

User Interface Engineering

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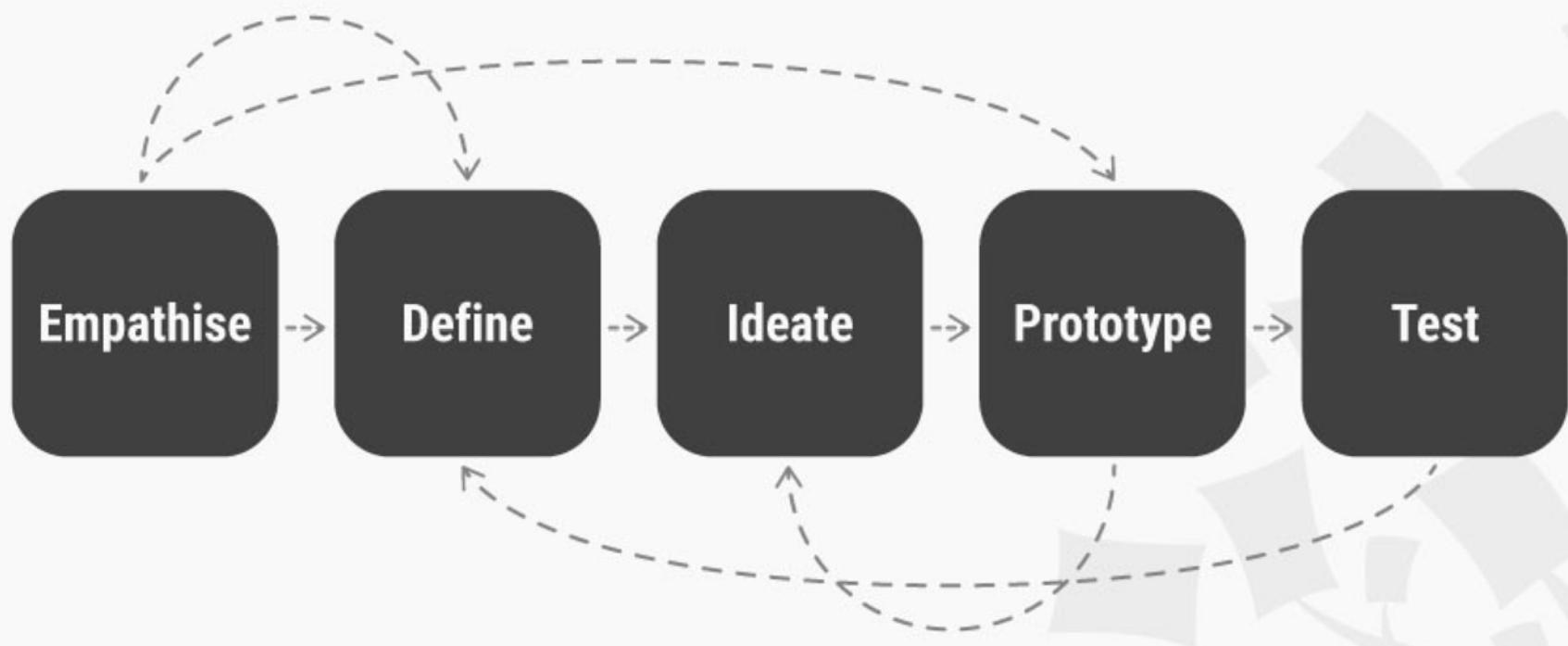


- Design Thinking
- Prototyping
- Types of Prototypes

Design Thinking



Design Thinking: A 5 Stage Process



INTERACTION DESIGN
FOUNDATION

INTERACTION-DESIGN.ORG



Empathize



- Research your users' needs
- Gain understanding of problem
- Setting aside your own assumptions
- Method: user research



Define



- Analyzing the 'emphatic' stage
- Synthesize your findings
- Define the core problem (in a human-centered way)



Ideate



- Generating ideas
- Brainstorming
- Thinking outside the box



Prototype



- Goal: identify the best, most complete solution for the problem(s)
- Experimental *making*
- Different types for different problems



Test



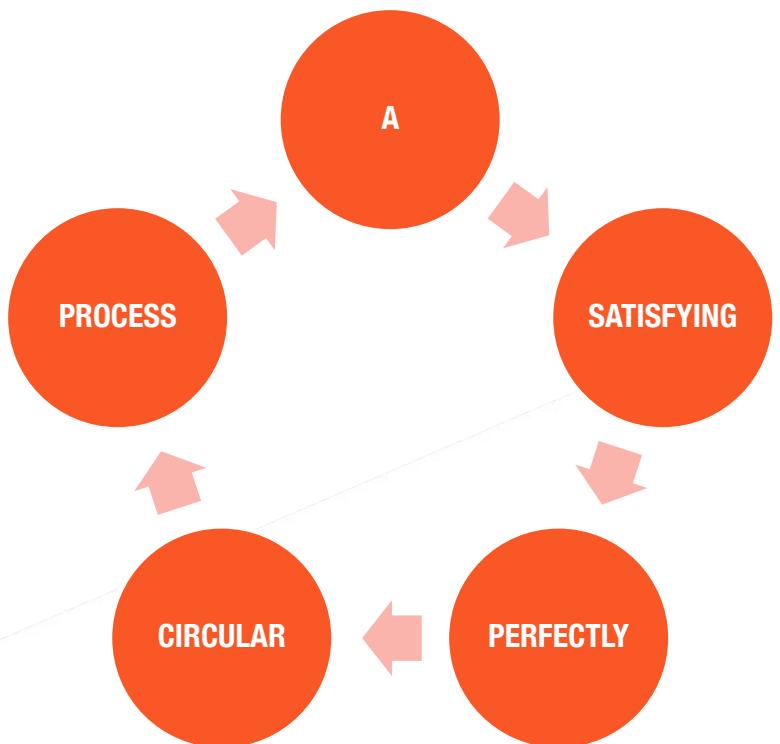
- Evaluate your prototypes
- Get feedback from your users
- Redefine your problem statement and solution if needed
- Repeat

