Aalto University
School of Arts, Design
and Architecture

From concept design to interaction design (IxD)

Week 4

MUO-E3055 Interaction Design (IxD)

Antti Salovaara

MyCourses frontpage > Slides > 04a From concept design to IxD.pdf

Contents of the day

Overview for the remaining weeks

Short snapshots:

- interaction design, design systems, prototyping tools
- Division of responsibilities within groups

Interaction design: basics

Design systems: basics

Reading material + quiz for Friday

Tutoring meeting instructions

Overview for the remaining weeks

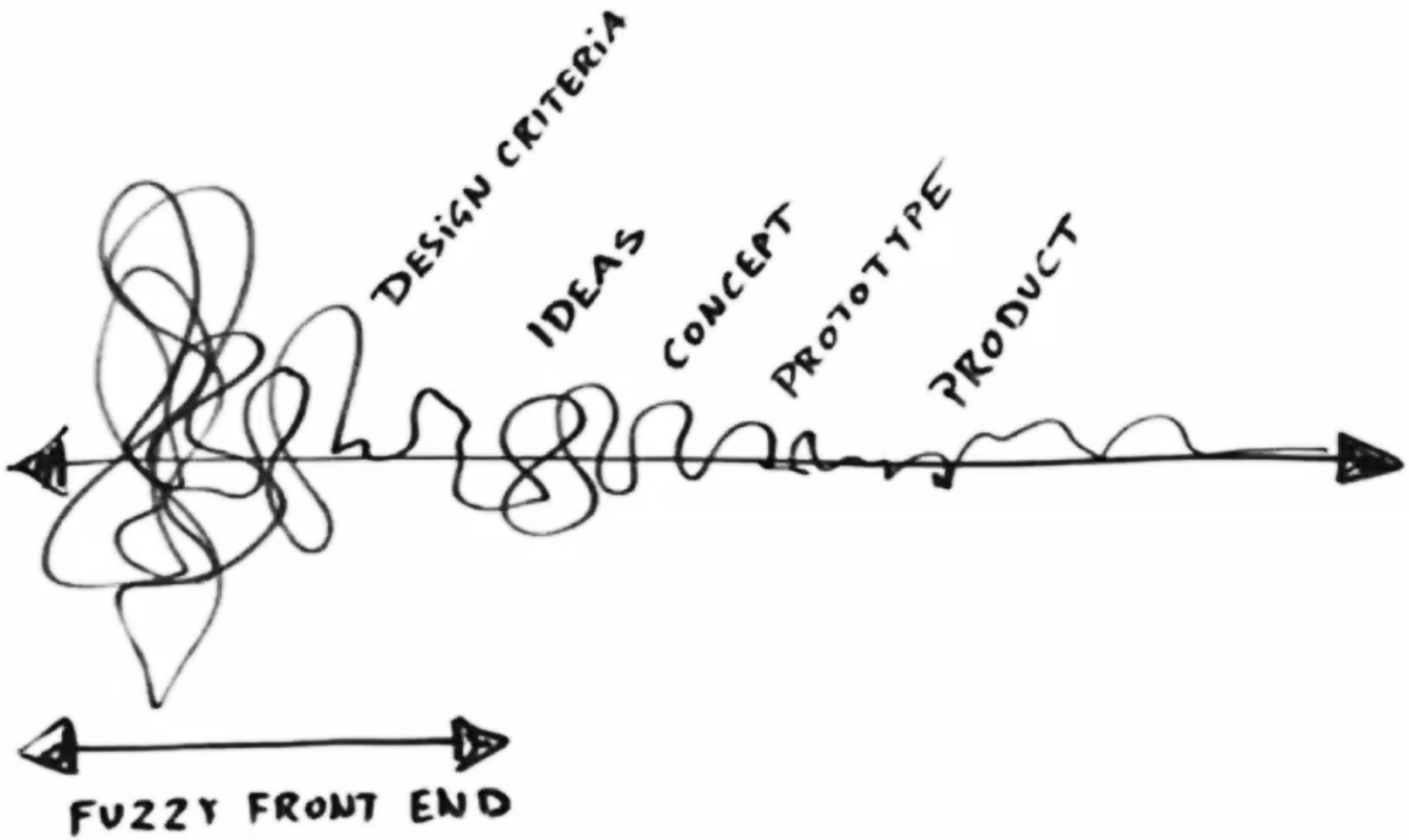
Interaction Design (IxD) 2024 – Department of Design – Aalto University

Weeks 2-7: Mondays (9.15-12.00 and 13:00-17:00), Fridays (13:00-17:00) and 16-19.1 (8:30-9:00) Room F102 (M202 on 19.1) @ Väre

	Analyze Week 1	Sprint Week 2	Ideate: Concept Design Week 3
Lecture	**Interaction Design Intro** Mon 8.1 (AM)	**Sprint** Mon 15.1 (AM)	**Interaction Styles** Mon 22.1 (AM)
Reading	Chapter 1: What is IxD? (*)	Knapp et al. (2016) Sprint	Chapter 7: Interfaces (*)
Exercise	IxD Disciplines	F-formations Sprint	Mindful Touch
Lecture	**F-formations** Mon 8.1 (PM)	**Daily Sprint Intro** Tue 16.1-Fri 19.1 @ 8:45	**Prototyping** Mon 22.1 (PM)
Reading	Kendon (1990) Conducting Interaction	-	Chapter 12: Design, Prototyping (*)
Exercise	F-formations	Work on Sprint	Paper Prototype
Presentation	**F-formations Observations** Fri 12.1 (PM)	**Sprint Results** Fri 19.1 (PM)	**Concept Design Results** Fri 26.1 (PM)

	Prototype: Detailed UI Week 4	Evaluate Week 5	Final Design Week 6
Lecture	**Design Systems** Mon 29.1 (AM)	**Heuristic Evaluation** Mon 5.2 (AM)	**A/B Testing (cont'd)** Mon 12.2 (AM)
Reading	Benyon (2019) Designing UX (CH2: PACT)	Goodman et al. (2012) Observing UC (CH11)	Lucero (2015) Affinity Diagramming
Exercise	Detailed UI Design	Evaluation	Final Design
Lecture	**Design Systems (cont'd)** Mon 29.1 (PM)	**A/B Testing** Mon 5.2 (PM)	**A/B Testing (cont'd)** Mon 12.2 (PM)
Reading	Benyon (2019) Designing UX (CH 2: PACT)	Goodman et al. (2012) Observing UC (CH11)	Holtzblatt (2016) Contextual Design(CH6)
Exercise	Detailed UI Design	Evaluation	Final Design
Presentation	**Detailed UI Design** Fri 2.2 (PM)	**Evaluation Results** Fri 9.2 (PM)	**Final Design** Fri 16.2 (PM)

(*) Sharp H, Preece J, Rogers Y. (2019) Interaction Design: Beyond Human-Computer Interaction (5: e ed.)

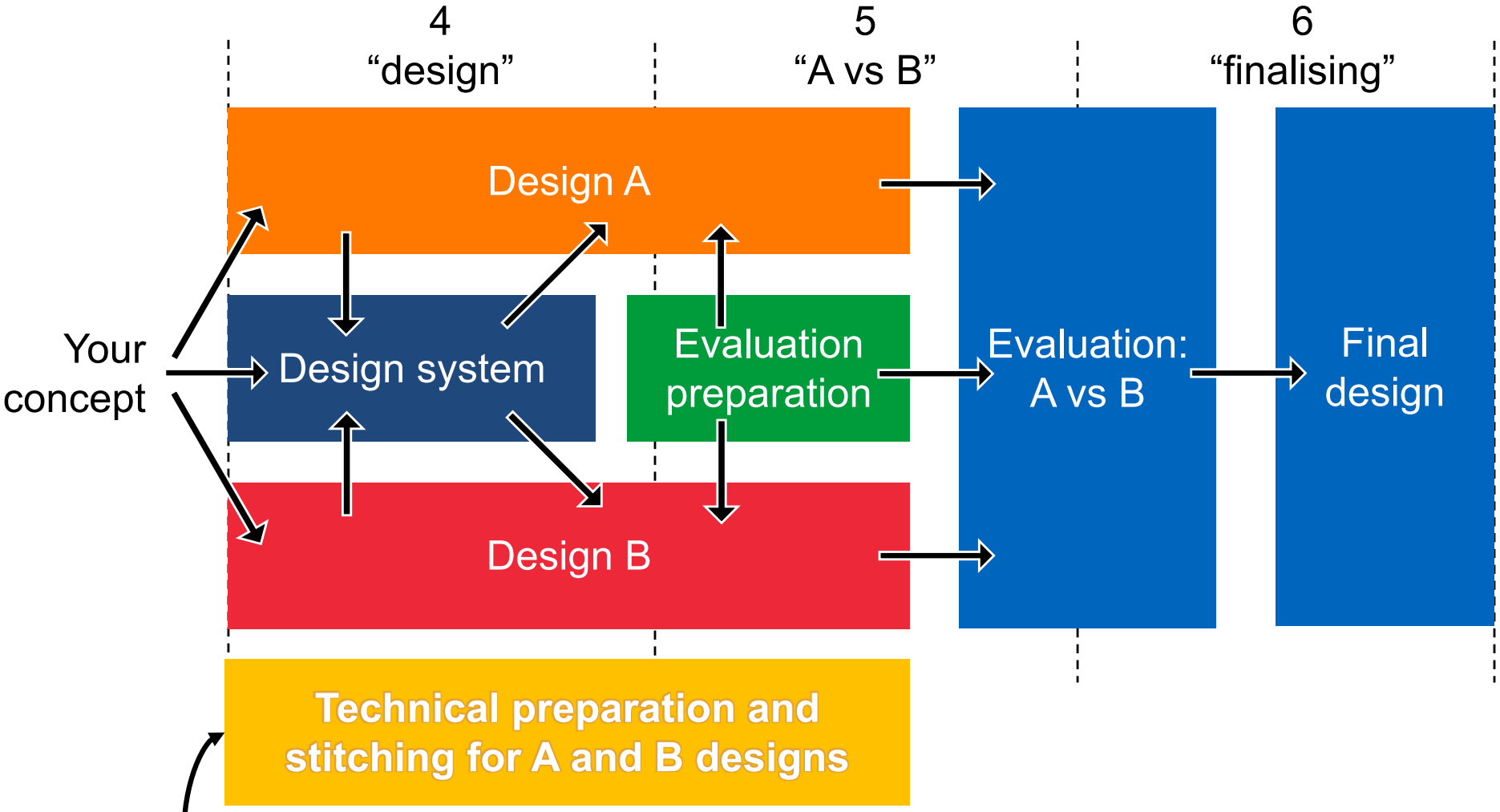


Concept design

IX design

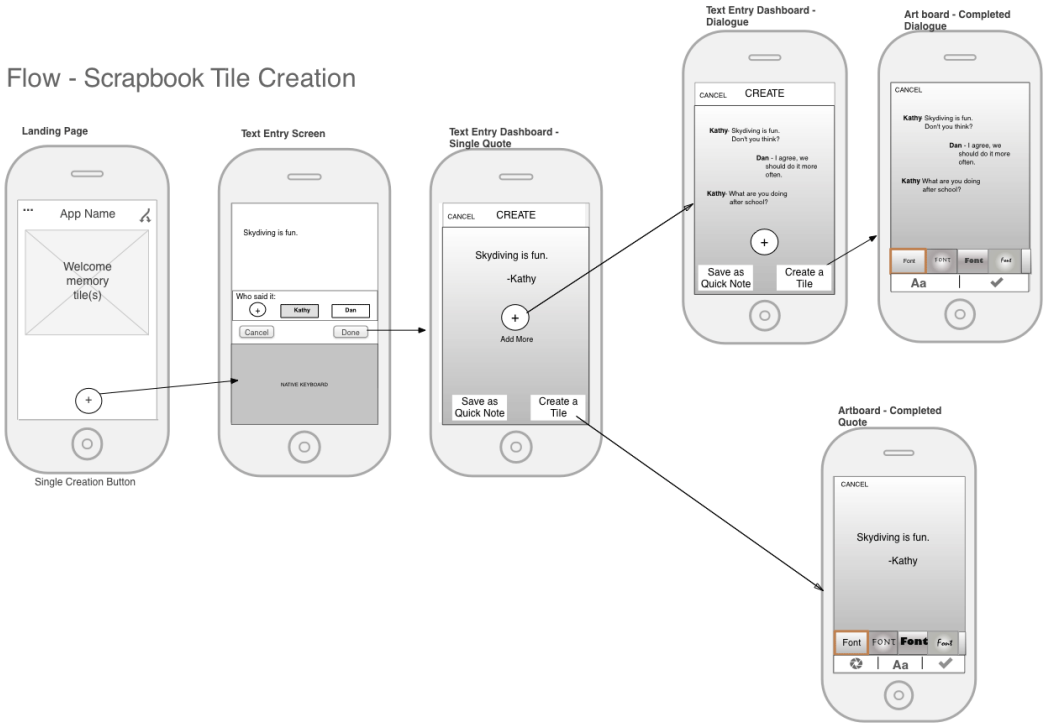
Sanders & Stappers (2008). Co-creation and the new landscapes of design. CoDesign, 4(1), 5--18. https://doi.org/10.1080/15710880701875068

Weeks 4–6 in more detail



Roles can be divided also other ways, and there can be other roles too

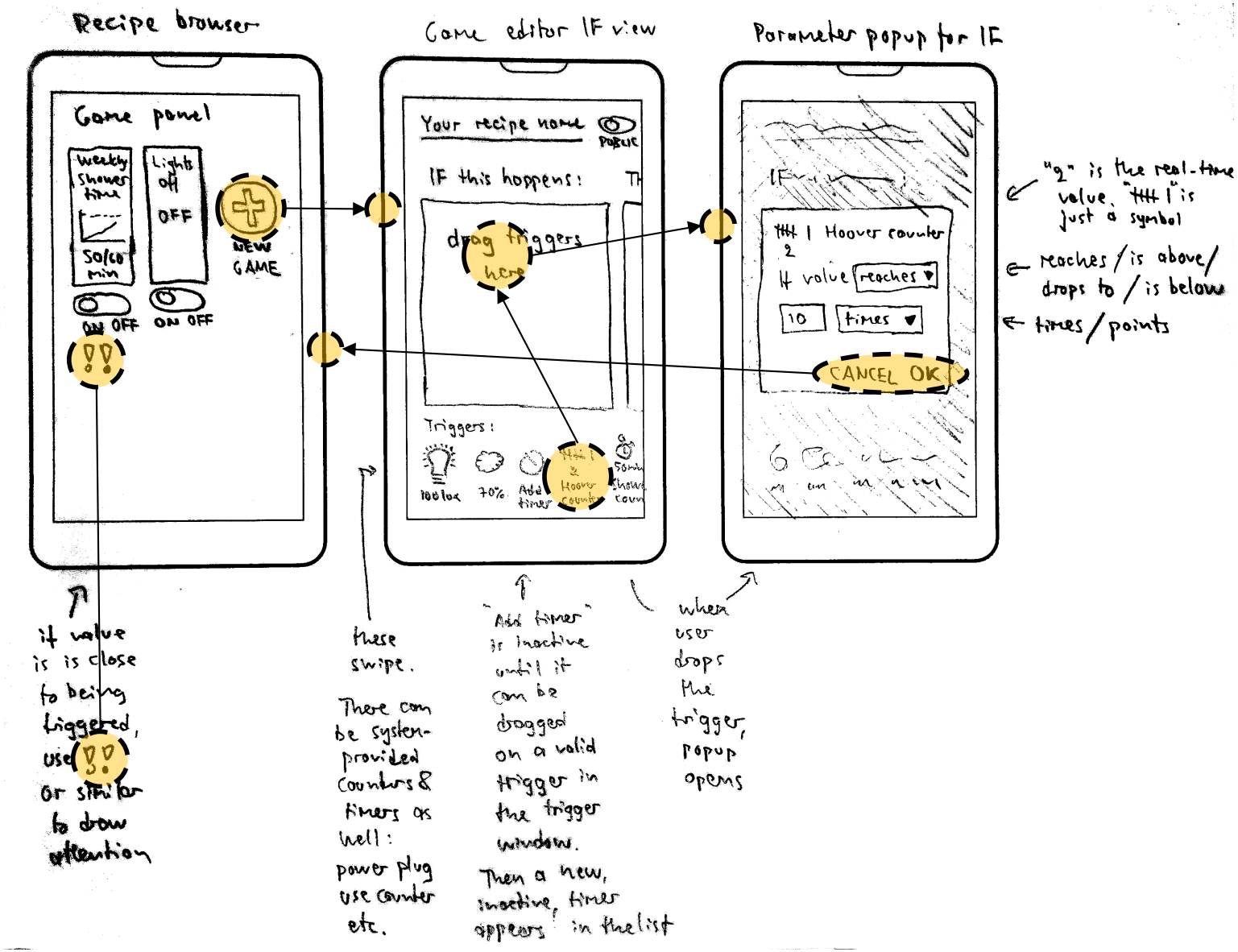
Week 4 in interaction design: Wireflows for designs A and B



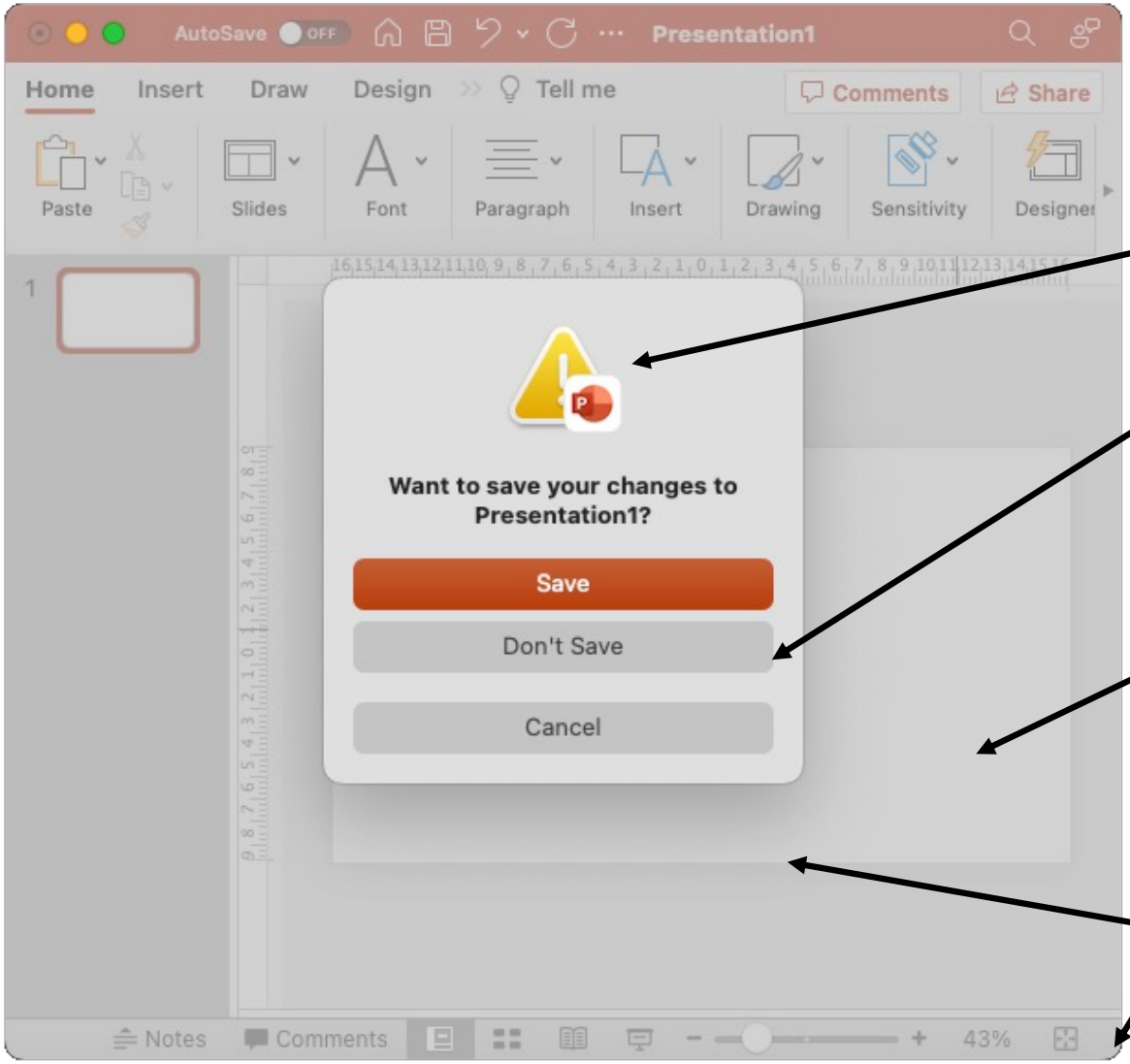
”format that combines wireframe-style page layout designs with a simplified flowchart-like way of representing interactions”

