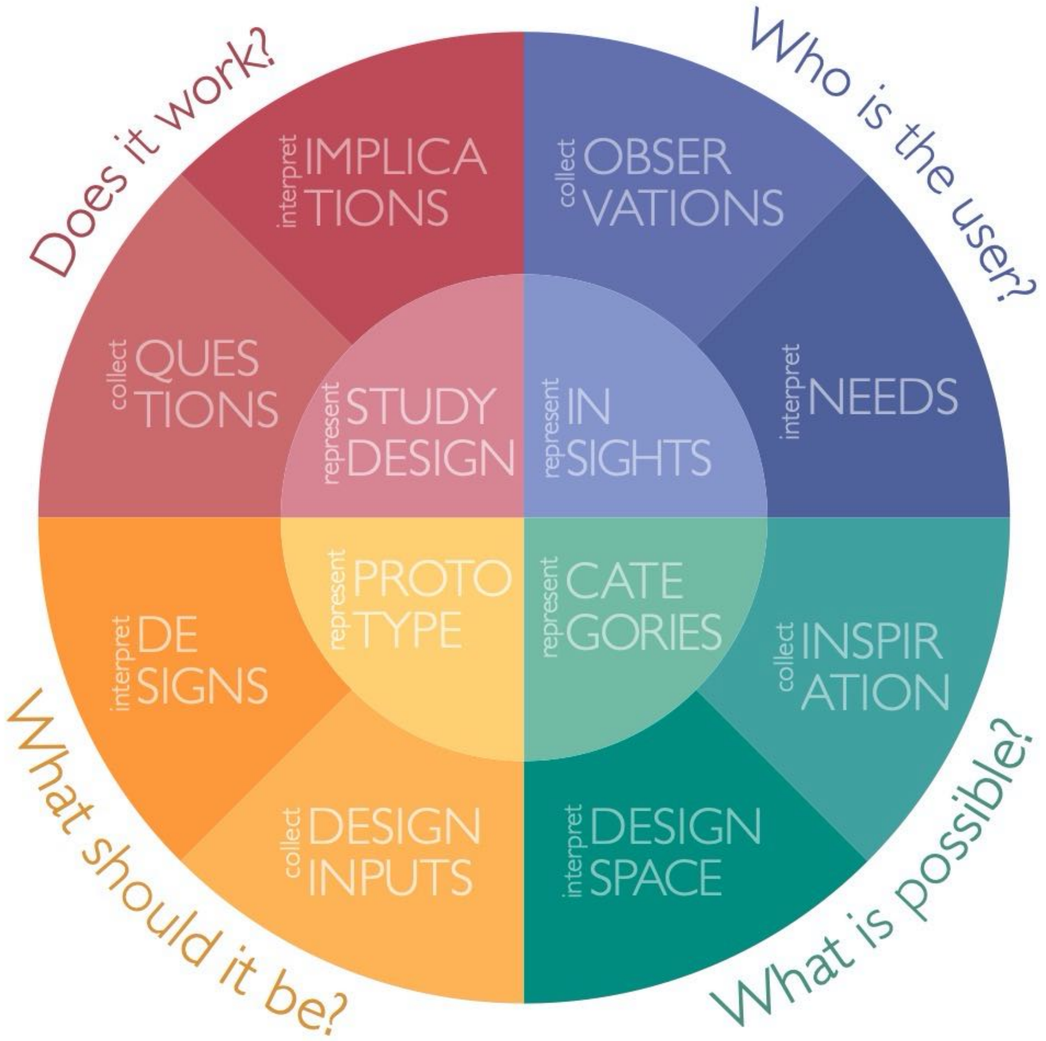
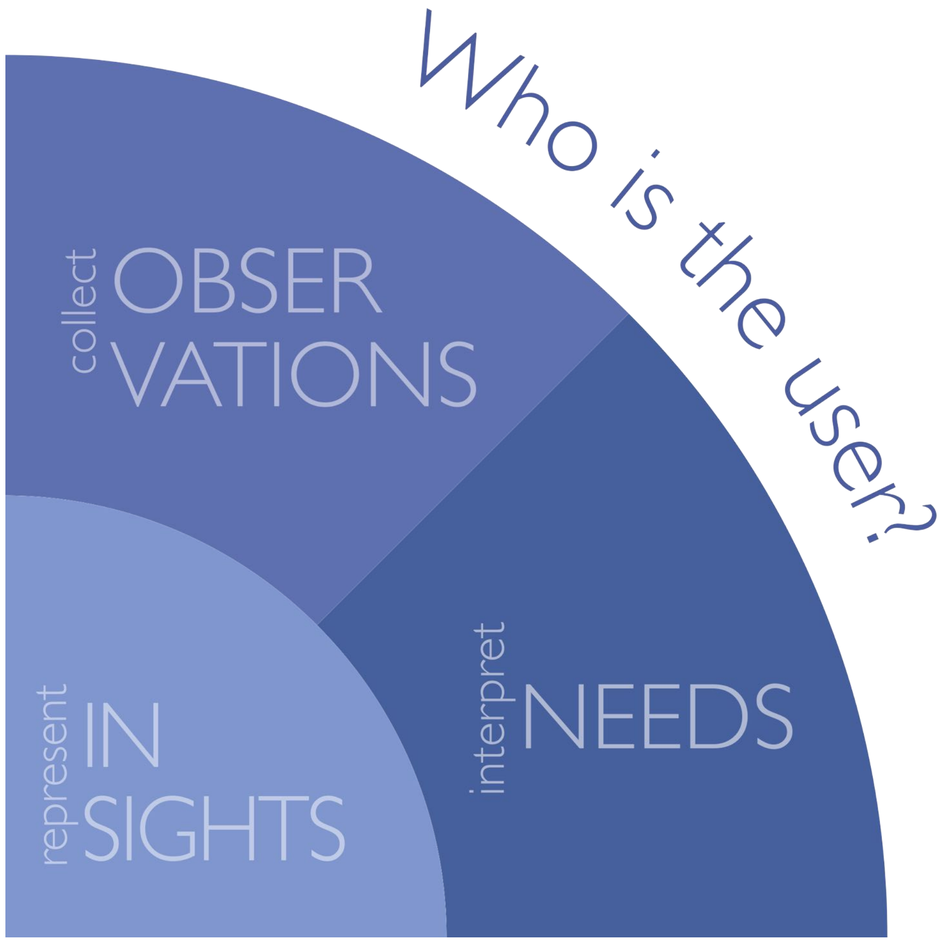