IT IS GENERALLY NOT



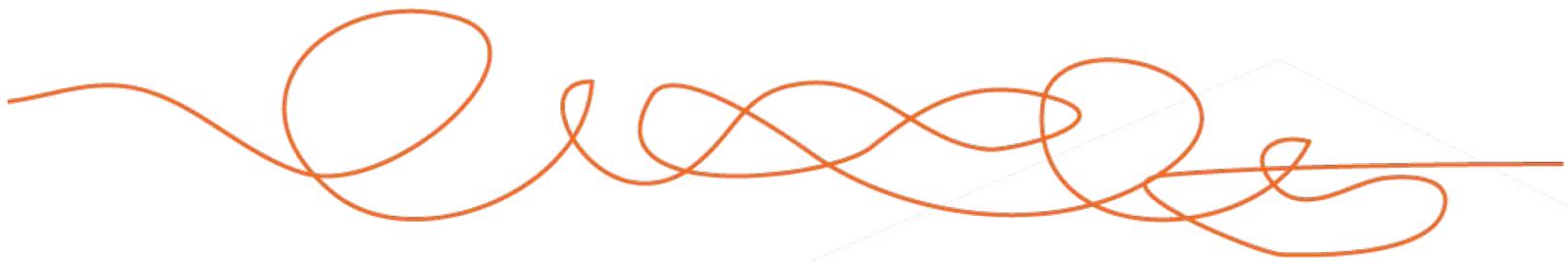
A NICE AND TIDY LINEAR PROCESS

AND USUALLY ALSO NOT



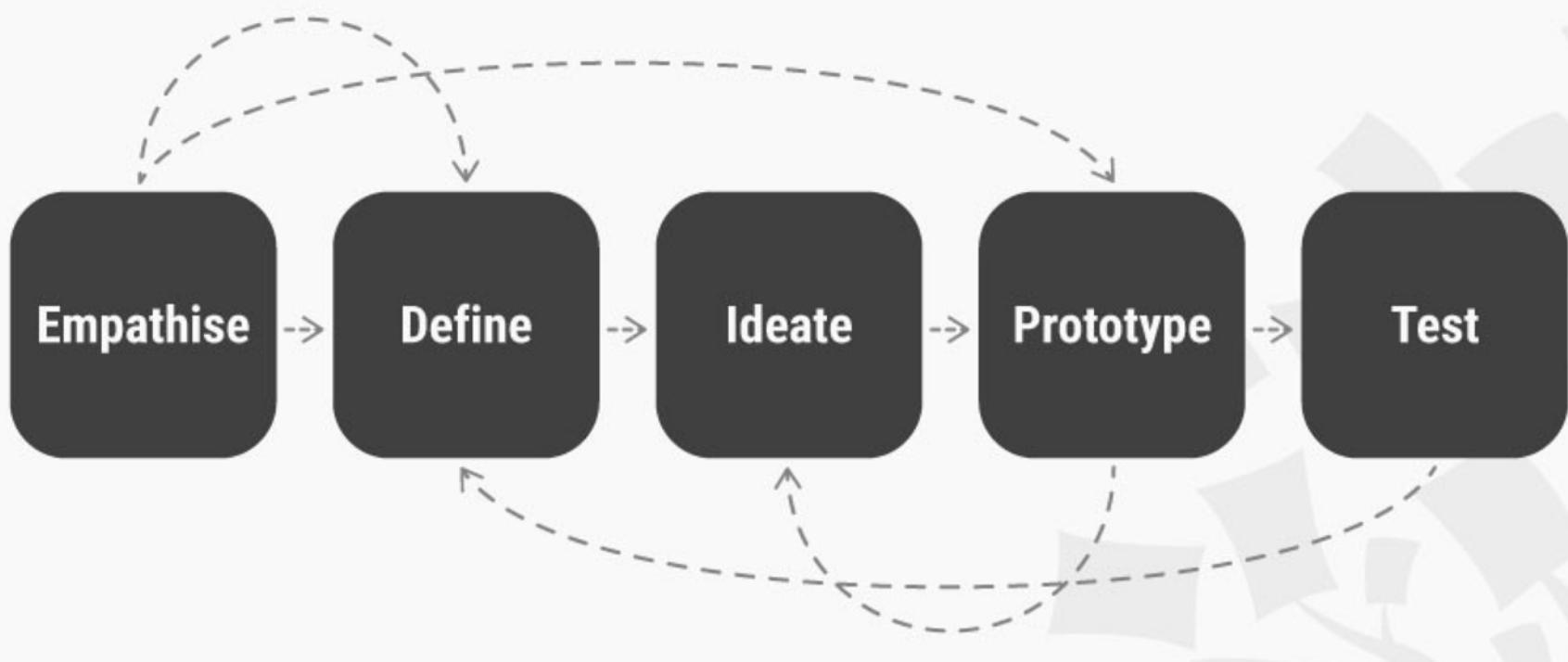


But often more like





Design Thinking: A 5 Stage Process



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Defining your problem



Design problems are often *wicked* problems

(Buchanan, 1992)