Laubheimer (2016). Wireflows: A UX Deliverable for Workflows and Apps. https://www.nngroup.com/articles/wireflows/

Week 4 in interaction design: Wireflows…



Week 4 in design systems



Things that are determined in design systems:

Use of icons

Colour hierarchy: safest choice presented in sharper colours

Inactive contents shown behind a semi-transparent gray “curtain”

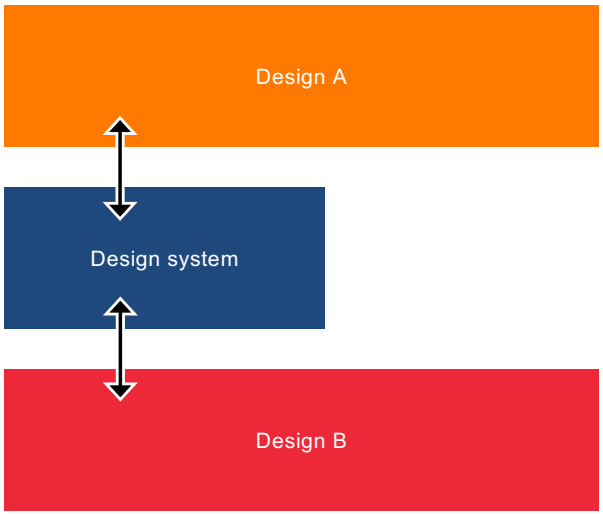
Rounded window corners

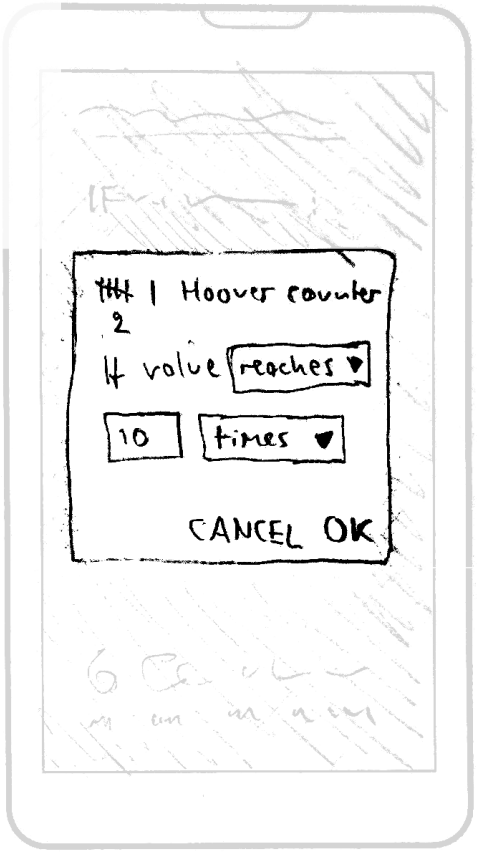
Fonts, colours, drop shadows, …

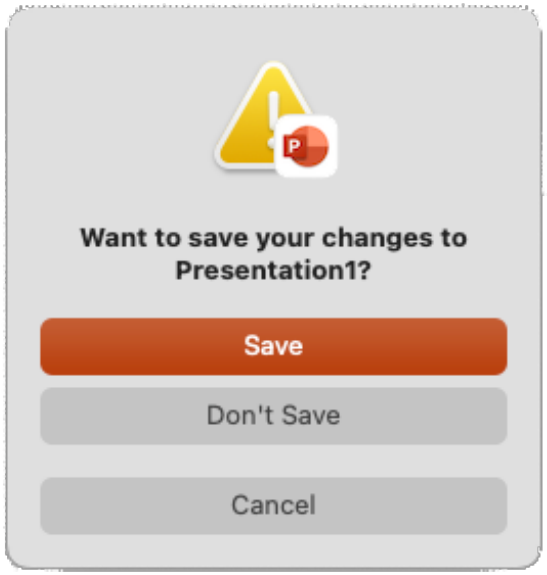
Collaboration on Week 4

What components will the interaction design have?

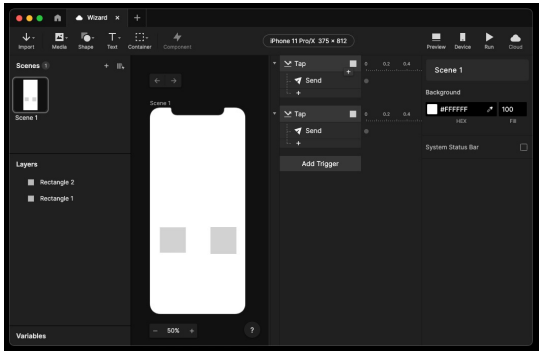
How will they look like?







Weeks 4+5: Prototyping

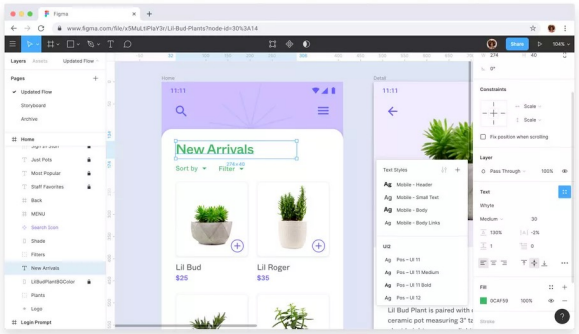


ProtoPie

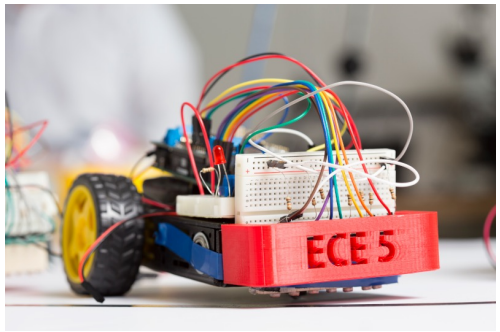
```
.sendbtn { color:black;
border-radius:5px; };

document.getElementById(
“sendbtn”).addEventListe
ner(“click”,function(e)
{ .. });
```

HTML + CSS + JS



Figma / InVision / Axure / Adobe XD / Sketch / …



Arduino

Wizard of Oz

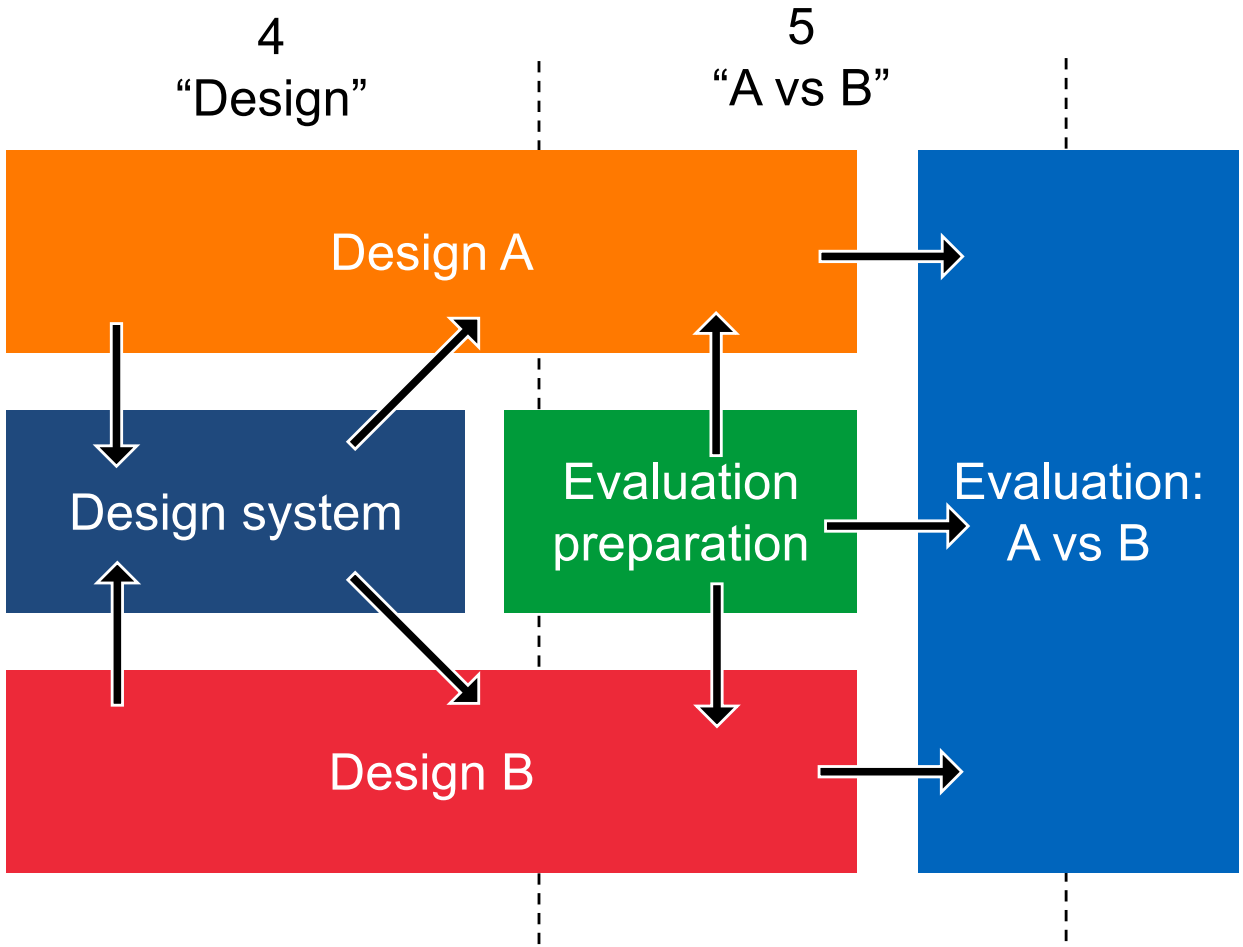
Reserve time to learn how to prototype the desired interactions!

* Scratch Fr Démo.png by Infofiltrage, CC 2.0 licensed. https://commons.wikimedia.org/wiki/File:Scratch_Fr_Démo.png
** https://www.freecodecamp.org/news/ui-design-with-figma-tutorial/
*** lab4.JPG by Jacobs School of Engineering, UC San Diego, CC 3.0 licensed. http://ece5.ucsd.edu/descriptions.php
*** https://hcde498processlog.wordpress.com/2015/05/11/wizard-of-oz-a-pen-that-corrects-you-when-you-write-off-line/

Week 5: Changing the wireflows to finished-looking designs A and B

Similar look and feel in both prototypes

Comparable starting point for the A/B testing



Overview of week 4 (this week)

Preparation for Tuesday's tutoring

Meeting times:

9:30
10:15
11:00
12:30
13:15
14:00

Location:
P210

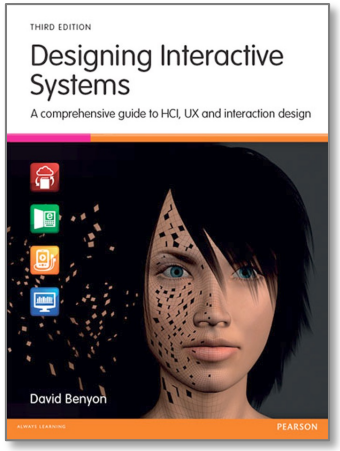
Come to the meeting with these decisions:

1. What is your division into sub-groups?
   - Design system, Design A, Design B, Stitching, Evaluation planning
2. Focus points of your design:
   - The most important use scenario(s)
   - The UX goal(s)

Be also ready to discuss:

- What will be the difference(s) between Design A and Design B?
- Which prototyping tools you will use in evaluations?

Reading material, quiz and discussion



David Benyon:

- Chapter 2: PACT: a framework for designing interactive systems
- Chapter 3: The process of human-centred interactive systems design
- https://primo.aalto.fi/permalink/358AALTO_INST/ha1cg5/alma99935537880652 6

Quiz:

- Answer to 3 short open-ended questions in MyCourses (deadline Friday 13:00):
- https://mycourses.aalto.fi/course/view.php?id=40122&section=3
- **Set a reminder so that you remember to answer!**

Discussion about reading material

- 13:00–14:00 on Friday

This week's quiz questions

One of the sections in Benyon's book is about personas. When is it a good idea to create personas during a design process, and why?

Benyon also talks about scenarios in interaction design. What kinds of scenario-like creations have you designed during this course already, and what purposes have they served in your group's design process?

If you would need to choose TWO categories (out of the four main categories of the PACT framework) that are more important than the others in your project, which ones would they be, and why?

Friday's presentations

10-15 minutes / group

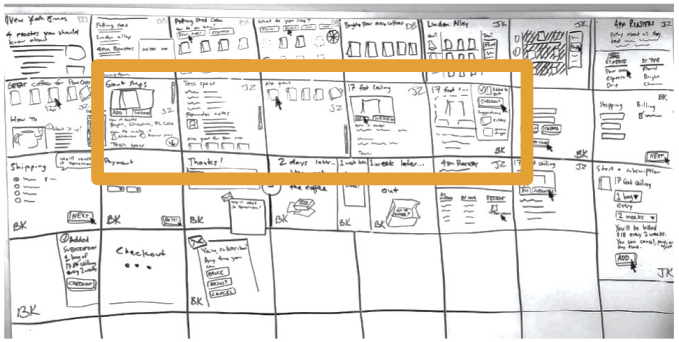
+

10-15 mins discussion

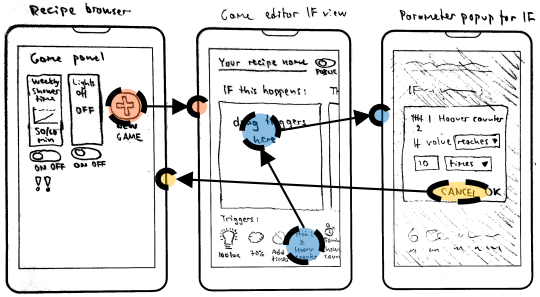
Submit the presentation via MyCourses by Friday 13:00

Create a three-part presentation =>

Part 1: Use scenario(s) and UX goal(s)



Part 2: Wireflows for Designs A and B



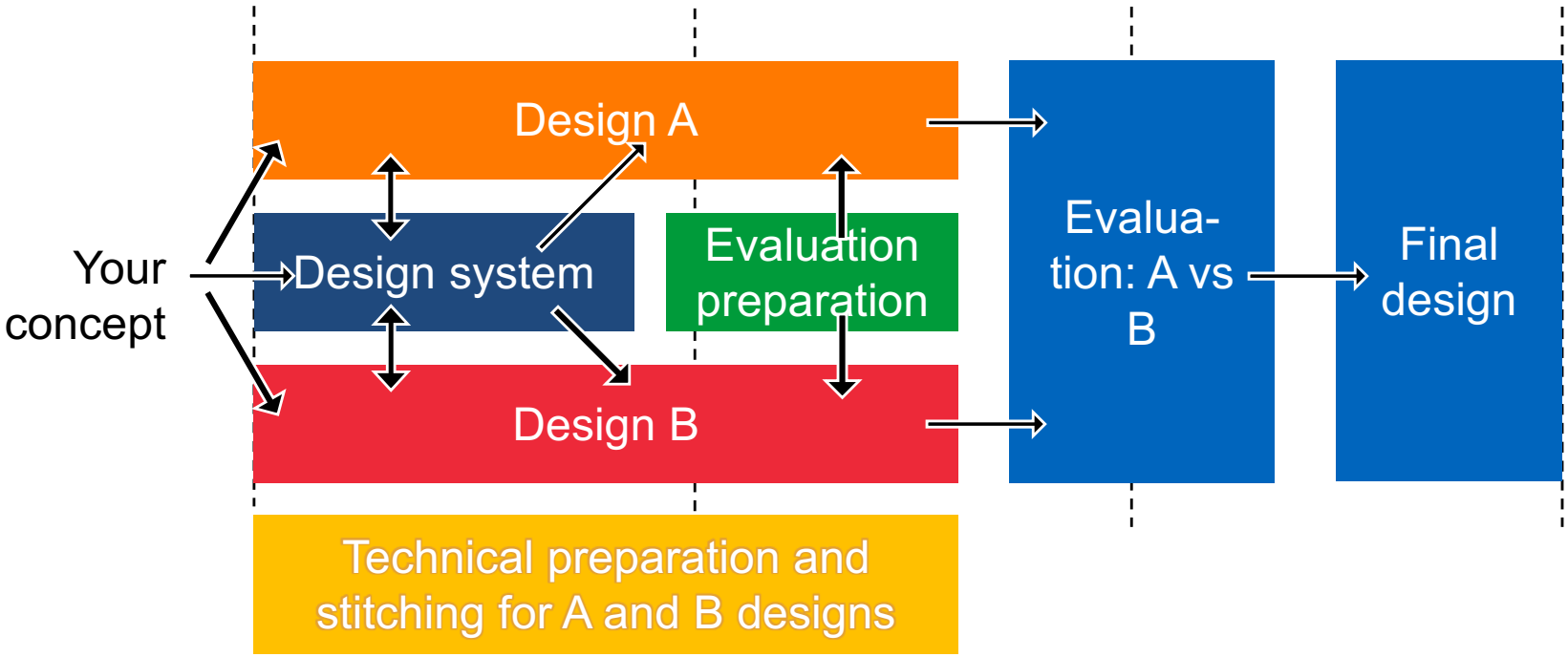
Part 3: Design system

Elements, layouts, fonts, backgrounds, ...

Group discussion:
How do you want to divide the roles?

Questions:

- What would each team member like to do?
- Will you elect a tech-savvy "Stitcher" who puts together both designs?
- Does the **design system** designer want to plan the **evaluations**?



