

# **Data Visualisation**

**About this course**

**Nathan Segers & Martijn Loth**



**Welcome!**



**Martijn Loth**



**Nathan Segers**

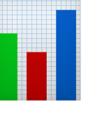
# Learning objectives

**Wow.**

- 1A.1.3 The student can identify characteristics of a target medium with a view to design.
- 1A.2.3 The student creates designs using a variety of tools and techniques.
- 1D.2.5 The student responsibly selects and implements the appropriate data service at the level of input, coding, output or maintenance
- 1D.3.1 The student integrates data tailored to the application
- 1D.3.2 The student establishes communication between application components and the data management system
- 1E.1.1 The student frames the basics of the front- or backend stack using sample code.
- 1E.1.2 The student outlines the collaboration of front- and/or backend technologies.
- 1E.1.3 The student explains the choice of a framework.
- 1E.2.1 The student writes efficient, structured code whether or not using design patterns.
- 1E.2.2 The student integrates front- and/or backend technologies into an interactive application.
- 1E.2.3 The student elaborates a front- and/or backend based on a prototype.

# Course planning

## Step by step.

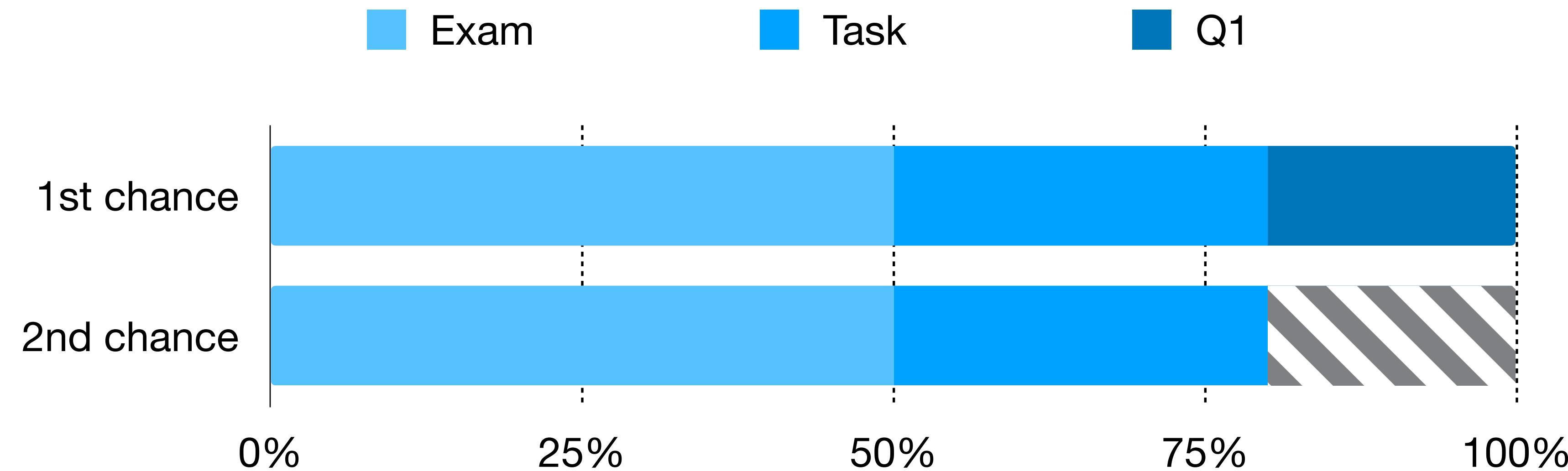
-  Basics for UI & UX
-  Database Setup Pt. 1
-  Gradio Setup
-  Database Setup Pt. 2
-  Plotly
-  Realtime Data Processing
-  Experimental Data Visualisation
-  Dockerize

**You will be able to have a basic understanding of design. You will be able to code a design to a working interface.**

- Goal of this course.

# Evaluation

## Getting marks.



# Project one

## Preparation

# Guides

## For this course.

-  **Be on time** - If you can't make it on time, give us a heads up.
-  **Ask questions** - Also give us an insight in what you tried and why it didn't work for you.
-  **Have fun** - We mostly want you to learn, but also have fun doing so.
-  **Take notes** - This can be a good way to process the course material and learn.
-  **Slow us down** - We can be enthousiast, slow us down if you can't follow along.

# How do you learn?

## Take ownership.

visual  
learner



learn what they see

kinesthetic  
learner



learn what they do

auditory  
learner



learn what they hear

stress  
learner



learn what stresses them

ease  
learner



learn what relaxes them

scribble  
learner



learn what they write out

trust  
learner



learn from authority

teach  
learner



learn by teaching

copy  
learner



learn what they can copy

# **Design**

## **Data Visualisation**

**MLoth**



# **Introduction: what is design?**



1

[www.projectcartoon.com](http://www.projectcartoon.com)  
How the customer explained it



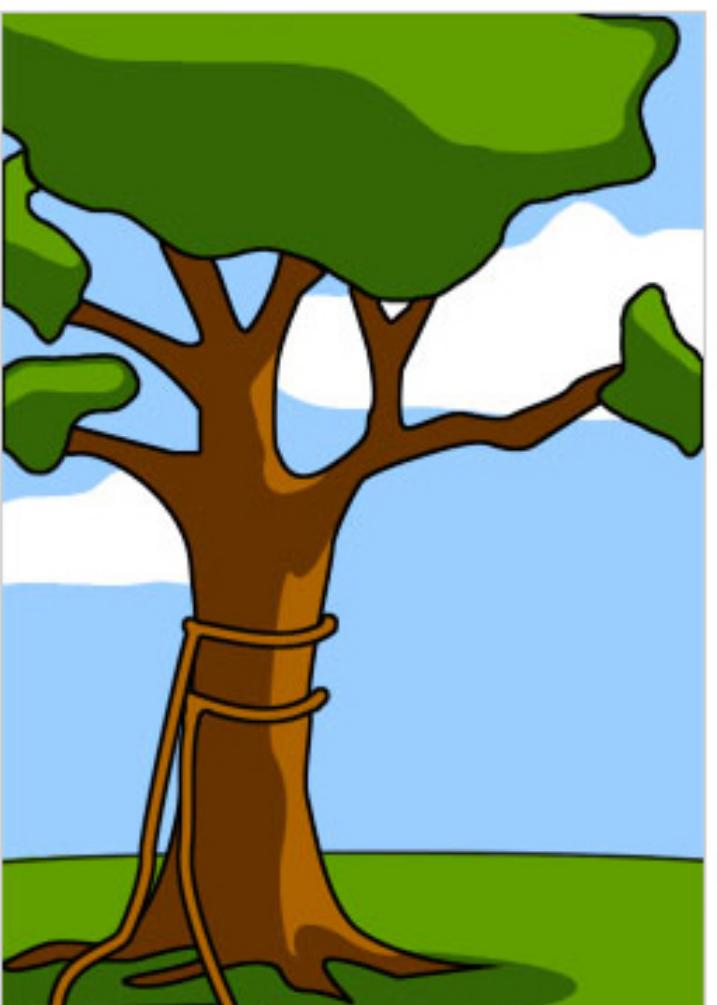
2

[www.projectcartoon.com](http://www.projectcartoon.com)  
How the project leader understood it



3

[www.projectcartoon.com](http://www.projectcartoon.com)  
How the analyst designed it



4

[www.projectcartoon.com](http://www.projectcartoon.com)  
How the programmer wrote it



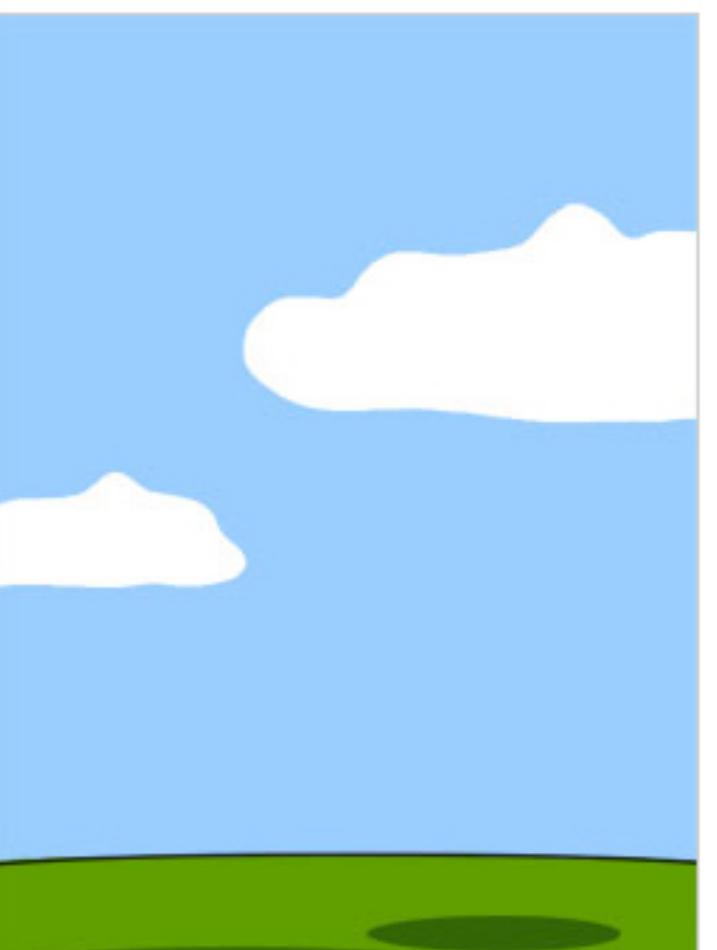
5

[www.projectcartoon.com](http://www.projectcartoon.com)  
What the beta testers received



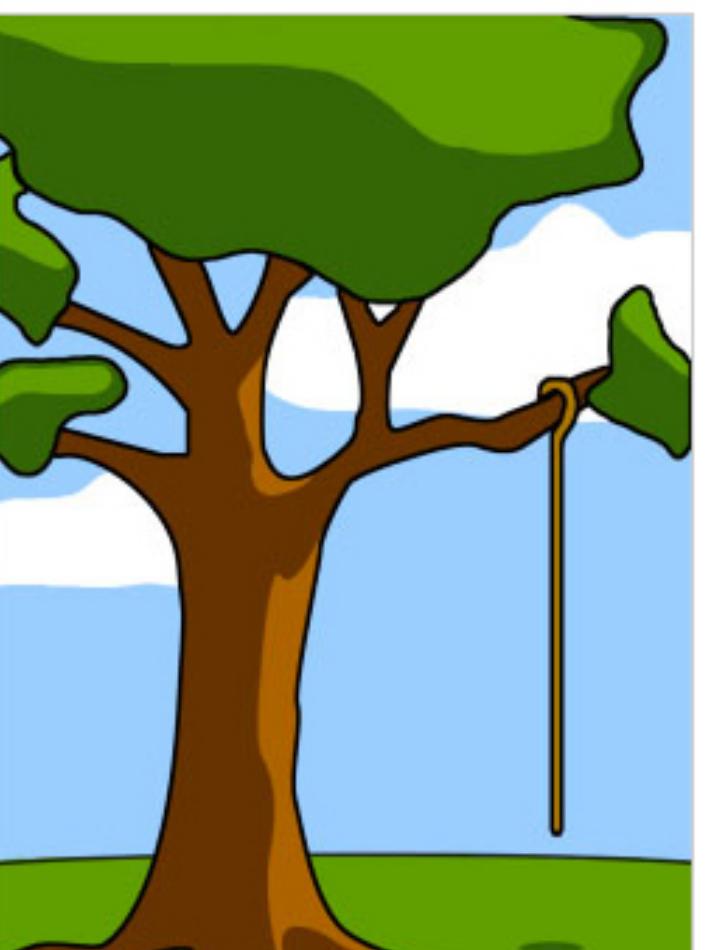
6

[www.projectcartoon.com](http://www.projectcartoon.com)  
How the business consultant described it



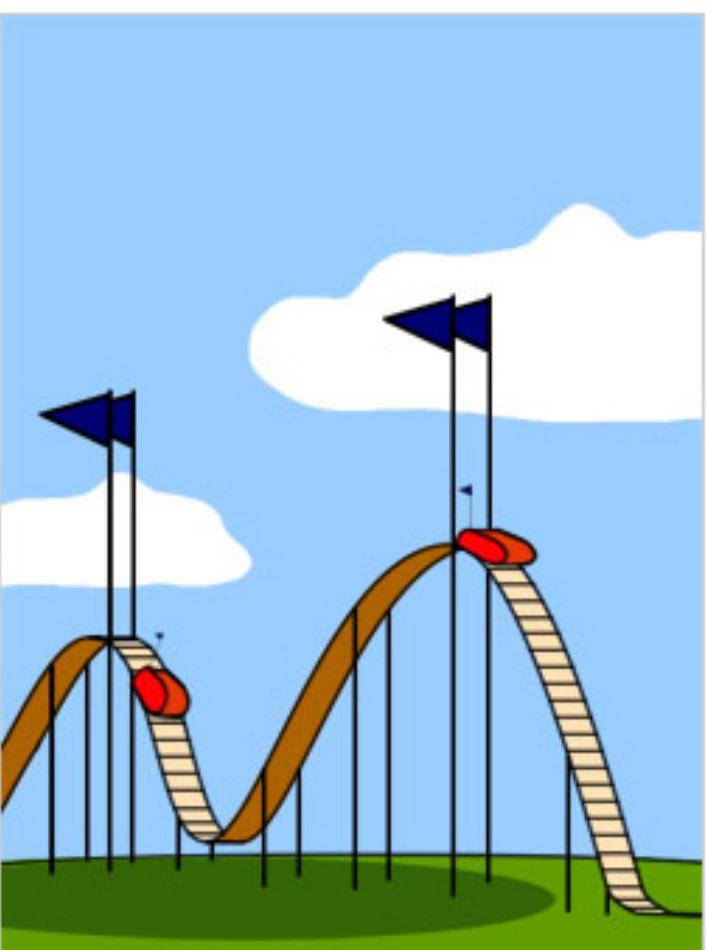
7

[www.projectcartoon.com](http://www.projectcartoon.com)  
How the project was documented



