02: User-Centred Design Process; User Research & Collecting User Data I
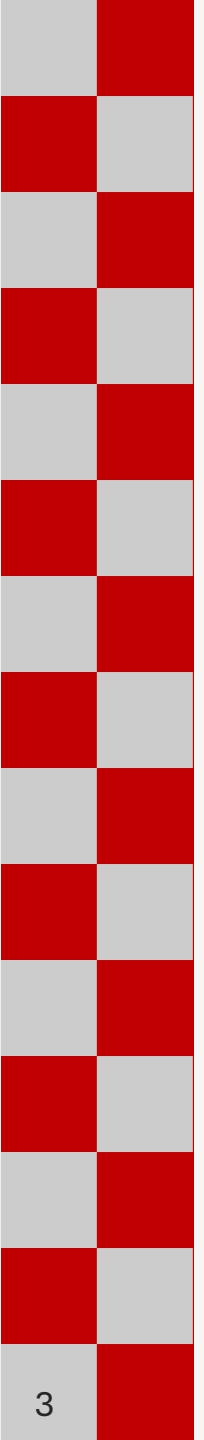
IN3065/INM355 | 2025–2026

User-Centred System Design

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Session 2: Learning objectives

- By completing this session, you should be able to:

  - Describe a structured process for undertaking user-centred design, including key activities.

  - Demonstrate understanding of the importance of effective data collection for interaction design.

  - Design and conduct effective data collection using observations.

Key concepts
The process of user-centred design

System-centred → User-centred

– 'What can the system do' → 'What does the user need to do, and how can the system help them'

– System functions → User tasks and goals

– Technical feasibility → User needs and context

– 1990s: Usability as a requirement, not an afterthought
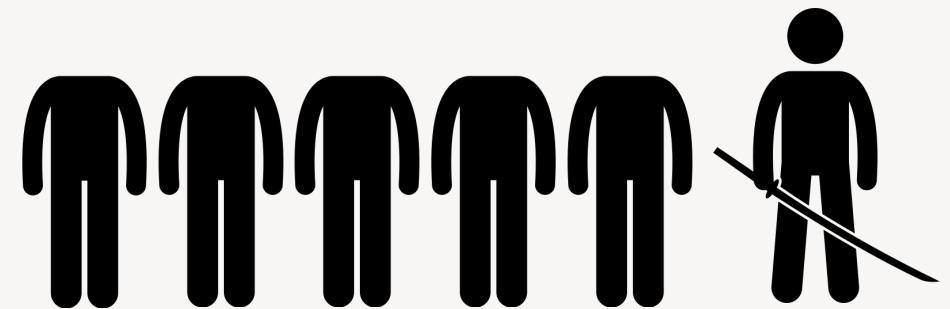
Gould and Lewis (1985) recommended 3 key principles for design:

1. Early focus on users and tasks—understand people & context first.

2. Empirical measurement—test design ideas with real users.

3. Iterative design—refine based on feedback, not assumptions.

User-centred system design: Process

- *How* design work is organised and delivered

- Several different design processes/frameworks exist
  - No single, "correct" one
  - Usually emphasise different priorities

- They can be adapted, even combined / used in conjunction

- Usually some commonality, e.g. in activities
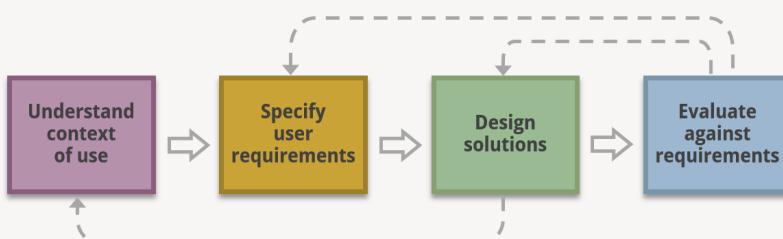
Process: "A series of actions which are carried out in order to achieve a particular result."
*(Collins English Dictionary)*
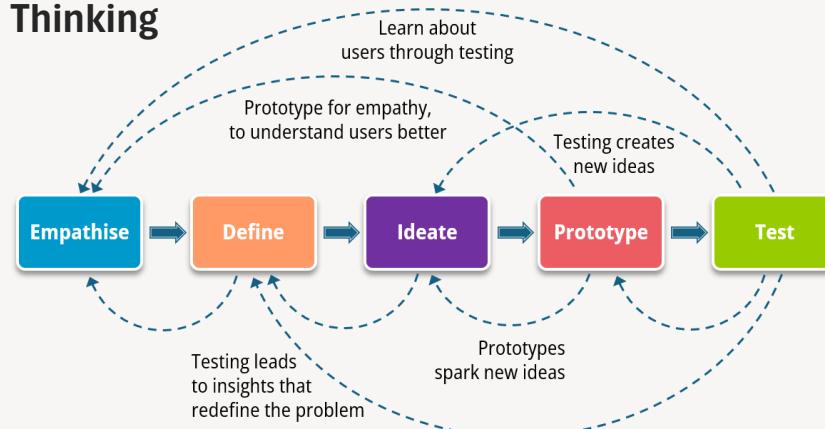
There can be only one design process]... NOT!

# Many processes and frameworks...
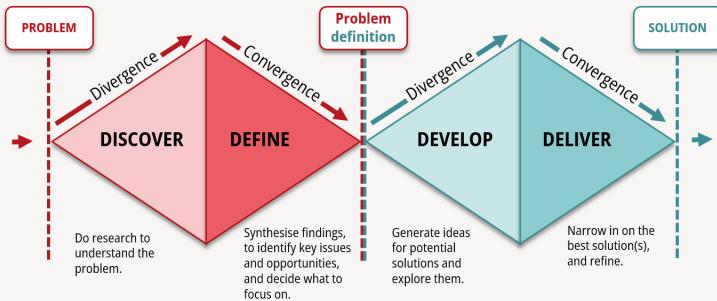
Design Thinking
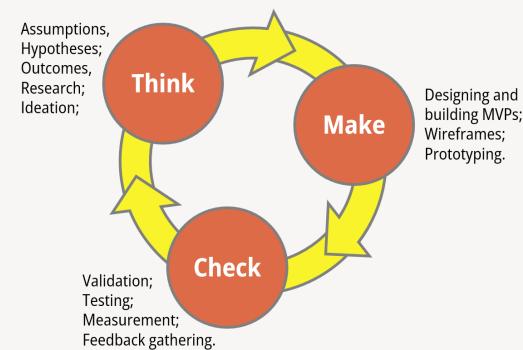
User-Centred Design (UCD)
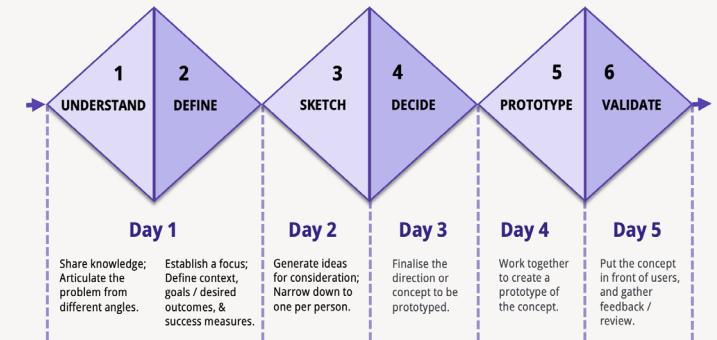
Double-Diamond framework (Design Council)