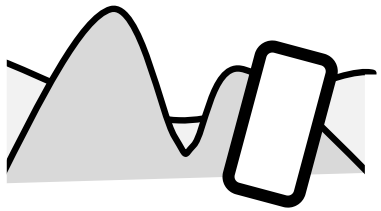
Group-wide decision-making using scenario-based thinking

User goals and use scenarios

Use context and PACT (people, activities, contexts, technologies)

Scenario formats

Sharpen your concept (10 mins)



Use scenarios for a mobile hiking map:

Route planning

SOS situations

Distance calculation

Finding where you are with a quick glance

Information search for camping sites, services, cabins etc

…

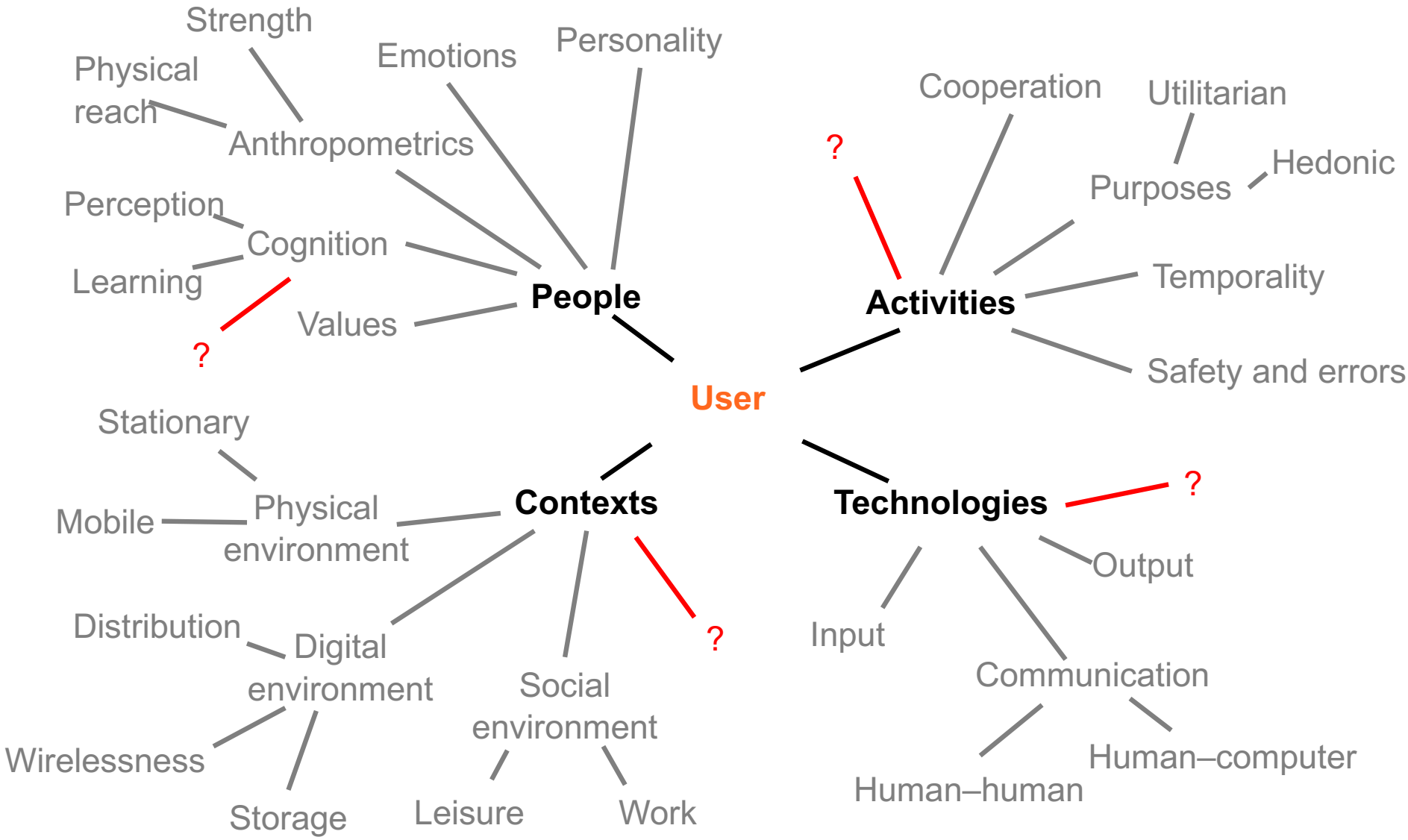
1. What **user goals** does your system / app / product support?
2. What **use scenarios** are related to those goals?
3. Discuss the goals and scenarios:

   Which ones are most important?

   Which one(s) do you want to focus on in your interaction design?

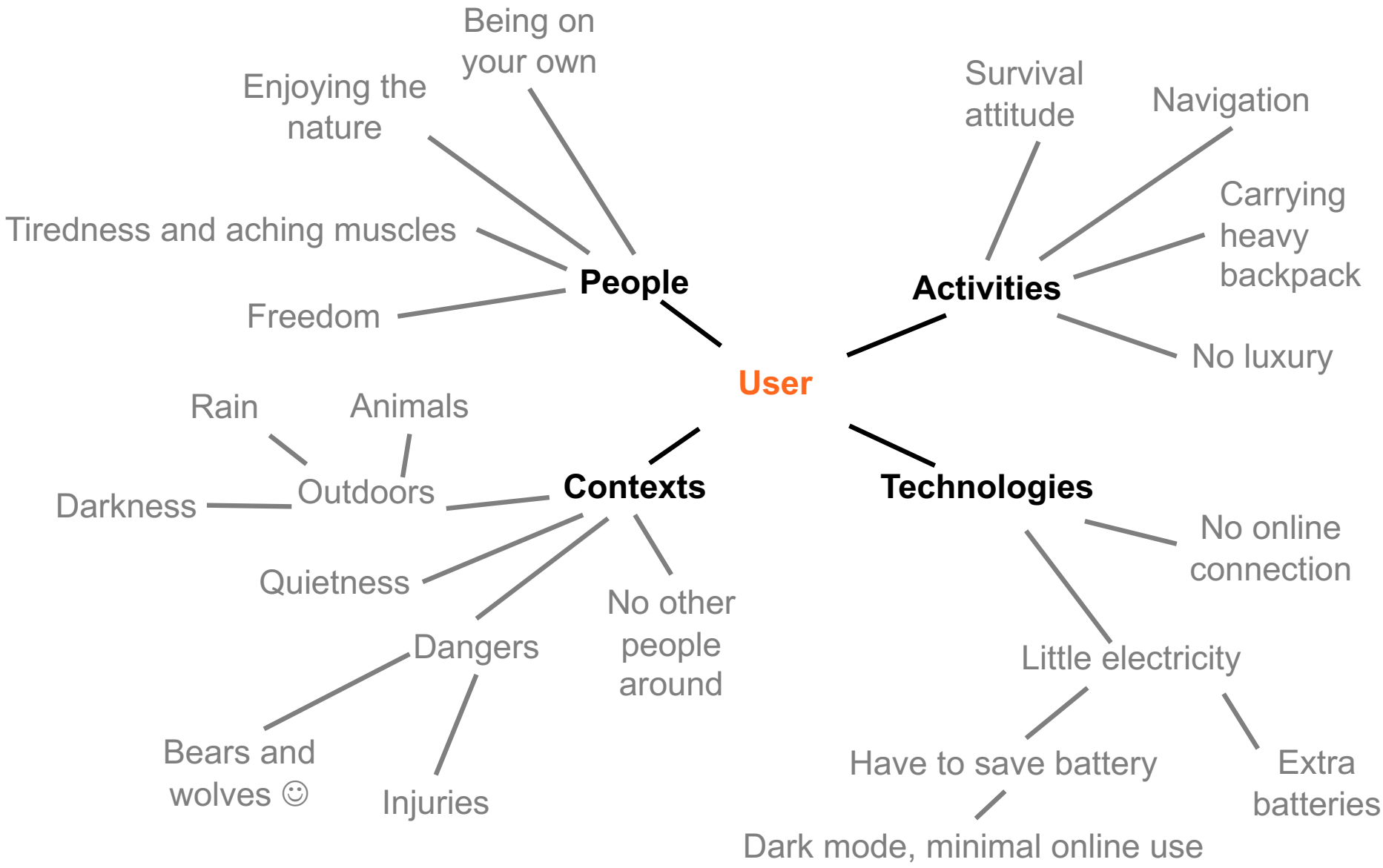
   Can some of the goals and scenarios be combined or linked?

Considering user's context: PACT framework



The "PACT" framework (Benyon: Designing interactive systems) – see the reading material for this week

User's context for the mobile hiking map:



Further refining for goals and scenarios

1. Analyse the use context

   Use PACT, site visits, expert interviews, background material, …

2. Select a UX goal

   Do you aim for simplicity? Minimalism? Particular kind of aesthetics? Learnability? Efficiency? Prevention of errors? **

   Do not choose too many goals!

   Prioritise UX goals that you can “measure”

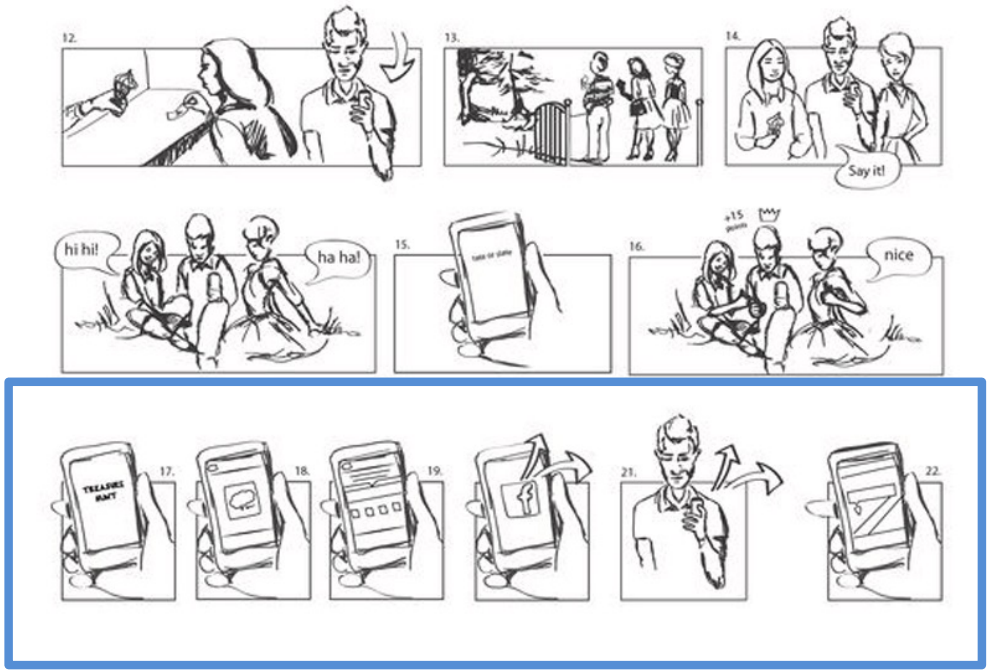
3. Develop more complete use scenarios

   Storyboard / Textual story / Hierarcical task diagram / Flowchart …

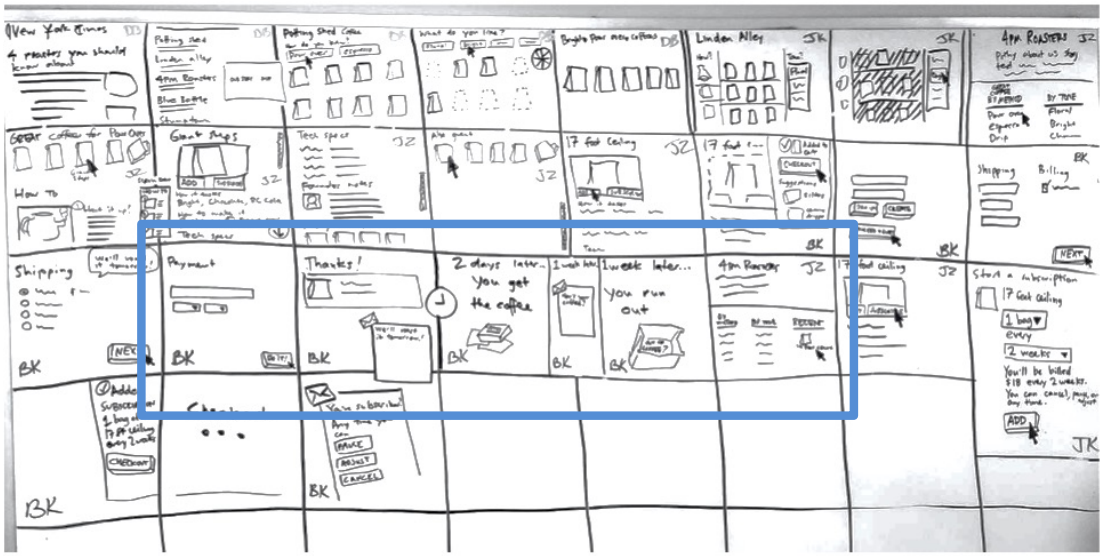
   (See the following slides)

Outcome of these activities: you know what you want to optimise in weeks 4–6

Scenario formats: Storyboards



Storyboard shown in the Sprint book

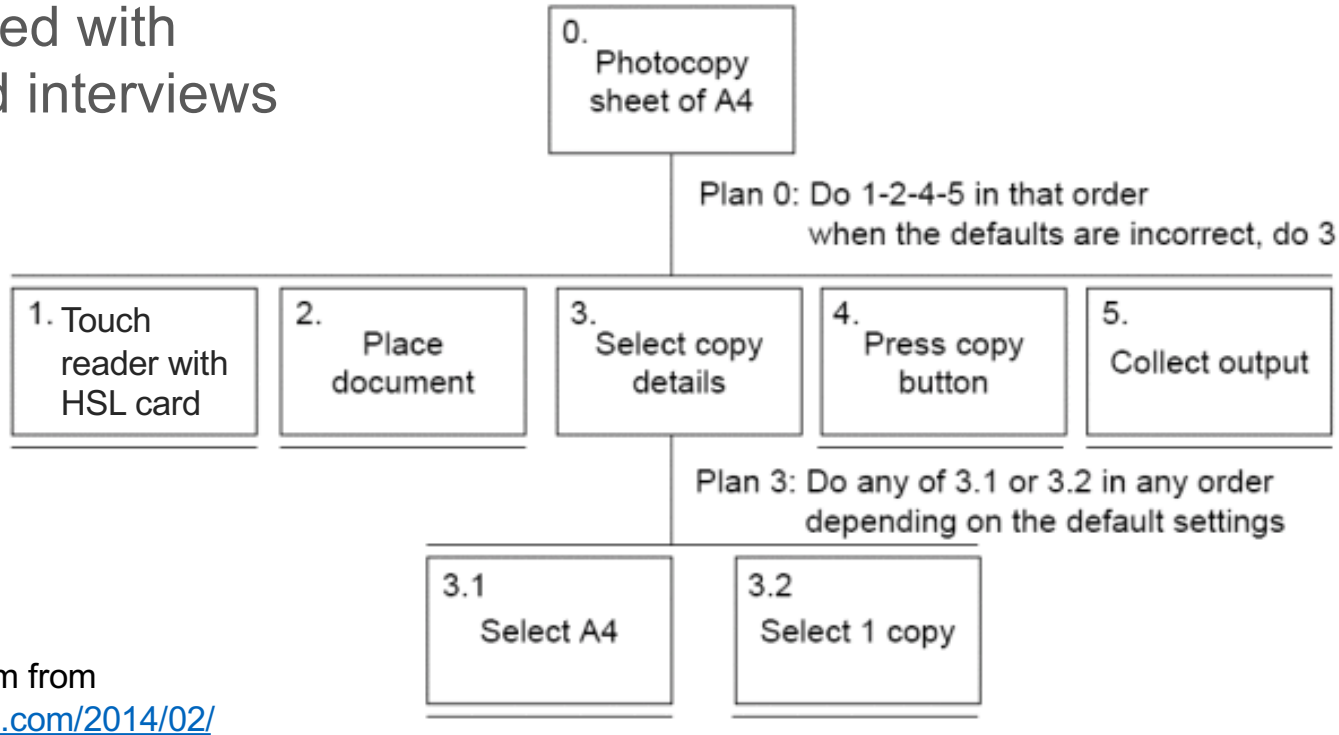


https://uxplanet.org/user-personas-scenarios-user-stories-and-storyboards-whats-the-difference-cf00315f0799

Scenario formats: HTA

Hierarchical task analysis:

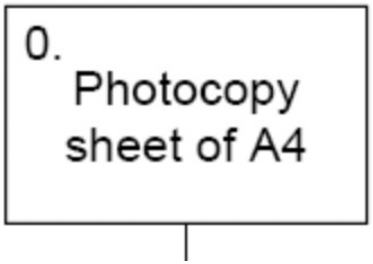
- Useful for understanding the structure of existing practices
- You may then design your system to support this task structure or to re-structure it
- Can be generated with observation and interviews



Example of a HTA diagram from https://aakins1.wordpress.com/2014/02/06/week-1-task-analysis/

Scenario formats: HTA…

Task that has subtasks

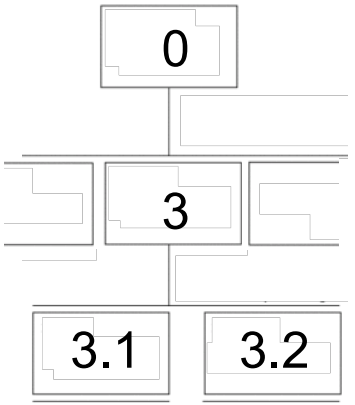


A terminal task that does not have subtasks

Plan for how subtasks are carried out:

Plan 0: Do 1-2-4-5 in that order
when the defaults are incorrect, do 3

Task numbering:



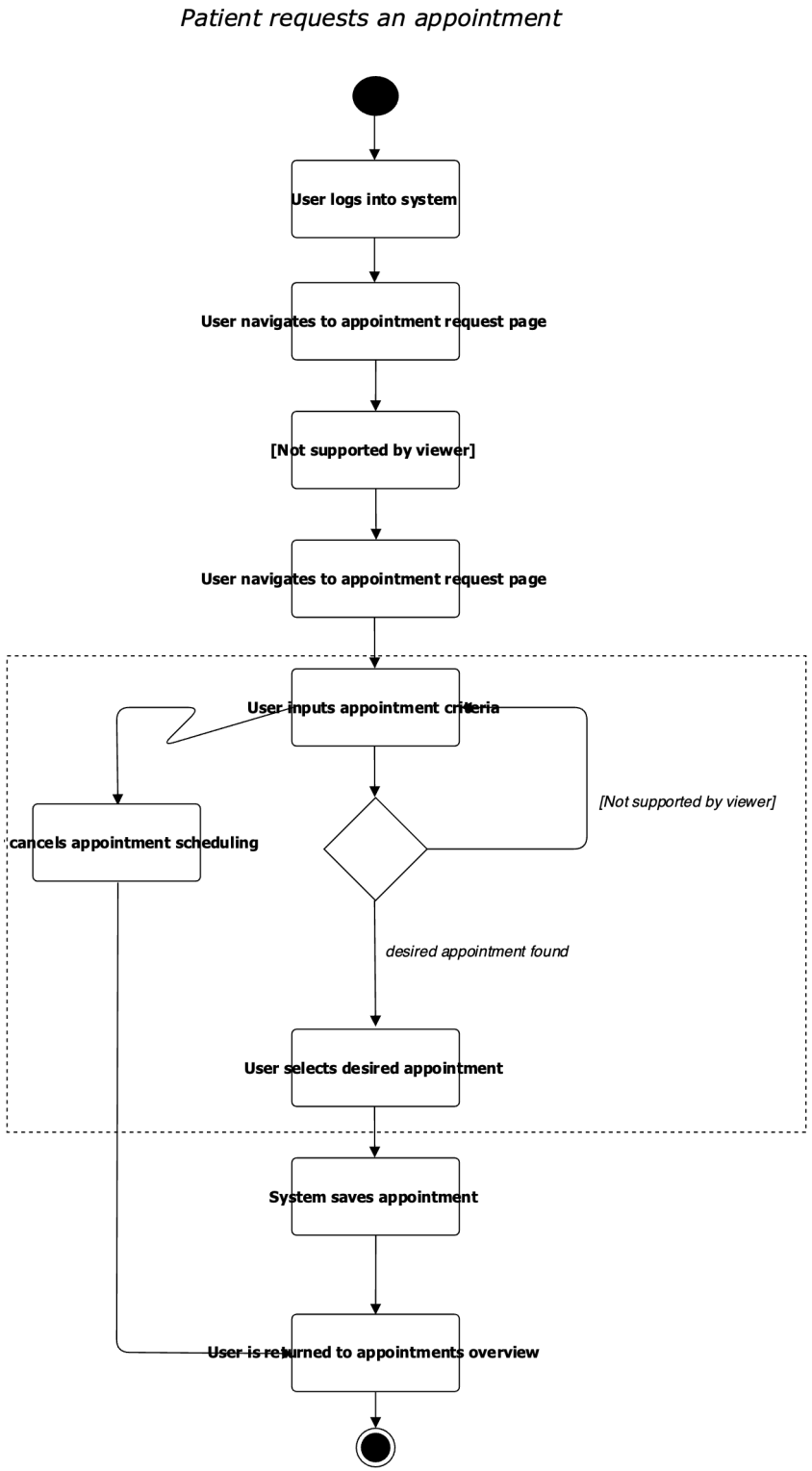
Annett, J. (2003). Hierarchical task analysis. In E. Hollnagel (Ed.), *Handbook of Cognitive Task Design*, ch. 2 (pp. 17--35). Mahwah, NJ: Lawrence Erlbaum. https://mycourses.aalto.fi/pluginfile.php/1689946/mod_folder/content/0/annett2003%20Hierarchical%20Task%20Analysis.pdf?forcedownload=1

Scenario formats: Flowcharts

More info:

