Design

Dr Charles Martin

Announcements

- **Class reps!** Needed now! (need at least 4 in total, ~2 UG and ~2 PG)
  - If you would like to nominate as a class rep, please make a private post on the class forum.
- **Tutorial 1**: Making, this week make a zine!
- **Big class!**
  - keep showing up,
  - keep asking questions,
  - stay constructive and positive (especially with your tutors!)

- Design Processes
- Discovering Requirements
- Ideation

The Interaction Design Process
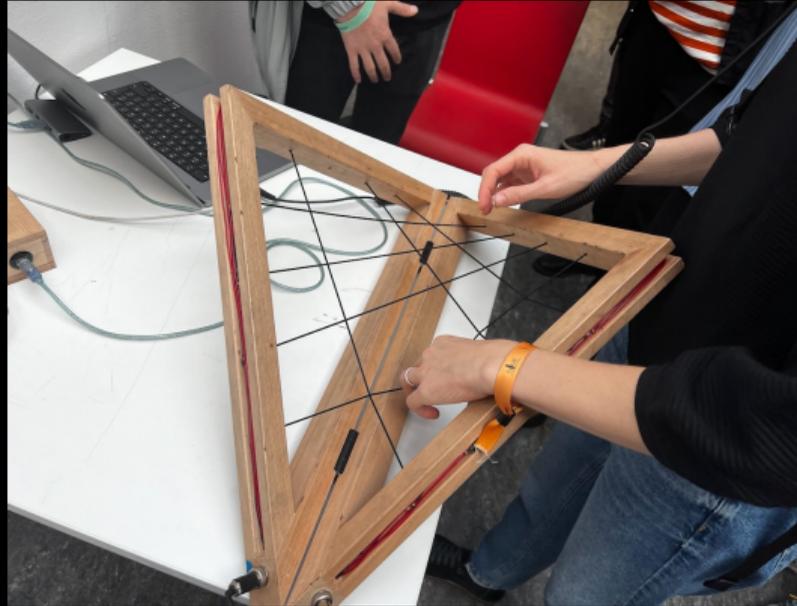
Figure 1: Designing an interactive system.

Interaction design involves creating systems that work for people.

- discovering requirements
- defining needs
- ideating possible solutions
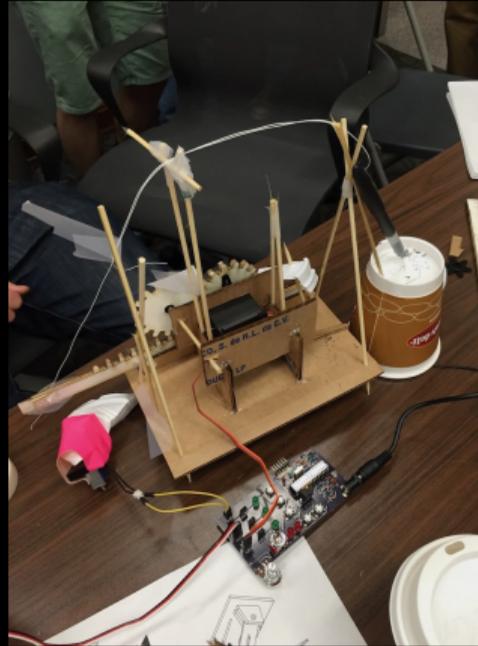- producing prototypes
- evaluating systems

Figure 2: Prototyping some solutions (to what?)
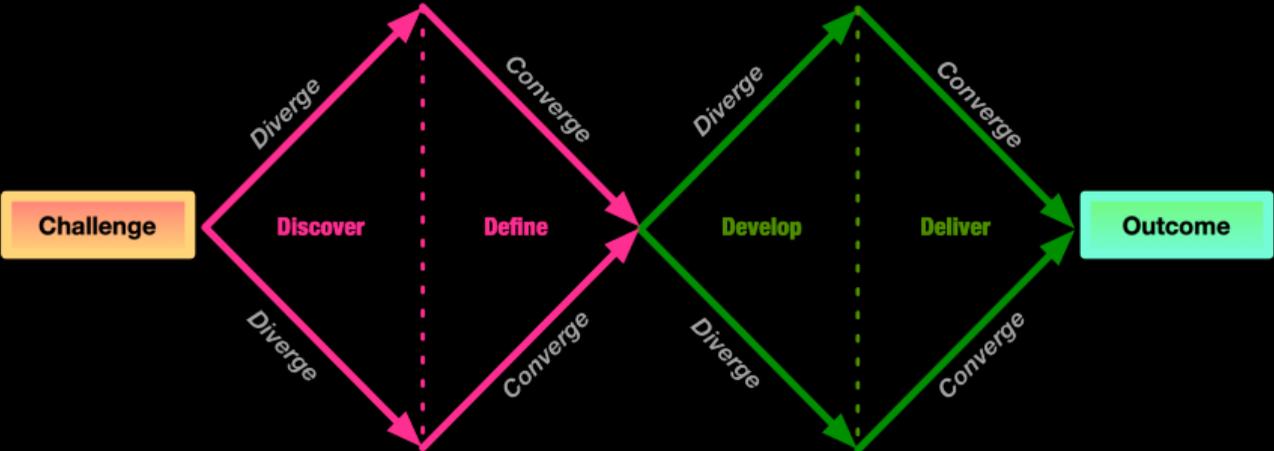
Double Diamond Model

Figure 3: The double diamond model of design (adapted from Design Council, 2025)