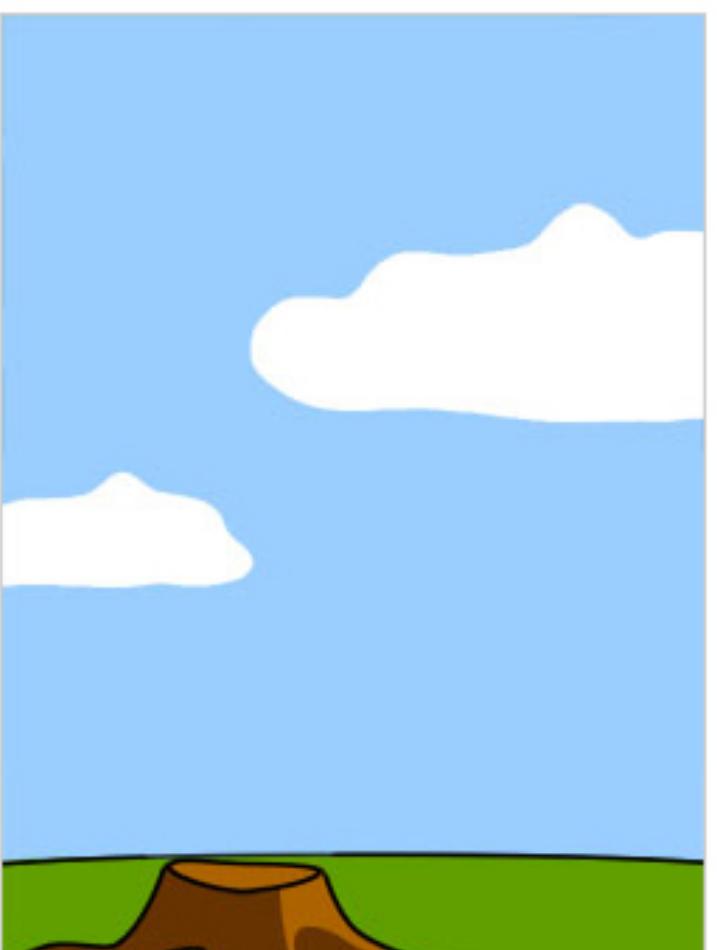
8

[www.projectcartoon.com](http://www.projectcartoon.com)  
What operations installed



9

[www.projectcartoon.com](http://www.projectcartoon.com)  
How the customer was billed



10

[www.projectcartoon.com](http://www.projectcartoon.com)  
How it was supported



11

[www.projectcartoon.com](http://www.projectcartoon.com)  
iSwing  
What marketing advertised



12

[www.projectcartoon.com](http://www.projectcartoon.com)  
What the customer really needed

**"Build the right thing, for the right people."**

**- Something I thought of, while making these slides...**

# **DESIGN**



**MAKING  
SENSE**



**GIVING  
FORM**

*why are things the  
way they are?*



*how can we  
make them  
better?*

**"Design is art that people use."**

**– Ellen Lupton**

ART IS ABOUT THE ARTIST  
**DESIGN IS ABOUT THE USER**

ART IS SUBJECTIVE  
**DESIGN IS OBJECTIVE**

# Design concepts

## Two most important terms

**#1 - UX**

User eXperience design

- How does the user interact with the software?
- What are the goals?
- What do users want to achieve?
- Who will be using this?

**#2 - UI**

User Interface design

- How does it look?
- What colors do I use?

# UX & UI

## Go hand in hand

- You always **start with user experience design**, than you proceed with the user interface design.
- In this course, **we will keep the UX process short** and focus on the UI.
- **Both disciplines can fill a whole bachelors degree.**
- You can **objectively** determine whether a product has bad UX or UI.  
It is not art, but it is an art.

Let's have a look at both their inputs, processes and outputs. →



**UX: think before you build**

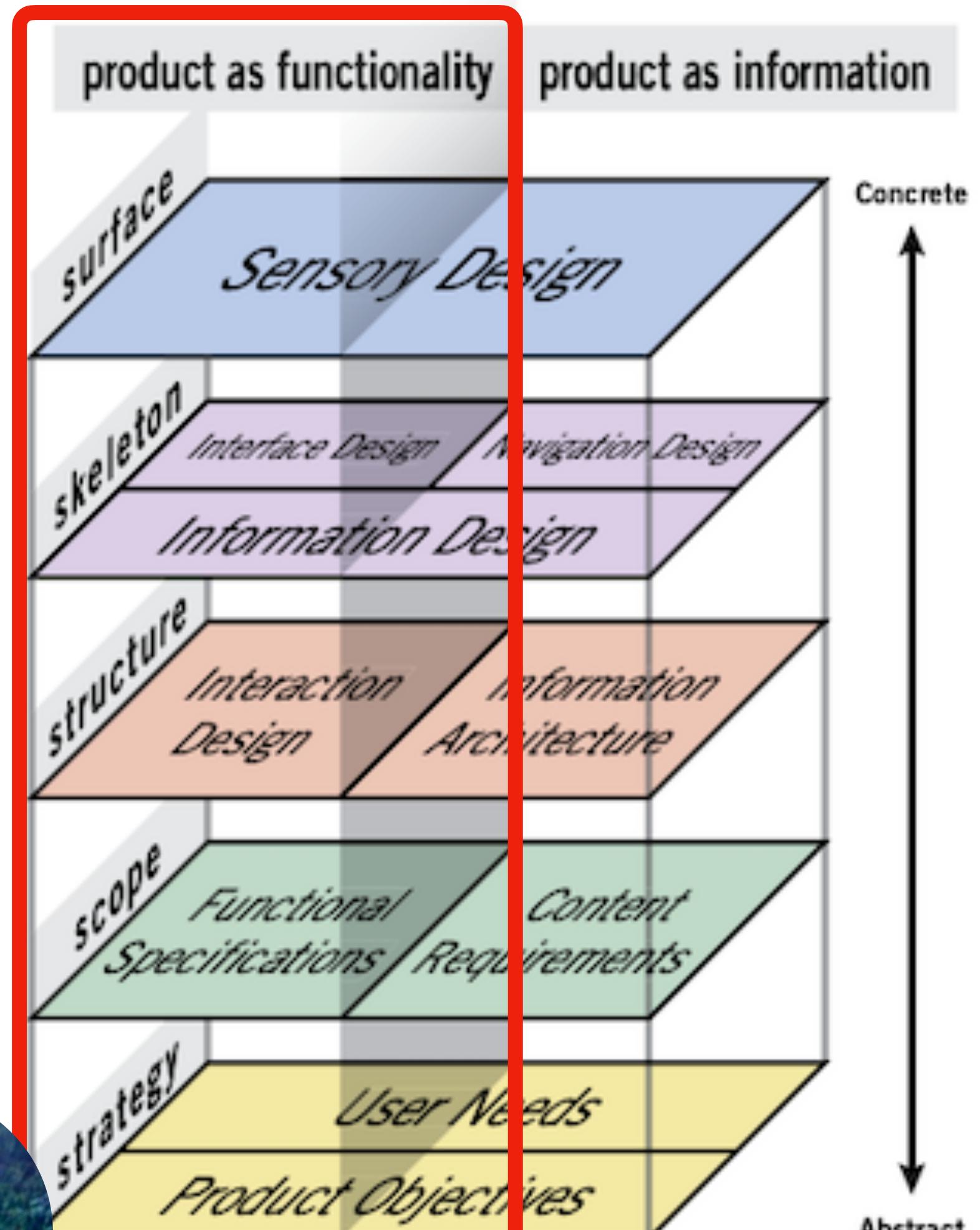
# UX

## Origins

- Jesse James Garett create a diagram to give form to the process of thinking how a digital product should be given form.
- Most approaches to UX are based on this diagram.
- This is a proven solution to create a product that users will use and can use.
- All too often, UX is a step that is skipped or neglected by companies.



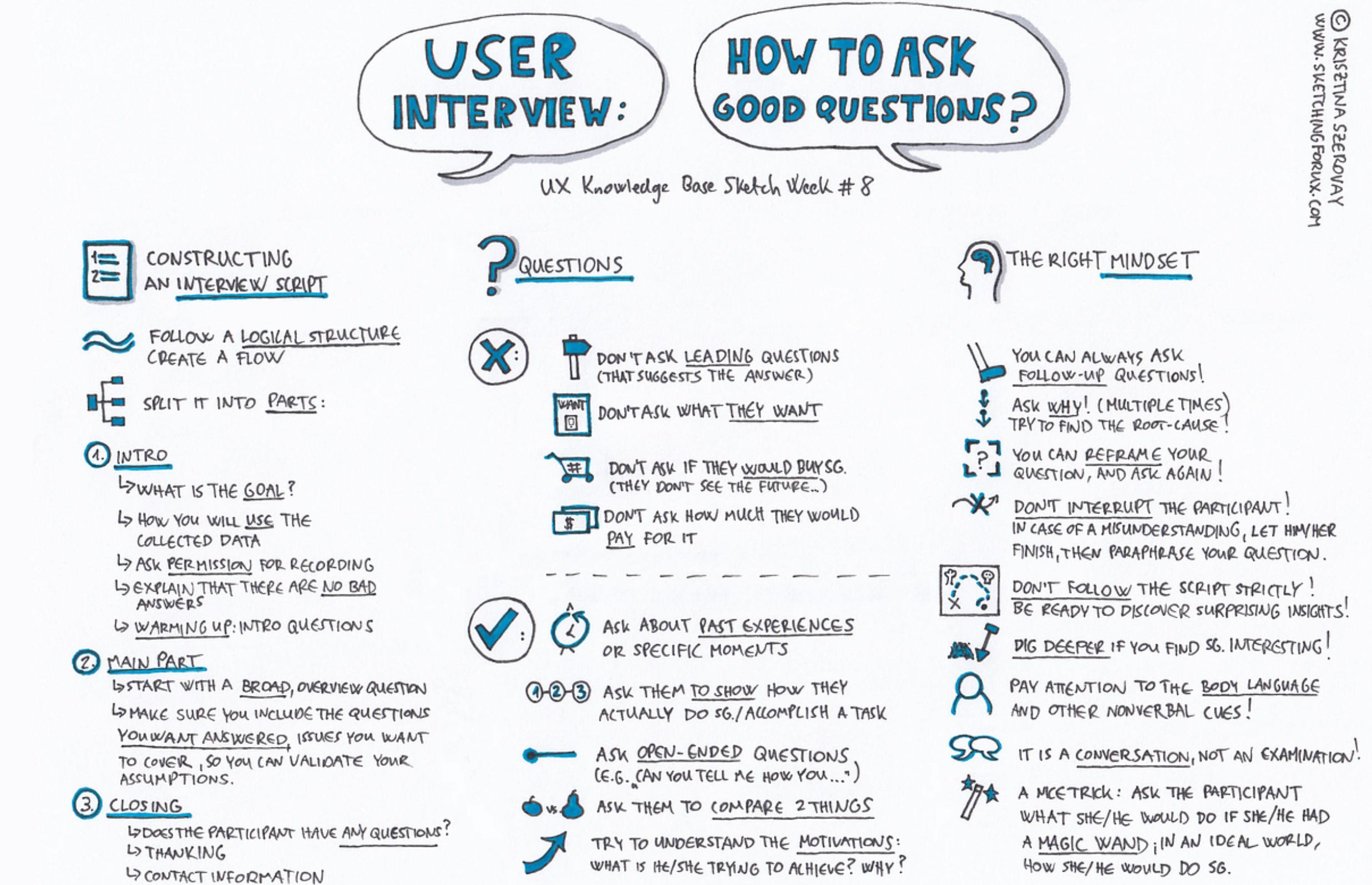
Jesse James Garett



# UX

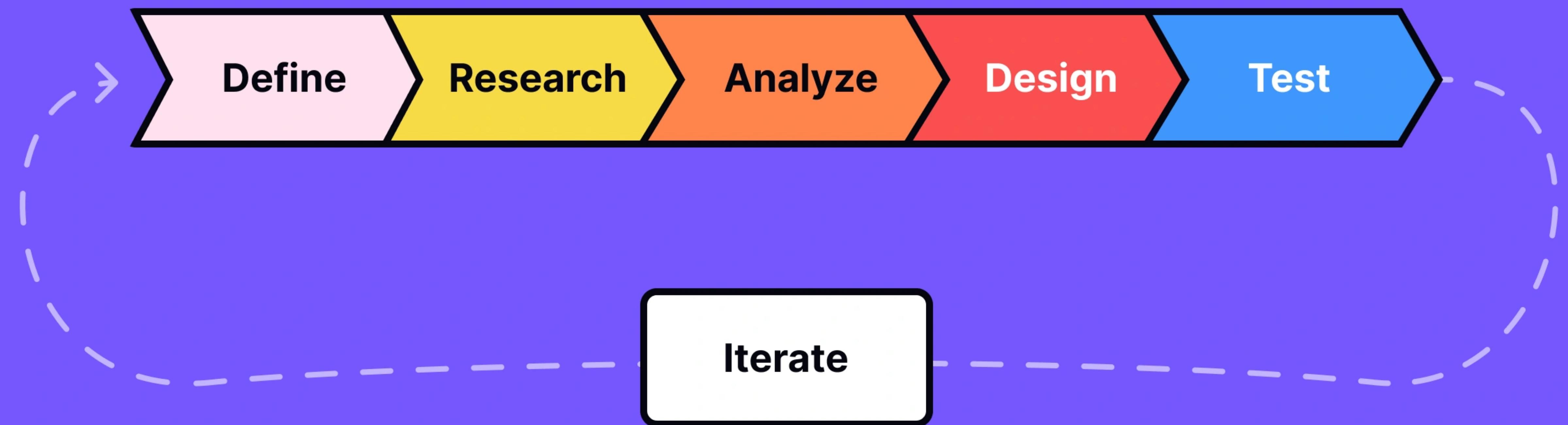
## Input

- The base of good UX, is **talking with end users and other stakeholders.**
- You always create products for someone else. Get to know them:
  - 💥 What problem do they want to see solved?
  - 😠 What frustrates them?
  - 📱 What devices are they on?
  - 🏭 What processes are in place at the moment (eg. in businesses)?