Silvio Piccolo (2016): Why Flowcharts are important in UX Design

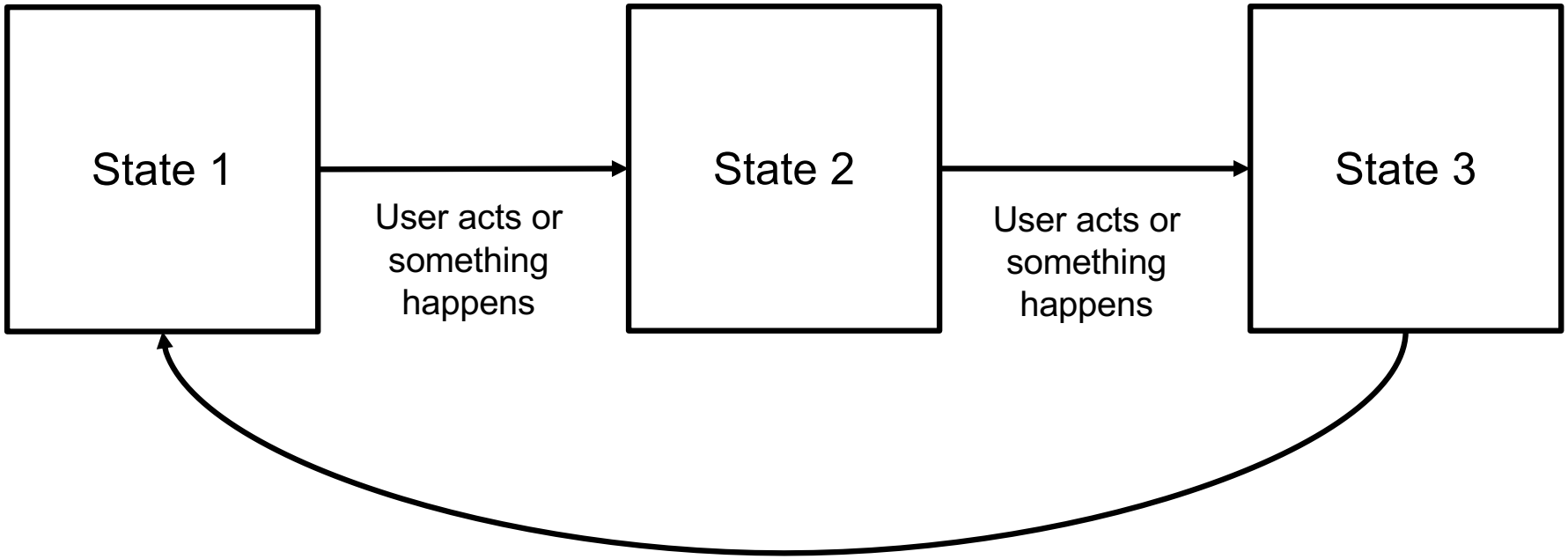
https://medium.com/@silviopiccolo/why-flowcharts-are-important-in-ux-design-f6bf3dfee080



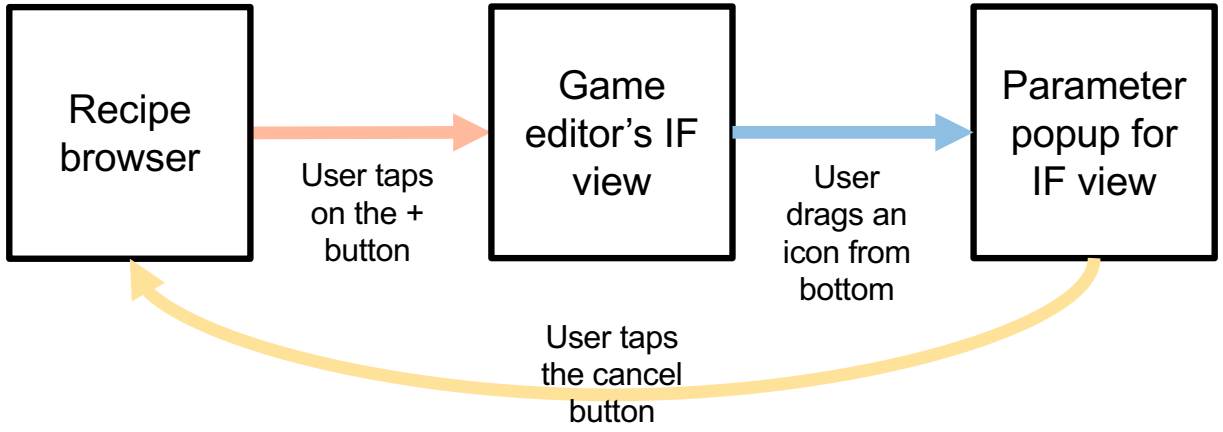
"activity diagram requesting appointment" Creative Commons licensed image from https://freesvg.org/activity-diagram-requesting-appointment

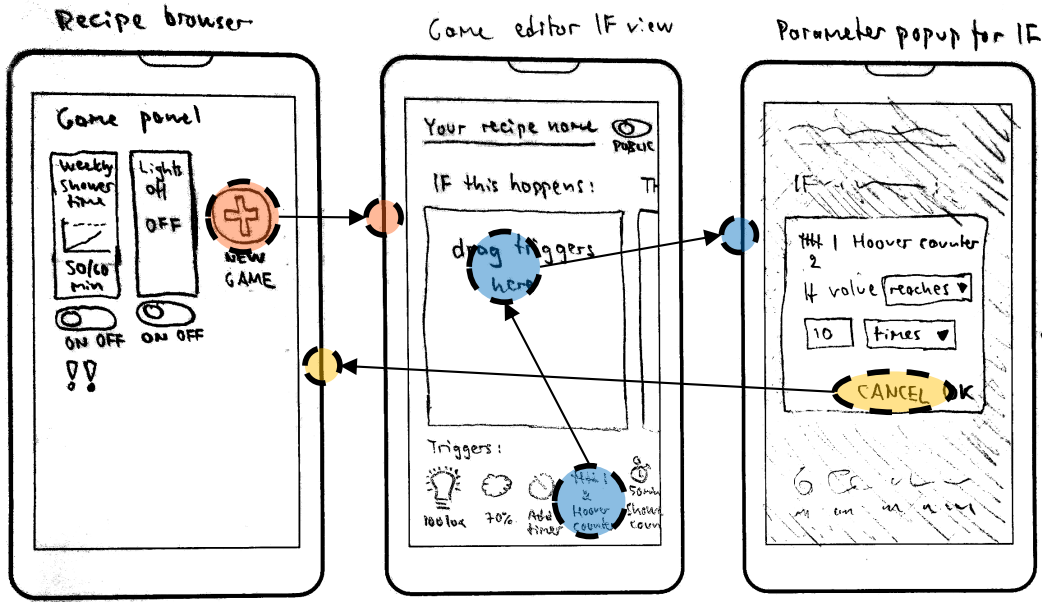
Scenario formats: Interaction sequences

How do the user and the system interact in a task



Scenario formats: Wireflows





Discussion in groups (15 mins): Further refining for goals and scenarios

1. Start analysing the use context

   Use PACT, site visits, expert interviews, background material, …

2. Select a UX goal

   Do you aim for simplicity? Minimalism? Particular kind of aesthetics? Learnability? Efficiency? Prevention of errors? **

   Do not choose too many goals!

   Prioritise UX goals that you can “measure”

3. Develop more complete use scenarios

   Storyboard / Textual story / Hierarcical task diagram / Flowchart …

Break? Lunch?

Background concepts for interaction design

With repetition from the User-Inspired Design (UID) course

A vs B designs

Usability heuristics / criteria

Gestalt laws

Affordances

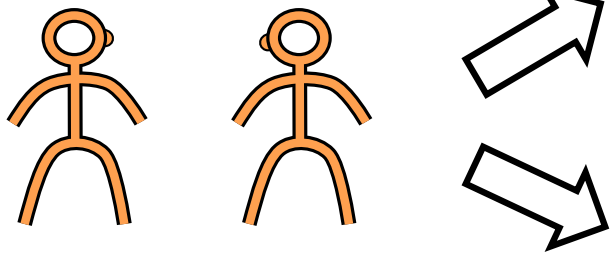
Mental models

Cognitive offloading

Gulfs of evaluation and execution

This design has a layout where users swipe between alternatives.

Why?

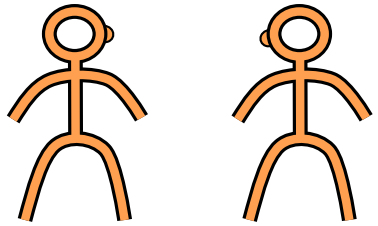


Designer

Team leader

I don't know, I think it looks nice

??

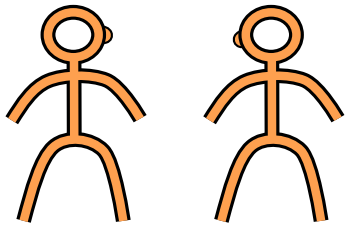


Designer

Team leader

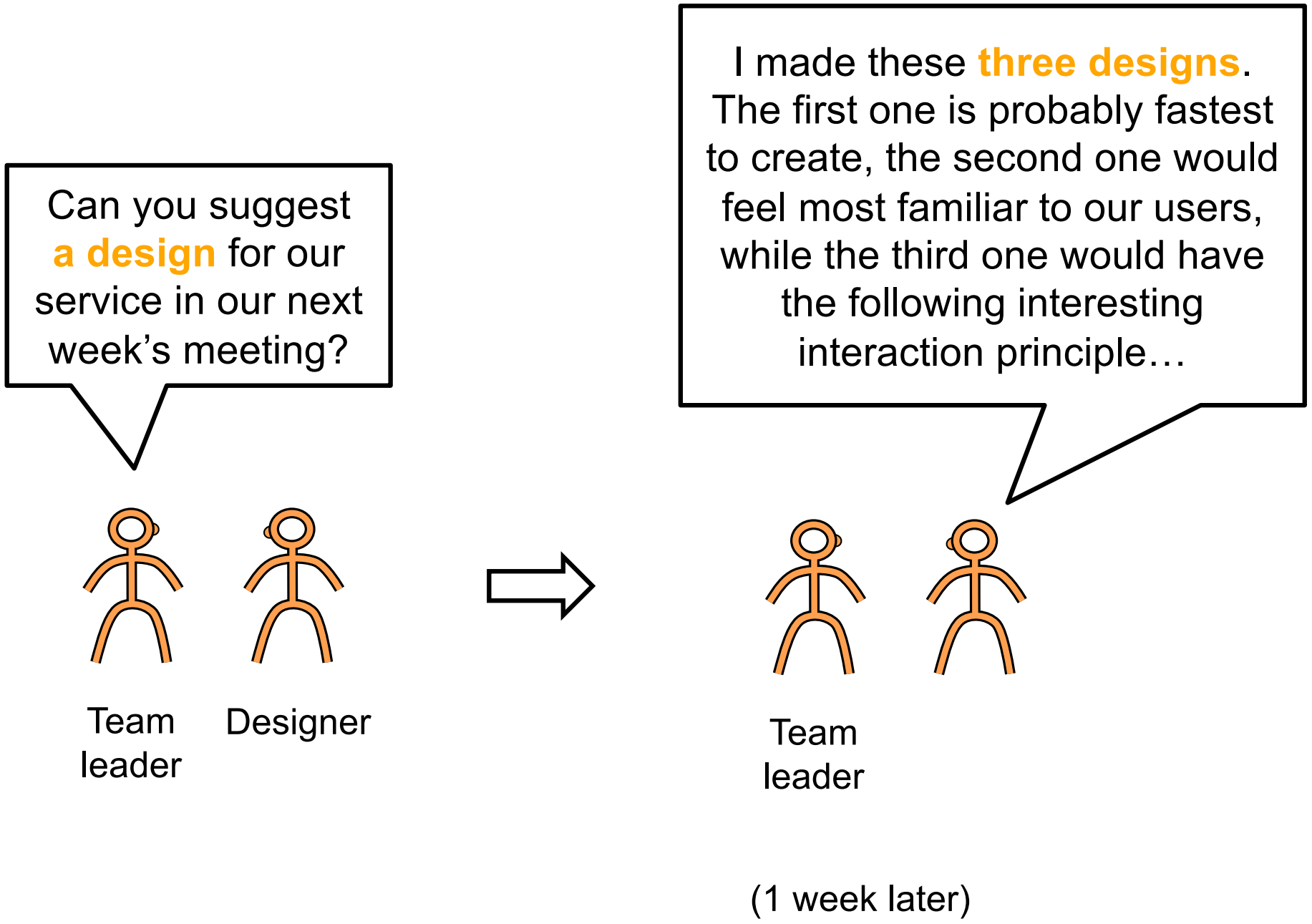
It uses the carousel pattern. That is familiar for users from Netflix UI, for example

Ok, great! It makes it easy for people to learn our UI



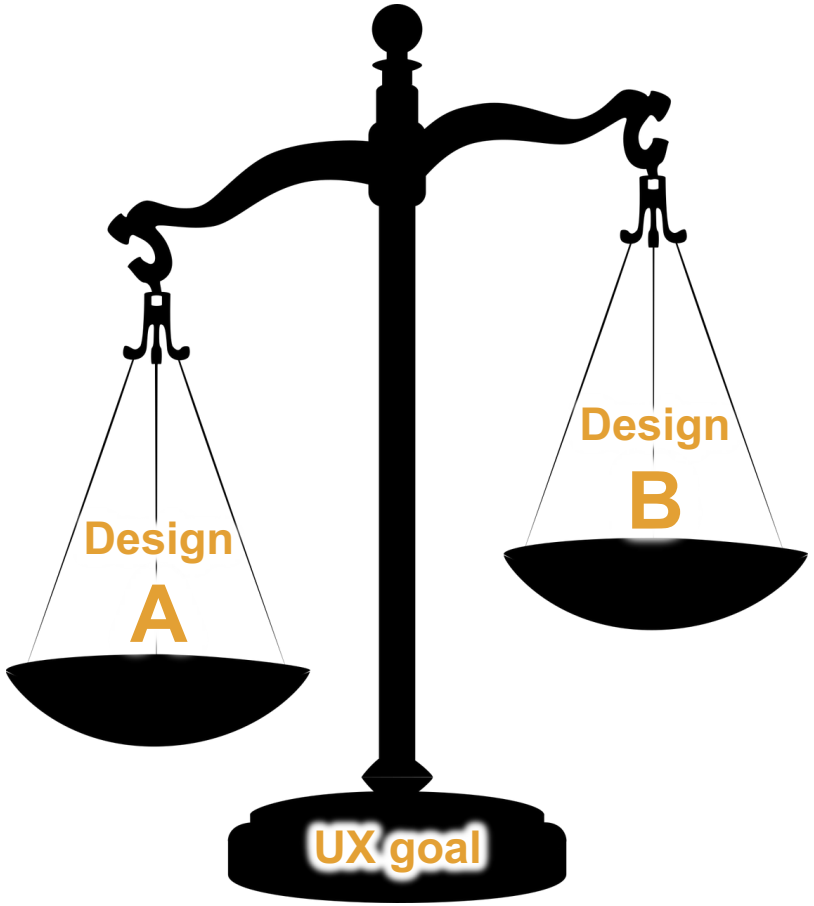
Designer

Team leader



Stolterman, E. & Wiberg, M. (2010). Concept-driven interaction design research. Human--Computer Interaction, 25(2), 95--118. https://doi.org/10.1080/07370020903586696

Your UX goal — A vs B design evaluation



How Designs A and B can differ

Different interaction sequences

- “First step A, then B” vs “First step B, then A”

Different IxD patterns

- Wizard vs. accordion

Different solutions to the same problem

- Different information visualizations

Etc.

Purpose of A vs B evaluations

This is not a competition between teams!

Think designs A and B as **complementary** alternatives

a) Two equally good-seeming options – you don't know which one is better

b) One that seems stronger, and another one that you'll try out to be sure about A's superiority

Usability criteria (Norman)

Use both knowledge in the world and in the head

Simplify the structure of tasks

Make things visible

Get the mappings right

Exploit the power of constraints

Design for error

When all else fails: Standardize!

“Seven principles for transforming difficult tasks into simple ones”;
Norman (1988). The psychology of everyday things.

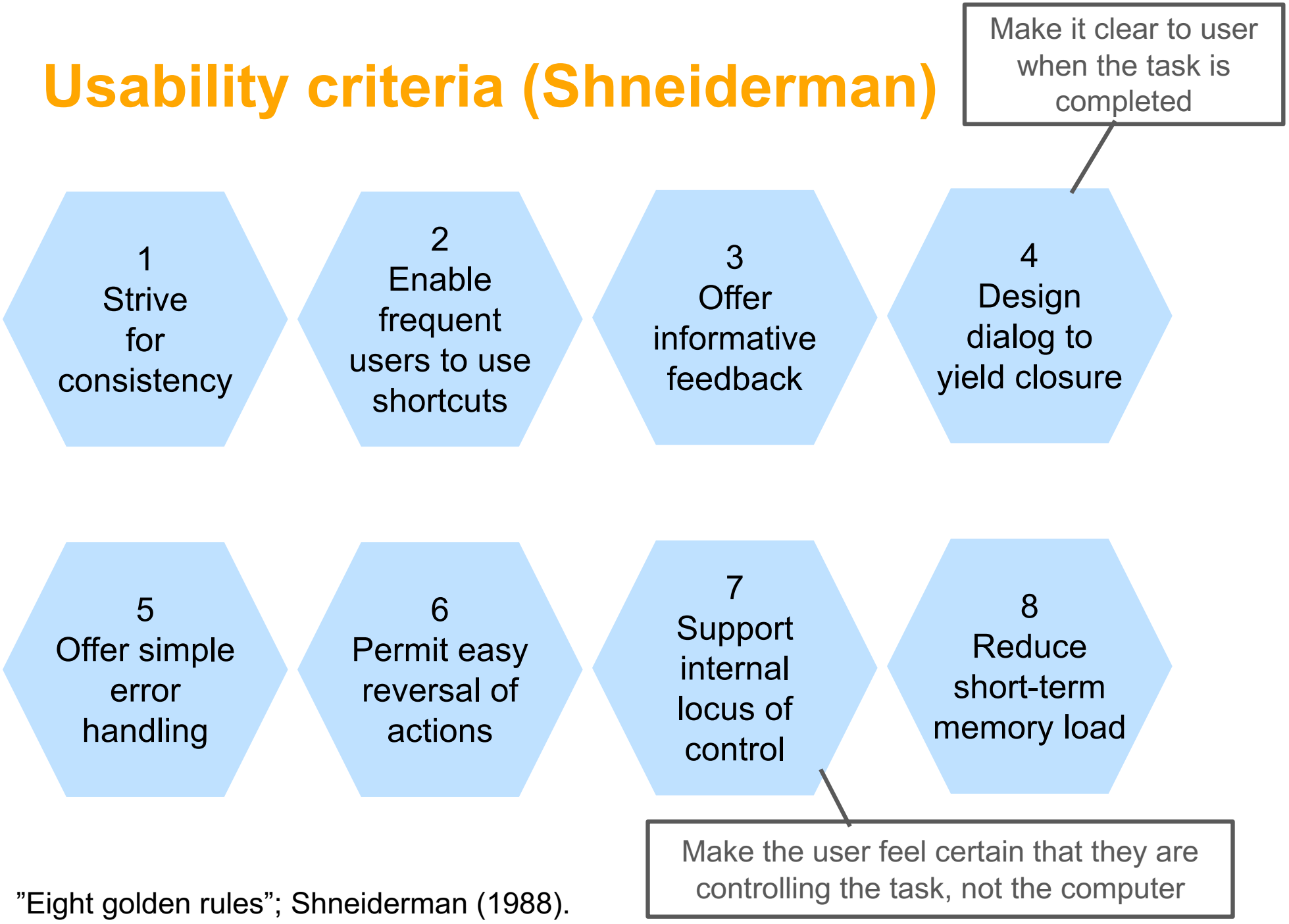
Usability criteria (Nielsen)

Visibility of system status	Match between system and the real world	User control and freedom	Consistency and standards	Help users recognize, diagnose, and recover from errors
Error prevention	Recognition rather than recall	Flexibility and efficiency of use	Aesthetic and minimalist design	Help and documen-tation

”Usability heuristics”; Nielsen (1993). Usability engineering.

https://www.nngroup.com/articles/ten-usability-heuristics/

Usability criteria (Shneiderman)



”Eight golden rules”; Shneiderman (1988).
Designing the user interface.