Lean UX
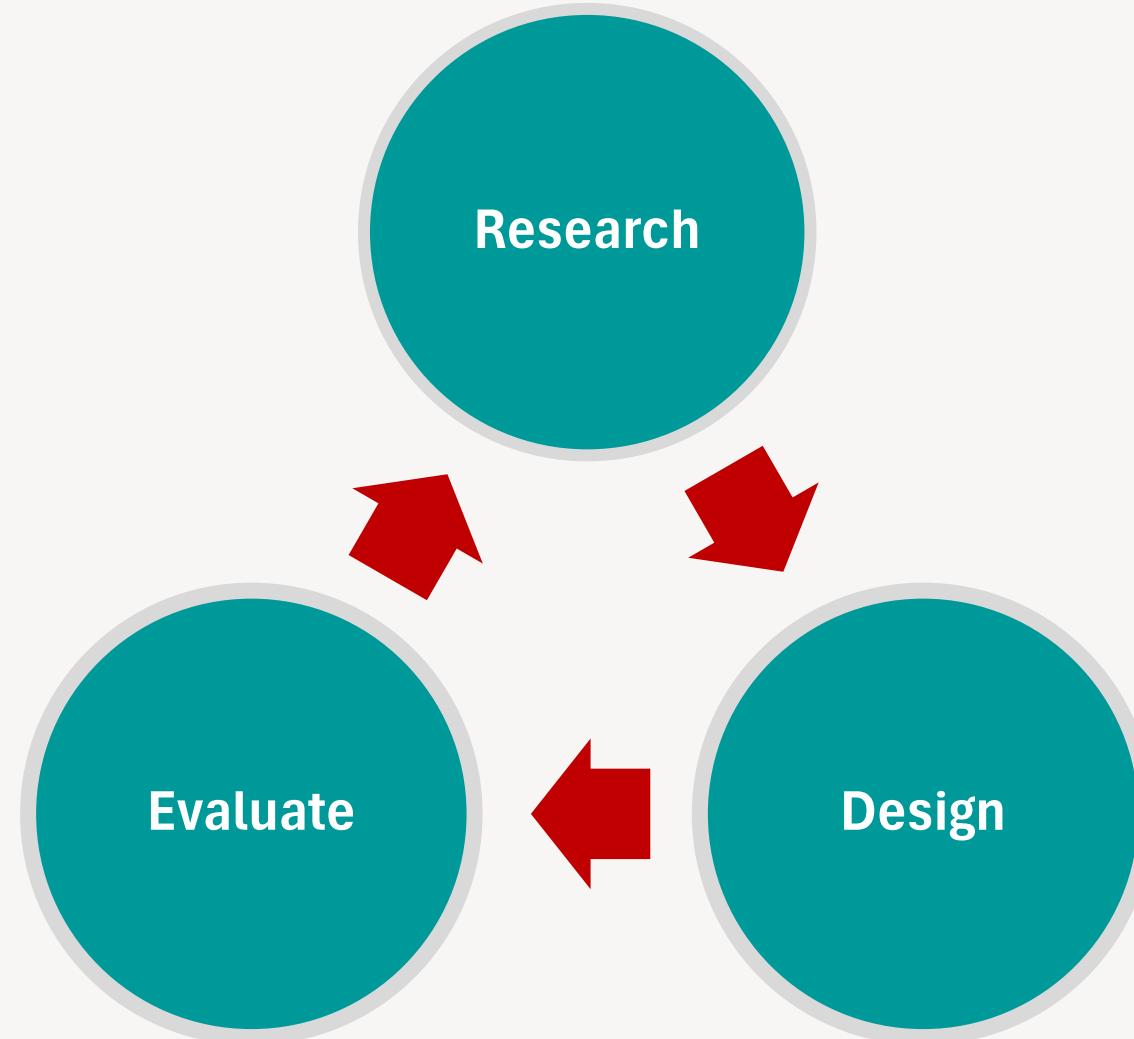
## Design sprints (Google ventures)

Key activities in user-centred system design

Understand & specify the context of use	**User Research**	Find out about *users*: *who* they are, *what* they're trying to achieve, and *where/when/how* interaction takes place.
Define design goals and requirements	**Definition**	Derive high-level *design goals* and specify any concrete *requirements or constraints*
Produce design solutions	**Conceptual Design** (incl. ideation) & **Detailed Design** (prototyping during both)	*Ideation & concept generation*—create and explore alternative high-level design ideas. Concept development—define interaction logic and user journeys. Detailed design—refine the detail of design. Prototyping—make ideas tangible.
Evaluate designs	**Evaluation**	Test / evaluate what is being designed, during / throughout the process

A simplified **cycle**

Research → Design → Evaluate → Research
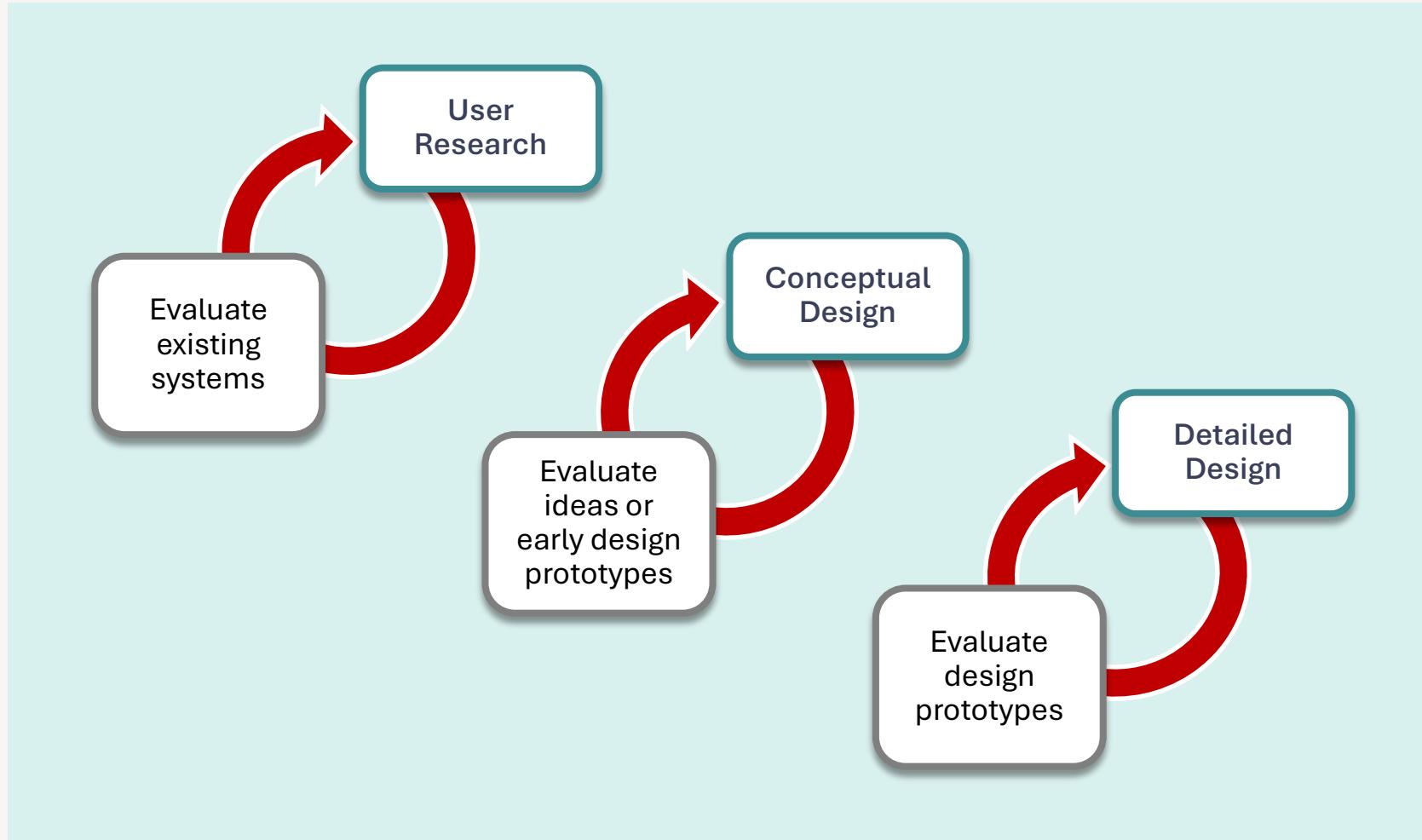
An **iterative** process
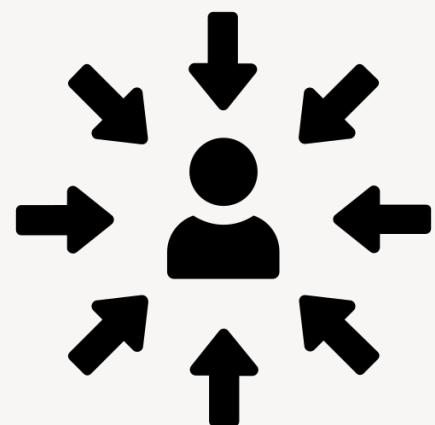
- – User-centred system design is iterative—there are cycles of creating, evaluating, improving and eliminating alternative designs.