# UX

## Process



# UX Process



- We will **iterate the UX process** many times.
- **Keep on questioning** the stakeholders; but sometimes build what they need, not what they want.
- **Test decisions and prototypes often.**
- **Don't reinvent the wheel.** Look for (proven) solutions.

# UX Patterns

**Rating at least**

ANY 2.0 ★★★★ 3.0 ★★★★★ 4.0

**Instant Book**  
Book without waiting for the host to respond

**Bedding Material**

- Cotton
- Microfiber

AT&T 6:56 PM Q tiny home

Posts People Photos Videos Pages Places

App Store 4:07 PM Q sneakers

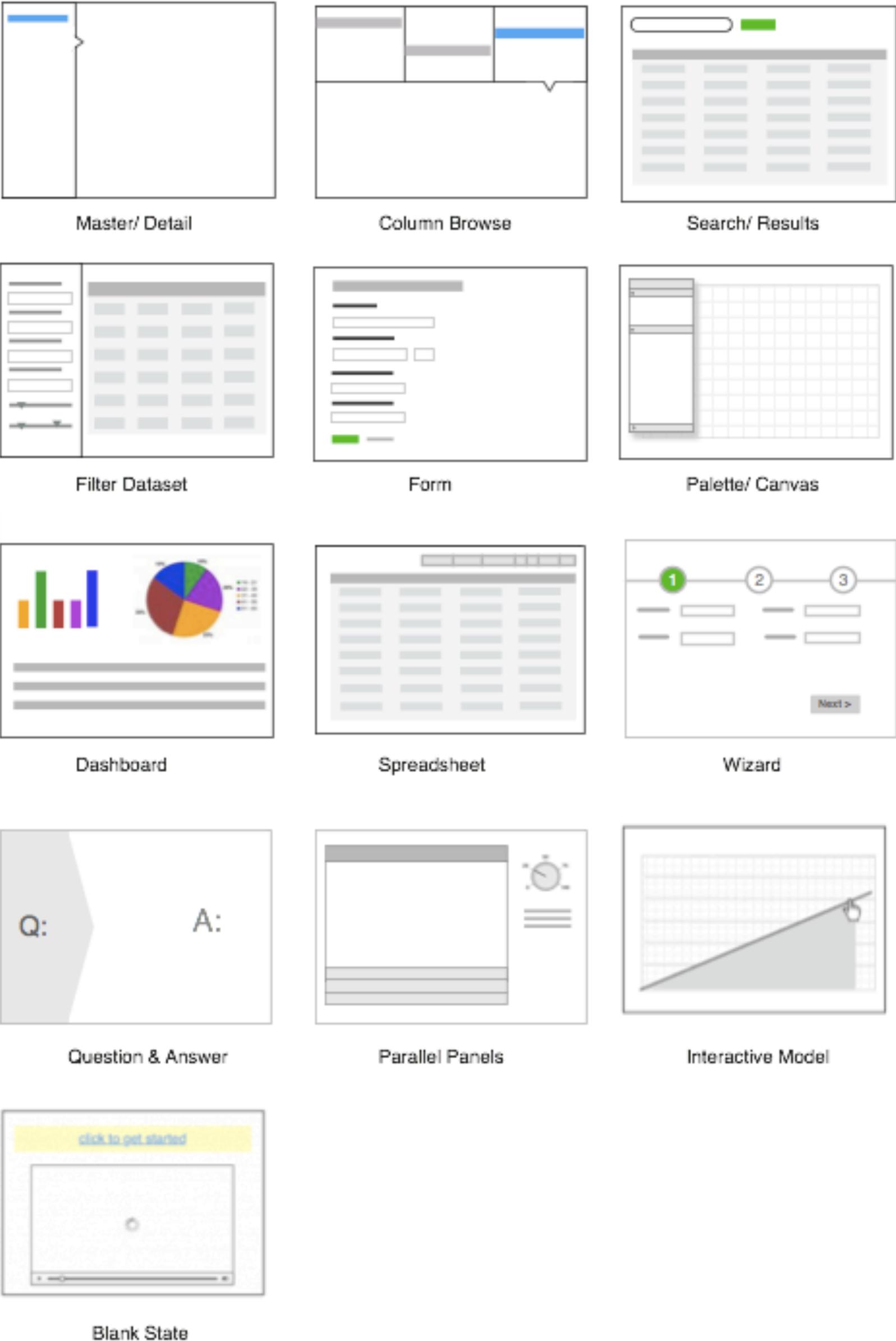
Set up your My Size filter now.

Filters Sort Category Brand Type

(4/9) Just Shared Men | All All Closet + B

AT&T 6:37 PM Q tiny home

Top People Tags Places



# UX

## Process output

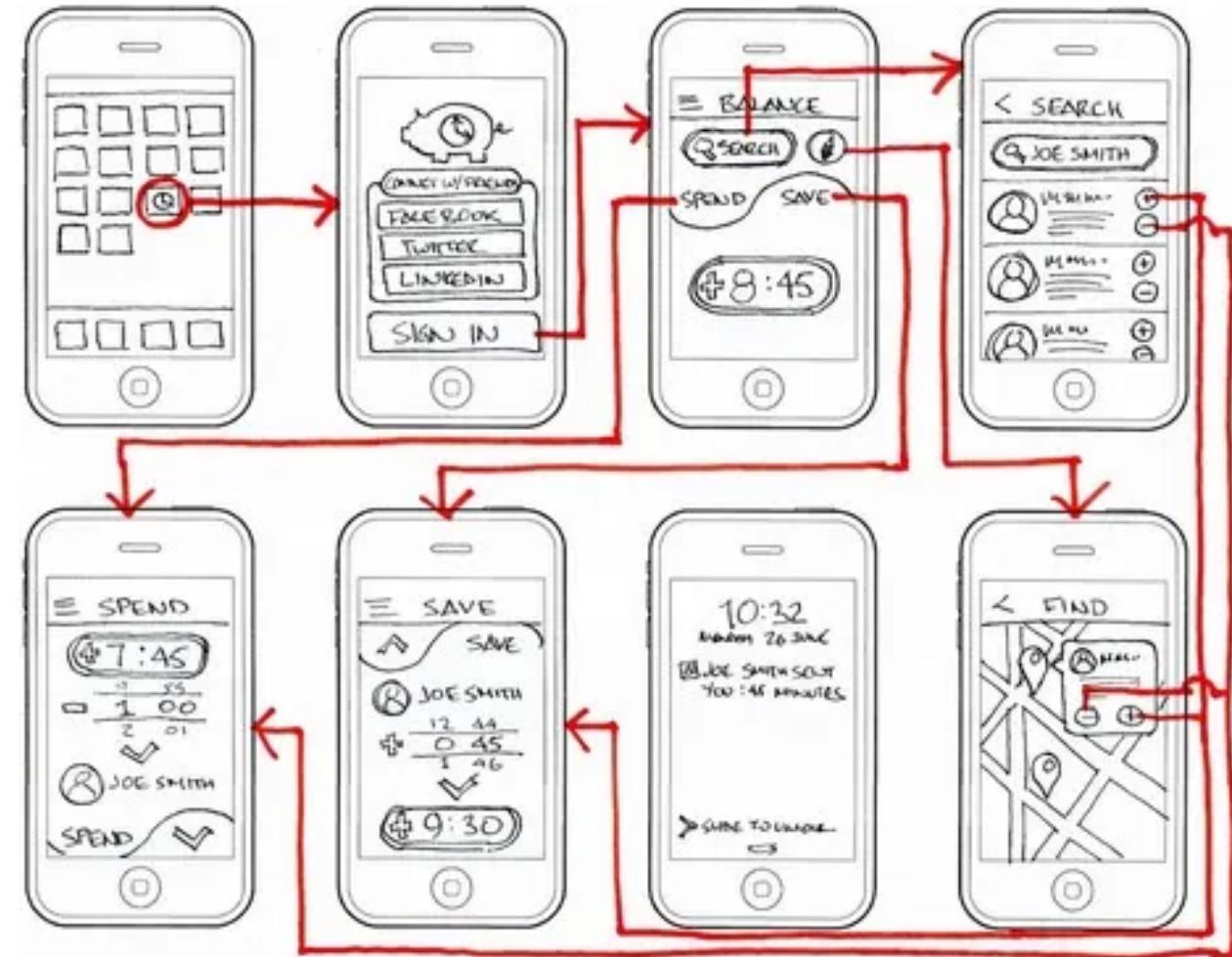


- Define → **create a list of requirements.**
- Research → **report on competitor analysis, patterns, pitfalls.**
- Analyze → **interview** with users.
- Design → **wireframe** of potential solution.
- Test → **testing** of prototype.

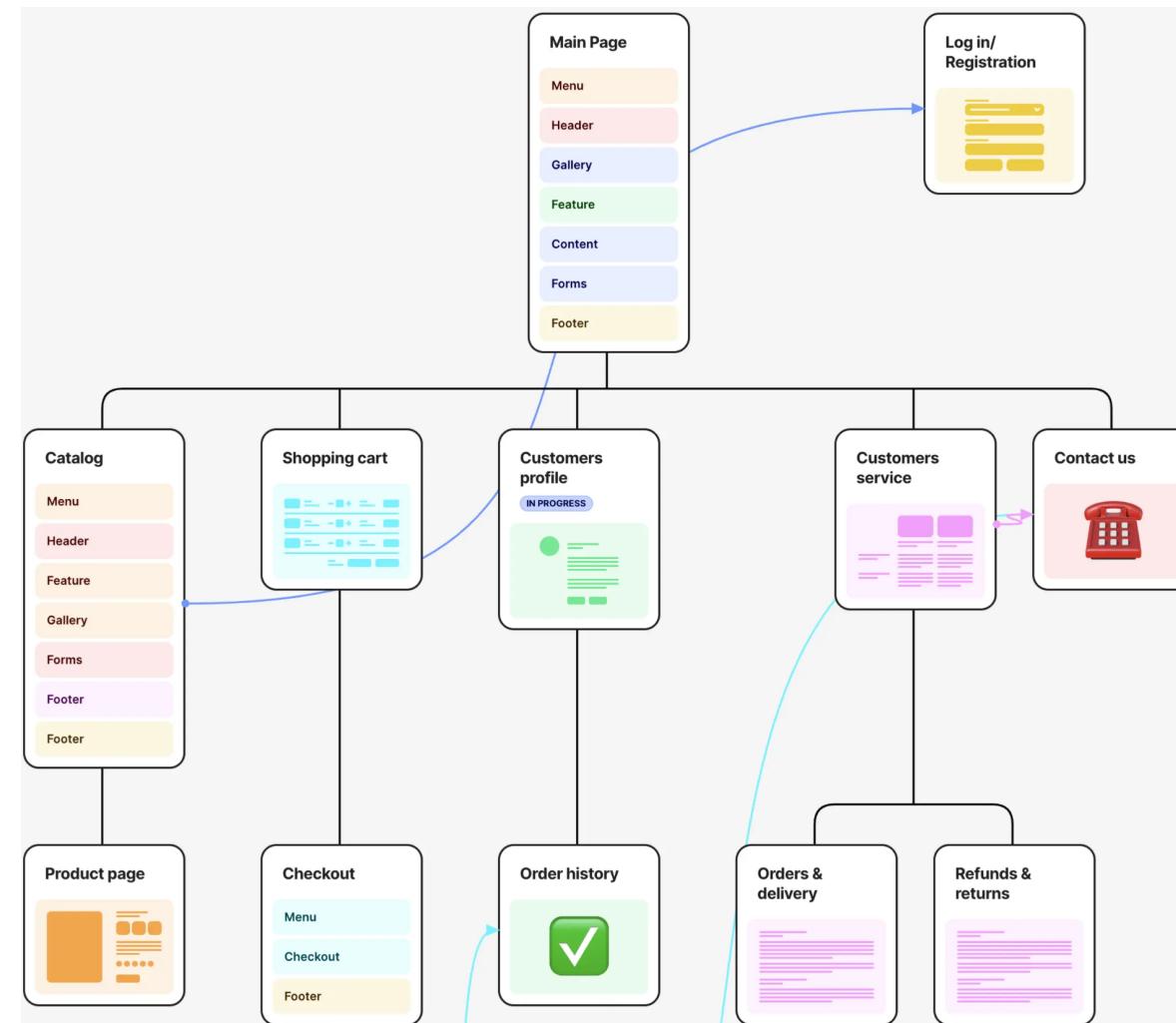
# UX

## Output / deliverables

- *Something* a user interface designer can use to make it nice.
- Can be in different forms, can be 'ugly'.



Can be a rough sketch. What goes where?



Or it can be a flowchart.



Or a report on users, requirements, competition, etc.