Problems:

- that are ill-formulated,
- where the information is confusing,
- where there are many stakeholders with conflicting values,
- where the ramifications in the whole system are unclear.

A wicked curriculum



More one-on-one time with students leads to better results.

But:

- How much one-on-one time is enough one-on-one time?
- What are 'better results'?
- More one-on-one time puts strain on teachers
- Strained teachers are worse teachers than relaxed teachers
- Hiring more staff puts strain on budgets

*ill-formulated
confusing information
ramifications
ramifications
multiple stakeholders*

A wicked car



Safer cars are better than not-so-safe cars

But:

- What is a safer car? When is the car safe enough? *ill-formulated*
- What is a not-so-safe car? *confusing information*
- Adding safety structures reduces car mileage *ramifications*
- The designers and engineers will have to agree on safe vs. beautiful *multiple stakeholders*

A wicked environment



We need to reduce CO₂ emission to save the planet

But:

- By how much do we need to reduce it?
- What is the biggest culprit to global warming?
- Government and industry have to agree on action points
- Fossil fuel jobs and industries will disappear

*ill-formulated
confusing information
multiple stakeholders
ramifications*

Tackling wicked problems



Define your problem:

Instead of: we need to reduce CO₂ emissions

Go with: the Austrian production industry needs to reduce its CO₂ emissions from factory plants

This problem statement has clear subjects

Tackling wicked problems



Where possible, set a **finish line**:

Instead of: the Austrian production industry needs to reduce its CO₂ emissions from factory plants

Go with: the Austrian production industry needs to reduce its CO₂ emissions from factory plants by 15% in 2020

This problem statement has measurable objectives

Tackling wicked problems



Set priorities:

Instead of trying to solve the problem (reducing CO₂ emission by 15% in 2020) while pleasing all stakeholders (government, industry, citizens, Greenpeace) at once,

Try to **compromise** and find middle ground.

Tackling wicked problems



Where possible, **involve (all) stakeholders.**

Rather than: the Austrian government has decided on new regulations for CO₂ emissions for small production plants

The case of: in constant consultation with a focus group of production plant owners, the Austrian government has formulated a set of new regulations for CO₂ emissions for small production plants.



Prototyping

Prototyping



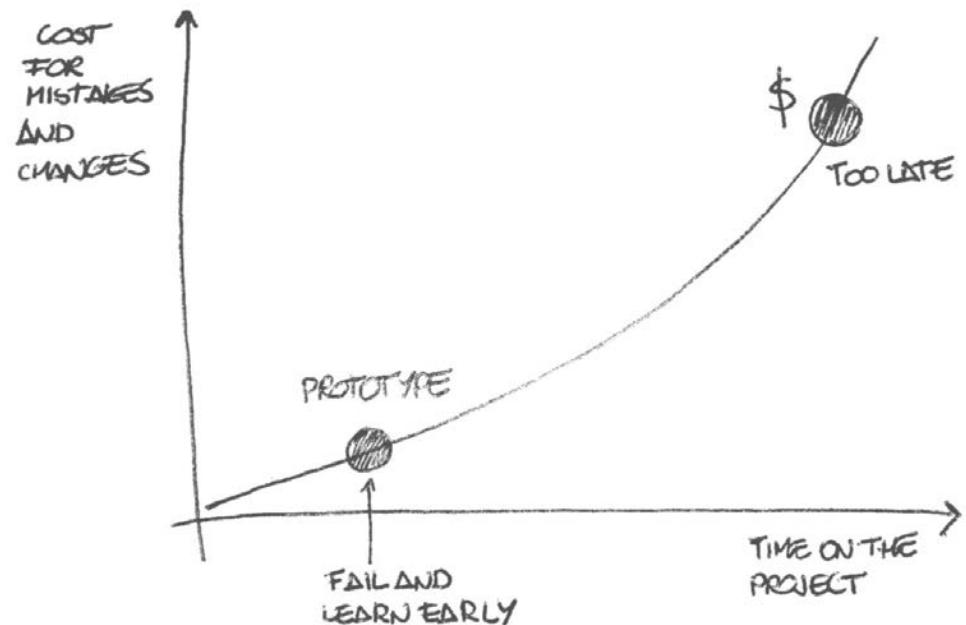
A user interface prototype is a hypothesis:

*"I think [my design] is
the best solution for [problem]."*

Why Prototype?