Design Stages

1. *Discover*: understand the problem and the people affected
2. *Define*: define the problem clearly so that it can be addressed
3. *Develop*: create ideas, prototypes, sketches, etc, that might address the problem
4. *Deliver*: test potential solutions to find promising directions, and iterate
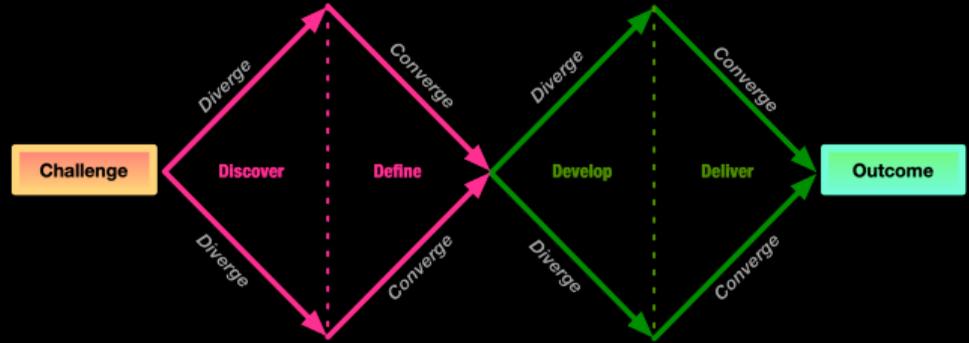

Figure 4: The double diamond model of design (adapted from Design Council, 2025)

Who is involved in design?

Usually a wide range of people are involved or affected by a design process. We call them *stakeholders*. Stakeholders includes not just the potential users of a system, but others who are not.

For example:

- **users**
- customers
- developers
- researchers
- managers / product owners
- government bodies
- non-government organisations (NGOs)

Degrees of Involvement

- *Personas*: limited/no real users, "fake" user personas to help frame design
- *Face-to-face:* small groups or individuals in information-gathering or evaluation settings[1]
- *Crowd-sourced:* large surveys, crowd-sourcing, community engagement
- *Participatory:* users central to planning, ideating, prototyping (co-design, co-creation)

Figure 5: A user participating in face-to-face evaluation at ANU.

[1] This one is pretty normal in academic HCI research.

User-centred design principles

From *Designing for Usability: Key Principles and What Designers Think* (Gould & Lewis, 1985)

- *Early focus on users and tasks*: who are the users? what are they like? what are the tasks?

- *Empirical measurement*: users should **use** simulations and prototypes to carry out work. observe, record, and analyse.

- *Iterative design*: when problems are found in testing, they must be fixed. design, test, measure, repeat.

Expanding from "users" to "people" with more details (Rogers et al., 2023)
- tasks and goals drive development
- behaviour and context of use are studied
- people's characteristics included
- stakeholders are consulted throughout development
- design decisions consider context of use, people's activities, and their environment

Figure 6: Photo by Timon Studler on Unsplash

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Find someone near you, ask who they are and discuss these questions:

1. Who is the most important stakeholder? Users? Managers? People? And why?
2. How would you get information from this stakeholder?
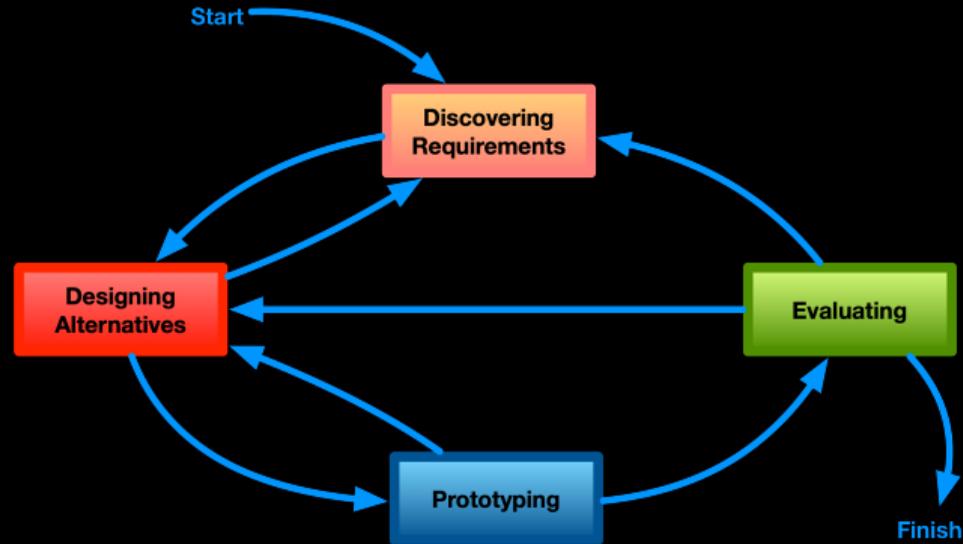
Chat for 3 minutes and we'll hear a few responses.