    ⚠️ You won't get design right the first time.

- – Alternative designs are tested individually and against each other.

    ⚠️ The first idea is not always the best—give it competition.

- – Design involves both conceptual and detailed design

    ⚠️ Explore lots of ideas. Get the concept right, *then* work out the detail.

Evaluation in a user-centred design process

Some **principles** of user-centred design

- The people (users) who will use a product are central to it the design and development of it.

- Designs are based on understanding these users, including their needs, motivations and goals, their tasks / activities, views, contexts and environments of use, etc.

- Users are involved throughout design and development.

- The process of user-centred design is iterative.

- Designs are driven and refined by user-centred evaluation.

Design Process

Key activities

User Research: Aims

- Find out about users.
  - Who they are, their abilities and views.

- Find out what users do, and how and why they do it.
  - Their goals, the activities and tasks they engage in to achieve those goals, and their current behaviours; the problems they experience, what they need.

- Find out about where and when users do these things.
  - The context(s)—physical, social, organisational…

- Identify opportunities for design.

- Use to define design goals, collate requirements and constraints.

Common **User Research** techniques
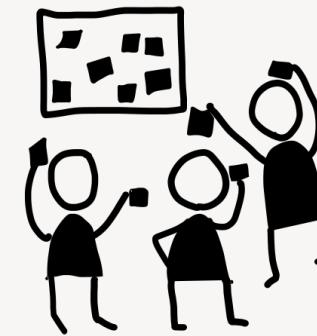
Interviews

Empathy maps
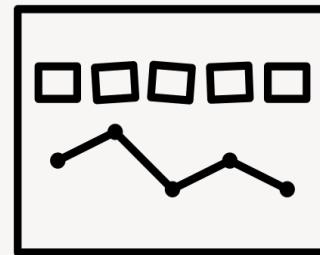
Observations
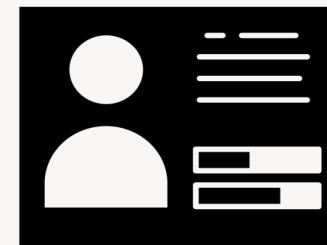
Affinity mapping

Questionnaires
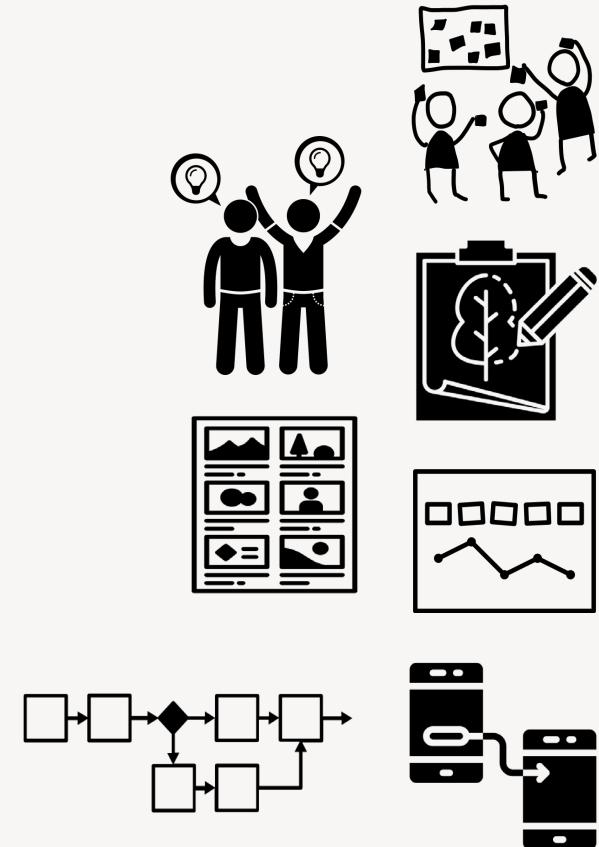
User Journey Maps (current)

Personas
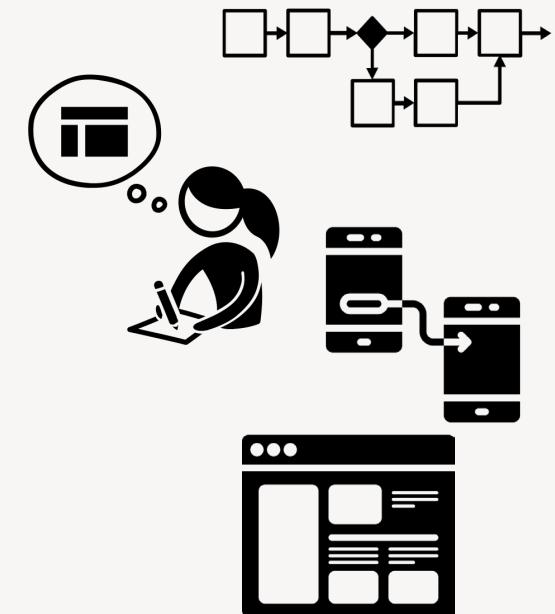
Conceptual Design: Aims

– Generate ideas.

– Explore alternatives—<u>lots</u> of alternatives.

– Design high-level concepts.

– Get user feedback on early designs.

– Envision users' future activities.

– Make high-level decisions.