1. Failing early
2. Understanding your user
3. Understanding your problem
4. Resolving conflicts
5. Investigating production feasibility



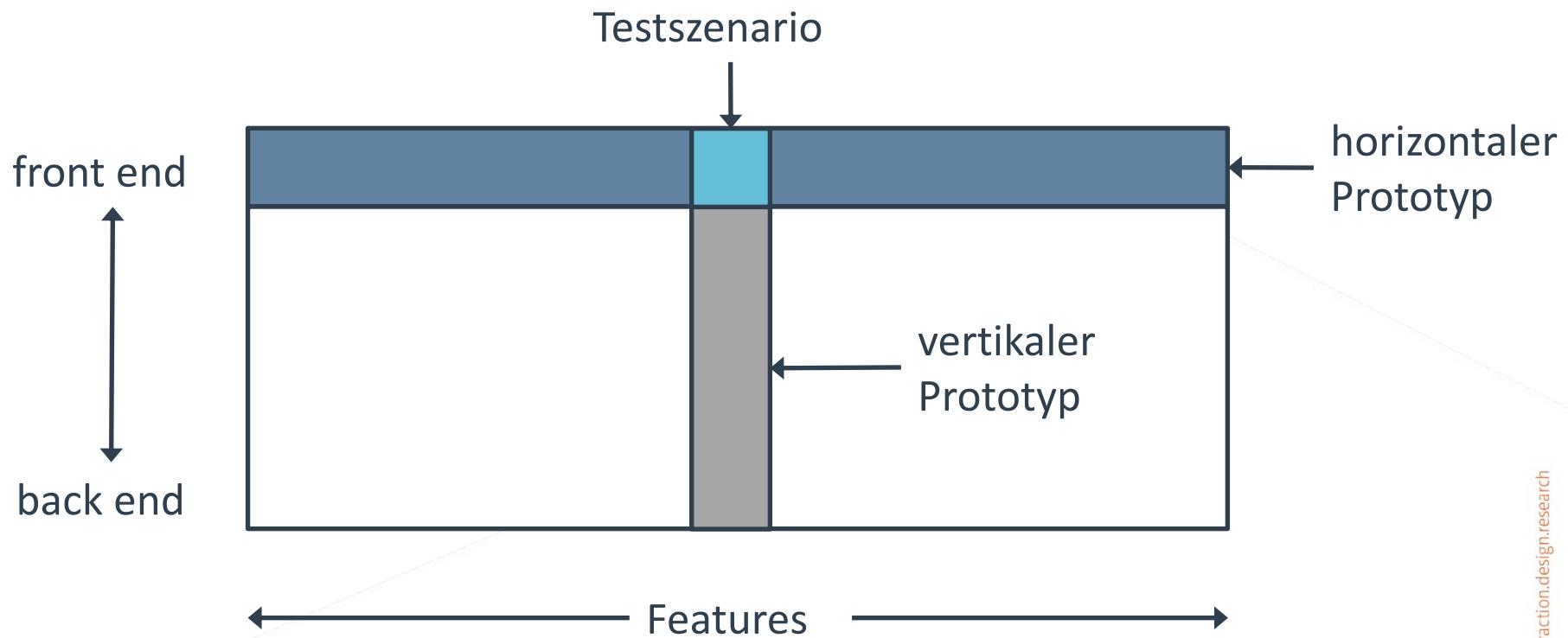
contextual.interaction.design.research

<https://medium.com/@demianborba>



con

Prototype Fidelity

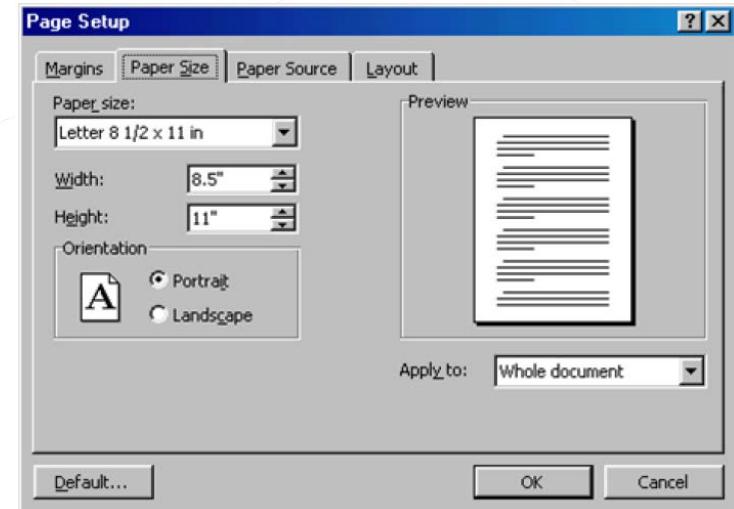
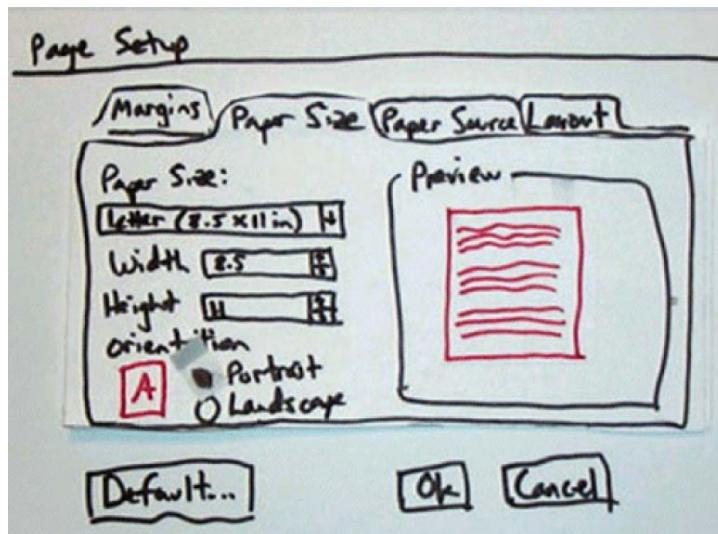