Figure 7: An interaction design lifecycle (adapted from Rogers et al., 2023)

Design and HCI *related* but *not the same*:

- *Discover* and *Define* stages are highly related to "uncovers the needs of different kinds of computer users" (from week 1)
- *Develop* and *Deliver* are more related to "proposes computer systems (incl. software) that can be better used by humans"

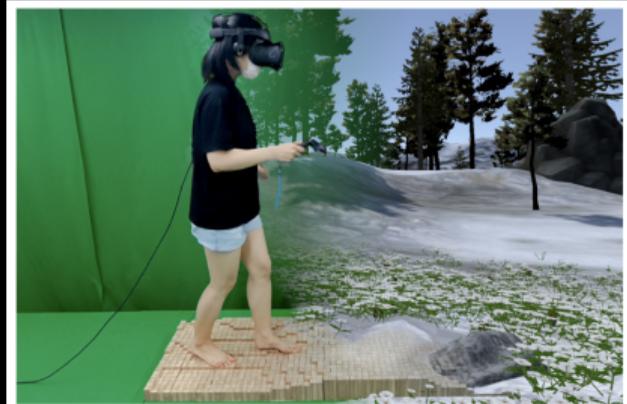Some HCI research is technical or speculative, inventing technologies that are *not yet common or popular*

Figure 1: Elevate is a walkable high-resolution and large-scale pin-array display that can generate a variety of physical terrains for virtual reality. Here, we demonstrate our device generating the terrain of a landscape and a user walking on it.

Figure 8: An uncommon technology: a VR walkable interface (Je et al., 2021)

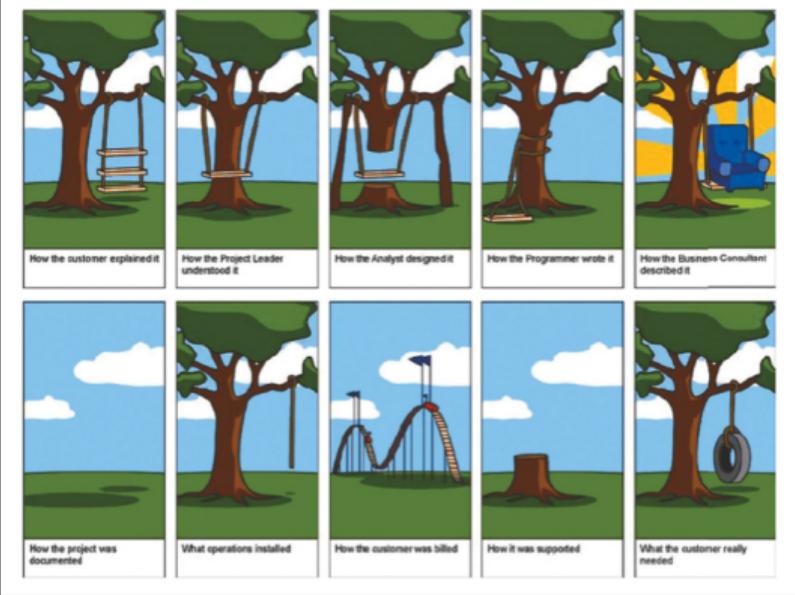# Discovering Requirements

Discovering Requirements

Figure 9: Image: (Rogers et al., 2023, p. s11.2)

What is a requirement?

"A statement about an intended product that specifies what it is expected to do and how it will perform" (Rogers et al., 2023, p. 387)

- Discovered through targeted activities or tangentially throughout the design process
- Evolve during design
- Different levels of abstraction and detail
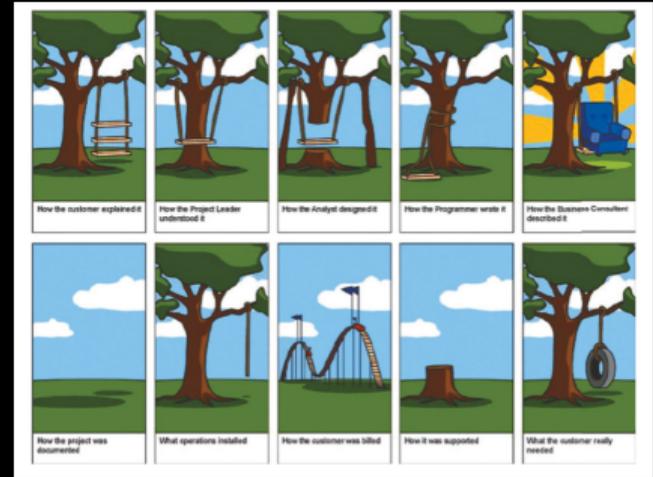- Needed to avoid misunderstanding and miscommunication

Figure 10: Image: (Rogers et al., 2023, p. s11.2)

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Defining a requirement

- Requirements can be captured casually, e.g., "app needs to be fast"
- Can be useful to have more details, precision about the requirements, who needs them, and why.
- Formal methods exist for capturing requirements in complex projects
- Epics, user stories in Agile methodologies
- Volere "Atomic Requirements Shell" (see figure)
- *"Description, Rationale, Source, Fit criterion, Customer satisfaction..."*

Figure 11: (Rogers et al., 2023, p. s11.3)

User stories

Communicates a requirements between stakeholders. Have the generic form:

```
As a <role>, I want <behaviour> so that I can <benefit>
```

e.g.,:

- "As a student, I want to choose a tutorial time that doesn't clash with other activities, so that I can attend all my classes in a week."
- "As a lecturer, I want to adjust the number of students in tutorials, so that I can provide a good learning experience."

A user story is a simple way to connect a requirement to a particular type of user in a particular situation. In agile, user stories can be grouped into larger arrangements called "epics" and even bigger groups called "initiatives".

Types of requirements

- *Functional requirements*: What the product will do

- *Data requirements*: type, properties of data involved in an interactive system

- *Environmental requirements*: context of use, what are the circumstances in which interaction happens?
  - *Phsyical environment*: noise, lighting, movement, etc
  - *Social environment*: sharing data, collaboration
  - *Support environment*: assistance, training or help available or integrated
  - *Technical environment*: technologies available for the system (phone, watch, laptop, supercomputer?) or technical limitations

- *User characteristics*: abilities, skills, attributes of users

- *Usability and user experience goals*: what goals (see last week) prioritised

Activity: Requirements

Let's think of some design requirements for one of the following products:

- 🗣️ A voice-activated smart home assistant that helps individuals control lighting and temperature.