Finding out about users

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

- All observation is subjective
- “Validity” depends upon the details
- Observing ≠ interacting with users

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:

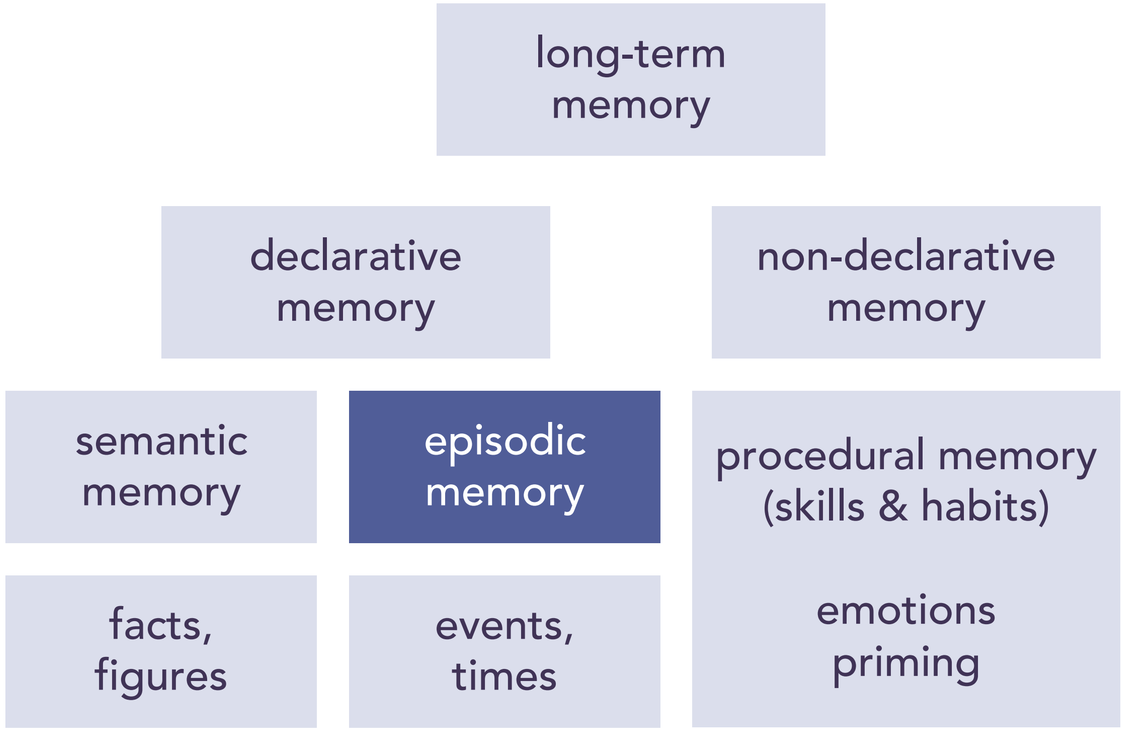
- semantic memory (facts & figures)
- episodic memory (events & times)

Non-declarative memory involves:

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

Human memory

Focus on episodic memory



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

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. Tell me what you did to find it, step-by-step.”