   – e.g. mode(s) of interaction; type(s) of interface; tasks to support; main objects and actions; major workflows.
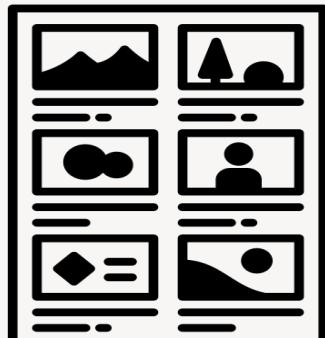
Detailed Design: Aims
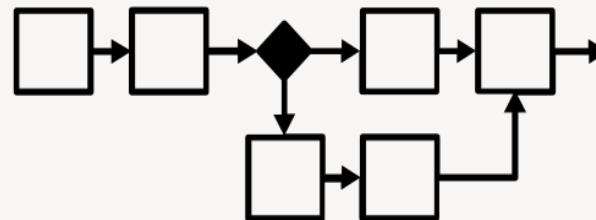
- Choose between alternatives and refine them.

- Design the details of presentation and interaction.

- Create interactive prototypes.

- Refine our designs.
  - Including through evaluation—get user feedback; identify problems, and fix them

- Specify and document design decisions.
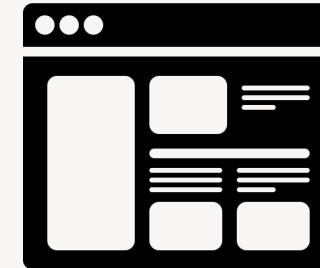
Common **Design** techniques

Ideation
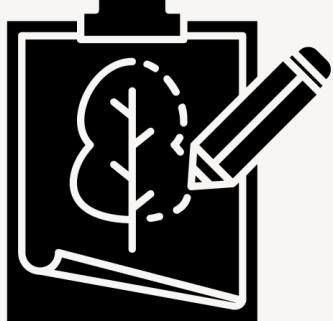
Storyboards
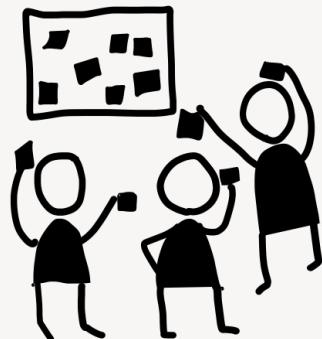
User/Task Flows & Wireflows
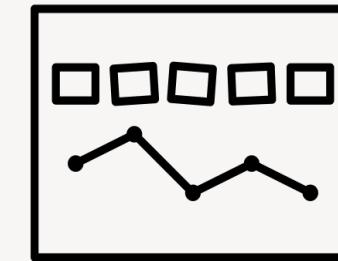
Wireframes
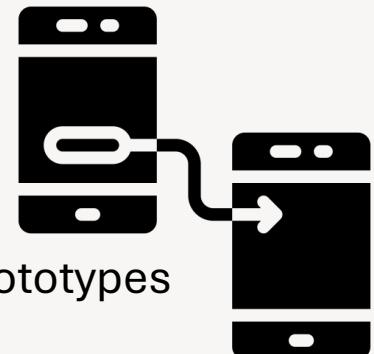
Sketching

Affinity mapping

User Journey Maps (future)

Prototypes

Evaluation: **Aims**

- – **Formative** evaluation of designs.
  - – Identify problems and improve.
  - – Test concepts.
  - – Get feedback.

- – **Summative** evaluation of designs.
  - – Measure usability and user experience (metrics).

Common **Evaluation** techniques
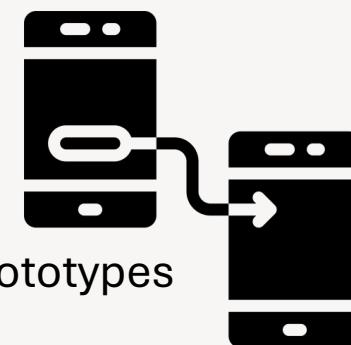
Usability testing
(Observations of system use)
(in-person, remote, lab, guerilla)

Questionnaires

Interviews

Prototypes

Metrics
Usability & UX

Questions?
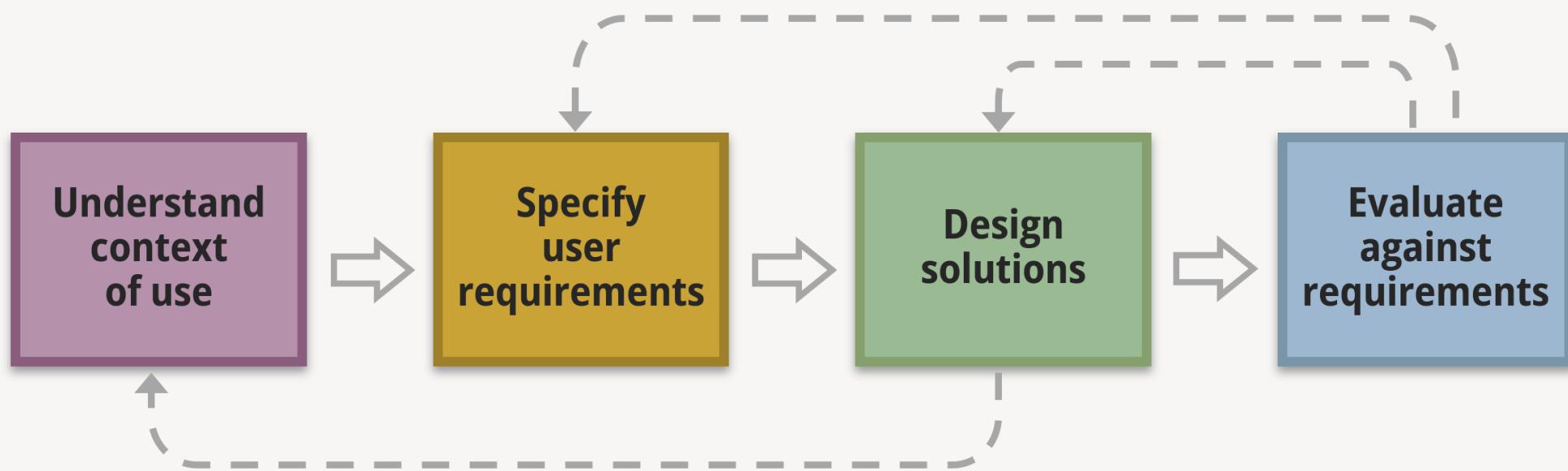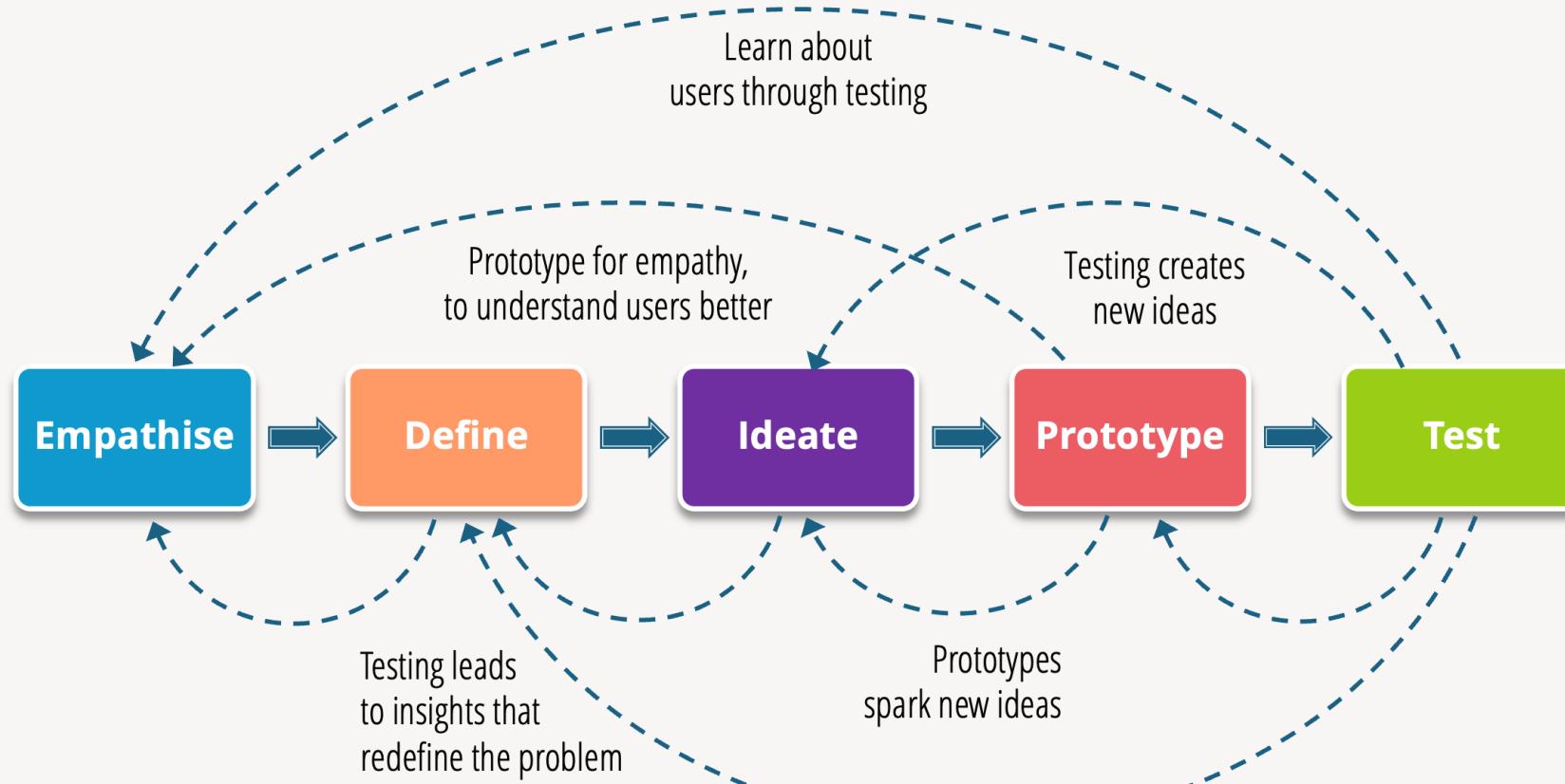
Design Process
Specific approaches