Optional



**Bonus: a complete UX flow**

<b>Research</b>	 <b>Competitive Analysis</b> See how others solve similar problems and try to not reinvent the wheel. <a href="#">Read more</a>	 <b>Data analysis</b> Do you have all the useful data you need? Try to have a look at funnels, clicks, page views, performances... <a href="#">Read more</a>	 <b>User feedback</b> Always speak with Customer Care team! Don't have one? Check your old surveys or videos, what your customer says? What do they actually do? <a href="#">Read more</a>
<b>Plan</b>	 <b>User stories</b> Have you done personas yet? If not DO IT NOW. Ok, now use them to write down user stories and scenarios. <a href="#">Read more</a>	 <b>User flows</b> Create your user's flow based on the scenarios you created, you can use it later to review the journey and create wireframes on top of each step. <a href="#">Read more</a>	 <b>Red routes</b> Define red routes for your product and you'll be able to identify, prioritise and eliminate any usability obstacles on key user journeys. <a href="#">Read more</a>
<b>Explore</b>	 <b>Brainstorm &amp; sketch</b> Find a war room, fill it with markers and drinks, get together and sketch, discuss, vote, disrupt, have fun! <a href="#">Read more</a>	 <b>Wireframe</b> Add some details and structure to your ideas, reuse patterns and create pages on top of your user flows so you'll not leave anything behind. <a href="#">Read more</a>	 <b>Prototype</b> You can start creating paper prototypes and continuously iterate to more functional ones. Use sketches, HTML pages or static images, then just get some people and test. <a href="#">Read more</a>
<b>Communicate</b>	 <b>IA</b> Understand your users, your data structure and your channels. How can you organise your navigation and content in a clear and consistent way? <a href="#">Read more</a>	 <b>Language</b> Follow your brand personality, keep in mind users' culture and language, the context of your product and make sure they understand you. <a href="#">Read more</a>	 <b>Accessibility</b> You don't need to add extra functionality or to duplicate any content. The key is simply to assess the requirements of those with different skills and limited devices. <a href="#">Read more</a>
 <b>Sustainable</b> Help the planet by reducing the resources you use, reinforce greener behaviours and promote sustainability best practices. Yes, your product can do that! <a href="#">Read more</a>	 <b>Ethical</b> Move fast and break things! What about slow down and make sure your product is secure, private, honest? Be considerate when you design and follow good ethics. <a href="#">Read more</a>	 <b>Inclusive</b> Remember that everything you design is skewed by your own view and background. Be sure to open your design process to remove your biases and design for everyone. <a href="#">Read more</a>	
<b>Create</b>	 <b>UI elements</b> Reuse elements and patterns. Follow your style guidelines. Don't have any? Create your guidelines. Start small, then create pages. <a href="#">Read more</a>	 <b>Gestures</b> So you have a swipe slider? Tell me more about pinch, drag, zoom, rotate, shake, six-inch smartphones, left-handed people, mouseover, kinect, motion detection... <a href="#">Read more</a>	 <b>Responsiveness</b> Can I see it on my mobile? Oh wait, what about my smart-watch which works as a remote for my 50" TV. Bonus: remember cross device experience. <a href="#">Read more</a>
<b>Give feedback</b>	 <b>Waiting times</b> If your users have to wait ages for the page to load, at least show them a loader. If take longer why don't you try something more entertaining? <a href="#">Read more</a>	 <b>Errors</b> Be clear and specific on what and where user's error is. I mean, your error, because if it's your fault you should say it. <a href="#">Read more</a>	 <b>Completed actions</b> Give immediate and clear feedback of successful user's actions. Do not always wait for server response, trust your server once in a while! <a href="#">Read more</a>
<b>Finalise</b>	 <b>Finalise layout</b> It's time to let your design shine, make it in the right way, don't stop with the first solution, always ask "is this the best you can do?" <a href="#">Read more</a>	 <b>Use of images and icons</b> Use of icons and images is strongly influenced by context, culture and layout that you use. Like icons, test your images, small changes can bring huge improvements. <a href="#">Read more</a>	 <b>Font &amp; colours hierarchy</b> Use colours and font sizes properly, try to follow your guidelines and keep it simple. The best visual hierarchies lead users to take the action confidently. <a href="#">Read more</a>
<b>Delight</b>	 <b>Micro copy</b> Every word is important, and a bit of personality will help your brand. <a href="#">Read more</a>	 <b>Micro interactions</b> Trigger, rules, feedback, loop. Details make the product. Bonus: Ever heard about easter eggs? <a href="#">Read more</a>	 <b>Transitions</b> Motion shouldn't be only beautiful, it should build meaning about the spatial relationships, functionality, and intention of the system. <a href="#">Read more</a>
<b>Analyse</b>	 <b>KPI Setup</b> What you want to achieve? What are your goals? Write down how you define success and failure and check if you have everything you need to collect the data. <a href="#">Read more</a>	 <b>AB Test plan</b> Plan your AB test ahead and, if you can, plan a short roadmap of improvements. Your goal is not just improving KPIs, but learning something. <a href="#">Read more</a>	 <b>Test</b> UX lab, survey, sessions recording... test, observe and fix, test, observe and fix... <a href="#">Read more</a>

[ux-checklist.com](http://ux-checklist.com) - A (very) thorough approach would include all these aspects.



**UI: nicely build the thing**

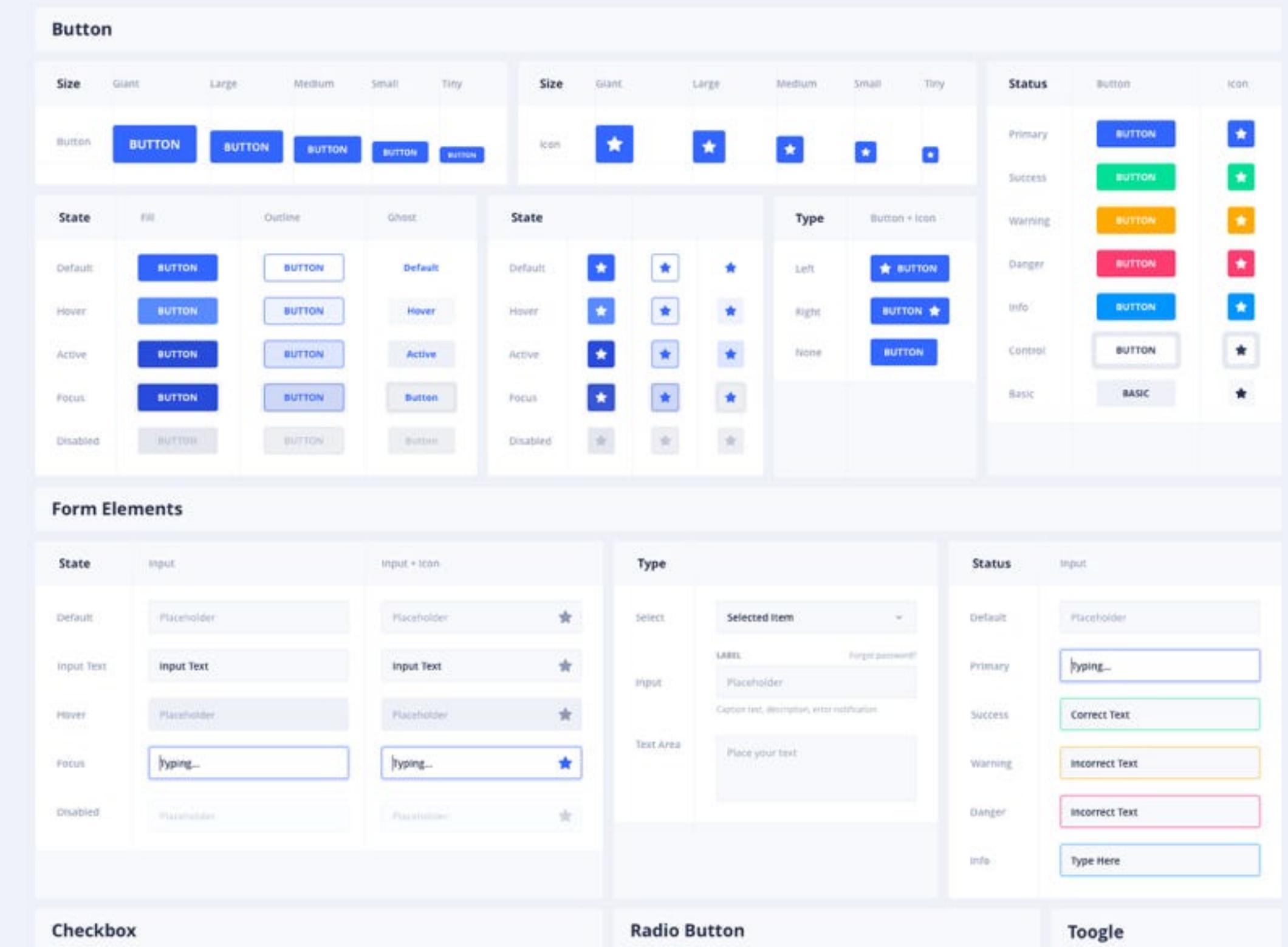
# UI Input

⚠ Disclaimer: we will not always be able to go in depth and do the whole UX process. In most cases in this course, we will start with a general knowledge of our users, the desired flow and the project goals.

- We **start** on making a UI from **the deliverables of the UX process**.
- From the rough sketches, flowchart and other reports, we start to design a professional product.
- The interface also relies on **patterns and common practices** that are natural for the user.
- Here **we can get creative** with the specific requirements that are handed over from UX designers.

# UI Process

- **Define** colors, UI elements, typography.
- Keep things **consistent**, rounded or not, same color scheme, same fonts, etc.
- Make sure everything is **readable**, it is clear what is interactive, etc.
- **Provide enough space** (whitespace).
- Stick to the output of the UX process!

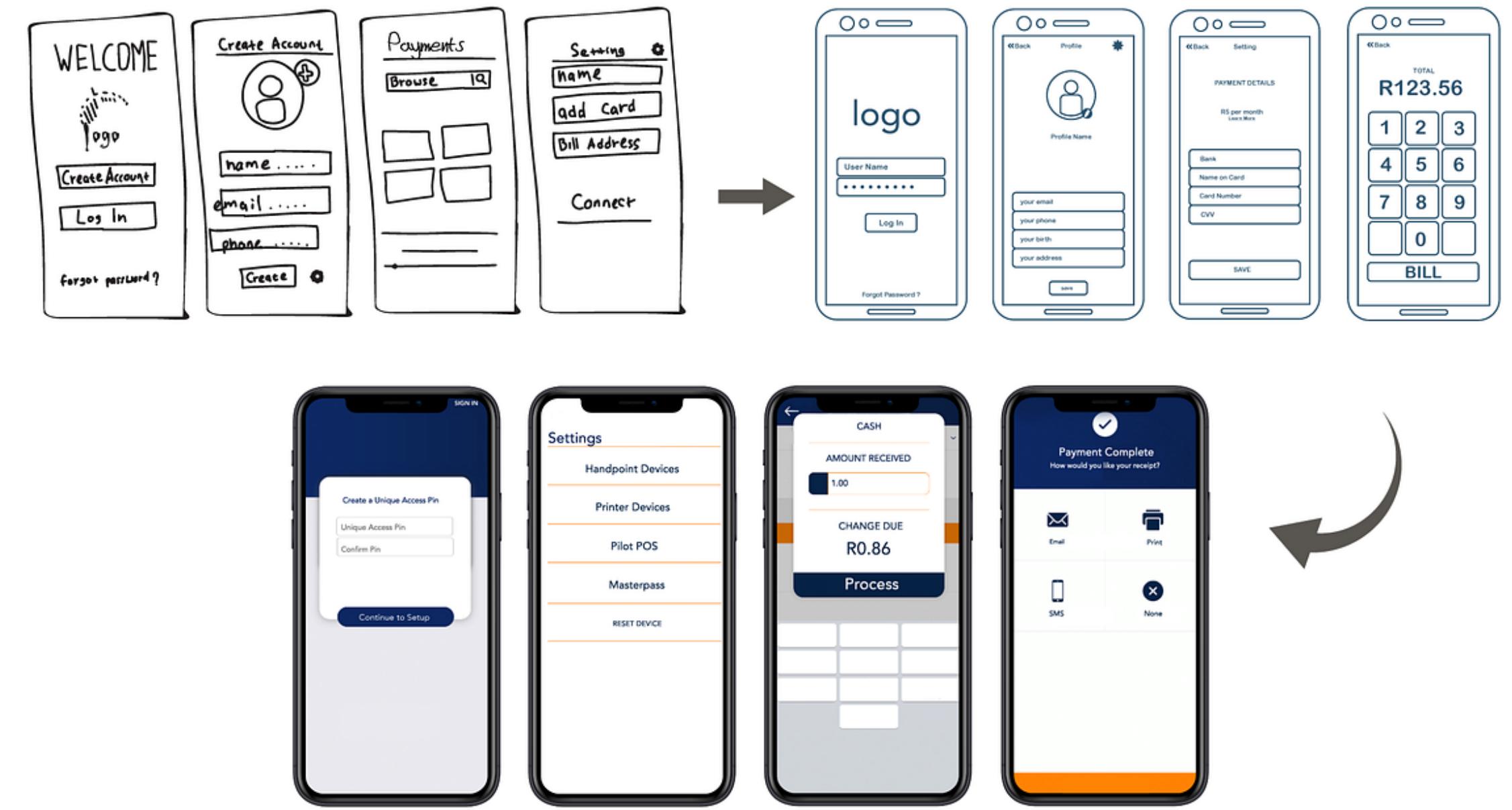


A whole set of design elements is also called a design system.

# UI Deliverables

- The **end goal is a prototype** that is as close as possible to how the end product will look.
- When the deliverable covers every aspect of the desired product, the development team can **code this without changes**.
- We want to have a **complete prototype** so changes are not needed in code, but are checked before development.