- 📲 A phone-based ordering system for a restaurant.

- 🤖 A humanoid robot for assisting computer science students in computer labs.

Spend 2-3 minutes developing one requirement and then let's hear a few.
🎤🎤🎤

Data Gathering

There are lots of ways to discover requirements, some examples are below:

- **Observation and Ethnography**: observing people in real situations
- **Diaries and interviews**: (aka, asking), talk to people about their requirements, or ask them to record information
- **Focus Group, User Study**: talking with one or multiple people
- **Questionnaires**: asking people to answer specific questions
- **Cultural Probes**: sending arts & crafts materials to users to find out about their life/needs (Gaver et al., 1999)
- **Contextual Inquiry**: researcher immersed in context of use, visits the participant and interviews them in context (Beyer & Holtzblatt, 1997)

In this course we focus on *interviews* and *user studies* as methods for data gathering. Our focus is on the evaluation stage of design, but these methods can work at the discovery stage as well.

Personas and Scenarios

More detailed than a user story, includes:

- the person, their characteristics, motivations, etc (**persona**)
- their story, when, where, how, as a sequence of events (**scenario**)
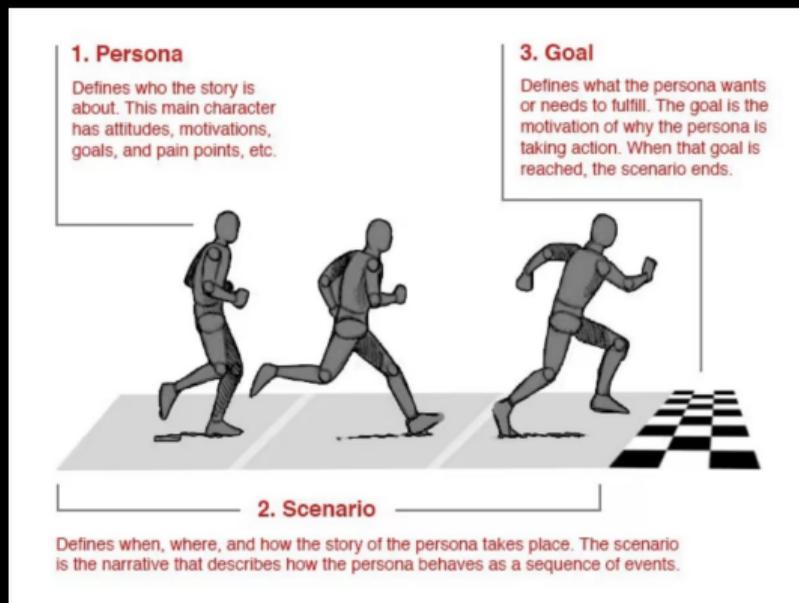- the goal, needs to fulfil, reason to interact with a system (**goal**)

Figure 12: A persona, a scenario, and a goal (© Smashing Magazine)

Personas

- Rich descriptions of typical users
- Don't describe specific people but realistic
- Describe goals, behaviours, activities, environment
- How would this person use this product?

Examples on Usability.gov

Figure 13: Image source
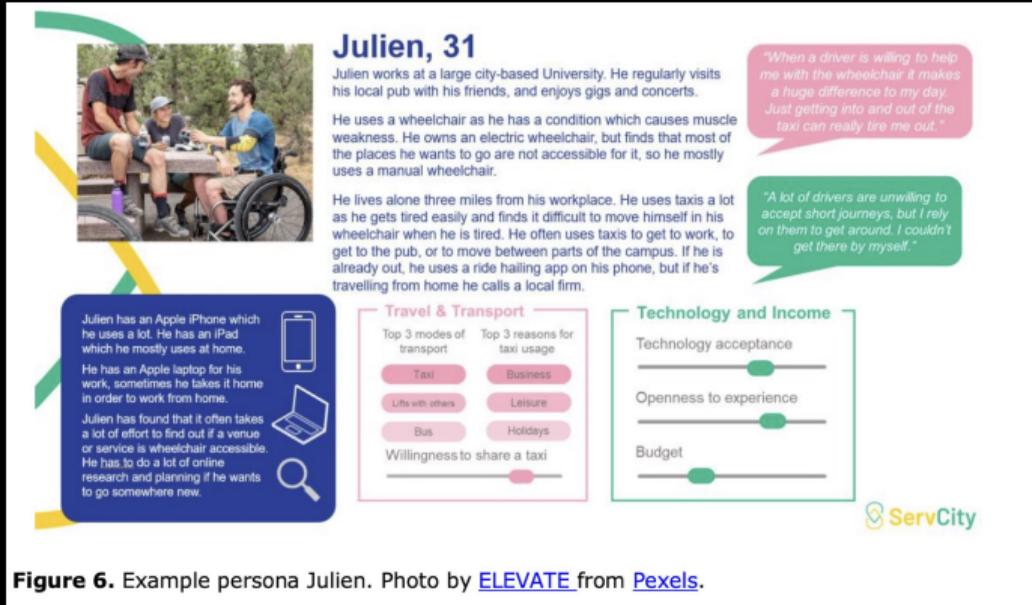
Personas: example, Julien the university worker

Figure 6. Example persona Julien. Photo by ELEVATE from Pexels.