'Classic' User-Centred Design (UCD)

Understand context of use ⇒ **Specify user requirements** ⇒ **Design solutions** ⇒ **Evaluate against requirements**

Design Thinking

Design Thinking

Empathise: Explore the problem, engage and empathise with users, to understand their experiences and motivations.

Define: Identify the core problems from the perspective of the user.

Ideate: Brainstorm lots of ideas to address the problem(s).

Prototype: Produce inexpensive, scaled-down versions of the product.

Test: Run rigorous tests on final product (and possibly iterate)

See also https://www.nngroup.com/articles/design-thinking (6-step variant)
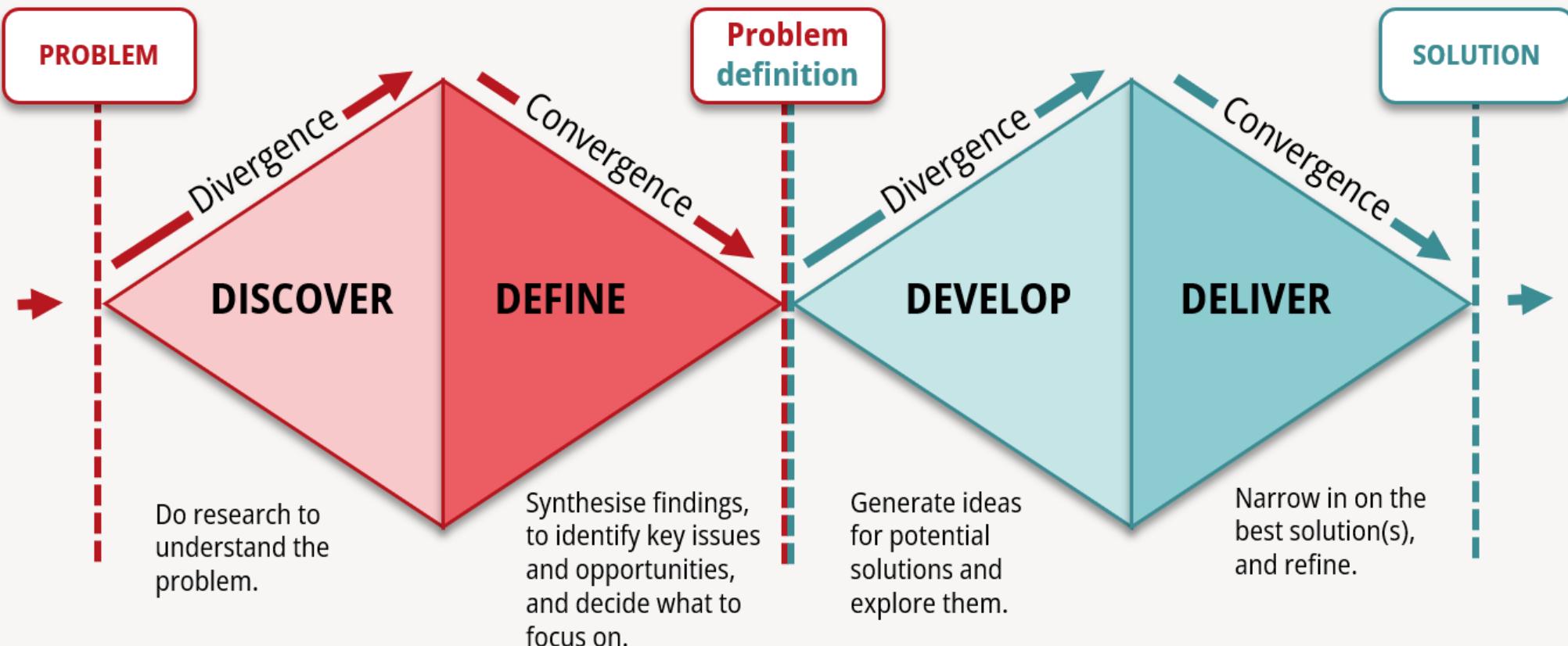
Design Thinking
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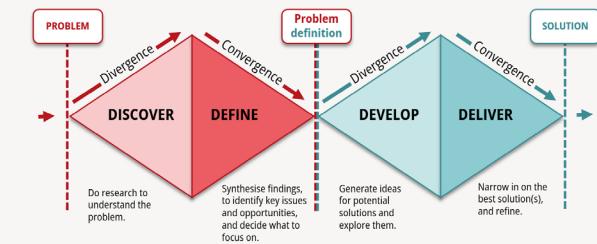
Double Diamond Framework (Design Council)