Why?

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

Asking questions

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 OK?”
“What did you do next?”

Probe for more context

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

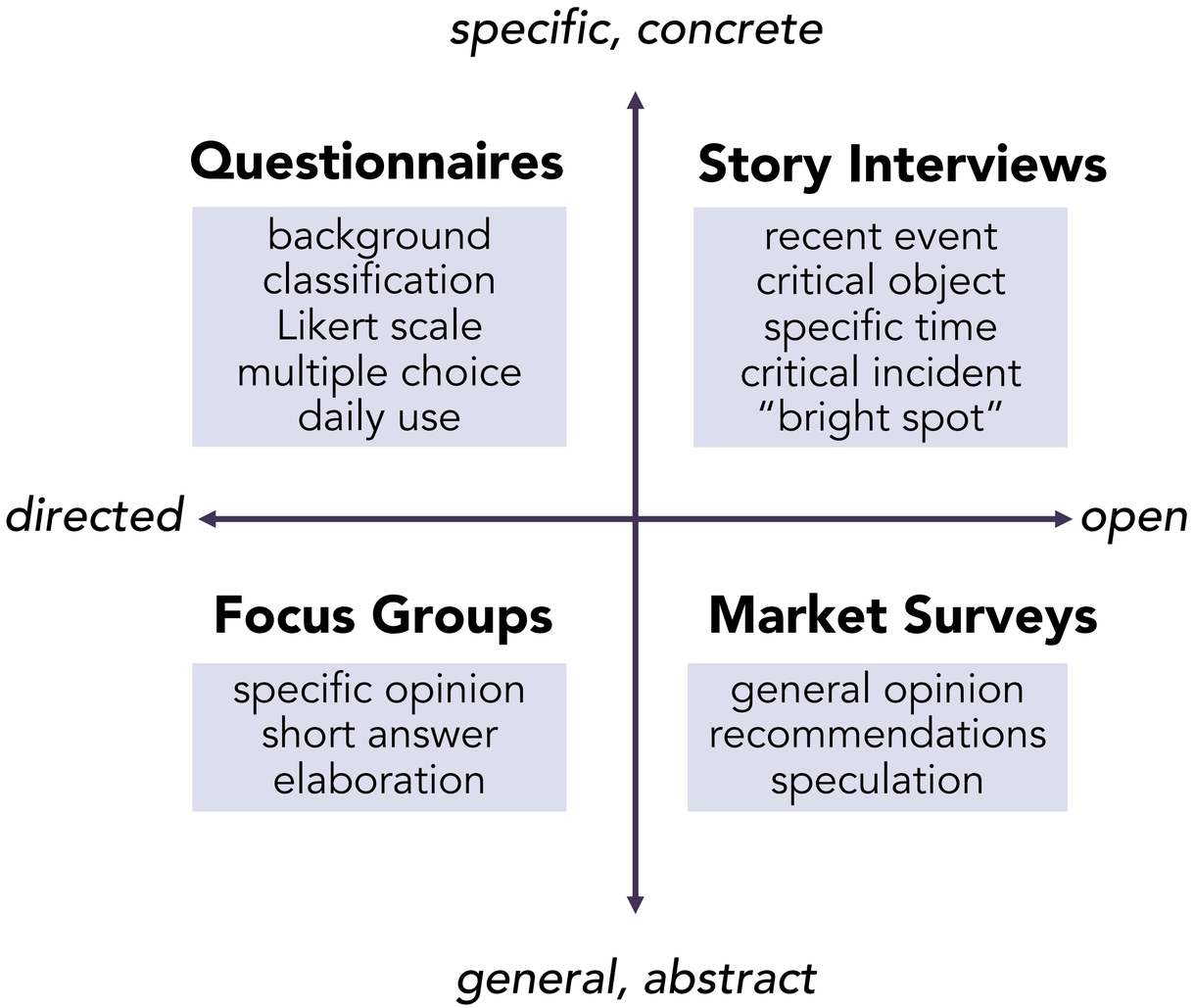
Asking questions

Question order matters!