Figure 14: Example of a persona from research into autonomous taxi services (Hallewell et al., 2022)

Personas: examples

Persona:	USDA Senior Manager Gatekeeper
Photo:	
Fictional name:	Matthew Johnson
Job title/ major responsibilities:	Program Staff Director, USDA
Demographics:	• 51 years old • Married • Father of three children • Grandfather of one child • Has a Ph.D. in Agricultural Economics.

Goals and tasks:	He is focused, goal-oriented within a strong leadership role. One of his concerns is maintaining quality across all output of programs. Spends his work time: • Requesting and reviewing research reports, • preparing memos and briefs for agency heads, and • supervising staff efforts in food safety and inspection.
Environment:	He is comfortable using a computer and refers to himself as an intermediate Internet user. He is connected via a T1 connection at work and dial-up at home. He uses email extensively and uses the web about 1.5 hours during his work day.
Quote:	"Can you get me that staff analysis by Tuesday?"

Scenarios

- A narrative describing human activities or tasks.
- Allows exploration and discussion of contexts, needs, and requirements.
- Doesn't necessarily describe the software/technology used
- Core: goal, steps to reach the goal, who the user is (persona)
- Extra: other details that might be useful.

- "Nia is a sound designer working in the automotive industry."
- "When tasked with creating sound signals for automotive applications, Nia needs to consider the cognitive flow of users, particularly how different chords interact and influence user attention. To support this logic-making process, Nia uses an AI-powered tool that helps her design a storyboard, select suitable chords, and assign them to the relevant phases."
- "After establishing the storyboard, Nia transitions to another MIDI software via the tool's connected API for sound creation[26] and refinement."

Scenario Mapping: Design Ideation Using Personas

Scenario mapping is a group activity for generating ideas for a product or system using personas and a specific scenario. (PS: you'll do a similar activity in next week's tutorial).

- choose a scenario and persona,
- split a scenario up into steps (use sticky notes)
- choose categories for ideas, e.g.: design ideas, questions, problems, friction points, comments
- brainstorm ideas under specific categories

A scenario map will look like this following ideation. It's useful to post the persona up on the wall next to the map to remind all participants what you know about this customer segment.
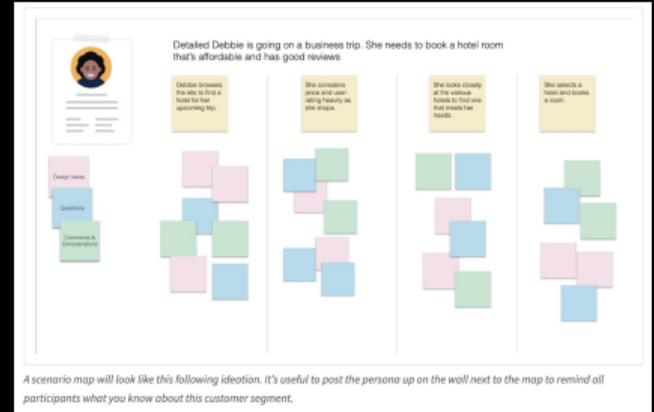
Figure 15: Scenario mapping example. Source: nngroup

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- Let's scenario map.
- Have a look at the following miro board and add a post it. (how many students are here? can we break miro?)
- https: //miro.com/app/board/uXjVJa-m2 gU=/?share_link_id=689171092569

Figure 16: The miro board

Ideation

Figure 17: Doing some circuit ideation at NIME2024.

We've already done some ideation today! But what do I mean by that?
Ideation is the process of **generating a broad set of ideas on a given topic**, *with no attempt to judge or evaluate them. (Aurora Harley, nngroup)*

Fundamentals of Ideation

- ideas are *not* evaluated
- ideas are recorded and documented
- collaboration leads to diverse ideas

Generating **many** ideas: high probability that *at least one* is close to ideal.

Ideation for Everyday Design Challenges, nngroup
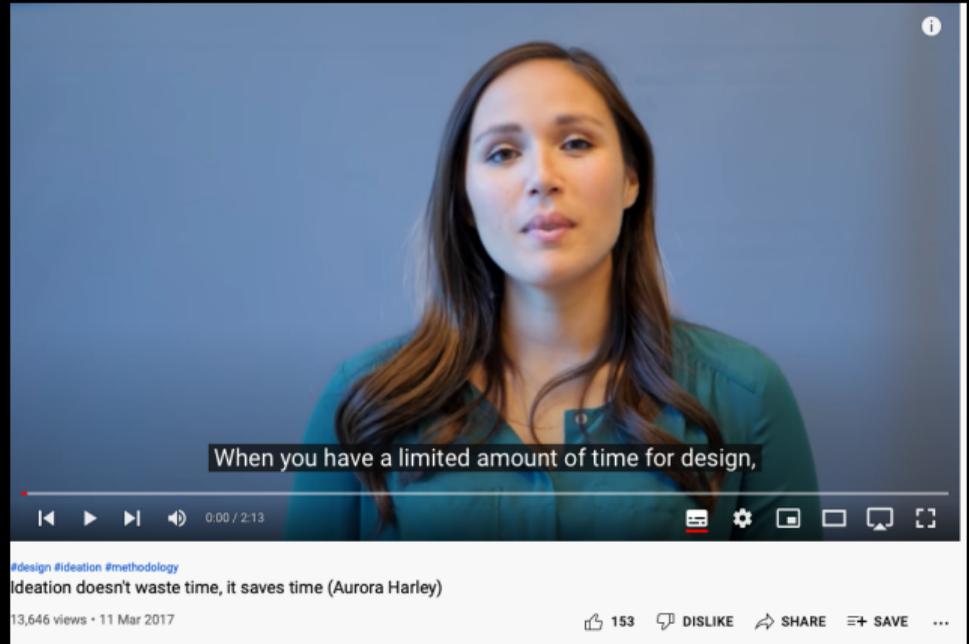
Figure 18: Ideation doesn't waste time, it saves time (Aurora Harley)