Usability criteria (Shneiderman)

Easy to learn

Efficient

Memorable

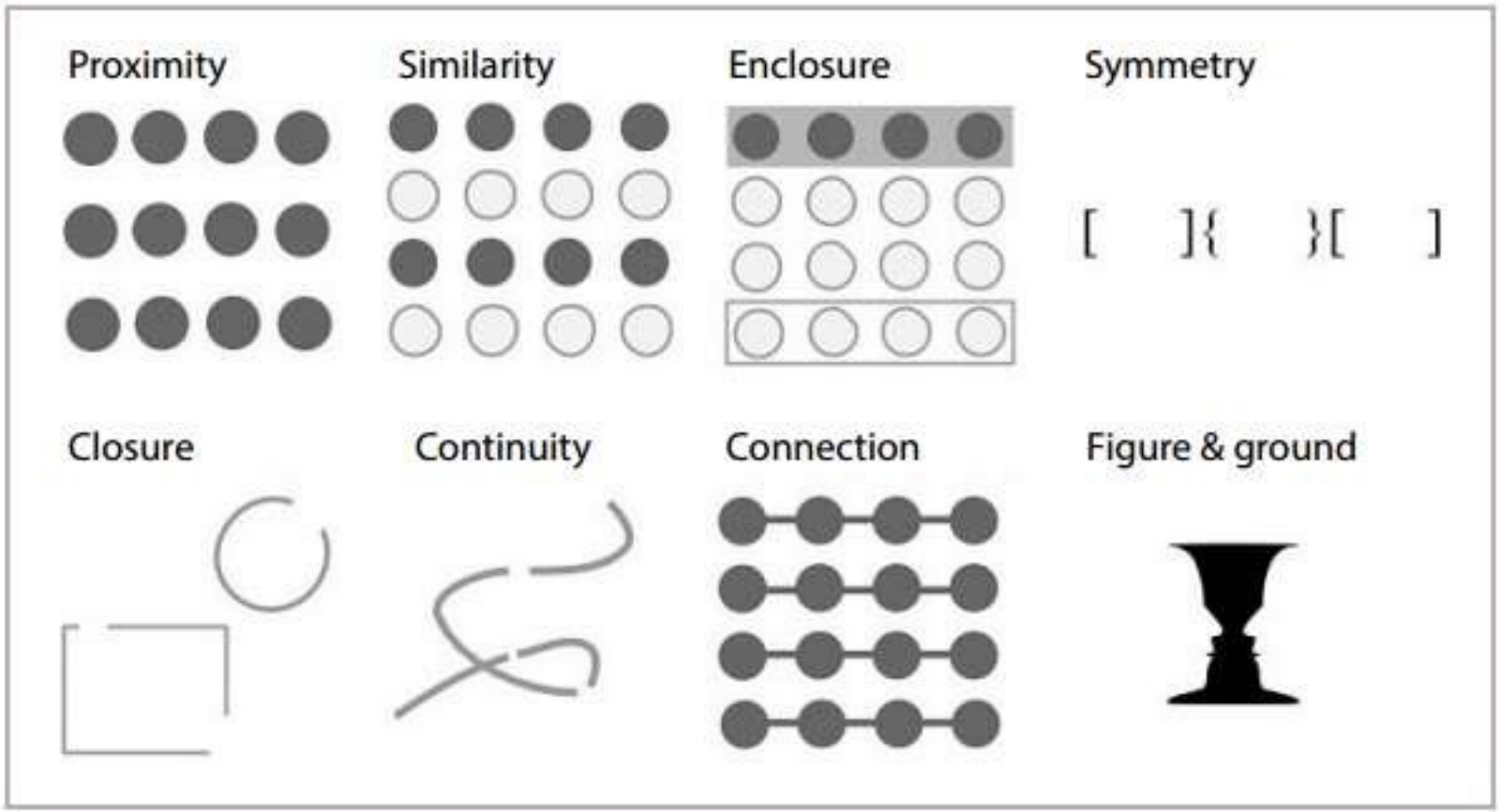
Designed for error

Satisfaction

Shneiderman (1980). Software Psychology.

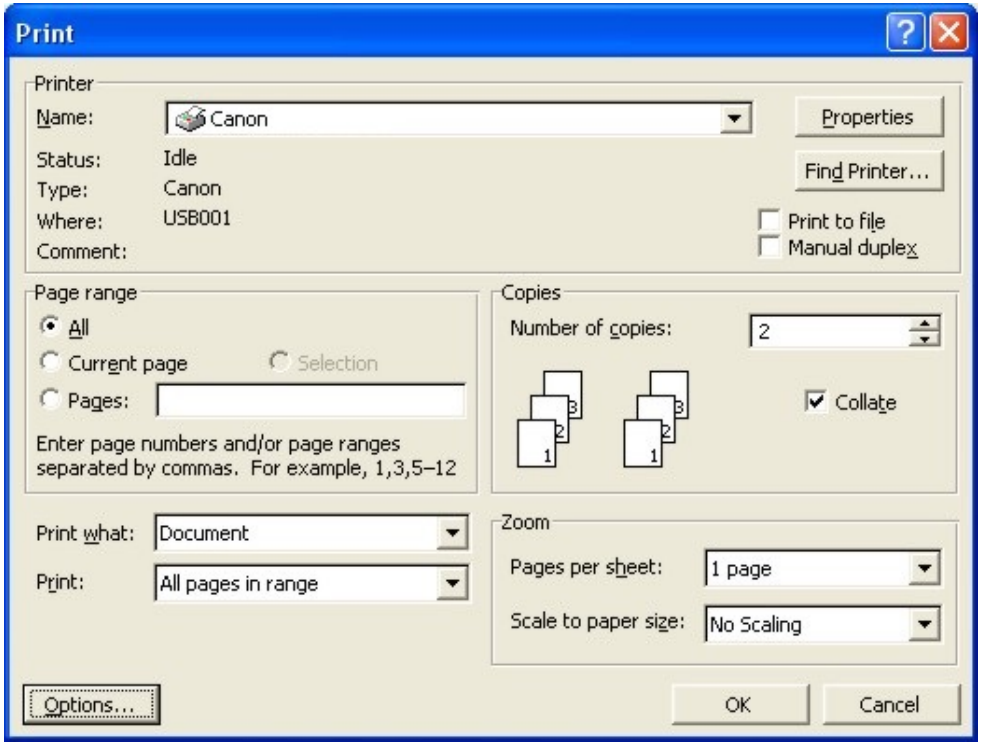
Visual layout principles: the Gestalt laws

Origin: Germany 1920–1950

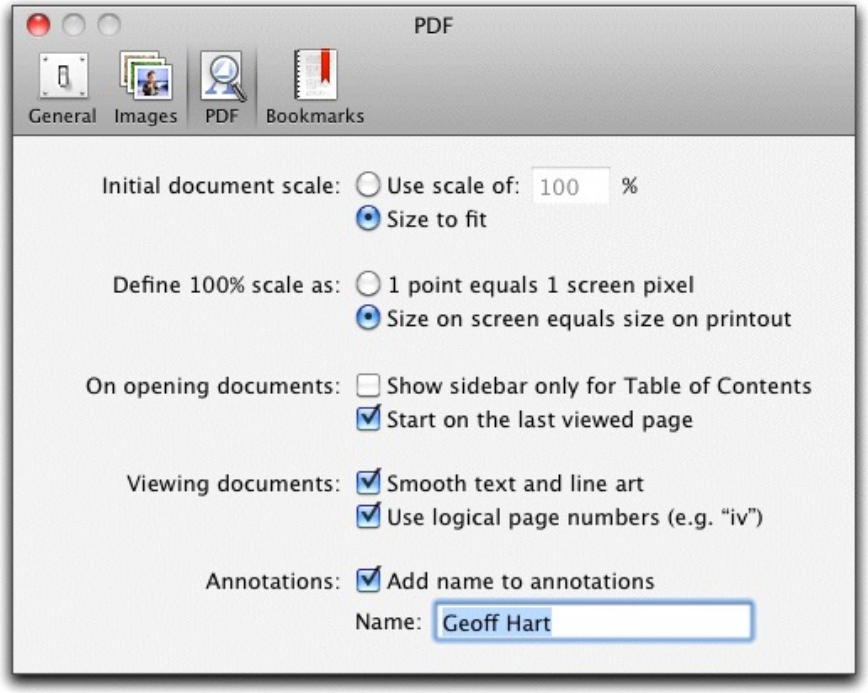


Original sources, Koffka 1935, Wertheimer 1959, Köhler 1969

Gestalt laws in UI design



Law of enclosure used to group functionally related items together

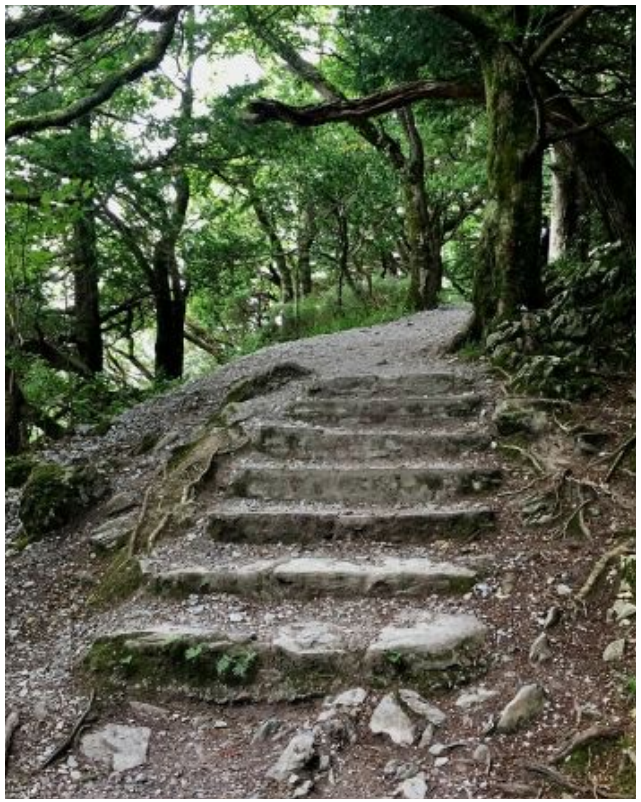


Law of proximity used to differentiate radio buttons from check boxes

Sources: Geoff Hart and Kevin Matz

Communicating what user can do: Affordances

"Direct perception" of action potential, different for each animal depending on its perceptual and action capabilities



https://www.needpix.com/photo/download/1097709/away-stairs-gradually-stone-rise-stair-step-staircase-forest-stone-steps

Image by Karen Arnold from Pixabay

Image by Elias Schäfer from Pixabay

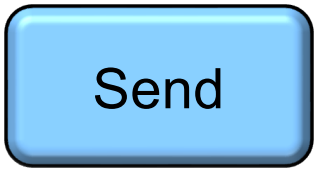
Sources:
Gibson 1979,
Norman 1988,
Gaver 1991

Affordances in IX design

Communicate possibilities for action with their visualization.

Send

Poor perceived affordance of pressing



Good perceived affordance of pressing

Memory

Humans:

- Good at recognition ←→ GUIs
- Bad at recall ←→ Command line interfaces (e.g. order of arguments in a function call)

Encoding into larger chunks of meaning

ADSGIXD
CRSWRK

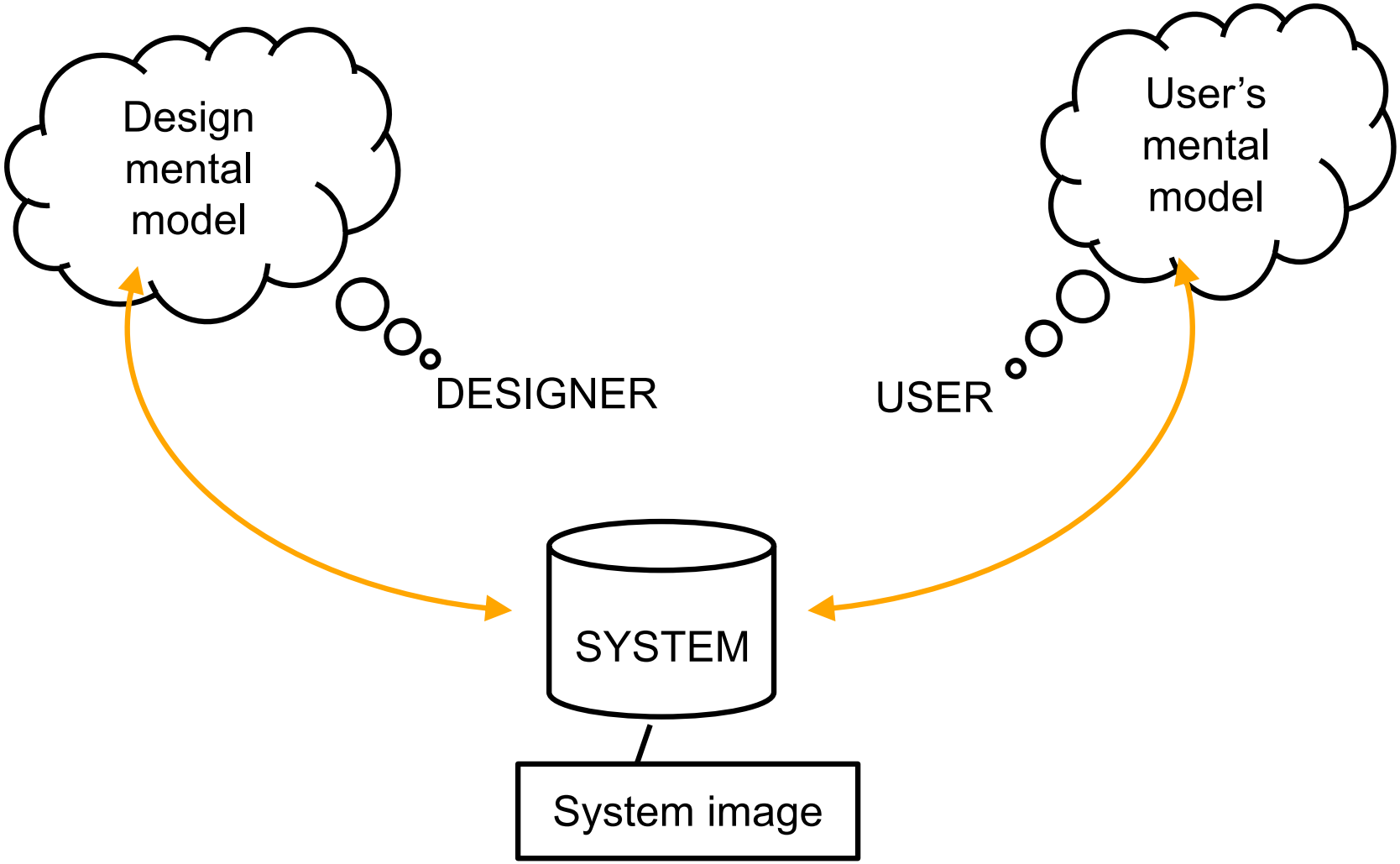
Recalling vs recognizing the colours of euro notes

How IDEs help recall

```
Customer c = new Customer();
c.
```

type	String
equals(Object obj)	boolean
getClass()	Class<?>
getType()	String
hashCode()	int
notify()	void
notifyAll()	void
setType(String type)	void
toString()	String
wait()	void
wait(long timeout)	void
wait(long timeout, int nanos)	void

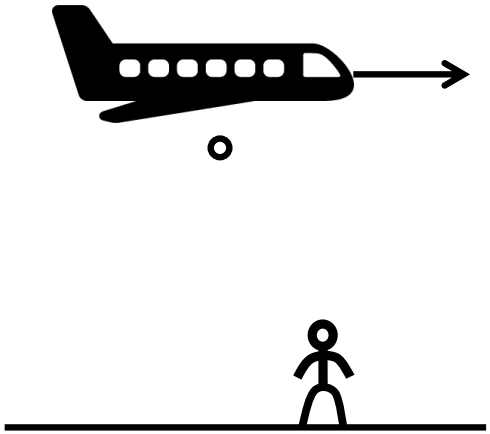
Mental models



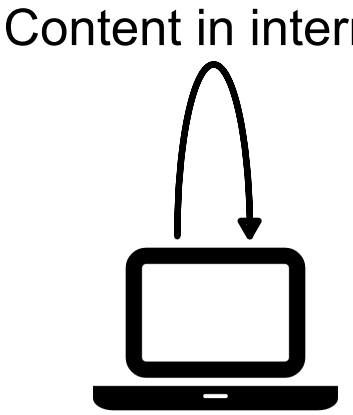
Norman, D. A. (1988). *The Psychology of Everyday Things*. New York, NY: Basic Books.

Mental models

= “mostly imagined, dynamic models that we use in everyday life to think about the world” *



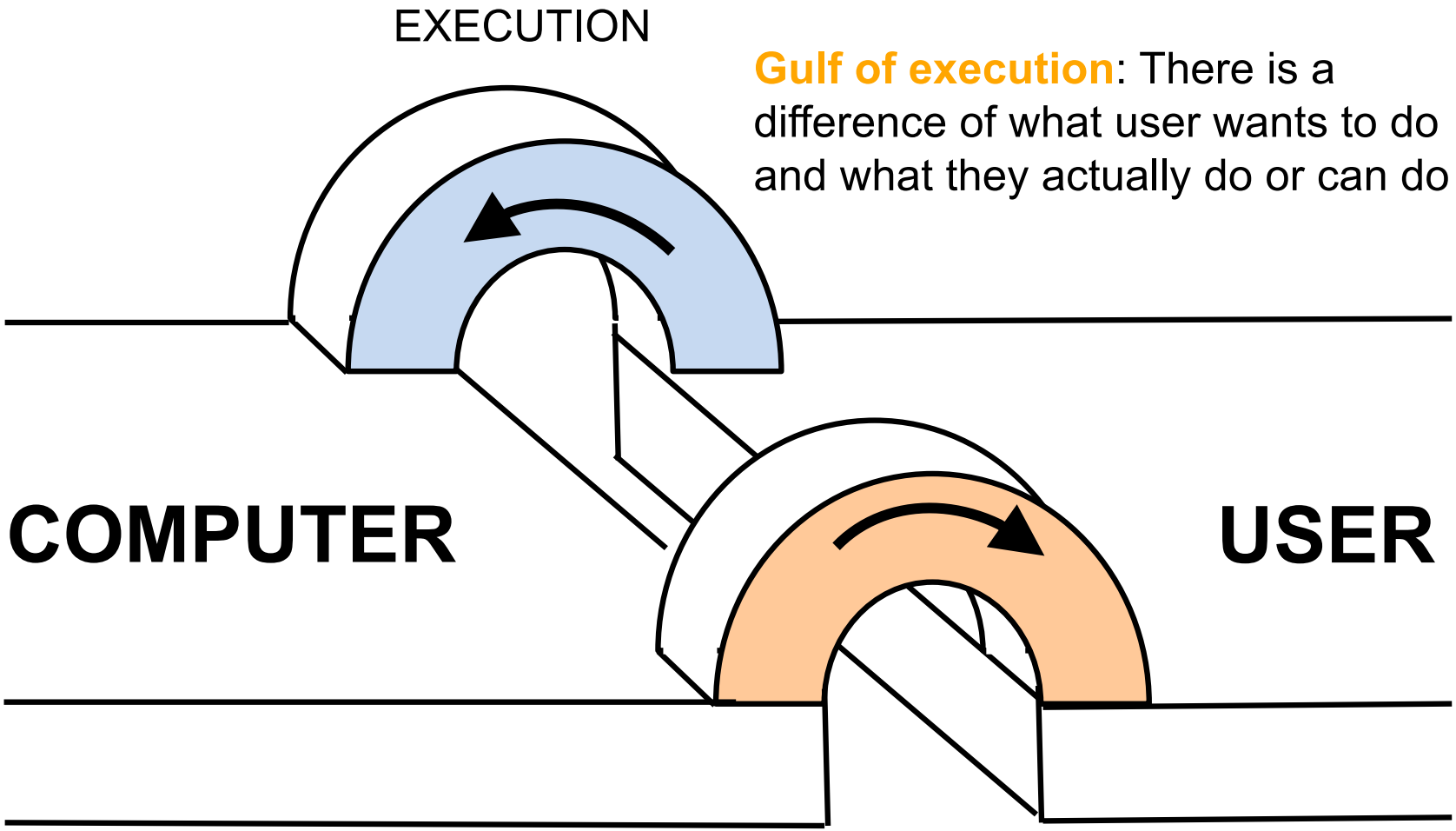
If you drop a metal ball from an airplane, what path will it fly?