Look and Feel



Look = Erscheinung des Prototyps

Feel = Gefühl des Benutzers bei der Interaktion



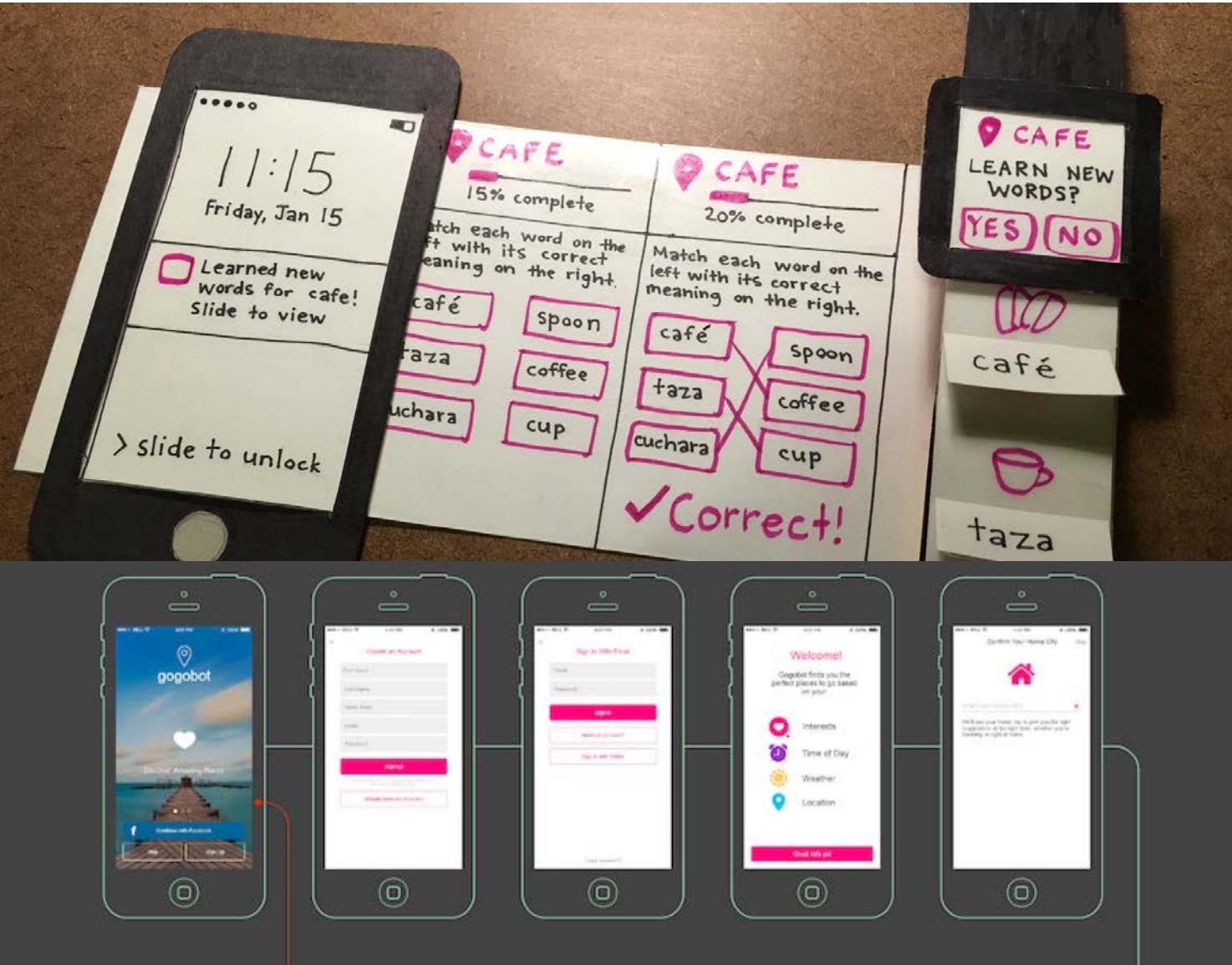
Arten von Prototypen



- **Low Fidelity**
 - Verbal description
 - Storyboards
 - Sketching
 - Papierprototypen
- **Medium Fidelity**
 - Wizard-of-Oz
 - Interaction Sketch
 - Videoprototypen
- **High Fidelity**
 - Interactive prototyping