Choosing a Technique

1. Brainstorm
2. Braindump
3. Brainwrite
4. Brainwalk
5. Worst possible idea
6. Challenge Assumptions
7. Mindmap
8. Sketch
9. Storyboard
10. Bodystorm
11. Analogies
12. Provocation
13. SCAMPER
14. Movement
15. Gamestorming
16. Cheatstorm
17. Crowdstorm
18. Co-creation
19. Prototype
20. Creative pause
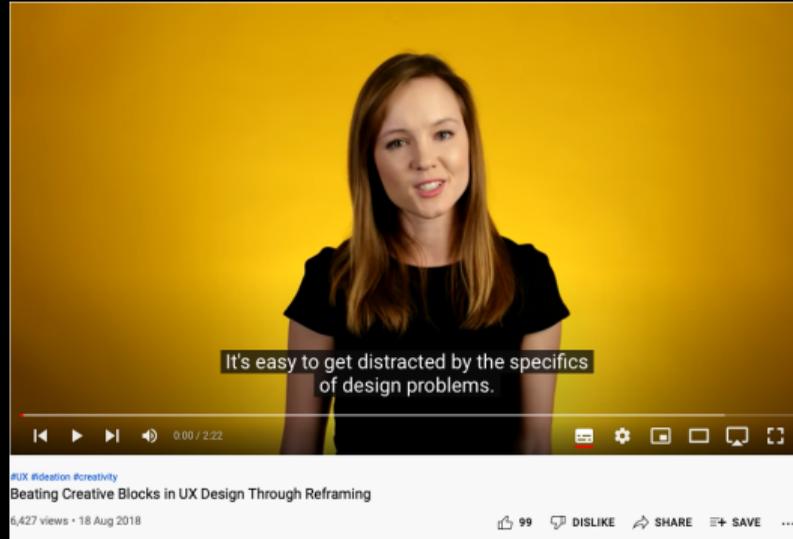
Figure 19: Beating Creative Blocks in UX Design Through Reframing

1. Brainstorm / 2. Braindump

- **Brainstorm:** leverage the synergy of the group
- new ideas by building on others' ideas
- blend ideas to create good ideas
- discuss ideas without fear of criticism
- **Braindump:** similar, but individual
- write ideas on post-its, then share ideas with group

3. Brainwrite / 4. Brainwalk

- **Brainwrite:** write ideas individually
- then pass ideas to someone else
- elaborate on the first person's ideas
- then pass to the next person etc
- after 15 minutes discuss
- **Brainwalk:** walk around "ideation stations"

Figure 20: HCI tutorial tables in 2025

5. Worst Possible Idea

- Flip brainstorming
- Come up with the worst ideas you can think of
- Playful, fun, adventurous, effective
- Know that ideas won't be scrutinised for being wrong

Figure 21: Photo by Andre Hunter on Unsplash

(let's try it!)

What's the worst idea for:
A way to help students balance work and study.

Think for a minute or two and then we'll hear some answers. ⭐ 🎙️ 🗣️

Prepare for this question: "Why is that bad?"

Alan:	Can someone think of a really bad idea?
	(a pause followed by encouragement: " it can be anything as silly as you like")
Lecturer:	Inflatable dart board.
Alan:	Ok, what's bad about it?
A student:	It's full of air.
Alan:	A car tyre is full of air, is that bad?
A student:	No.
Alan:	Ok, so something else bad? (followed by long pause …)
Alan:	Ok, what's good about it?
A student:	It floats.
Another:	You can deflate it and pack it away.
Alan;	Ok, so let's think again what's bad (eventually, with more encouragement …)
A student:	The darts would burst it.
Alan:	Can we make it good… but still must be inflatable
Another:	Those sticky ends (discussion here … velcro, suckers, etc.)

Figure 22: "Why bad ideas are a good idea" (Dix et al., 2006) (PDF link)

2.2 Analysis: what, why and when not

BadIdeas comes with a collection of questions to examine the nature of the ideas and use them to inform understandin
This turns the divergent nature of the ideas themselves in a more convergent and analytic direction. Table 1 shows th
initial set of what and why questions.

THE BAD	THE GOOD
1 what is bad about this idea?	1 what is good about this idea?
2 why is this a bad thing?	2 why is this a good thing?
3 anything sharing this feature that is not bad?	3 anything sharing this feature that is not good?
4 if so what is the difference?	4 if so what is the difference?
5 is there a different context where this would be good?	5 is there a different context where this would be bad?