⚠ You can also work in code straight away. This is a common practice with experienced designers or for small projects. If you have good UX delivery, this should be possible.



The last step is the UI.

**"For most of us, design is invisible.  
Until it fails."**

**– Bruce Mau**

# UI: tips & tricks

## Colors I



### ■ Main color

The main color will be used about 60% throughout the design. Choose one that is neutral and is easy on the eyes.

### ■ Secondary color

The secondary color will be used in 30% of the design. It should contrast with the main color to create visual interest.

### ■ Accent color

The accent color will be used in 10% of the design, and should contrast well with the other colors.

# UI: tips & tricks

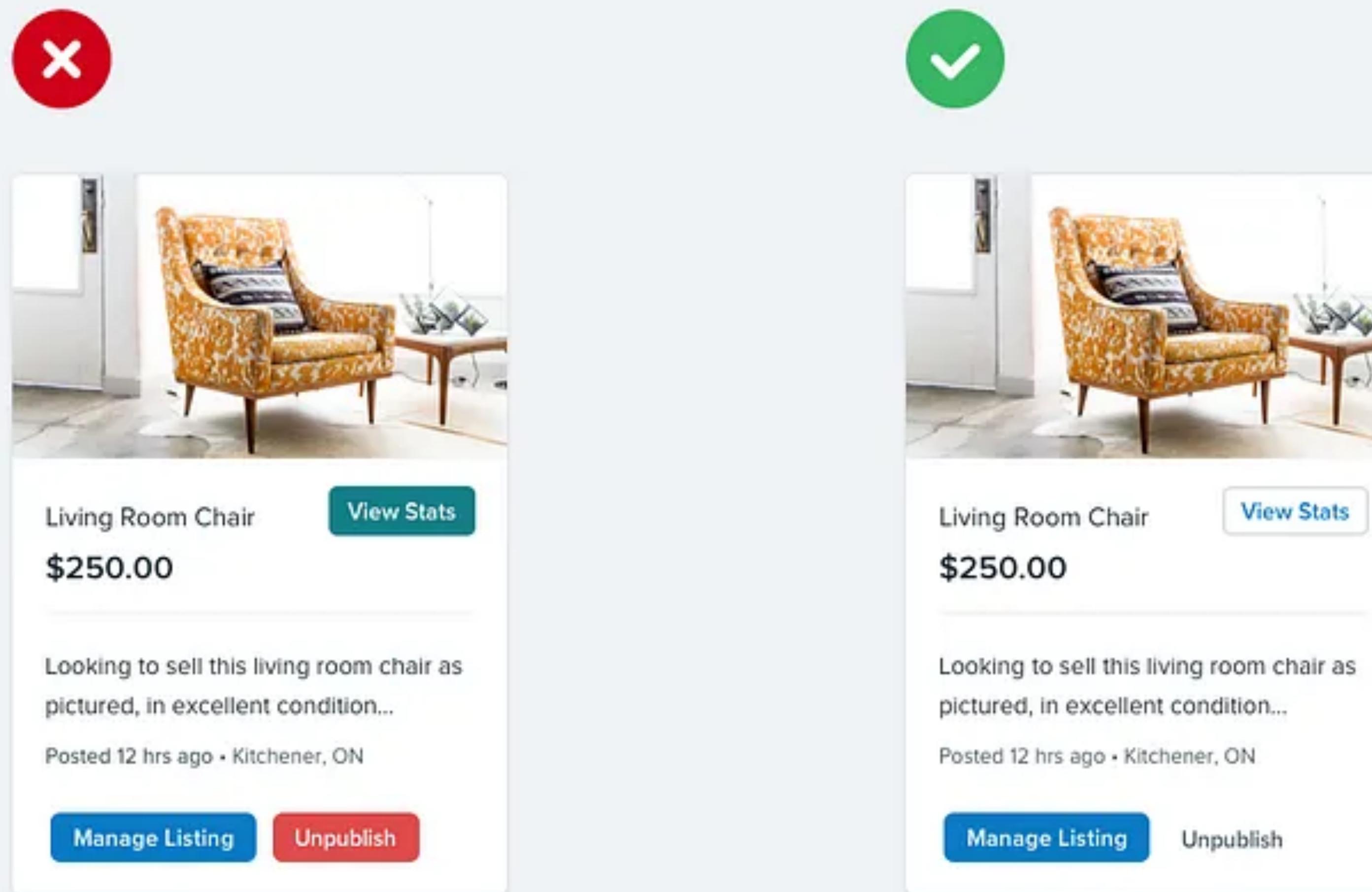
## Colors II

This screenshot shows a 'Team Directory' interface. At the top, there are tabs for 'All Members', 'Admin Accounts', and 'Standard Accounts'. Below these tabs, under 'Admin Accounts (3)', three users are listed: William Martinez (You), Sophia Anderson, and Olivia Smith, each with a 'Workspace Owner' badge and edit/delete icons. Under 'Standard Accounts (22)', ten users are listed with their roles: Alexander Martinez (UI Designer), Amelia Rose Wilson (Frontend Developer), Ava Williams (UI Designer), Mike Davis (UI Designer), Johan Brown (UX Designer), Evelyn Moore (UX Designer), Tommy Taylor (Frontend Developer), Mark Johnson (Frontend Developer), Nico Thompson (UI Designer), and Sophia Anderson (UI Designer). Each user has an edit/delete icon next to their name.

The first screen shows a welcome message: 'Welcome to Verbify, daniasyrofil! 🎉' with a 'Next' button. The second screen is titled 'Set Your Daily Learning Goal ⏳' and asks to choose time dedicated to learning each day, with options like 15 min, 30 min, 45 min, 60 min, 90 min, and Custom. The third screen shows 'Diverse Lesson Categories 🌱' with categories like Daily Conversations, Business English, English for Travel, and Listening Comprehension. The fourth screen is titled 'Curated Lessons Just For You' and lists lessons: 'Discover English Basics' (Start Learning), 'Jumpstart Your English Journey' (Start Learning), and 'Let's Start Speaking English' (Start Learning). The fifth screen is titled 'Lesson Complete!' and says 'Great job! You've successfully completed the "Jumpstart Your English Journey" lesson.' A progress bar at the bottom indicates completion.

# UI: tips & tricks

## Colors III



# UI: tips & tricks

## Fonts & text I

Serif



A<sup>•</sup>bc

Sans-Serif



A<sup>•</sup>bc

Serif fonts are designed for text printed on paper, so use sans-serif fonts.

# UI: tips & tricks

## Fonts & text II

### BAD

Lorem ipsum dolor sit amet, consectetur adipisicing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua. Ut enim ad minim veniam, quis nostrud exercitation ullamco laboris nisi ut aliquip ex ea commodo consequat. Duis aute irure dolor in reprehenderit in voluptate velit esse cillum dolore eu fugiat

### BAD

Lorem ipsum dolor sit amet, consectetur adipisicing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua. Ut enim ad minim veniam, quis nostrud exercitation ullamco laboris nisi ut aliquip ex ea commodo consequat. Duis aute irure dolor in reprehenderit in voluptate velit esse cillum dolore eu fugiat

### GOOD

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# UI: tips & tricks

## Fonts & text III

**YOU  
WILL READ  
THIS FIRST.**

*At some point you may come back to read this line or maybe not.*

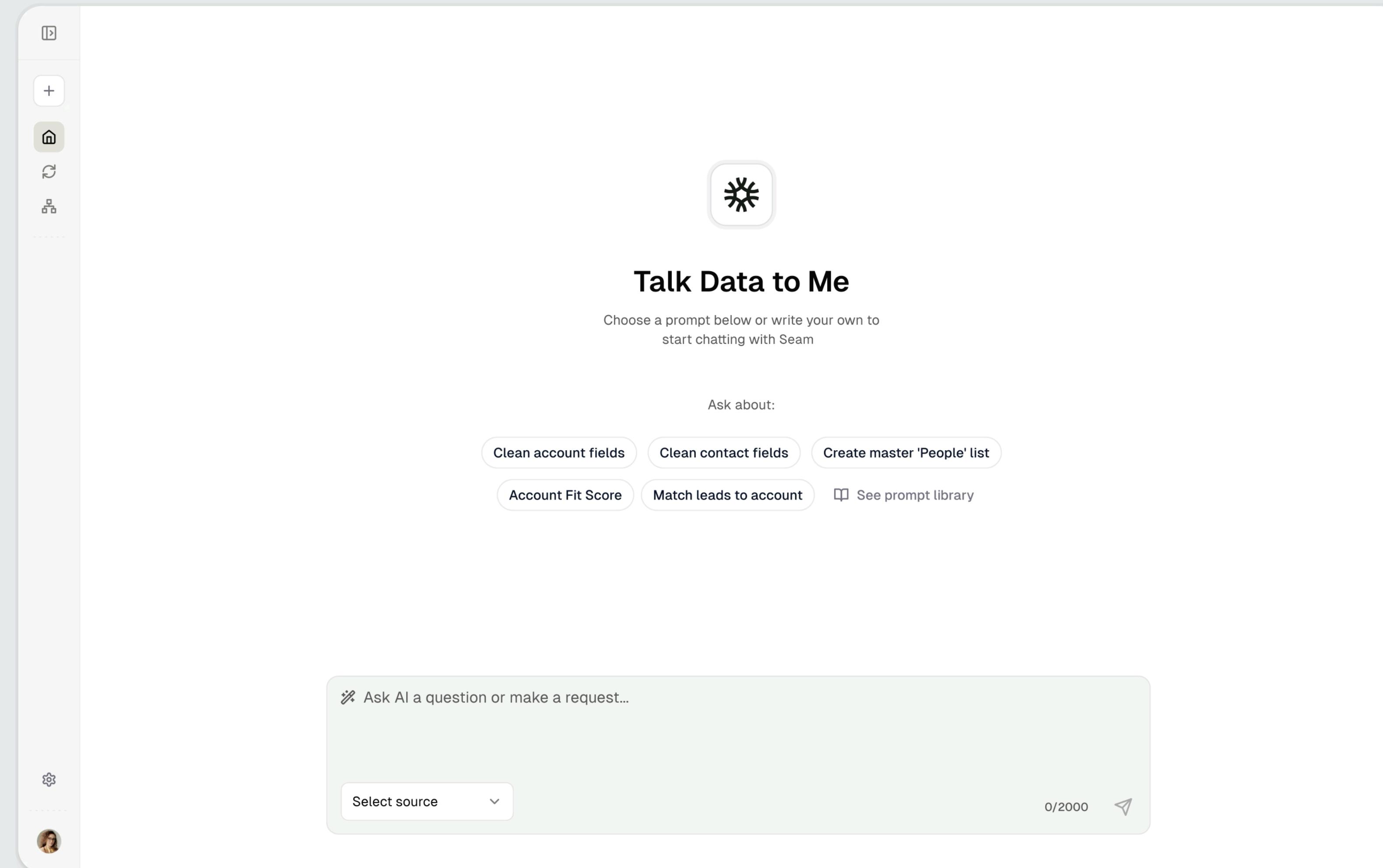
**And then you will read this line next.**

You will go back to read this body copy if you want to know more. It takes the most effort to read because it has a lot of text in a small font in a light weight with tight line spacing. Many people will skip paragraphs like this unless if they aren't engaged right away. This is why it's important to draw attention to your message using visual hierarchy.

**You'll probably  
read this before  
the paragraph.**

# UI: tips & tricks

## Whitespace & alignment I



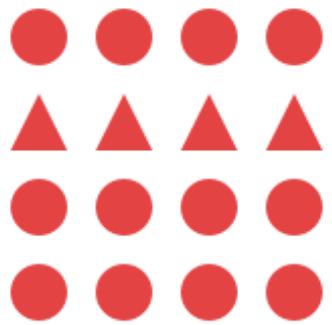
# UI: tips & tricks

## Whitespace & alignment II



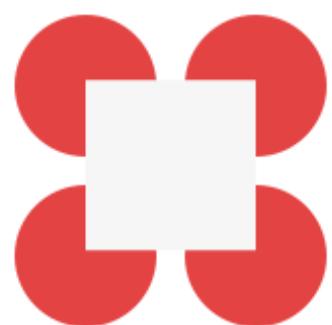
### Good Figure

Objects grouped together tend to be perceived as a single figure. Tendency to simplify.



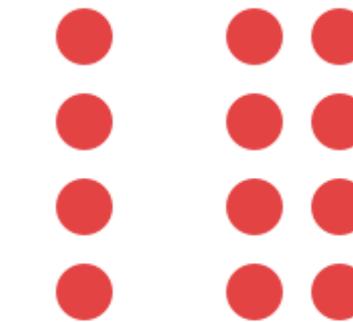
### Similarity

Objects tend to be grouped together if they are similar.



### Closure

Visual connection or continuity between sets of elements which do not actually touch each other in a composition.



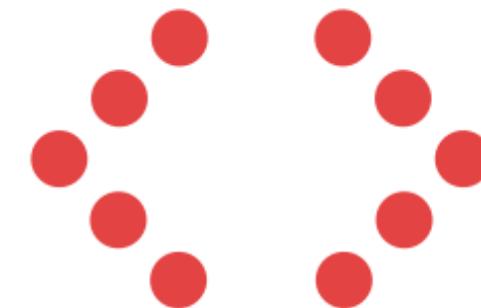
### Proximity

Objects tend to be grouped together if they are close to each other.



### Continuation

When there is an intersection between two or more objects, people tend to perceive each object as a single uninterrupted object.