Types of Prototypes



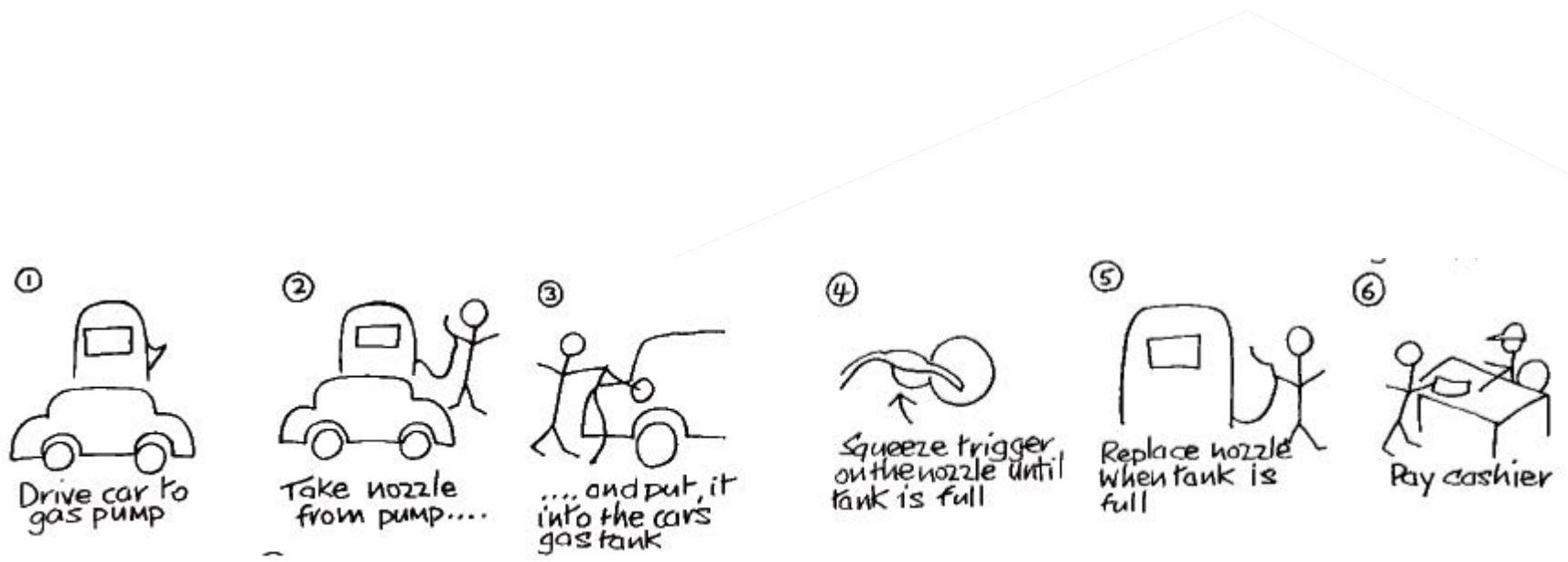
https://medium.com/@ergomania_UX/

<https://medium.com/@tristaljing/>

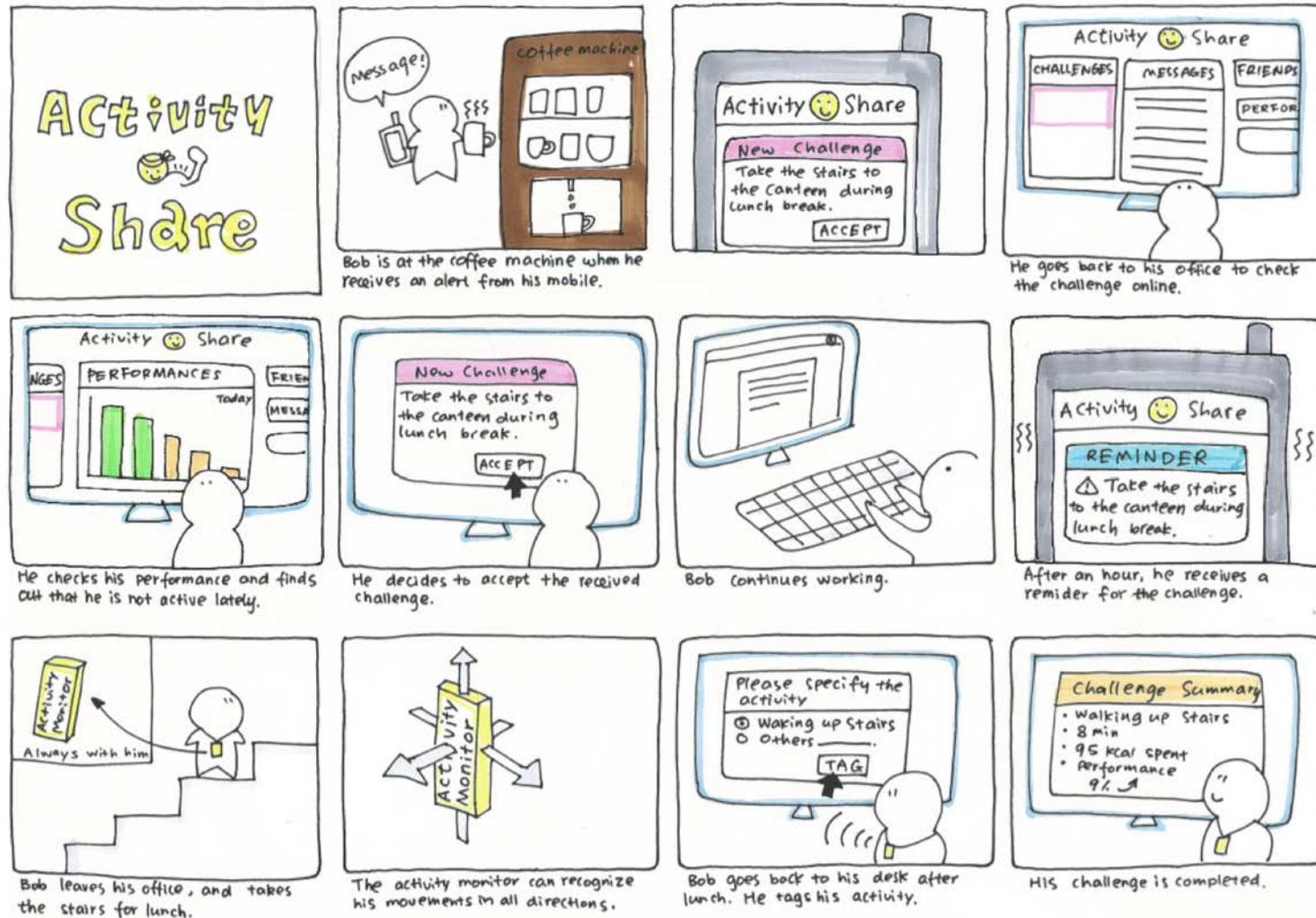
Storyboard (I)