Table 1. Prompt questions for BadIdeas

Figure 23: What, why and when not to. (Dix et al., 2006) (PDF link)

6. Challenge Assumptions

- take a step back from the challenge
- what assumptions were made?
- what were the users, context, activities
- are these decisions accurate and important?
- could re-boot a struggling ideation session

7. Mindmap

- graphical technique
- build a web of relationships
- write a problem statement in the middle
- write solutions and ideas on the same page
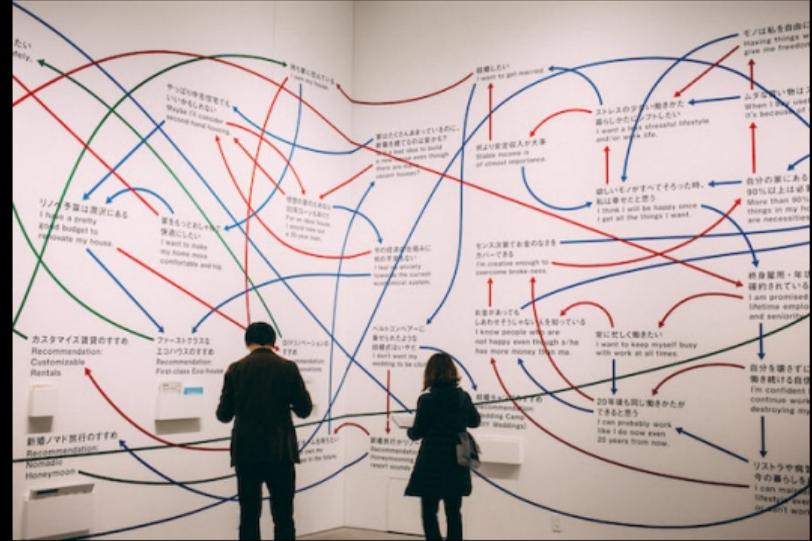- connect solutions and ideas with lines

Figure 24: Photo by charlesdeluvio

8. Sketch / Sketchstorm

- useful to express ideas as diagrams or sketches
- visuals can provoke further ideas
- sketches should be simple and rough
- enough detail to convey meaning
- but not supposed to be amazing
- think openly and creatively about ideas
- quantity over quality
- easier to discuss, critique, share ideas

Figure 25: Doing some circuit ideation at NIME2024.

9. Storyboard

- stories for communication, learning, exploring
- storyboard is a visual story
- can add details, show time progression
- understand people's lives and draw out stories
- research: scenarios with pictures and user quotes
- ideation: play with ideas, develop storyline, actors, plot
- tension, surprises, emotions, struggle, resolution

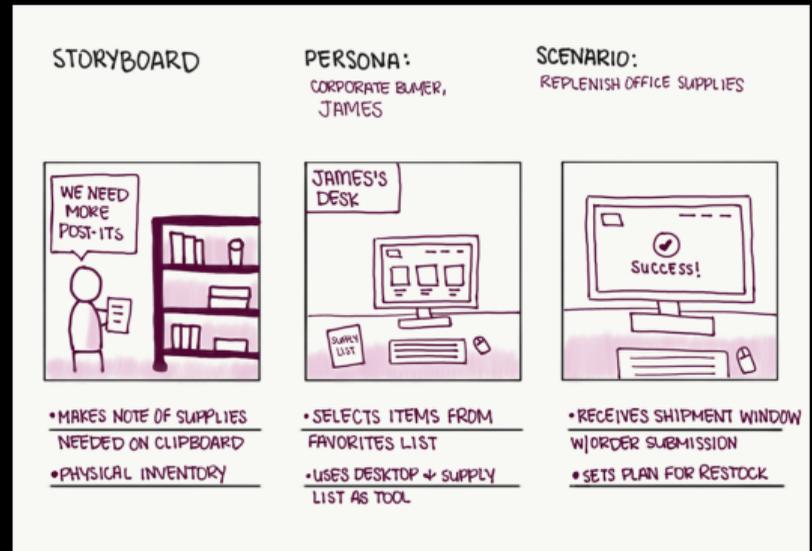**Figure 26:** Image source: Storyboards Help Visualise UX Ideas (NNgroup)

10. Bodystorm

- physically acting out processes, scenarios
- express solutions to ideas through physical activity
- enact problem scenarios
- get physically involved in theorising
- combines empathy, brainstorming, prototyping
- increased energy and movement
- could include a space with props

Figure 27: Bodystorming some art in 2008.

- **Analogies:** comparison between two things
- Powerful tool for communication and sparking ideas
- Express complex ideas clearly
- **Provocation:** lateral thinking technique
- challenges the status quo, explore new realities
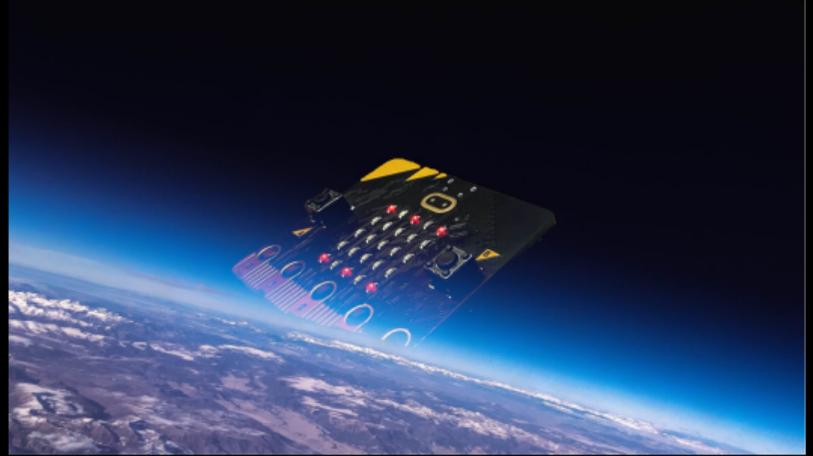
Figure 28: What if the microbit was really REALLY big.