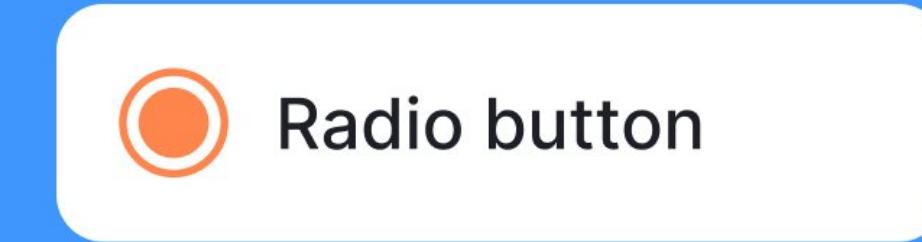
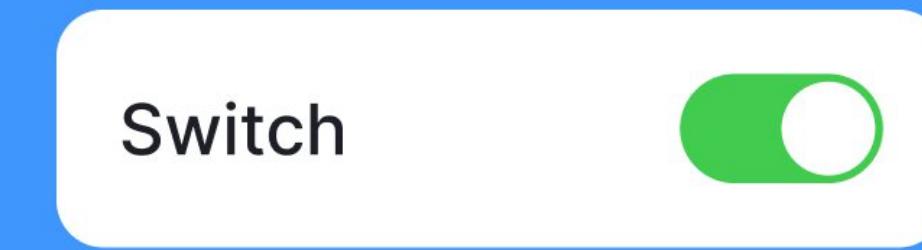
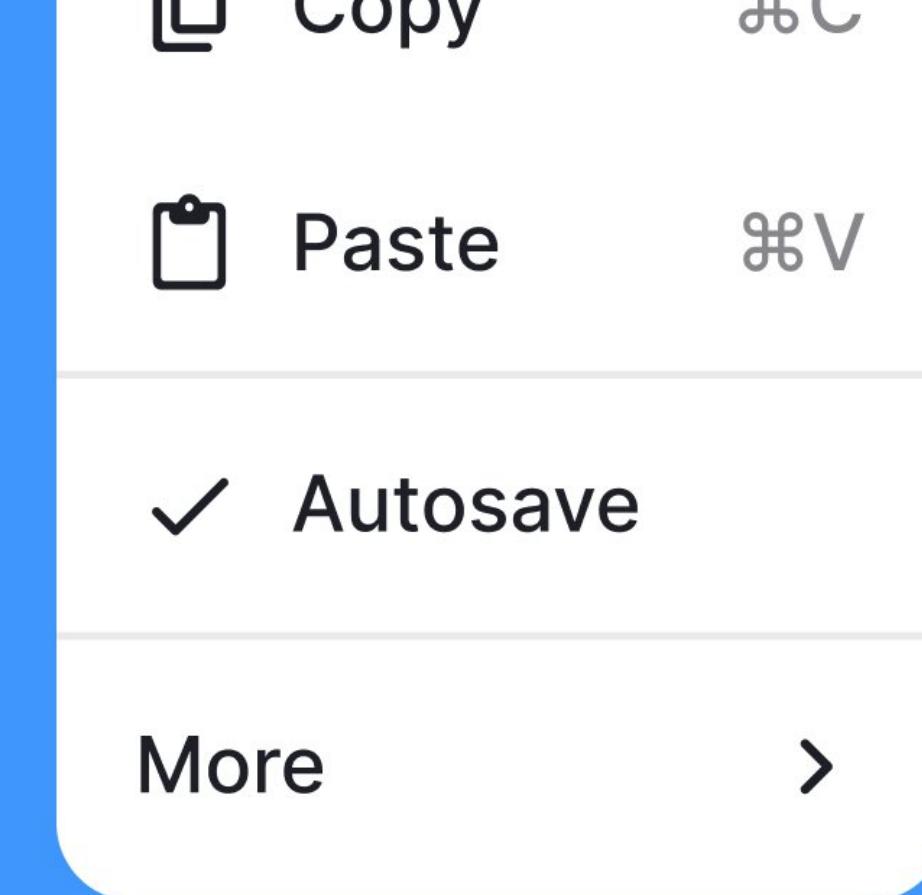
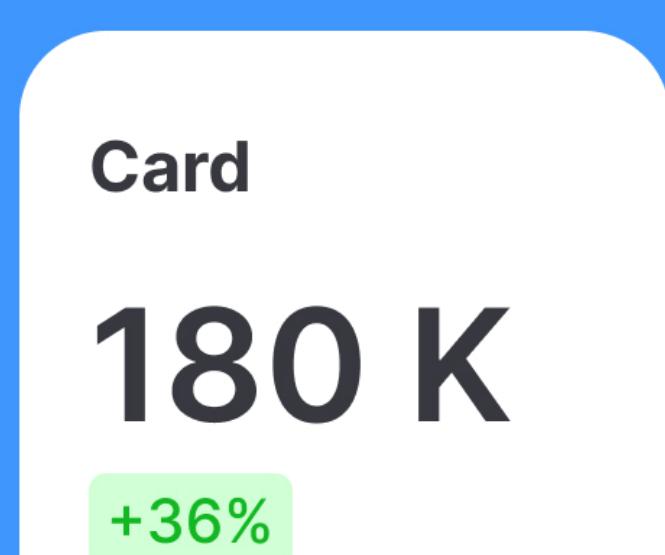
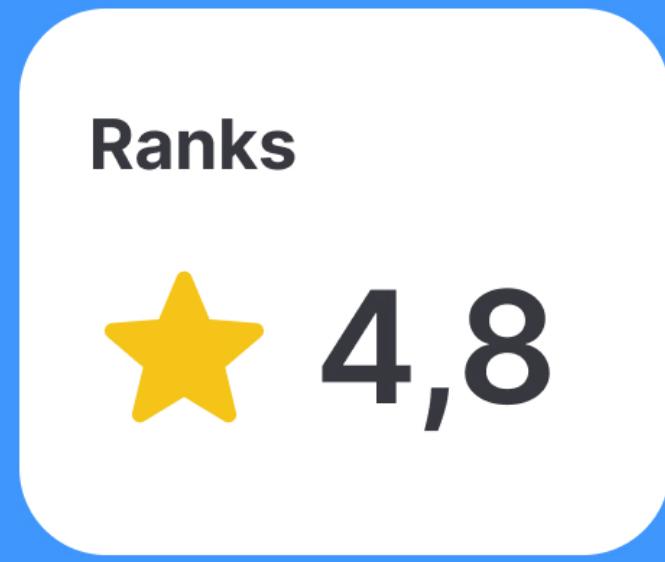
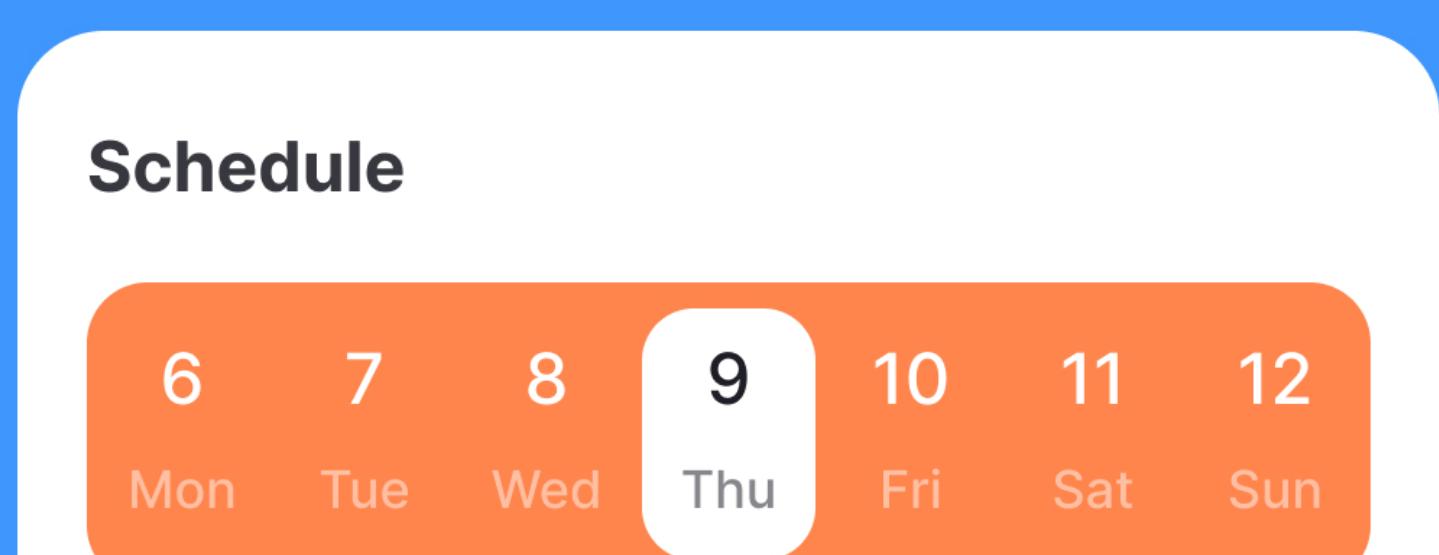
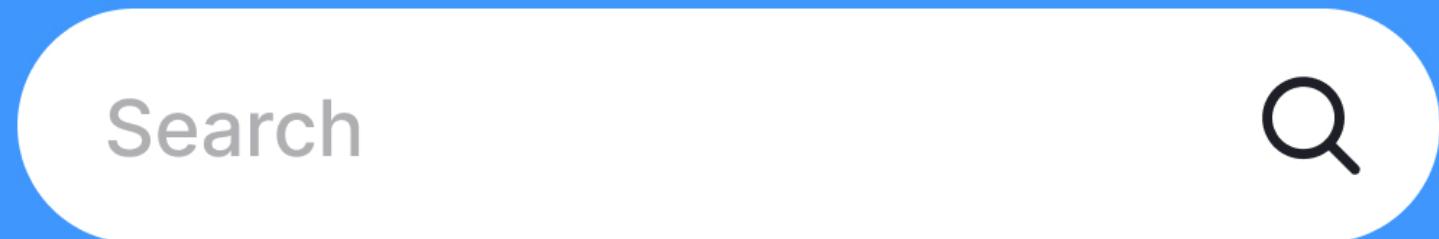


### Symmetry

The object tend to be perceived as symmetrical shapes that form around their center.