Serie von Entwürfen/Zeichnung, die zeigen wie der User Aufgaben mit den UI durchführt
Zeigt wichtige Ereignisse des Systems
Manchmal in Form eines Comics



TYPE: Storyboard



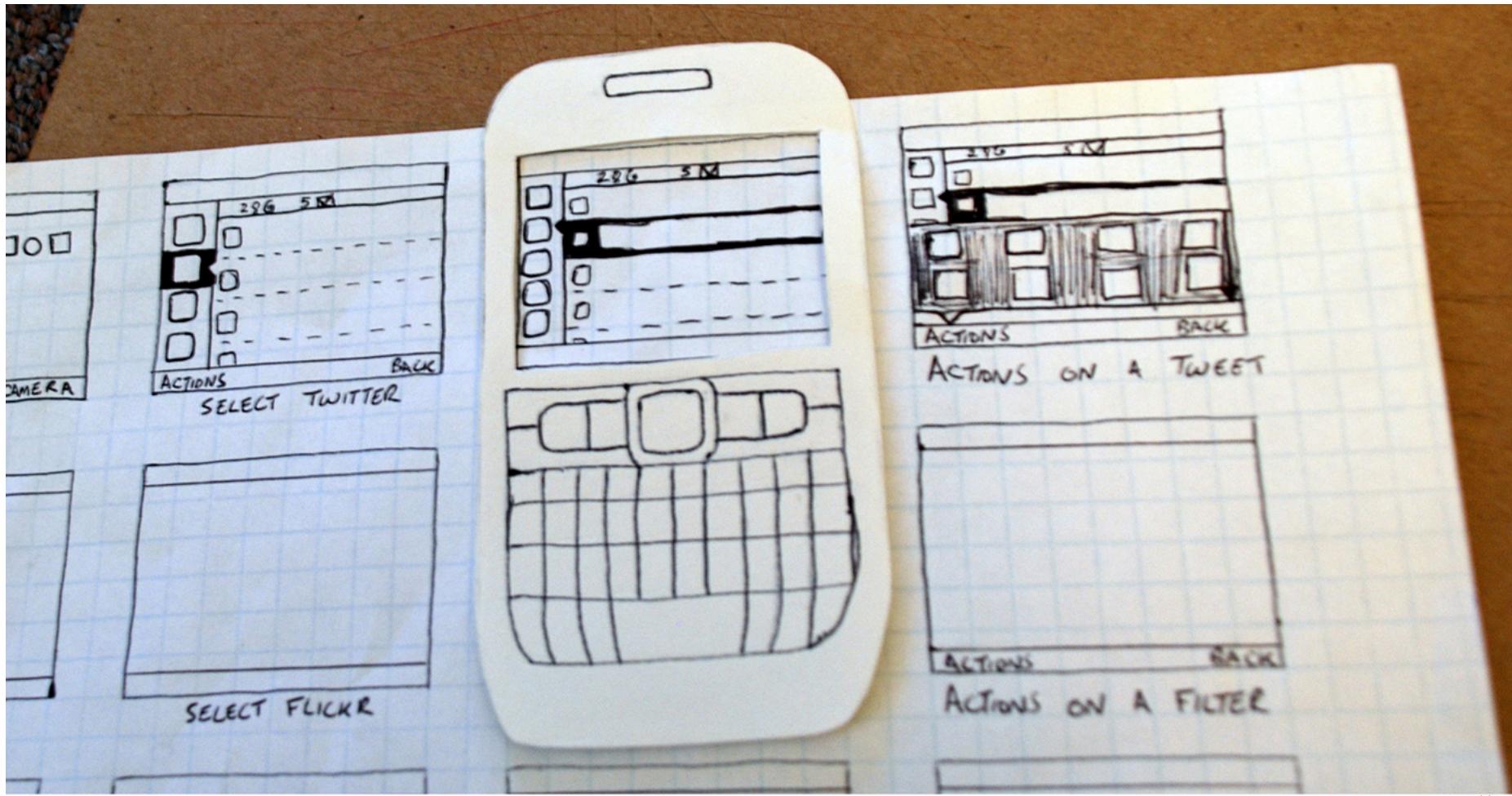
<http://www.ruocheng.me>

Paper Prototyping



- Interaktives Papiermodell
 - Skizzen vom Aussehen des Interface
 - Papierstücke zeigen Fenster, Menüs, Dialogelemente, ...
- Natürliche Interaktion
 - Mausklick = mit dem Finger zeigen
 - Tippen = schreiben
- Person simuliert die Computeroperationen
 - Legt Papierstücke auf und nimmt sie weg
 - Schreibt Antworten auf den Bildschirm
 - Beschreibt Effekte, die nicht mit dem Papierprototypen gezeigt werden können
- Low Fidelity Look and Feel
- High Fidelity in der Tiefe (Person simuliert Backend)

Beispiel Prototyp



<http://chiefdisruptionofficer.com/helpful-rapid-prototyping-methods-and-tools-to-bring-digital-ideas-to-life-fast/>

Beispiel Prototyp



<http://www.mickmcquaid.com/teaching.html>

<http://hci.sbg.ac.at>

Warum Paper Prototyping?



- Schnell umzusetzen
- Leicht zu ändern
 - Änderungen können zwischen oder sogar während Tests gemacht werden
 - Prototyp wird verworfen → kein „code investment“
- Aufmerksamkeit auf größere Zusammenhänge
 - Designer verschwendet keine Zeit mit Details
 - Kunde hängt sich nicht an Details auf
- Nicht-Programmierer können mitarbeiten

Nachteile von Paper Prototyping



- Sind weniger realistisch
- Man kann nicht alle Usability Probleme finden
- Es können keine Reaktionszeiten vom System evaluiert werden
- Inputmodalitäten vom System werden nicht evaluiert (zB Maus, Tastatur, etc.)
- Erlauben kein Remote Testing

Paper Prototyping Tipps



- Je größer desto Besser
- Monochrom ist besser als bunt
- Ersetze schwieriges Visual Feedback durch gesprochene Beschreibungen
 - z.B. Drag&Drop, Animationen, Progress Bar
- Organisiertheit ist wichtig
 - Benutze offene Briefkuverts, ...

Was kann man von einem Paper Prototypen lernen?



- Konzeptionelles Modell
 - Versteht es der Benutzer?
- Funktionalität
 - Macht das System was es soll?
 - Fehlt etwas?