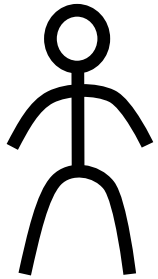
If my internet browser loads pages slowly, where is the problem?

* Eysenck & Keane, 2000 p. 432

Two stages where interaction can go wrong



Sharing of responsibilities: “cognitive offloading”



Pattern recognition

Intuitive interpretation (e.g., “reading between the lines”)

Ill-defined problem solving

Creativity

Brute force solutions

Simulations

Generation of alternatives

Automatable and repetitive tasks

Planning in well-defined problem spaces

External memory

Checking for human errors

Suggested reading: Kirsh (1995): The intelligent use of space.

Multi-tasking and multi-modal UIs

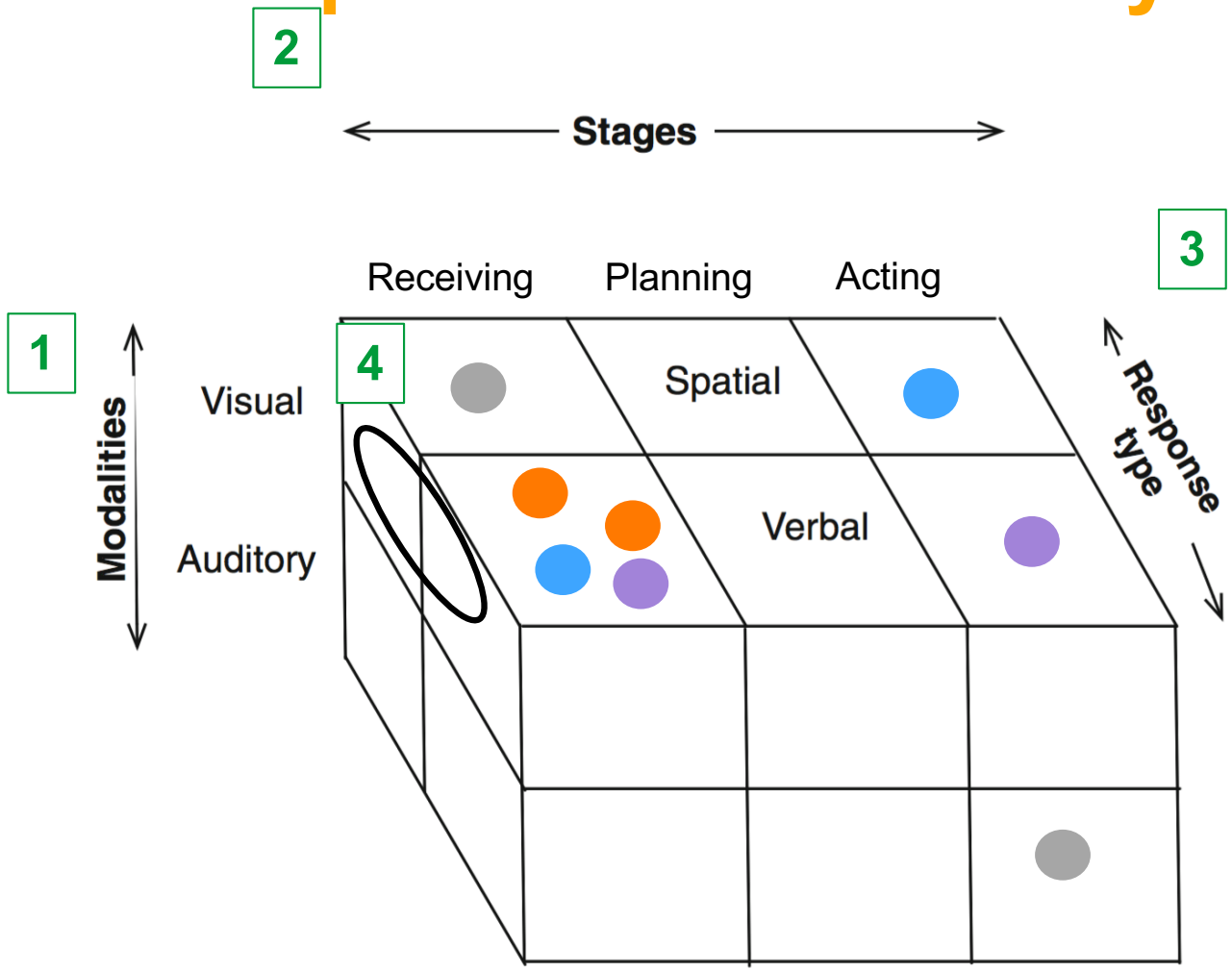
What would be a good wayfinding app for bike couriers?

Challenges:

- Hands are on handlebar
- Eyes are on the traffic
- Ears scan the surroundings
- Brain is planning actions and navigation

Photo credit: Bike messenger by Mal Booth. Attribution-NonCommercial-ShareAlike 2.0 Generic (CC BY-NC-SA 2.0)

Multiple resources theory



4 dimensions:

1. Modalities
2. Stages of processing
3. Response types
4. Focal vs ambient (only the visual channel)

\+ Motor conflict

(e.g., use of hands)

3D conflict 2D conflict 1D conflict No resource conflict

Wickens (2002): Multiple resources and performance prediction. Theoretical Issues in Ergonomics Science 3(2), 159–177.
http://libproxy.aalto.fi/login?url=http://www.tandfonline.com/doi/abs/10.1080/14639220210123806

Use design heuristics as your guide

- Use both knowledge in the world and in the head
- Simplify the structure of tasks
- Make things visible
- Get the mappings right
- Exploit the power of constraints
- Design for error
- When all else fails: Standardize!

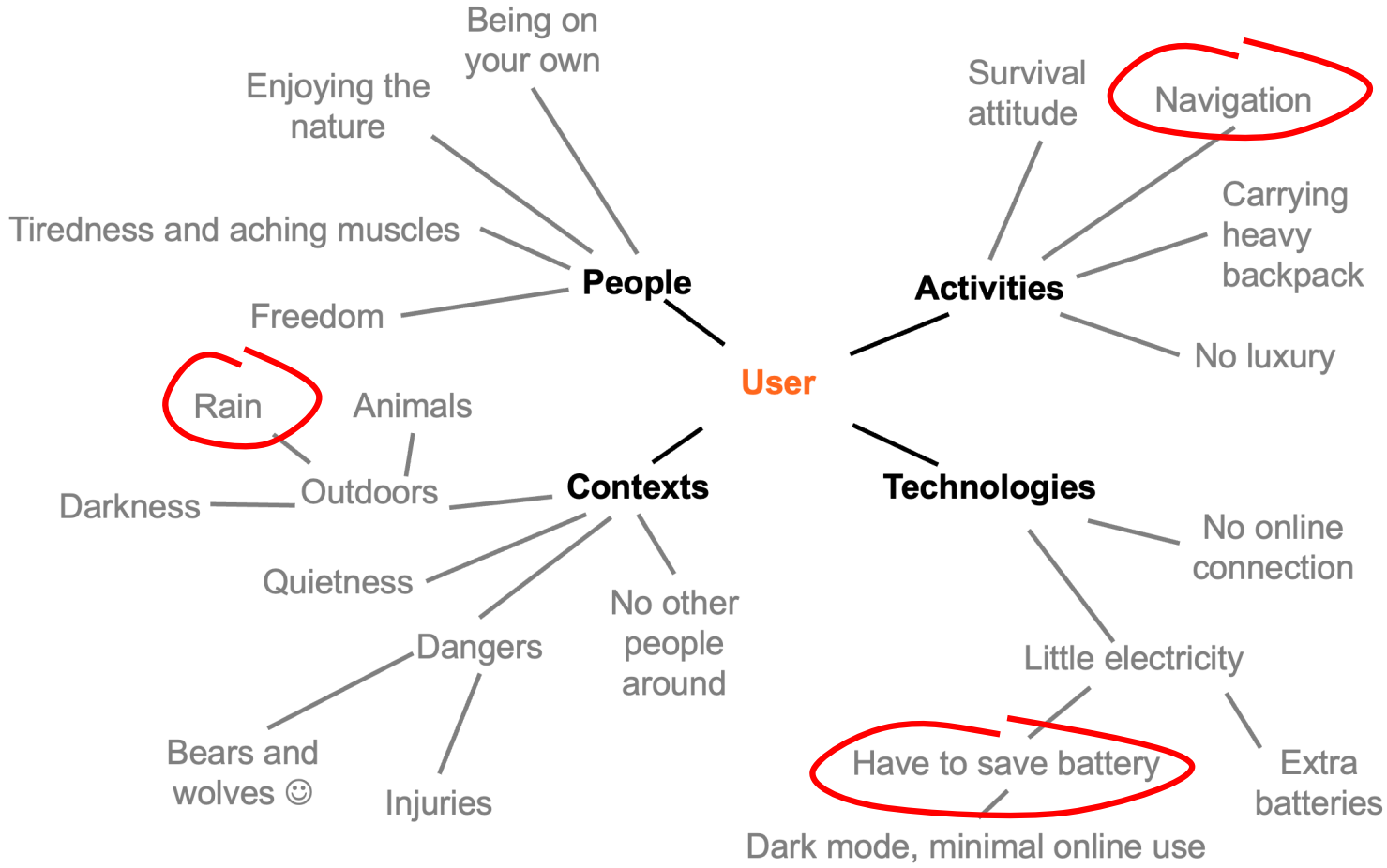
Visibility of system status	Match between system and the real world	User control and freedom	Consistency and standards	Help users recognize, diagnose, and recover from errors
Error prevention	Recognition rather than recall	Flexibility and efficiency of use	Aesthetic and minimalist design	Help and documen-tation

1 Strive for consistency	2 Enable frequent users to use shortcuts	3 Offer informative feedback	4 Design dialog to yield closure
5 Offer simple error handling	6 Permit easy reversal of actions	7 Support internal locus of control	8 Reduce short-term memory load

Easy to learn	Efficient	Memorable
Designed for error	Satisfaction	

Group work

What PACT factors you must focus on, based on cognition, design heuristics, user's goal, and your UX goal?

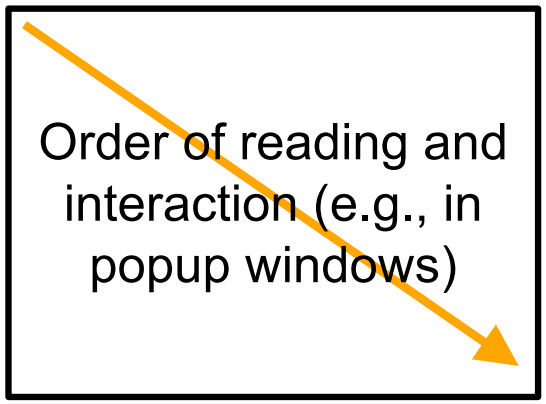


How are you going to design it?

Design conventions

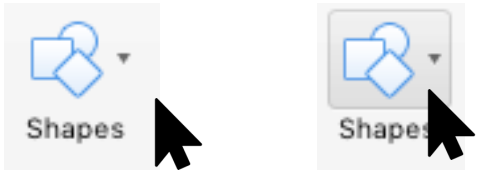
Design patterns

Conventions



Commonly known icons

[Blue text is a hyperlink]



Item is clickable if it changes when it is hovered

Design patterns

”A design pattern is the re-usable form of a solution to a design problem” (Wikipedia)

Origins of the design patterns:

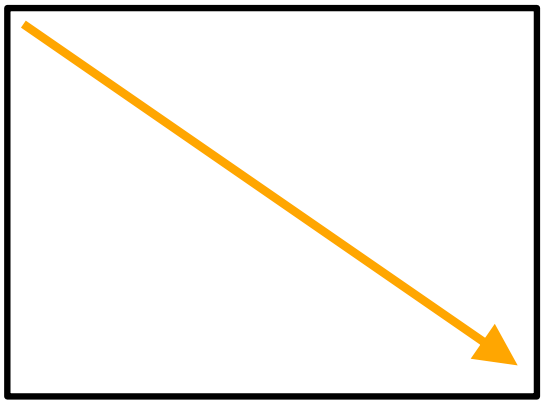
- Christopher Alexander (architect)
- Design patterns are repeatable design solutions to in urban planning and house design
- ”You can use this solution a million times over, without ever doing it the same way twice” – Alexander, *A Pattern Language*, page x

In computer science and interaction design:

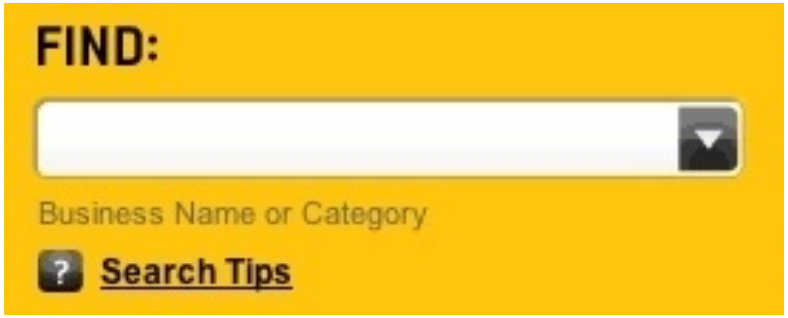
- Highly adopted especially in object-oriented programming
- Also in IxD

Design patterns are a toolbox of good, tested design solutions

Design patterns

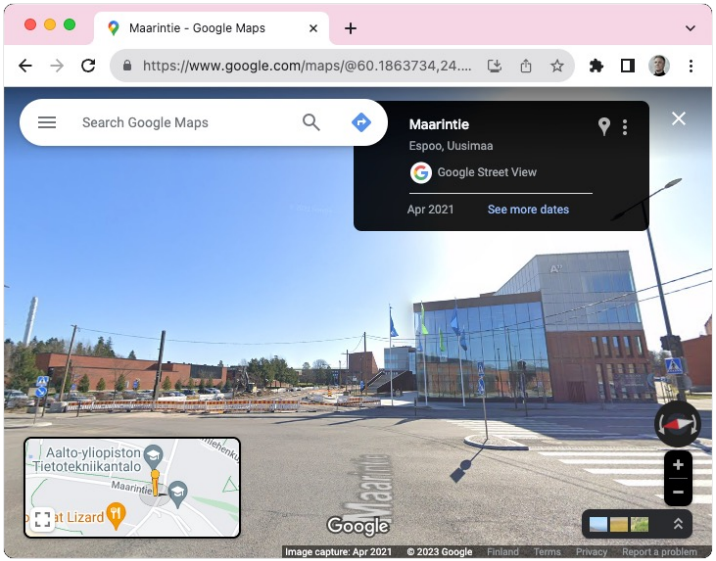


Direction of reading

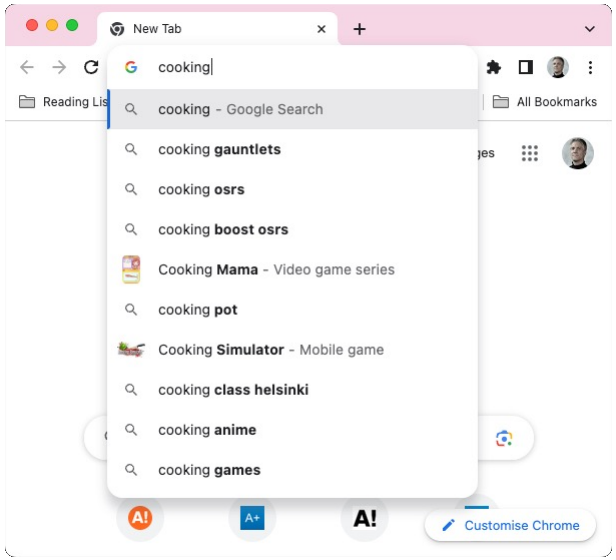


“Forgiving format”

https://ui-patterns.com/patterns/ForgivingFormat

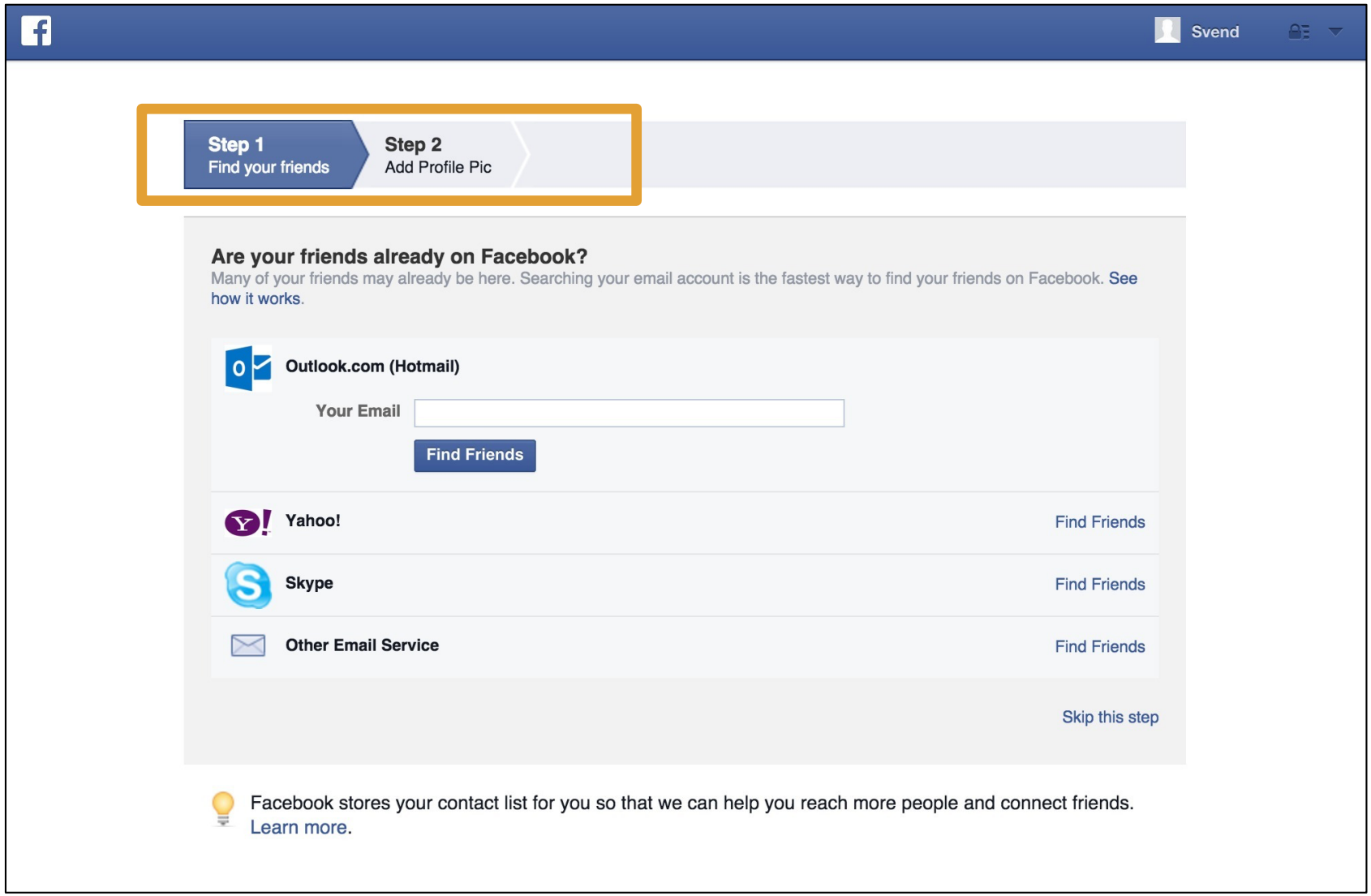


“Overview + detail”



“Autocompletion”

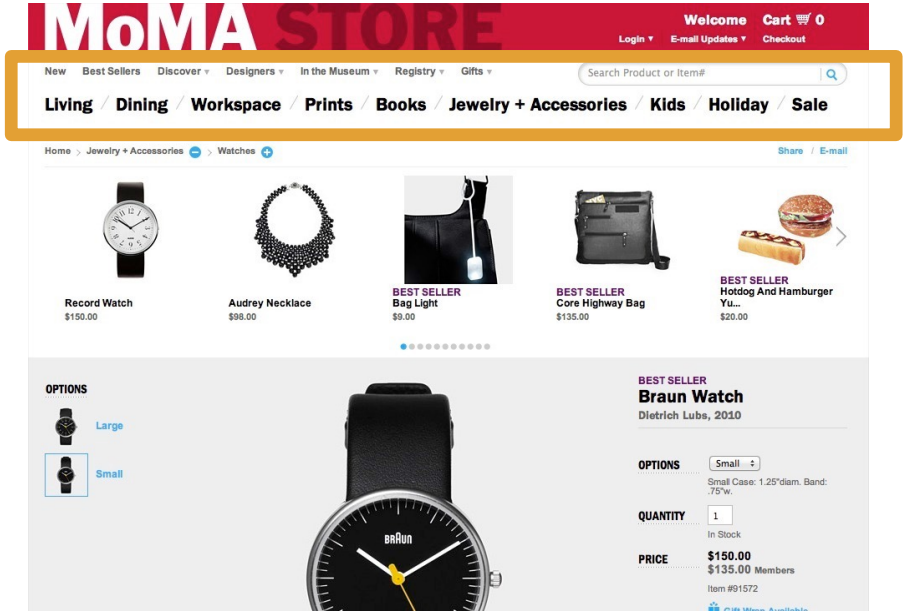
Wizard


Svend
Step 1
Find your friends
Step 2
Add Profile Pic
Are your friends already on Facebook?
Many of your friends may already be here. Searching your email account is the fastest way to find your friends on Facebook. See how it works.
Outlook.com (Hotmail)
Your Email
Find Friends
Yahoo!
Find Friends
Skype
Find Friends
Other Email Service
Find Friends
Skip this step
Facebook stores your contact list for you so that we can help you reach more people and connect friends.
Learn more.