See also https://www.designcouncil.org.uk/our-resources/the-double-diamond
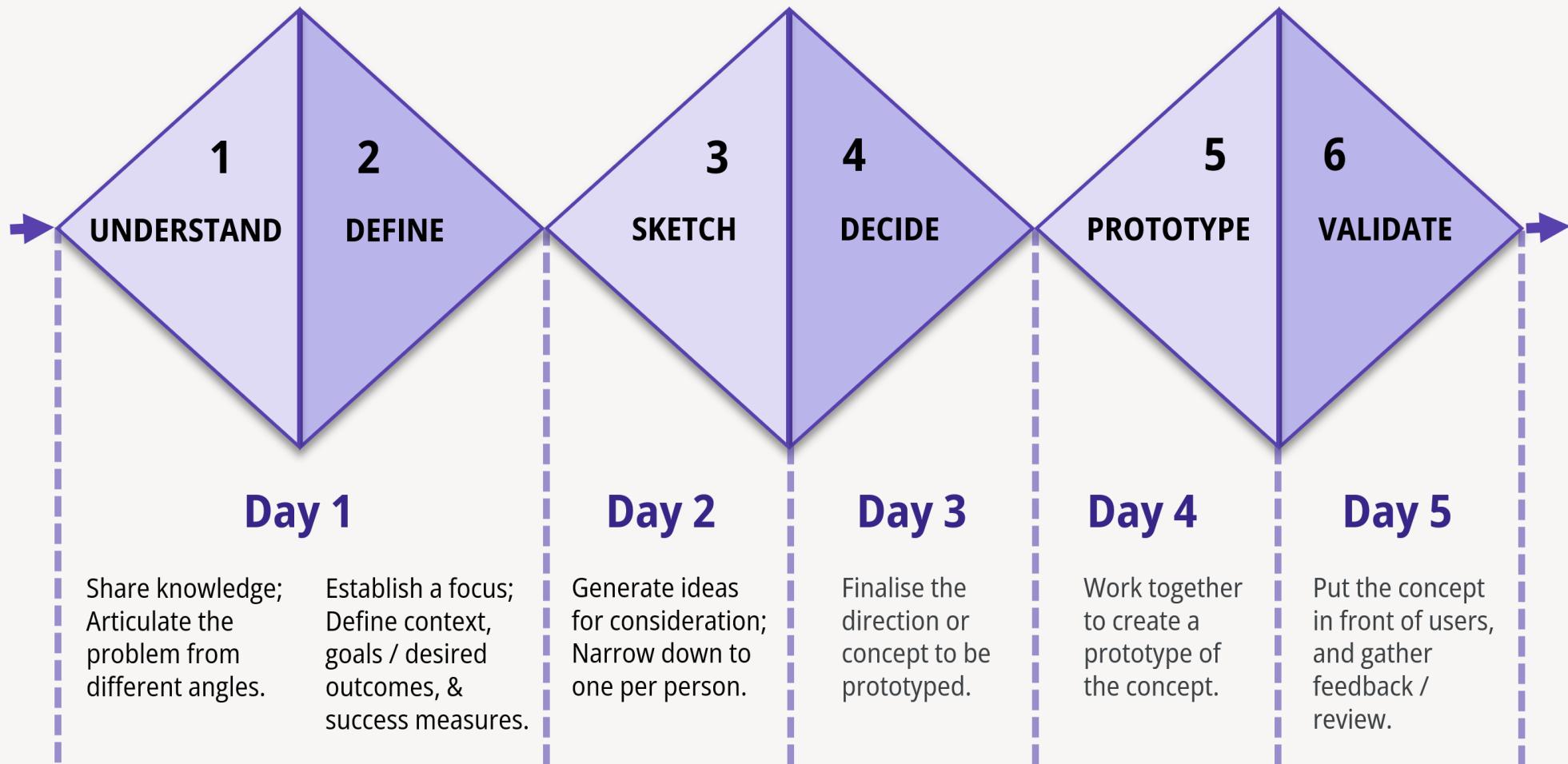
Double Diamond Framework

– Produced by the Design Council as a guide for designers and non-designers running innovation projects.

– Research and design are represented as two diamonds.

– The diamonds are split into 4 distinct stages:

  – Discover, Define, Develop, and Deliver.

– Each diamond involves Divergent and Convergent Thinking.

  – Divergent Thinking: Explore multiple angles and perspectives; Explore a problem space. e.g. Discovery through user research, or producing a large number of ideas, quickly and non-linearly.

  – Convergent Thinking: Scope down to specifics. Process insights and ideas from divergent thinking, to progress or focus on those with most potential.
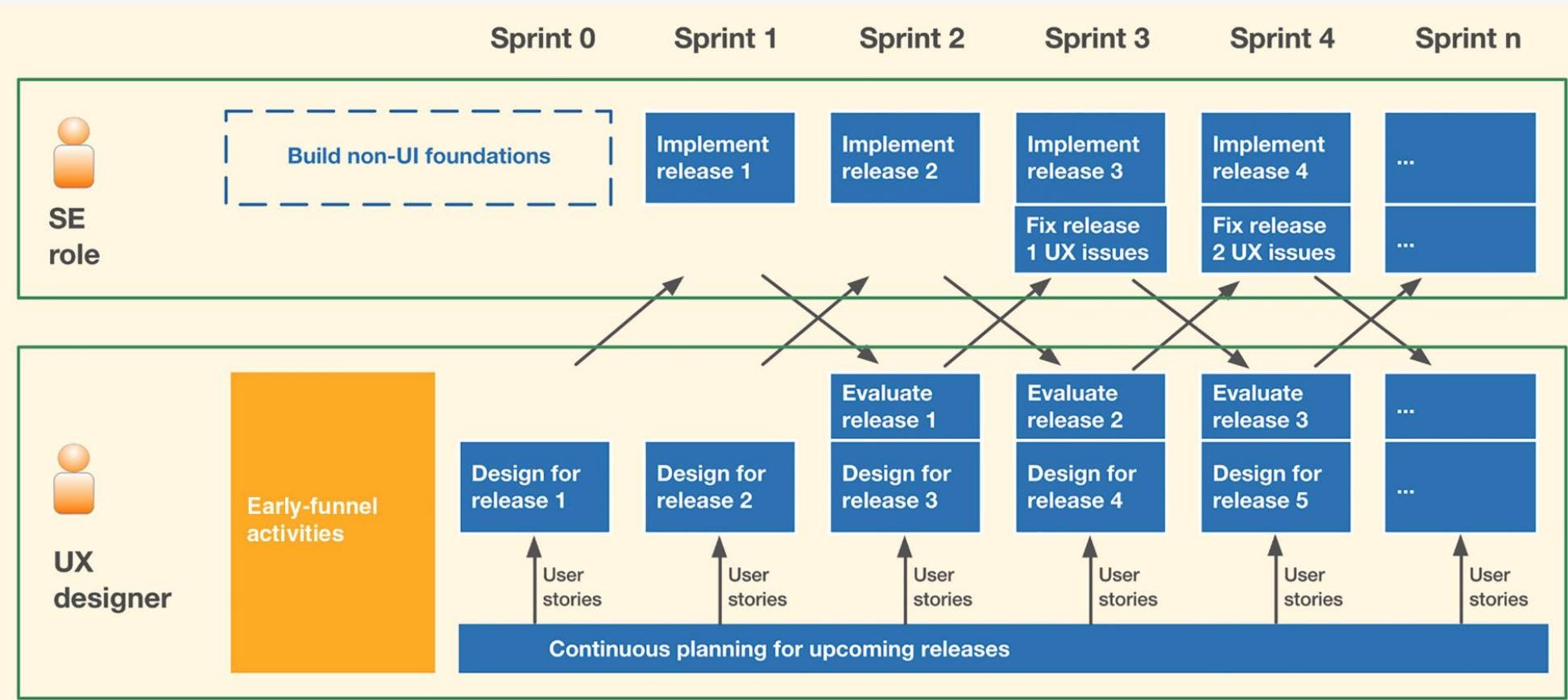
Design Sprint (Google Ventures)