13. SCAMPER

Substitute, Combine, Adapt, Modify, Put to another use, Eliminate, Reverse (SCAMPER)

- Lateral ideation technique, utilises action verbs as stimuli
- Asks seven kinds of questions to generate ideas
- Take a product/service, work through the list and ask questions, are any of the answers viable?
- Scamper: How to Use the Best Ideation Methods (Interaction Design Foundation)

14. Movement

- Help if blocked in idea generation
- Follows on from lateral thinking techniques
- Might not result in concrete/usable ideas
- Create a range of thinking stimuli
- Making use of stimuli requires movement
- Movement is a process to turn provocation into usable ideas
- https://thoughtegg.com/provocati ons-creative-technique/

Figure 29: Photo by Asher Legg on Unsplash

15. Gamestorming

Gamified ideation aimed to increase engagement, energy, collaboration (gamified versions of other methods), e.g.,

- Fishbowl: inner (discussion) and outer (observation) circles with different roles
- Anti-Problem: flips the problem to consider the opposite
- Cover Story: what future state would get on a magazine cover?
- More here: https://gamestorming.com/

16. Cheatstorm

- Re-using ideas from previous brainstorming sessions
- Existing ideas leveraged as input or stimulus
- Promotes "cognitive sustainability through reuse"
- https://www.interaction-design.org/literature/topics/cheatstorming

17. Crowdstorm

- Involves target audience generates/approves ideas
- Can be helpful to involve users in ideation process
- Methods include social media, customer surveys, focus groups, co-design workshops
- Can provide insights on which ideas to choose
- Can find ideas that the team might have missed

18. Co-Creation Workshops

- Combines different methods over hours, days, or weeks
- Can be condensed into full day workshops
- Full day workshops usually follow a sequence like:
- Introductions and Icebreakers, Vision and Values Exercises, Empathy Exercises, Insight Mining, Challenge Framing, Ideation, Prototyping

Figure 30: Co-creation in 2010.

19. Prototype

- Prototyping can be an ideation technique
- Creating a physical object requires decisions to be made
- Encourages generation of new ideas
- Explore alternative solutions
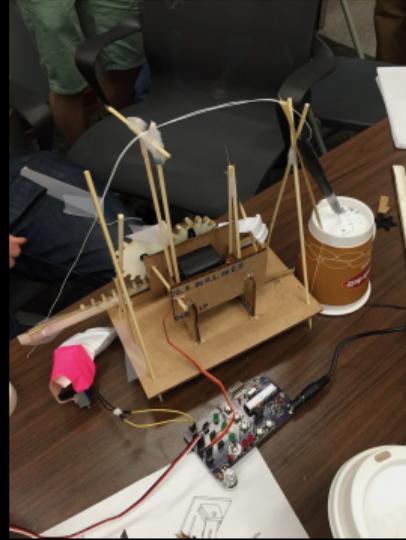- Building to think, thinking by doing

Figure 31: Prototyping weird stuff at NIME2015

20. Creative Pause

- ideation can get stuck.
- block of ideas, hit a wall,
- anchored to an early idea
- caught up in negative thoughts
- **creative pause:** step back, reflect, extract ourselves
- proactive thinking, not reactive (can be negative)

Figure 32: Touch grass and look at the sky.

Online Ideation Tools

- Miro: *https://miro.com/online-brainstorm-tool/*
- Mural: *https://www.mural.co/*
- Collections and Templates:
- *https://www.sessionlab.com/library/idea_generation*
- *https://uxdesign.cc/the-master-online-ideation-toolbox-part-1-2-47401c3ad861*
- *https://uxdesign.cc/the-master-online-ideation-toolbox-part-2-2-414f5122f8b7*

Who has a question?

References

References i

Beyer, H., & Holtzblatt, K. (1997). *Contextual design: Defining customer-centered systems*. Morgan Kaufmann Publishers Inc. https://doi.org/0.5555/2821566

Choi, M., Andres, J., Hunter, A., & Martin, C. P. (2025). Scenario-based design to envision how GenAI can support sound design practices. *Proceedings of the 36th Australasian Conference on Human-Computer Interaction*, 640–646. https://doi.org/10.1145/3726986.3727042

Design Council. (2025). *The double diamond: A universally accepted depiction of the design process*. https://www.designcouncil.org.uk/our-resources/the-double-diamond/

Dix, A., Ormerod, T., Twidale, M., Sas, C., Silva, P. A., & McKnight, L. (2006). Why bad ideas are a good idea. *HCI Educators Workshop 2006*. https://alandix.com/academic/papers/HCIed2006-badideas/HCIED2006-badideas-CRC-v2.pdf

Gaver, B., Dunne, T., & Pacenti, E. (1999). Design: Cultural probes. *Interactions*, *6*(1), 21–29. https://doi.org/10.1145/291224.291235

Gould, J. D., & Lewis, C. (1985). Designing for usability: Key principles and what designers think. *Commun. ACM*, *28*(3), 300–311. https://doi.org/10.1145/3166.3170

References iii

Hallewell, M. J., Hughes, N., Large, D. R., Harvey, C., Springthorpe, J., & Burnett, G. (2022). Deriving personas to inform HMI design for future autonomous taxis: A case study on user requirement elicitation. *Journal of Usability Studies*, *17*(2).

Je, S., Lim, H., Moon, K., Teng, S.-Y., Brooks, J., Lopes, P., & Bianchi, A. (2021). Elevate: A walkable pin-array for large shape-changing terrains. *Proceedings of the 2021 CHI Conference on Human Factors in Computing Systems*. https://doi.org/10.1145/3411764.3445454

Rogers, Y., Sharp, H., & Preece, J. (2023). *Interaction design: Beyond human-computer interaction, 6th edition*. John Wiley & Sons, Inc. https://quicklink.anu.edu.au/kv9b