# UI: tips & tricks

## UI elements I



Username

Daily | Weekly **Monthly**

August 2023 < >

S	M	T	W	T	F	S
30	31	1	2	3	4	5
6	7	8	9	10	11	12

# UI: tips & tricks

## UI elements II

Primary CTA

Create new user

Secondary CTA

Create new user

Tertiary CTA

Cancel

Destructive CTA

Delete user

Switch

Light

Dark

Email Address

Email

Email Address

diana@fintory.de

Email Address

diana@fintory.de

Email Address

diana%fintory%de

Password

••••••••



Password

Hello123



Amount

\$ 1,020.00

Width

250 px

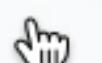
Dropdown

Select option



Option A

Option B



Option C

Toggle



Inactive

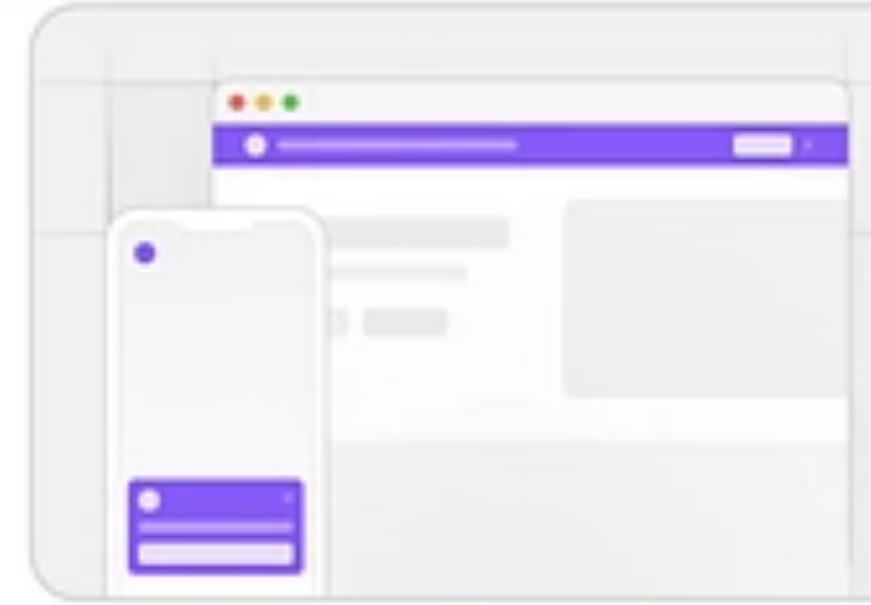


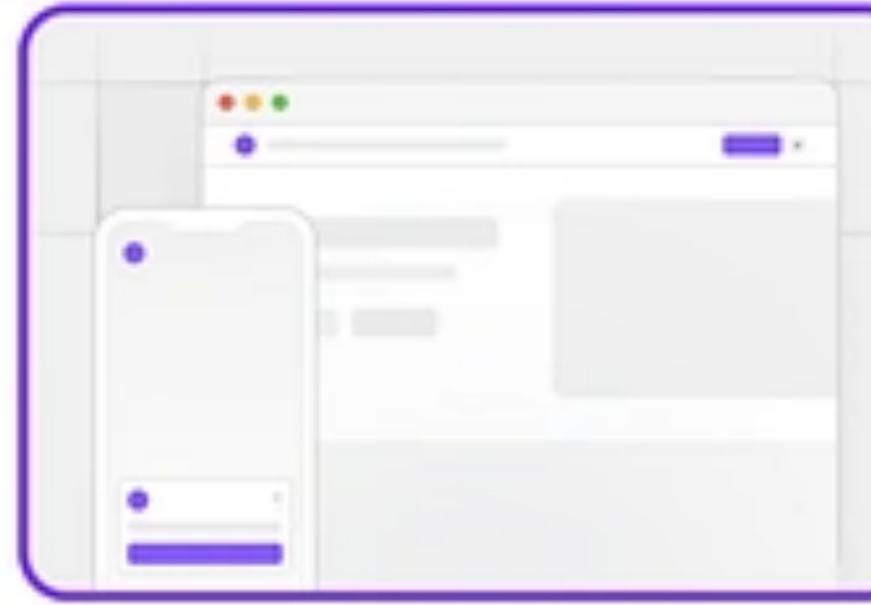
Active

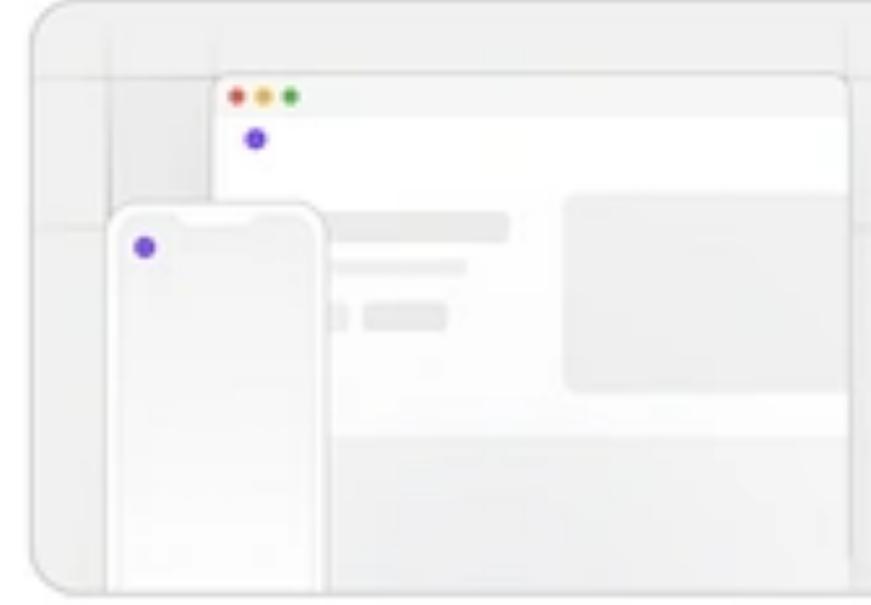
# UI: tips & tricks

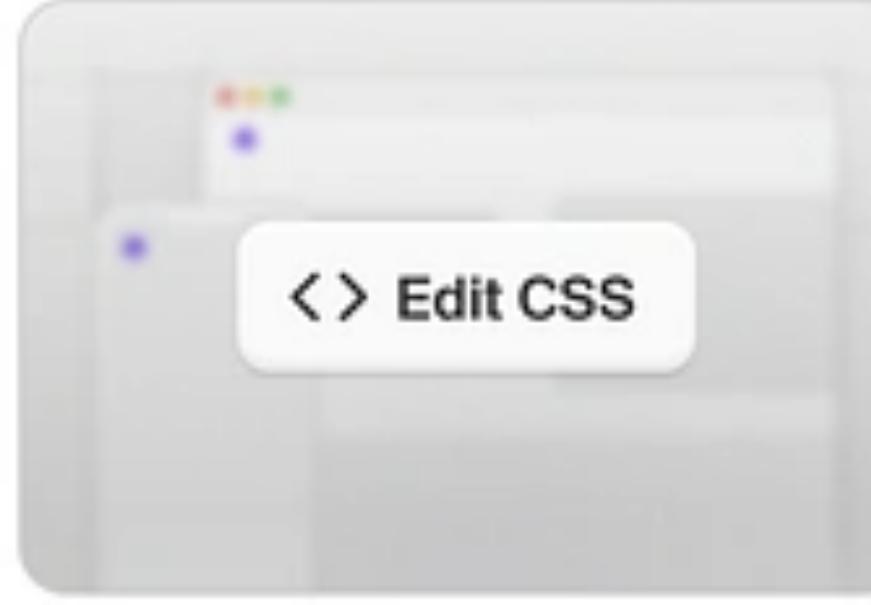
## UI elements III

**Banner appearance**  
Change how banners appear to visitors.

 Default  
Default solid brand color.

 Simplified   
Minimal and simplified.