| 1 UNDERSTAND | 2 DEFINE | 3 SKETCH | 4 DECIDE | 5 PROTOTYPE | 6 VALIDATE |

Day 1

Day 2   **Day 3**

Day 4   **Day 5**

Share knowledge; Articulate the problem from different angles.

Establish a focus; Define context, goals / desired outcomes, & success measures.

Generate ideas for consideration; Narrow down to one per person.

Finalise the direction or concept to be prototyped.

Work together to create a prototype of the concept.

Put the concept in front of users, and gather feedback / review.

More info: https://designsprintkit.withgoogle.com/methodology/overview

Agile UX

Image from: Hartson & Pyla (2025) The UX Book, Ch26

Lean UX cycle

Assumptions,
Hypotheses;
Outcomes,
Research;
Ideation;

Think

Make

Designing and
building MVPs;
Wireframes;
Prototyping.

Check

Validation;
Testing;
Measurement;
Feedback gathering.

Process you'll follow for the coursework

User Research	→	Conceptual Design	→	Detailed Design	→	Evaluation *(plan)*

- Based on existing user-centred design process, but simplified.
  - More linear than in real-world practice.
  - No time for iteration ☹
  - You'll *plan* evaluation but won't conduct it.
- Will expose you to main activities and key techniques.

Design as a **creative process**

"It is one thing to lay out a list of criteria for good design. It is quite another to do design well [...]

designing is a creative activity that cannot fully be reduced to standard steps, and that cannot even be comprehended as problem solving [...]
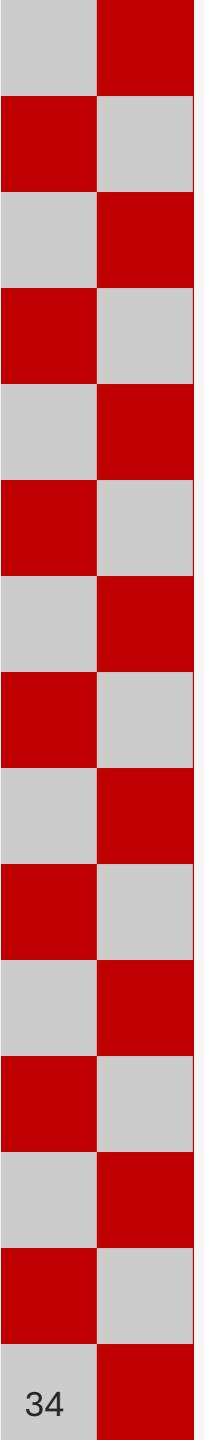
a designer lacks the comforting restraints of a well-organised engineering discipline, because design is inherently messy; it includes, but goes beyond, the ability to be creative in solving problems. It begins with creativity in finding problems—envisioning the needs that people have but do not recognise."

– Winograd (1996) Bringing Design to Software

http://hci.stanford.edu/publications/bds/bds-intro.html

Questions?

Understand the context of use
User Research

Find out about users: who they are, what they're trying to achieve, and where/when/how interaction takes place.

Good design means understanding

"Designers resist the temptation to jump immediately to a solution to the stated problem. Instead, they first spend time determining what the basic, fundamental (root) issue is that needs to be addressed. They don't try to search for a solution until they have determined the real problem, and even then, instead of solving that problem, they stop to consider a wide range of potential solutions. Only then will they finally converge upon their proposal.'"

– Don Norman
Rethinking Design Thinking

User Research: Focusing on users

In the early stages of interaction design, we focus on users:

- to find out who they are
- what they do
- where they do it
- what they want to achieve or be able to do (goals)
- what problems, frustrations, pain points they experience
- what opportunities there are to change things
- what they are able to do and not do (abilities)

Why involve users?

– Designers and developers (and managers) are not like the actual users of a system.

– There is no such thing as an "average user".

– Training will not save non-usable systems.

– Look-and-feel does not make an unusable system usable.

– Design principles are guidelines.

User Research: Be responsive

- Different design projects need to find out different things in user research.

- Sometimes the design brief might be rather open-ended:
  - E.g. design a digital technology to enhance the experience of visitors to a museum,
  - and it is important to look for design opportunities.

- In other situations, the design brief might be more constrained:
  - E.g. design a timetabling app for students
  - and the scope is more limited.

Collecting **User Data**

When and why do we collect data about users?

- Early in design (e.g. during user research)
    - to learn about users, their activities, needs, opportunities, contexts, etc.

- During evaluation of prototype designs and final products
    - to test concepts, gather feedback, to reveal usability problems, to investigate the UX and to measure usability.

Techniques for collecting user data

- Observations
    - Direct observations: in lab, in field, ethnography.
    - Indirect 'observations': user diaries, interaction logging, literature.
- Query techniques: interviews, questionnaires (surveys), focus groups.
- Usability testing with thinkaloud.
- Experimental techniques e.g. card sorting.
- ...

These are all data collection techniques, and there is lots of great advice about how to do data collection effectively in different disciplines.

Qualitative vs **Quant**itative

Qualitative

- Exploring things you don't yet know about, or don't want to measure.

- All **non-numeric** data.

- E.g. words, images, videos, sounds.

- Explain complex phenomena through verbal descriptions.

- Analysis involves human coding; not clear cut; fewer techniques; no single accepted approach.

Quantitative

- Measuring things you know you want to measure.

- All **numeric** data or data based on numbers.

- E.g. discrete numbers, rankings, categories.

- Test hypotheses with statistical tests using numerical values.

- Analysis draws upon established maths and stats procedures.

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Data collection is not neutral

- It is planned and conducted by people (like us) who are biased.

- This bias influences the data that is collected and how it is analysed.

- So, how you "measure" what you are studying influences what you find.

Minimising bias

There are lots of different steps you can take to help minimise bias, including some technique-specific ones—what you need to do will depend on which data collection technique you're using.

But for starters...

- Be aware of your bias—start by acknowledging your influence, your potential to affect the data and thus the results.