Module tabs

From: news.com

Navigation tabs



Fat footer

FOLLOW US ON:
Site Links
Home
Privacy & Security
Help
Personal Finance Blog
Site Map
Company Information
About Mint
Awards
Reviews
Testimonials
Contact
Automatic Money Management
Online Money Management
Investing in Stocks
Commodities Investing
Savings Account
Investment Management
Better Budgeting
Personal Budget Planner
Real Estate Investing
Household Budget Tracking
Personal Budgeting
Creating a Budget
Personal Finance Made Easy
Online Financial Management
Credit Card Offers
Personal Finance Software
Online Budgeting Tools
Financial Planning
VeriSign Secured
VERIFY
TRUSTe
CERTIFIED PRIVACY
McAfee SECURE
TESTED DAILY 09-FEB
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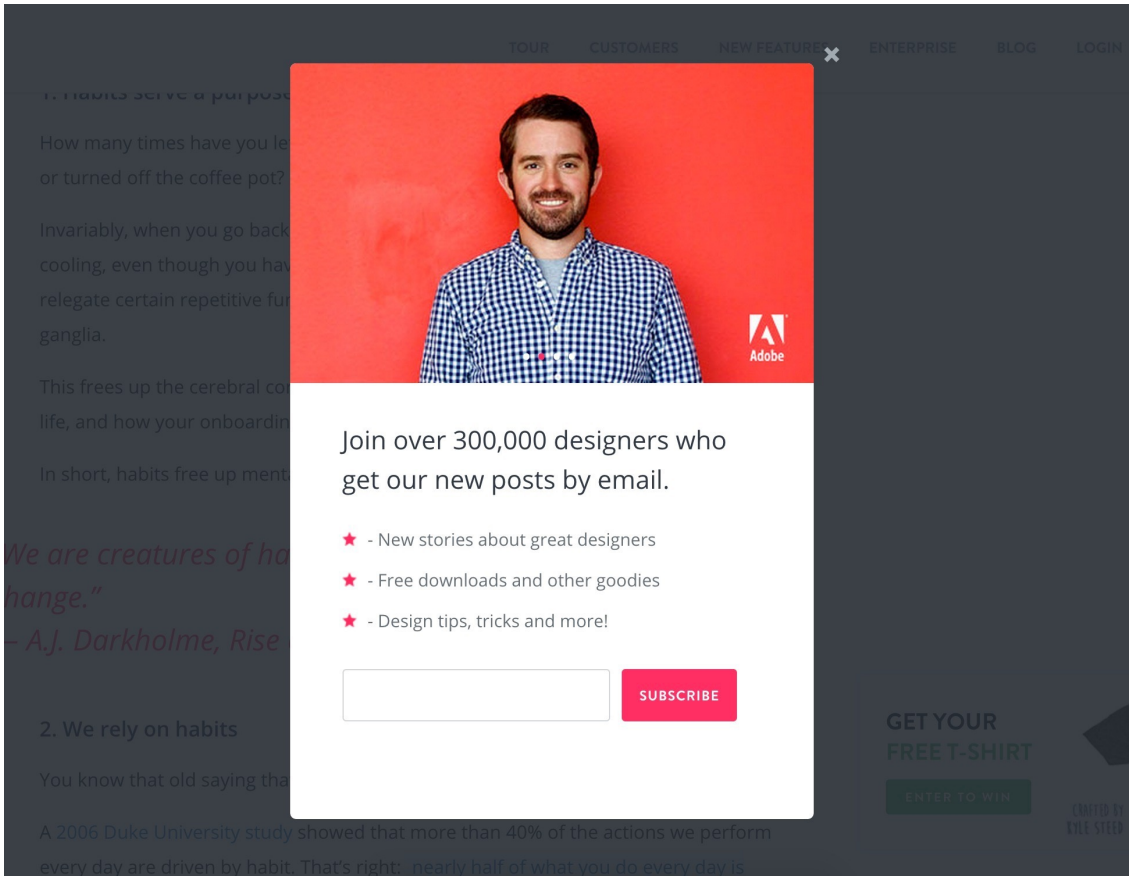
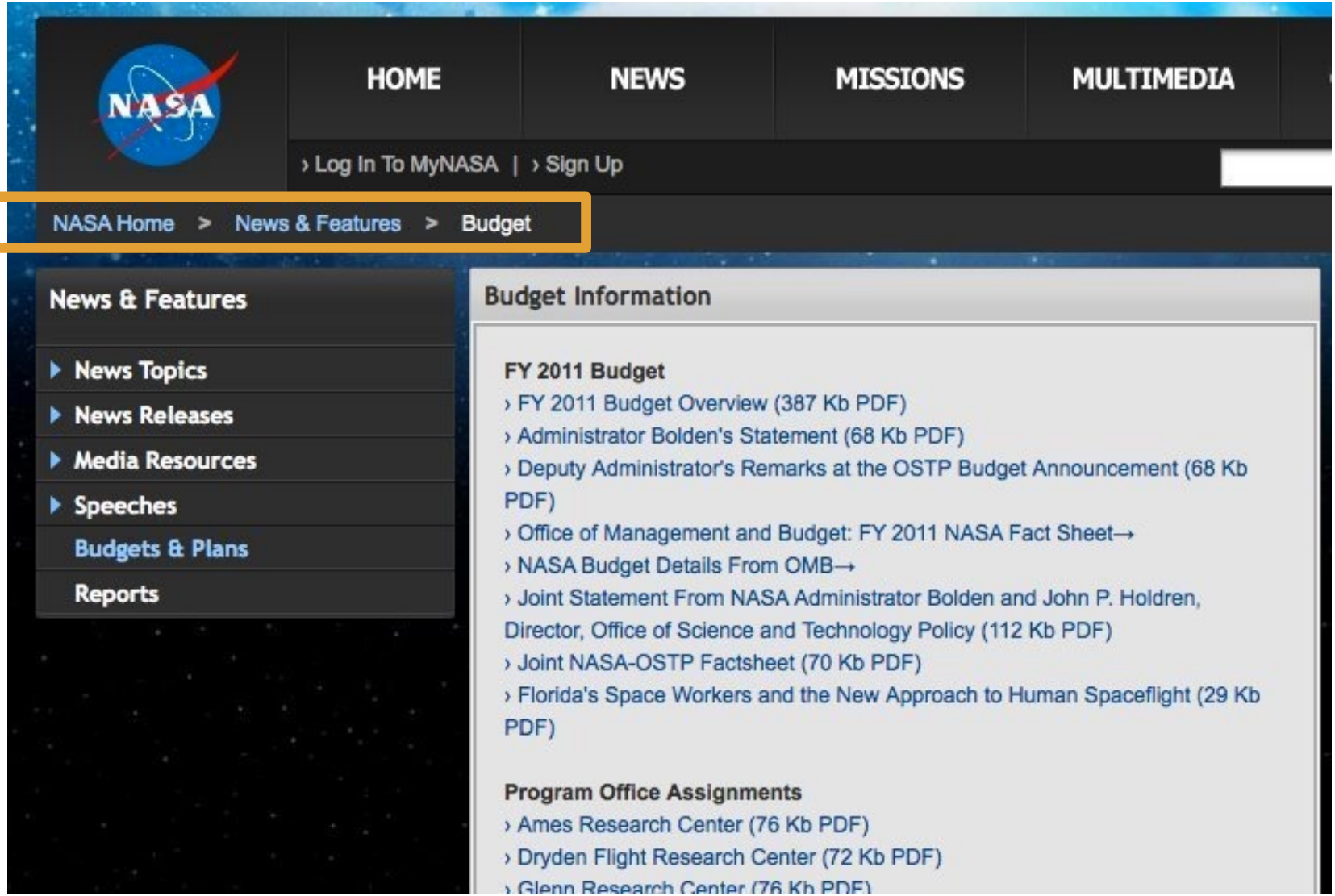
Modal dialogs

Popup windows that demand an answer from the user before they can do anything else



Breadcrumbs



Resources on design patterns

Jennifer Tidwell (Book that covers many patterns)

https://primo.aalto.fi/permalink/358AALTO_INST/ha1cg5/alma999358717706526

UIPatterns.com (Computer screen oriented)

Dozens of patterns organized by their type: Getting input, Dealing with data, Navigation, …

All examples in previous slides were from the Navigation section

http://ui-patterns.com

UsabilityGeek (Mobile UI oriented)

6 patterns with short desciptions and examples

https://usabilitygeek.com/ui-patterns-for-navigation-good-ux/

UxPin (Computer screen oriented)

Every pattern presented through Examples, Problem, Solution, and Tips

https://www.uxpin.com/studio/blog/website-navigation-trends-16-ui-patterns-completely-deconstructed/

More ”patterns”

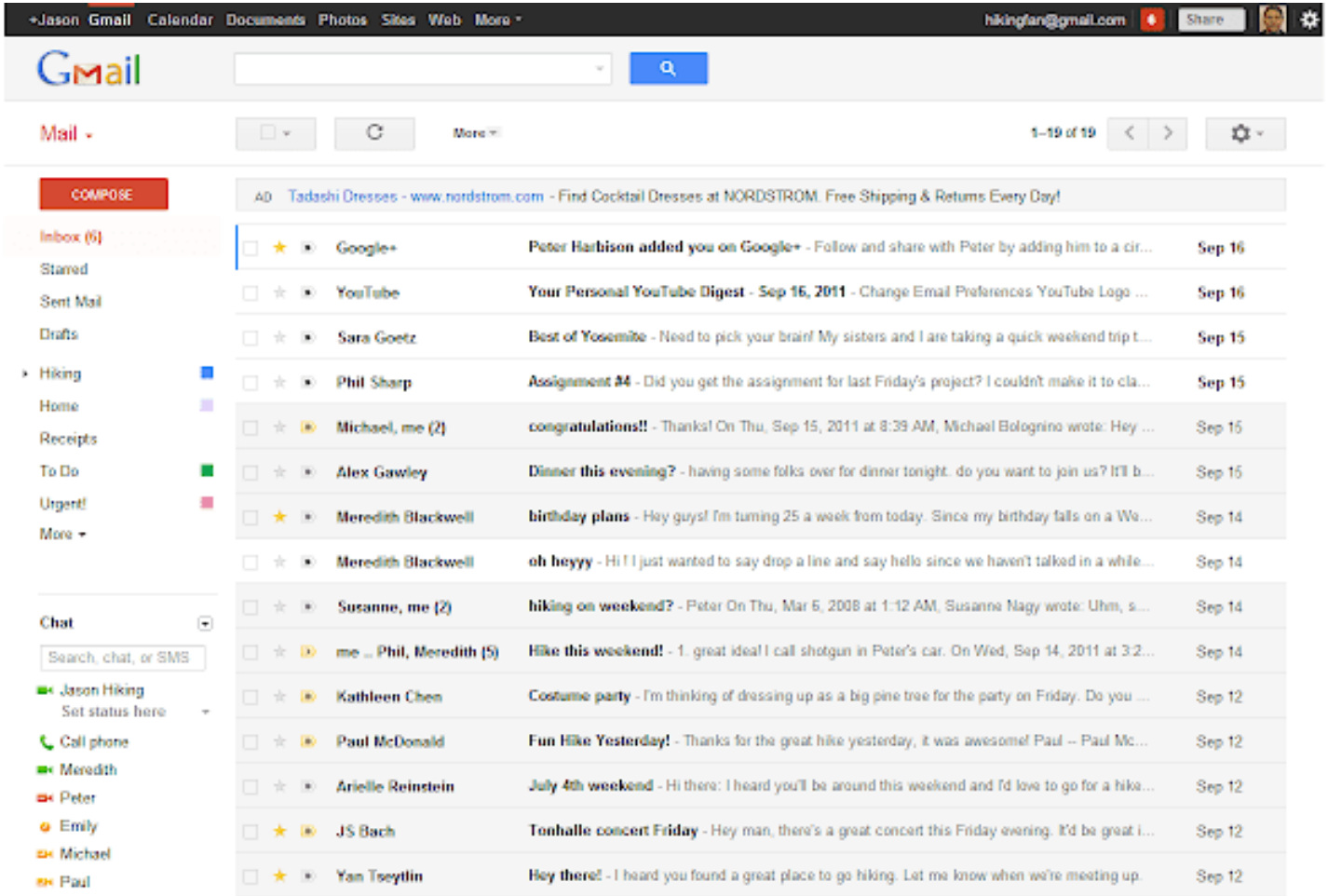
Single page app design (as in Gmail)

Landing page

Long format instead of a star-like navigation

Responsive design

Single-page app



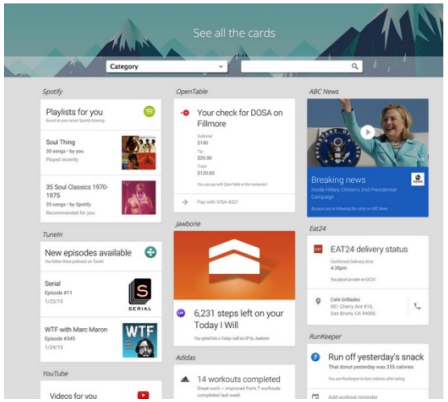
Design fashions

Skeumorphism

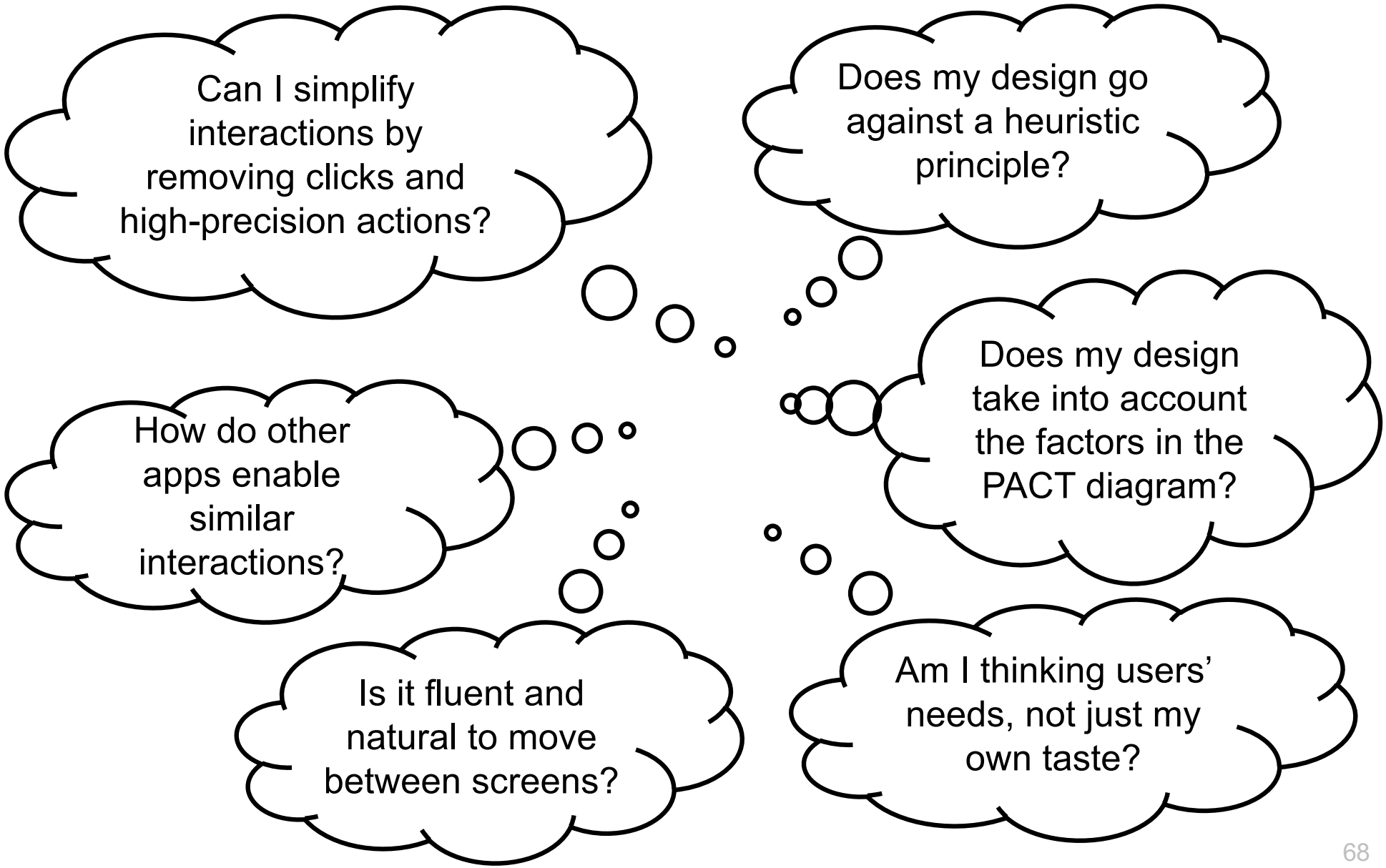
Flat design

Infinite scroll vs pagination

Card-based design



Questions you can ask when designing



Wizard of Oz prototyping

Wizard of Oz (“WoZ”) prototyping

https://hcde498processlog.wordpress.com/2015/05/11/wizard-of-oz-a-pen-that-corrects-you-when-you-write-off-line/

Wizard-of-Oz simulations

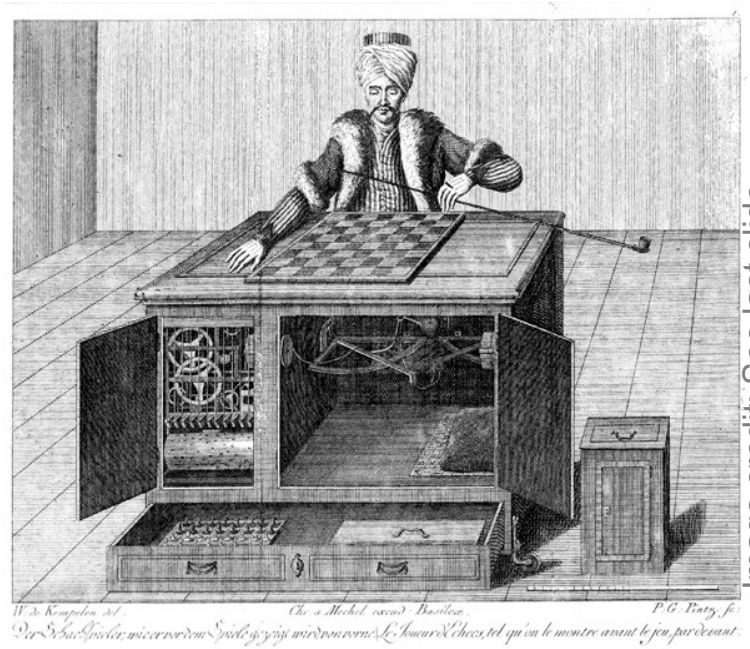


Image credit: See last slide

Chess-playing automaton constructed by Wolfgang von Kempelen in 1770

Used in studies on futuristic technologies

- e.g., artificial intelligence

Applies deception:

- Participant believes that the system is real while a part of its operation is controlled by the experimenter
- Setup is revealed after the study
- E.g., speech recognition studies

Wizard-of-Oz setup

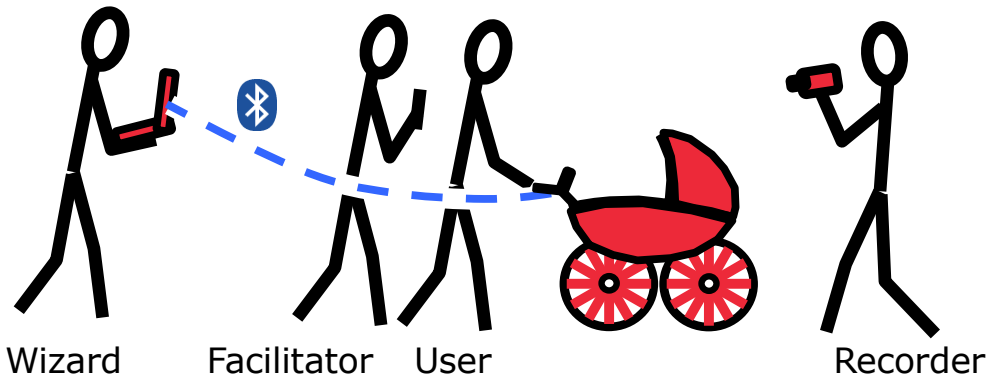
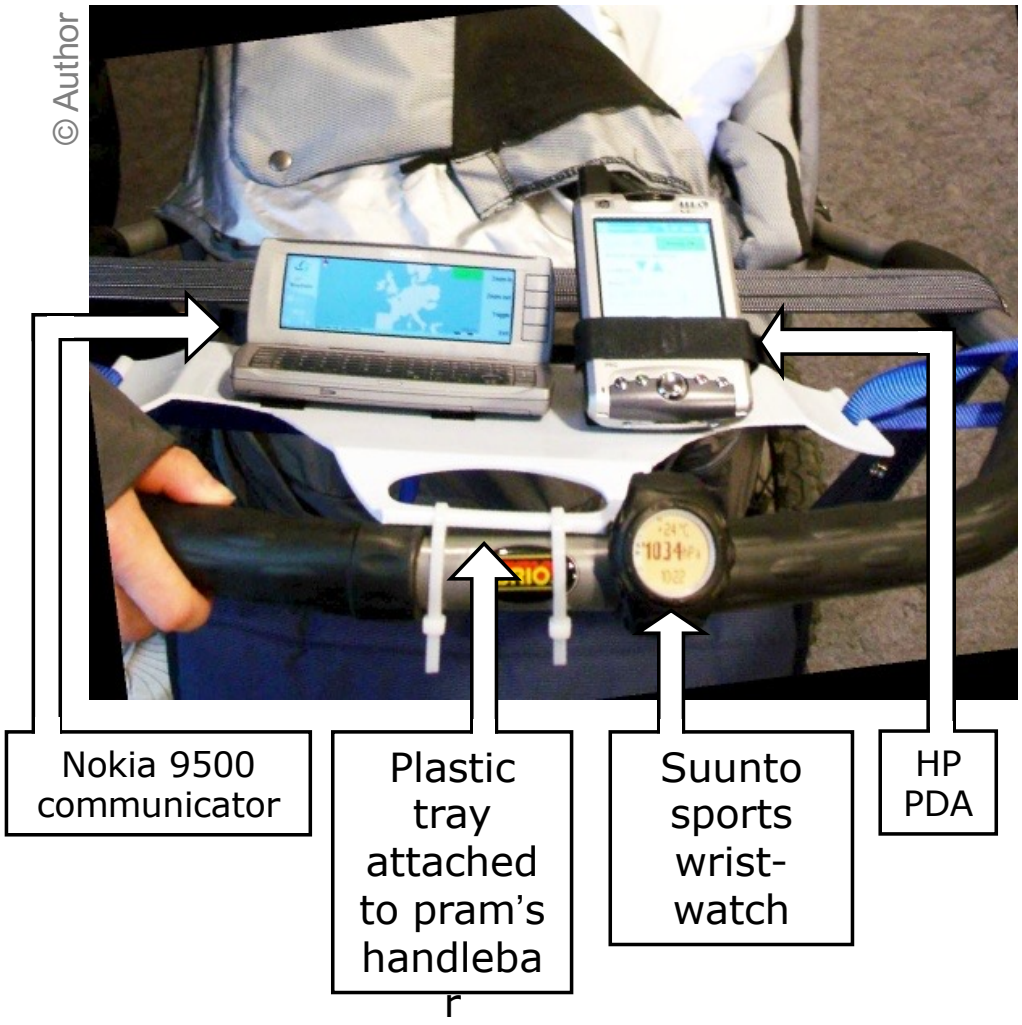


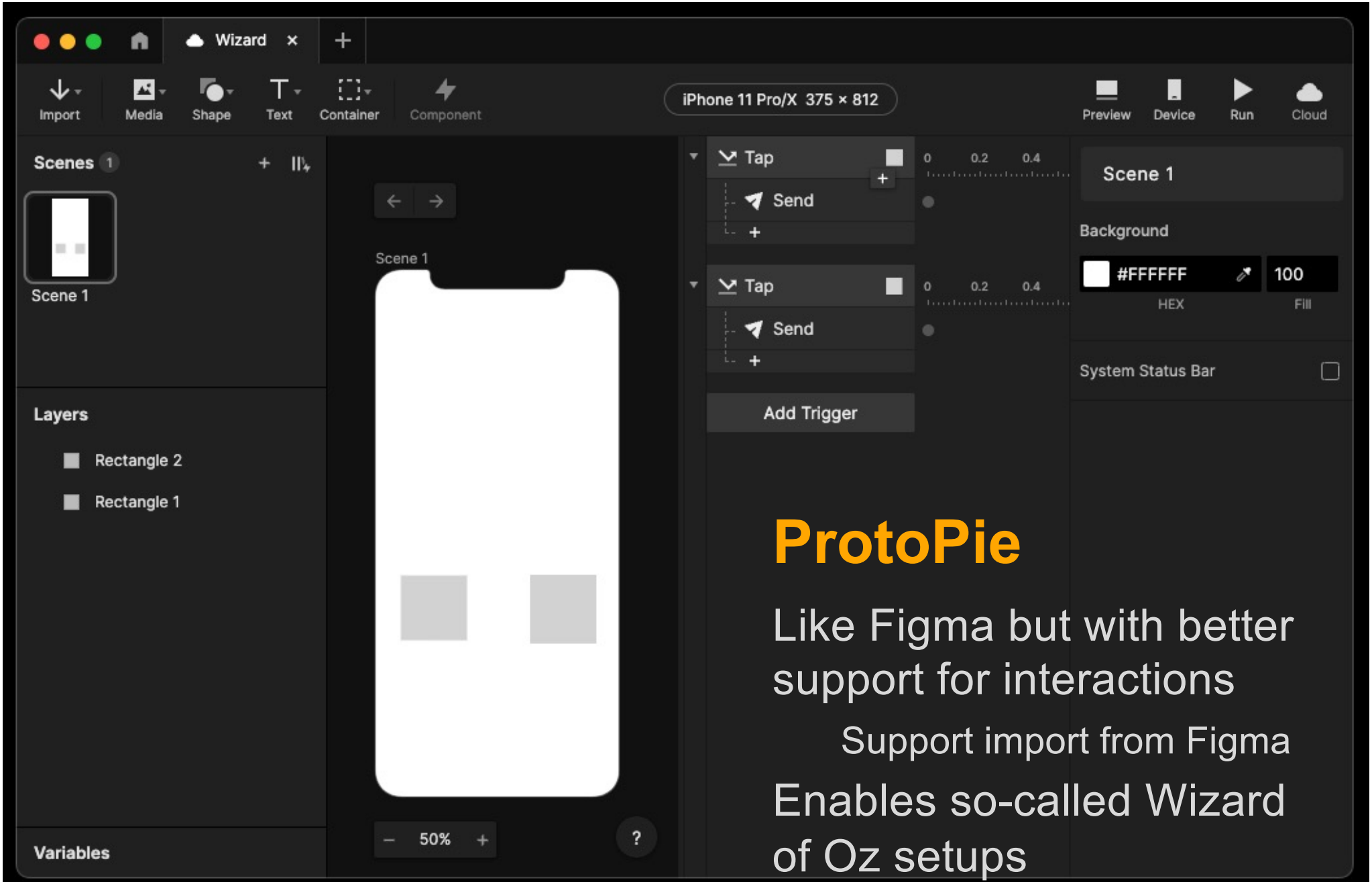
Image credits: See last slide

The Ruoholahti canal by Oghmoir. http://commons.wikimedia.org/wiki/File:Ruoholahden_kanava.jpg. Licensed under Creative Commons Attribution-Share Alike 3.0 Unported

WoZ study on location-based service recommendations

© Author





ProtoPie

Like Figma but with better support for interactions

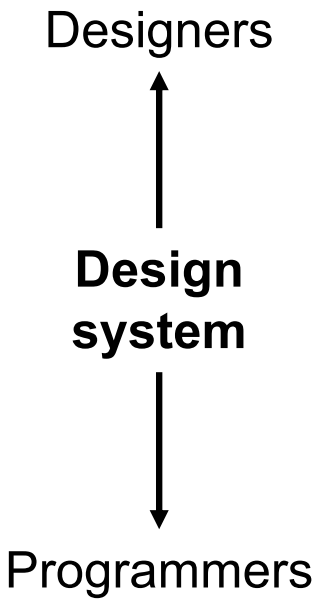
- Support import from Figma

Enables so-called Wizard of Oz setups

- You can change prototype's screen contents remotely

Design systems: basics

Design system: a definition



"A complete set of standards intended to manage design at scale using reusable components and patterns."

(https://www.nngroup.com/articles/design-systems-101/)

Contains:

- Colour palettes and in which cases which colour is used
- Fonts and their sizes
- Page layout principles
- Graphical specifications of UI components
- .. On a level that is also readily usable by programmers (such as CSS, JavaScript libs)

Example: Helsinki Design System

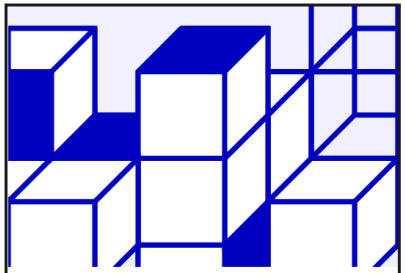
https://hds.hel.fi

Brand guidelines

The visual identity guidelines of the city of Helsinki

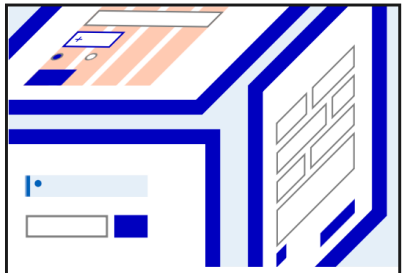
Foundation

Guide for applying the visual guidelines to digital experiences



Components

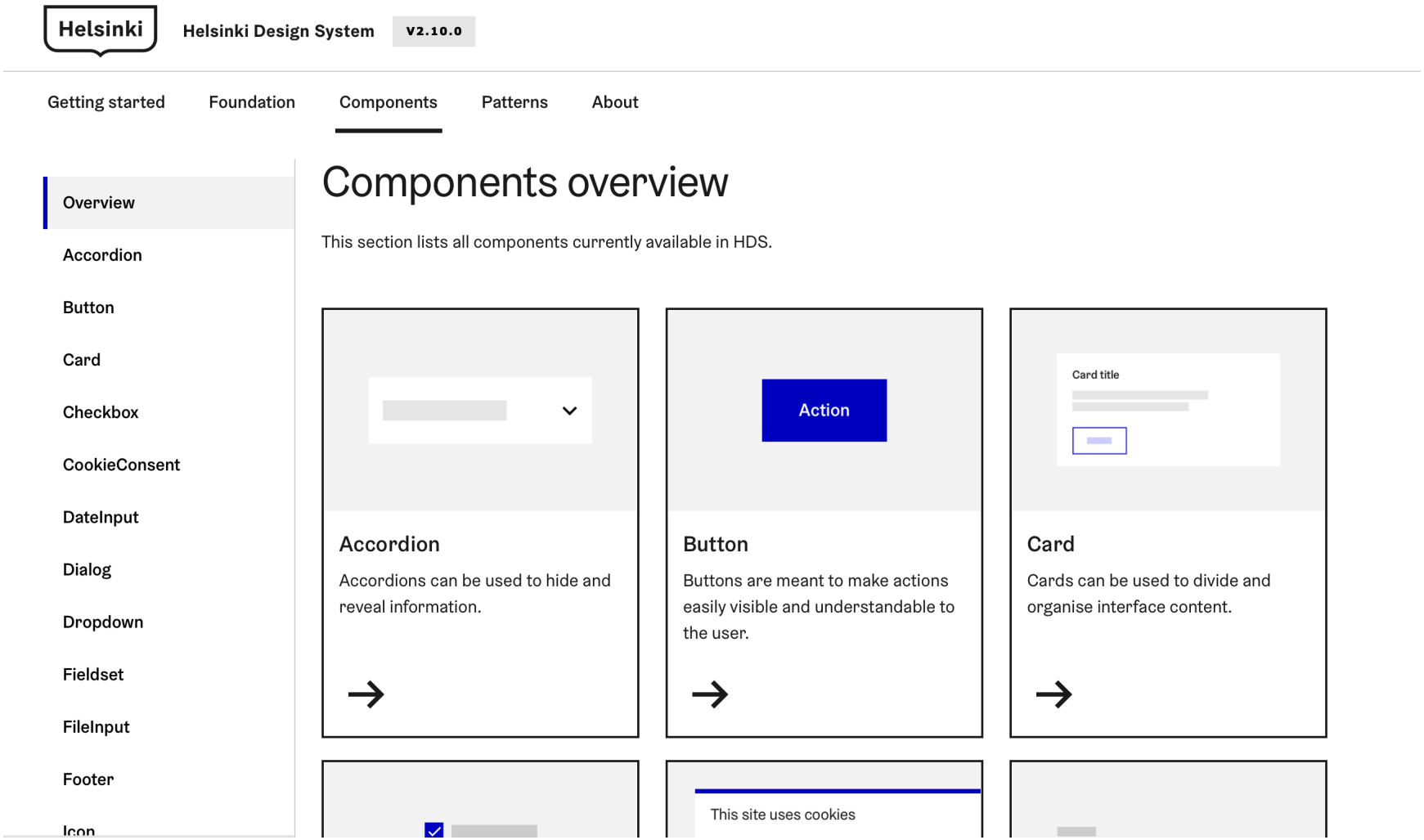
UI components ready to use for complete layouts



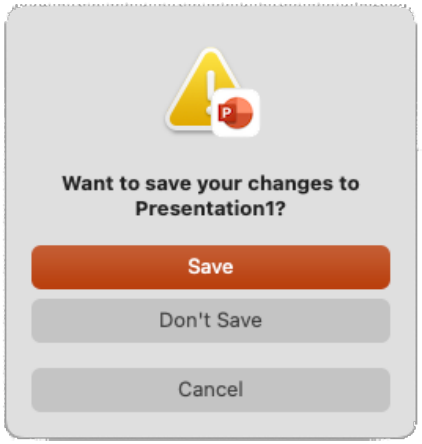
Patterns

Components and guidelines are used to build pages for specific user flows

Helsinki Design System: Components



Helsinki Design System: Button



Variations

Primary

A Primary button is reserved for the most important action on the screen. Primary action is usually either mandatory or essential for the user. Primary buttons are designed to clearly highlight the most important action, and therefore you should avoid having multiple primary buttons on one screen. For less important actions, consider using secondary or supplementary buttons instead.

Primary

Secondary

Secondary buttons are used for actions which are not mandatory or essential for the user. Often screens will include multiple secondary buttons alongside one primary button.

Primary

Design Systems in this course

Purposes:

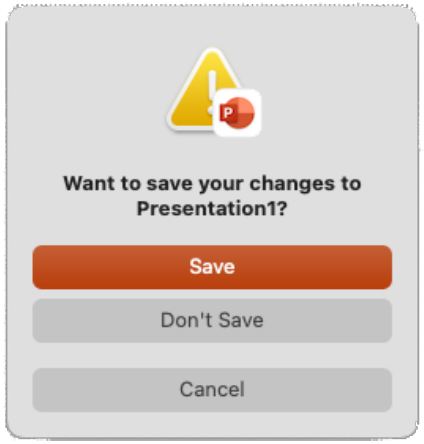
- Communicate to the user how the UI can be interacted with
- Ensure visual consistency
- Make Designs A and B on the same level

Not in this course's focus:

- Branding
- How the design system would support programmers
  => ~~CSS settings and component libraries~~

Think about these:

Colours

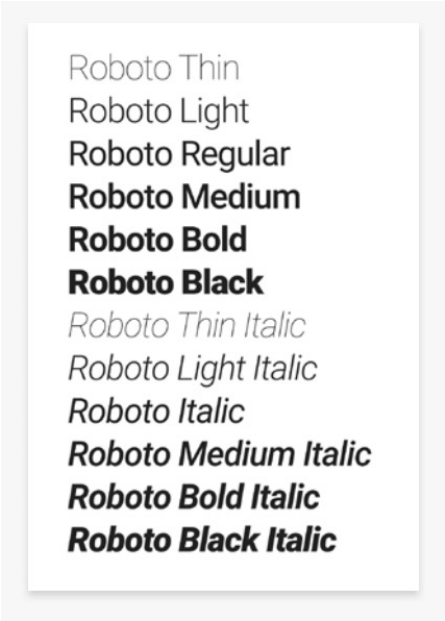


Hierarchies: colour-coding of primary and secondary action options

60-30-10 rule*

Contrasts + web-safeness

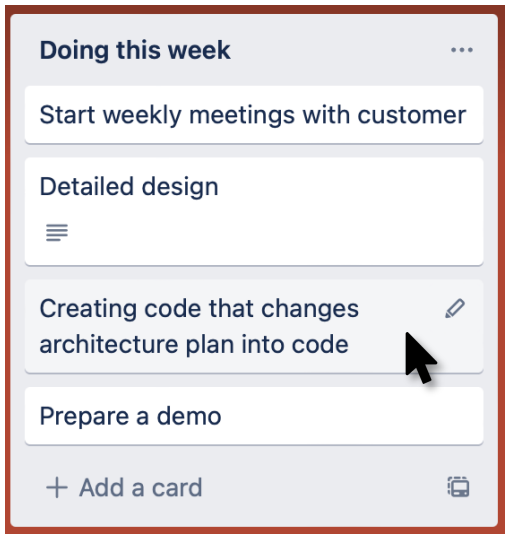
Fonts



"2 fonts is enough" rule

Sufficient differences between fonts

Communicating "actionability"



Hovering

Animation

* https://www.youtube.com/watch?v=UWwNIMHFdW4

Resources

DesignBetter.co's Design Systems Handbook:

https://www.designbetter.co/design-systems-handbook/

Free PDF, 197 pages

FreeCodeCamp's intro for their online course:

https://www.freecodecamp.org/news/designing-a-styleguide-elements-that-go-into-functional-and-beautiful-products-ff1621e00a0e/

InVision's "Comprehensive guide to design systems":

https://www.invisionapp.com/inside-design/guide-to-design-systems/

UXPin's "Design Systems: Step-by-Step Guide to Creating Your Own"

https://www.uxpin.com/create-design-system-guide/

See you in the tutoring meetings tomorrow!