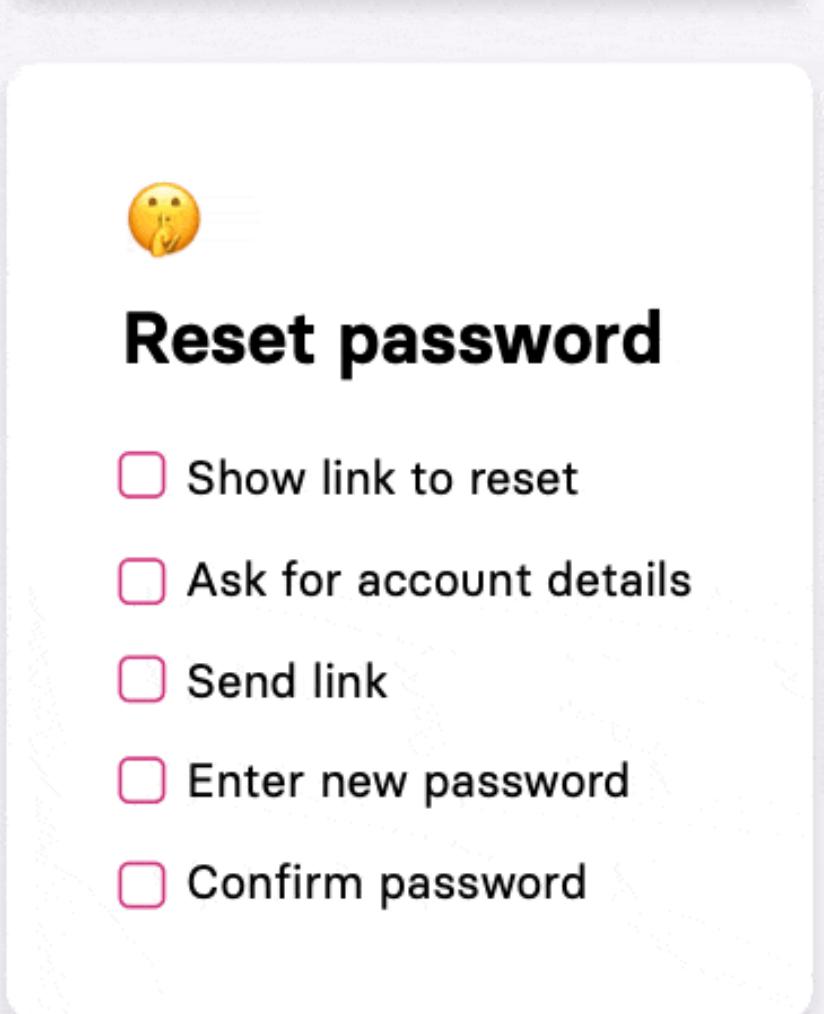
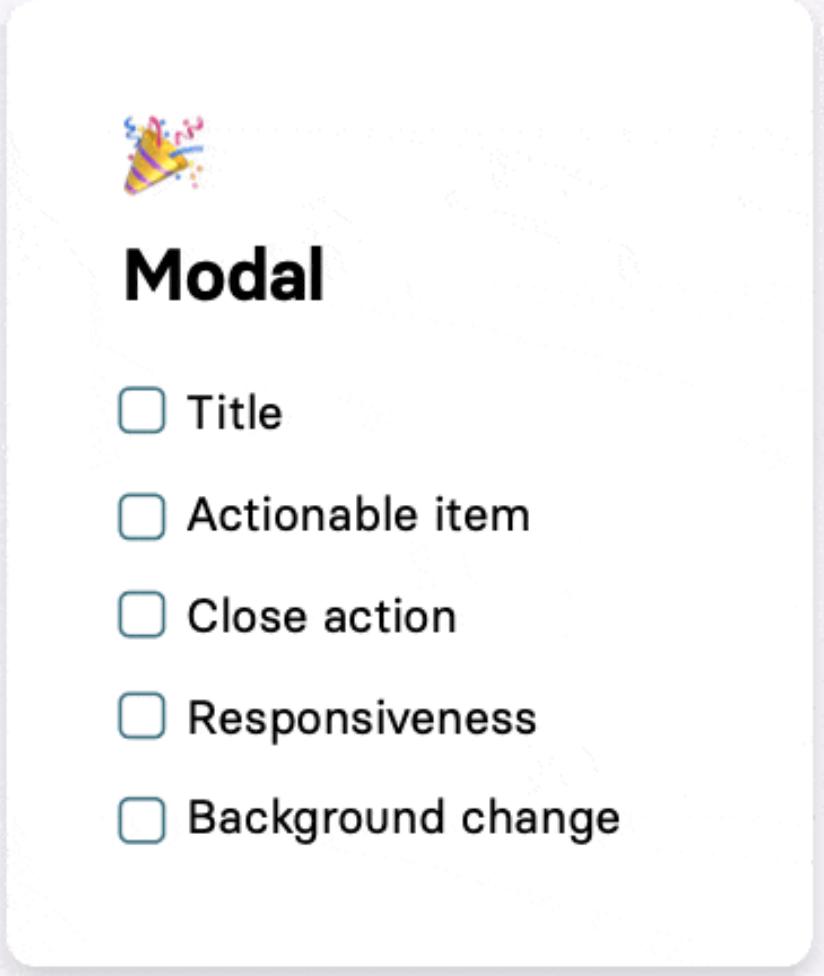
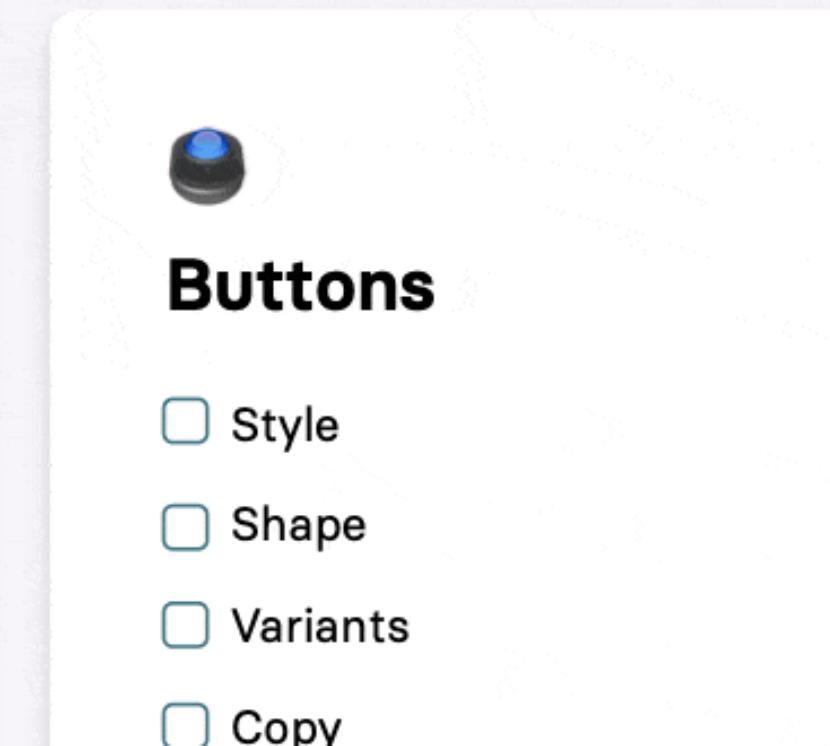
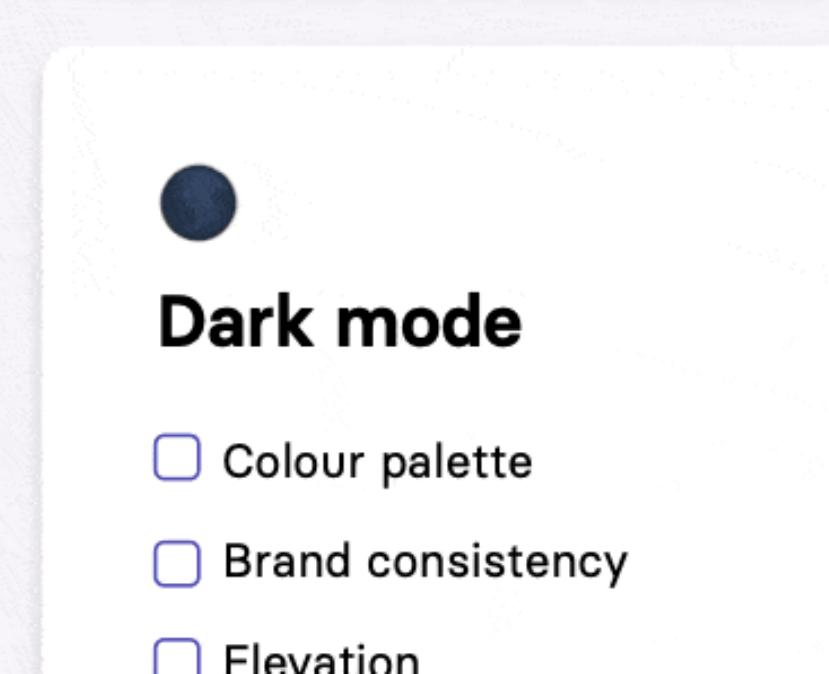
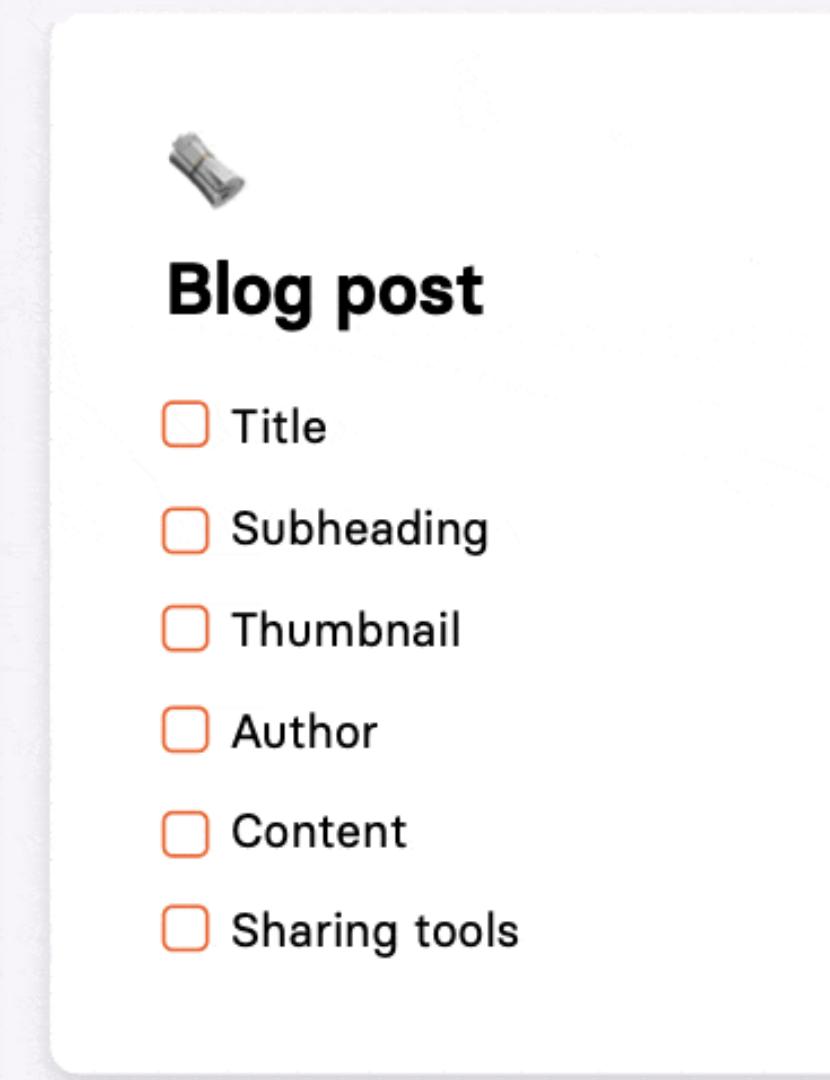
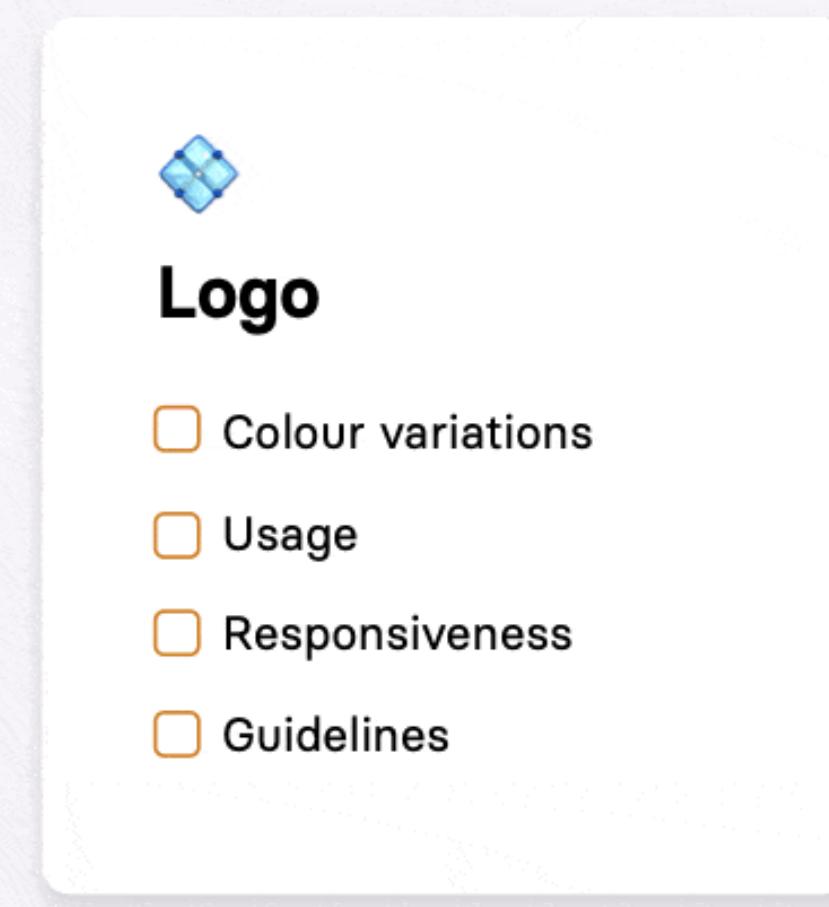
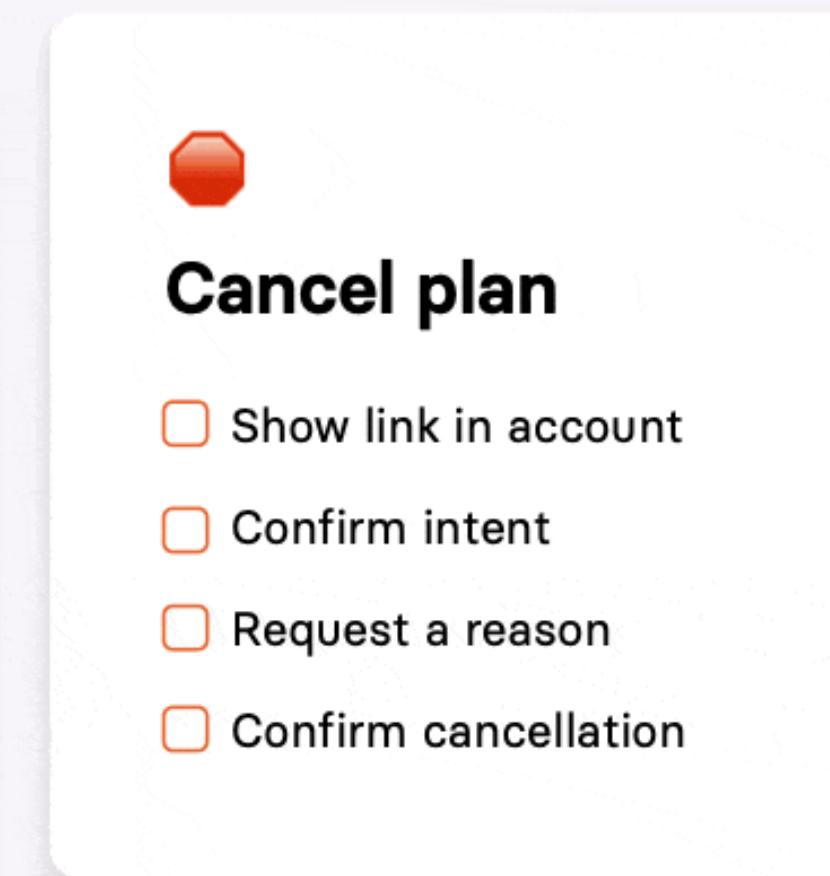
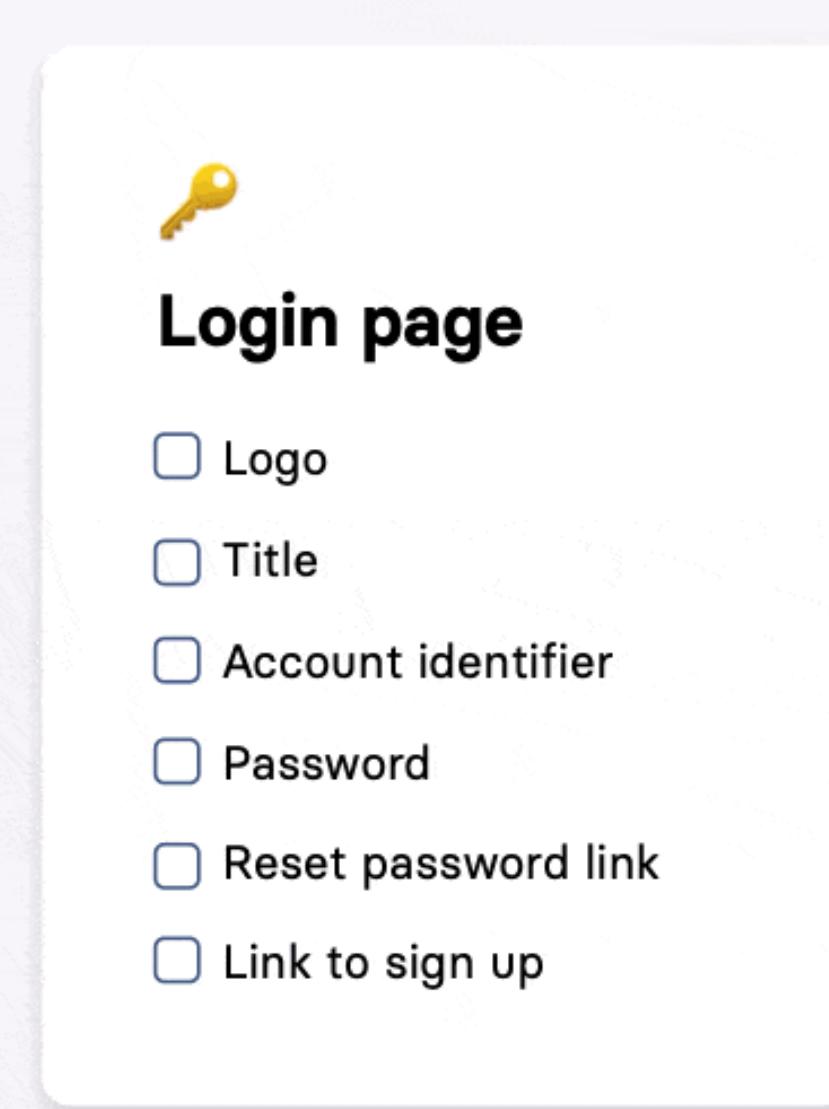
 None  
Hide all banners.

 Custom styling  
Manage styling with CSS.

Need help? [Cancel](#) [Save changes](#)

# Getting started With designing

- Think *before* you create an interface.
- Keep your end user in mind.
- <https://www.checklist.design/> use available resources.
- Don't overthink it, use patterns.





**Optional**



**Bonus: useful resources**

# Resources on design

But be critical

-  <https://uxarchive.com/> - UX flows that work.
-  <https://calltoidea.com/> - UI elements for inspiration (a little outdated).
-  <https://dribbble.com/> - Where the worlds best designers post their work.



## Exercise



# Introduction to UX design

**The city wants to let  
users photograph  
and count pigeons.**

**To get an idea of how many there are.  
People get info about the bird after posting.**

# Interviewing a user

## Introduction to UX design

⚠ We will see how smooth this will go. In such a short amount of time, it would be difficult to get a very good idea about the required solution.

1. Interview the client.
2. Either:
  - Create a **flowchart** of what a solution could be.  
- or -
  - Create a **wireframe** of what a solution could be.
3. Try to find a similar product.

What phone do you have? How old a

⚠ At this moment in time, we do not care about the technical specifications.

Do you like birds? What about privacy?

What info about the bird is available?

How will users know about this initiative?

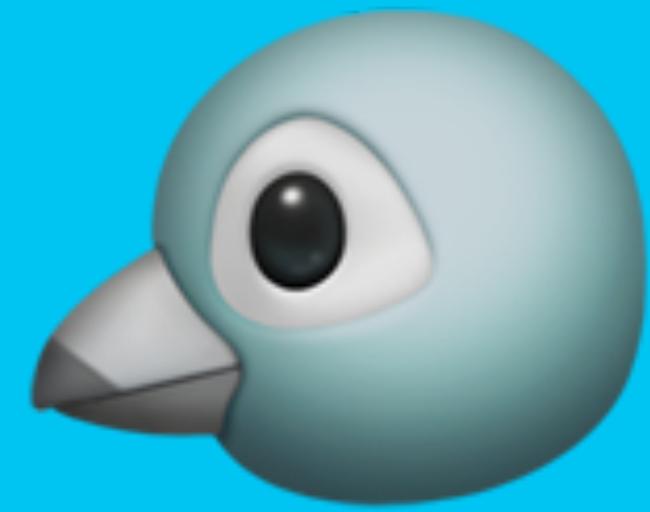
What is the budget? Who will be using?

users need to login? Are you willing to?

How do we show errors? How do we han-

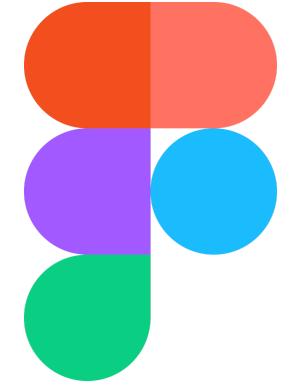


## Exercise



# Introduction to UI design

# Making a UI With Figma



- We gathered enough information in the UX process.
- Now, we will start to really make a nice design in Figma.  
*(We won't go too deep into the working of Figma.)*
- How could users use our app in a nice way?
- What colors, typography, etc. can we use?
- From here on, this can be different for everyone!
- Go to <https://www.figma.com>, login with your Howest account *via Google*.

# Recap

## What is design?

- UX is the process of creating the right product for the right people.  
This is the step before the UI design.
- UI is the process of creating a clean and professional interface.  
This is the step before development.
- UI elements make the interface.



**Done.**