- Don't be the only researcher—work with others.
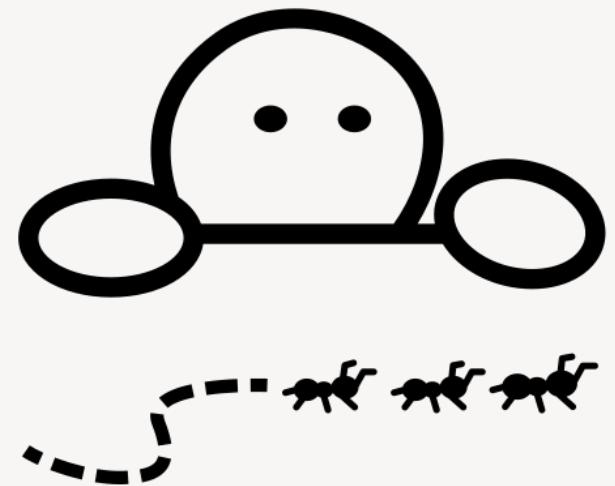
6 **considerations** for all data collection

1. Setting goals.
   – Decide what you want to discover and how to analyse data once collected.

2. Identifying participants.
   – Decide from whom to gather data and how many of them are needed.

3. Relationship with participants.
   – Clear and professional; Informed consent when appropriate.

4. Ethical considerations
   – Decide how you will collect and store data ethically, ensuring privacy and security.

5. Triangulation.
   – Look at data from more than one perspective; Collect more than one kind of data.

6. Pilot studies.
   – Conduct a small trial run of the study to identify potential problems

Adapted from Sharp, Rogers & Preece (2023) *Interaction Design,* Ch 8, pp274–281

Questions?

Collecting User Data:
Observation

Direct observation

– Observe and record people carrying out an activity.

– Focuses on user actions and changes of state in the observable world.

– Really valuable technique for finding out what people really do rather than what they *say* they do, especially early in the design process.

– Great for yielding detailed information and when tasks are difficult to verbalise.

– Supplement with other techniques such as interviews—what is the user thinking?

Direct observation: Where?

- In the field (naturalistic observation)
    - A natural environment
    - Sometimes can be quick and dirty

- In the lab
    - A controlled environment

Naturalistic observation

- Observing people in real-world settings.

- Researcher does not initiate or create the activity.

- Researcher does not manipulate the setting.

- Need to think carefully about sampling:

  - when, what, where, who to observe?

Tom Kelley: Field Observations with Fresh Eyes

https://www.youtube.com/watch?v=XrpAveg7ZIg&t=3s

Contextual Inquiry

– Takes place in the field.

– One-on-one interview with users, coupled with observing and collecting artefacts while they are doing some kind of activity that you want to support with your product or system.

– Carefully study a few individuals to understand practice across all users.

How to observe: basics

- Be clear about the purpose of your observation.

- Select a framework to guide data collection in the field.

- Decide how to record data (notes, photos, sketches, video).

- Think about how to gain access and ethics.

- Capture the details of what you are observing.

- Highlight and separate personal opinion from what happens.

- Consider working as a team; confirm observations with another team member.

- Afterwards, check your notes and write them up the same day.

Some observation data recording methods

Method	Advantages	Disadvantages
Note taking	– Not intrusive. – Flexible	– Difficult to listen/observe and write concurrently, – Biases creep in. – Hand writing is slow and can be difficult to decipher.
Audio recording	– Less intrusive than video – Easier to pay attention than note taking. – Evocative	– Transcribing is laborious (but you don't always need to transcribe it all). – Equipment can fail. – Background interference. – People talking over each other.
Photography	– Can supplement other techniques	– Not that useful by itself. – Needs permission.
Video	– Visual and audio data. – Attention-light – Rich detail for later review	– Intrusive. – Same as audio recording

Structured **frameworks** for direct observation

Basic:

– The person. Who?

– The place. Where?

– The thing. What?

Goetz and LeCompte framework (1984):

– Who is present?

– What is their role?

– What is happening?

– When does the activity occur?

– Where is it happening?

– Why is it happening?

– How is the activity organized?

Structured **frameworks** for direct observation

Robson framework (2011) :

– Space: What is the physical layout of the space?

– Actors: Who is present and what are their roles?

– Objects: What physical objects are present?

– Acts: What are specific individual actions?

– Events: Is what you observe part of a special event?

– Time: What is the sequence of events?

– Goals: What are the actors trying to accomplish?

– Feelings: what is the mood of the group?

Direct observation: strengths

- Yields information about activities that have observable behaviour or stages.

- Provides detailed, in-depth information.

- Good for gathering information about activities that involve many individual steps which may be omitted in a verbal description.

- Good for gathering information about activities that are difficult to verbalise (e.g. skilled behaviour).

- Good for information about unknown and unexpected activities.

- Useful for corroborating information gathered using other techniques.

Direct observation: drawbacks

- – Time-consuming.

- – Not so useful when the users' activities are cognitive rather than observable.

- – Not so useful for events that happen only occasionally.

- – Often not sufficient on its own.

- – Involves a greater degree of inference on the part of the researcher— potential for bias.

Observation and user-centred system design

"To design the best UX,

   pay attention to what users do, not what they say.

Self-reported claims are unreliable, as are user speculations about future behaviour. Users do not know what they want."

- *"Watch what people actually do.*
- *Do not believe what people say they do.*
- *Definitely don't believe what people predict they may do in the future."*

Jakob Nielsen, <u>August 2001</u>

Don't listen to users?

NN/g

Don't Listen to Customers

https://www.youtube.com/watch?v=OARVjXqBI2A

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Indirect observations

- Sometimes it's not possible to collect data by direct observation (e.g. it's too obtrusive).

- Or observers (researchers) can't be present for the whole duration of the study.

- Indirect observation lets you collect data in this case.

- It gives you a snapshot of someone's behaviour and/or the environment in which it takes place.

- Examples include diaries, interaction logs, cultural probes.

Indirect observations

- Can use multimedia e.g. photo, sound + Whatsapp etc (be mindful of privacy issues).

- You can prompt users at random or particular times to record something about their context, feelings, actions etc, encouraging immediate data capture.

- Also, send multiple choice questions to a mobile phone which users can answer through the phone. Then use these as the basis for an interview later on.

Indirect observations: Diary studies

– A research method used to collect data about user behaviours, activities, and experience over time

– Takes place in the participant's context

– Participants self-report longitudinally, i.e. over a period of time.

– They are usually asked to log specific information about activities being studied

  – Researcher provides a framework of what to log and how.

– May log data via email, text message, chat applications, online questionnaires.

– Data may be text, photographs, video, audio…

Indirect observations: Diary studies

Strengths

- Useful when participants are scattered and unreachable in person.

- Don't take up much researcher time to collect data.

- Don't require special equipment.

- Suitable for long-term studies.

Weaknesses

- Rely on participants being reliable and remembering to self-report—like diary keeping in general, people start well, but lose enthusiasm, forget…

- May need incentives and reminders.

- Longer term studies are less likely to be successful.

Questions?

Session 2 **Summary**

- User-centred system design often takes place within a structured process
  - There are several different processes & frameworks available, but there is commonality to many of them.

- Data collection techniques are the basis of user research and evaluation.
  - They provide valuable real-world information to inform design.
  - There is a wide variety of techniques. Each has strengths and weaknesses, therefore they may be best used in combination.
  - One useful data collection technique is observation, which may be direct or indirect, and may take place in a lab or a more naturalistic setting ('in the field').