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

Asking questions

Asking questions



You can derive 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
not tutorials (how it should work)
not opinions (market surveys)

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?

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

Name		Team		Due	

Story interview

Discover Users **Worksheet**

ACTIVITY Ask the user questions that elicit recent stories about specific events or objects relevant to the design brief.

Interviewer:		**Interviewee:**	
Hardware:		**Software:**	
Question			
Answer			
Question			
Answer			
Question			
Answer			
Question			
Answer			
Question			
Answer			

Story interview

Story interview

Advantages

Captures detailed, open-ended answers and can probe for more information, in greater depth

Trade-offs

Disadvantages

Finding and interviewing users takes time and requires interviewing skills, and analyzing the resulting data takes time

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 ...

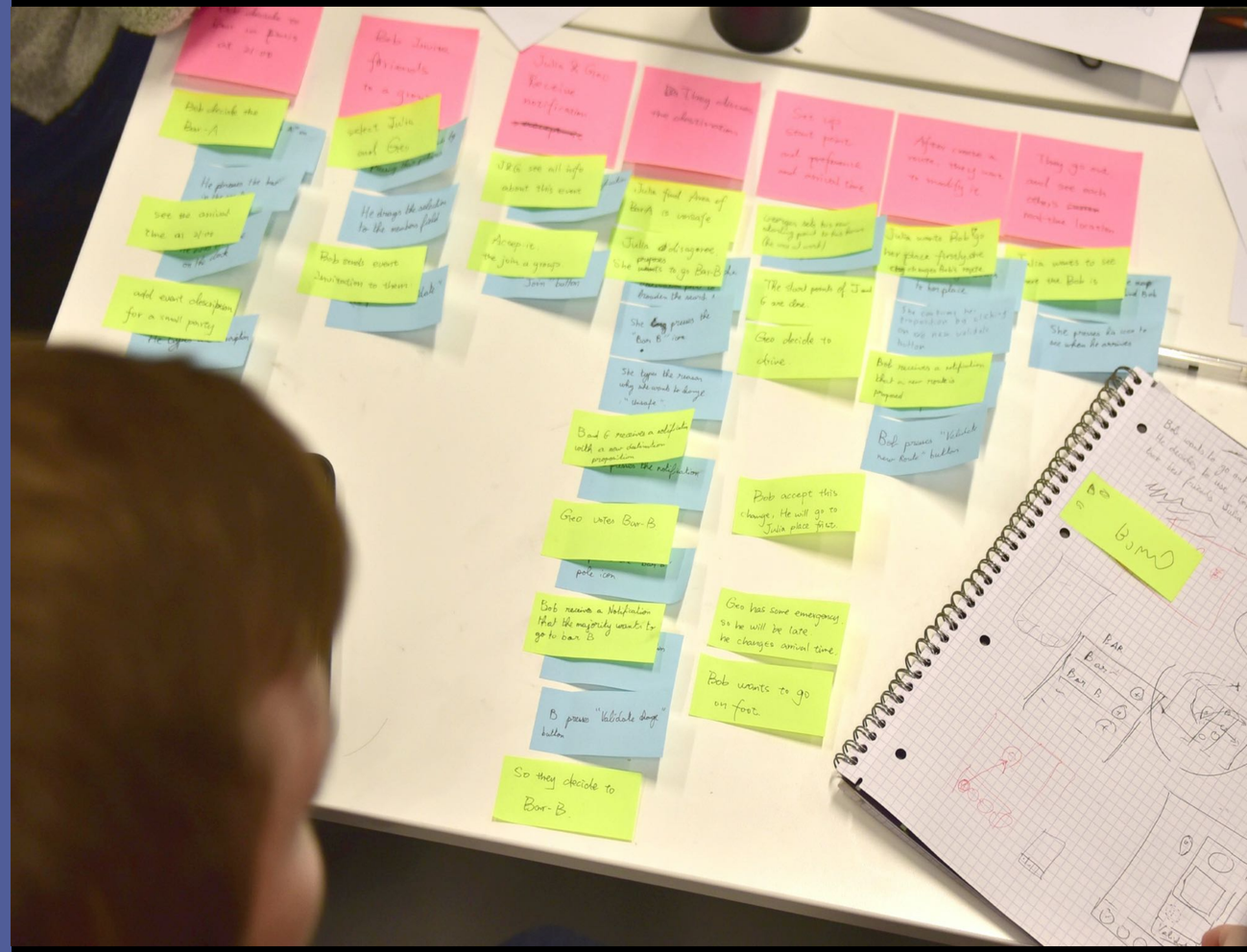
focus on recent or highly memorable stories

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.