- Navigation & Task Flow
 - Kommt der Benutzer zu recht?
 - Sind zu jedem Zeitpunkt die nötigen Informationen vorhanden?
- Terminologie
 - Versteht der Benutzer die Bezeichnungen?
- Bildschirminhalt
 - Was muss am Bildschirm angezeigt werden?

Was kann man von einem Paper Prototypen nicht lernen?



- Look
 - Farben
 - Schriftarten, Schriftgrößen, ...
- Feel
 - Alles rund um Fitt's Law
 - Antwortzeiten
- Werden kleine Änderungen tatsächlich bemerkt?
 - Am Papier Prototyp wird jede noch so kleine Änderung bemerkt
- Exploration vs. Deliberation
 - Erforschung vs. Überlegung
 - Benutzer überlegen mehr bei einem Papier Prototypen als bei einem Computer Interface (weniger „herum klicken“ und ausprobieren)

Was kann man von einem Computerprototyp lernen?



- Bildschirmlayout
 - Klar, zu viele Elemente, lenkt ab, kompliziert?
 - Kann der Benutzer die wichtigsten Elemente finden?
- Farben, Icons, andere Elemente
- Interaktives Feedback
 - Sieht der Benutzer Feedback?
- Effizienz
 - Sind die Elemente groß genug?
 - Sind die Elemente zu nahe beieinander?
 - Ist die Scrolling List zu lang?

TYPE: Physical Model



<https://www.interaction-design.org/literature/article/prototyping-learn-eight-common-methods-and-best-practices>



Produktank

Why?



- Size
- Shape
 - Aesthetics
 - Ergonomics
- Mechanics
- Materials

Wizard-of-Oz



- Austesten von Designideen ohne konkreter Implementierung eines Systems
- Nutzer glaubt, die Interaktion funktioniert direkt mit dem System
- Usability-Experte übernimmt Rolle des Wizards (Zauberer), reagiert im Hintergrund auf Aktionen des Nutzers
- Z.B. hinter Einweg-Spiegel oder mittels Videobeobachtung

TYPE: Wizard of Oz (WoZ)



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

Wizard-of-Oz



- Oft eingesetzt um zukünftige Technologien zu simulieren
 - Spracherkennung
 - Artificial Intelligence
 - Human-Robot Interaction
- Wizard ist Gefahrenquelle für Test (da „nur“ Mensch)
- Man muss zwei Interfaces implementieren
- Great for „Proof of Concept“



It's 1999



DEVELOPMENT
THAT PAYS

TYPE: Acting Out/Roleplaying

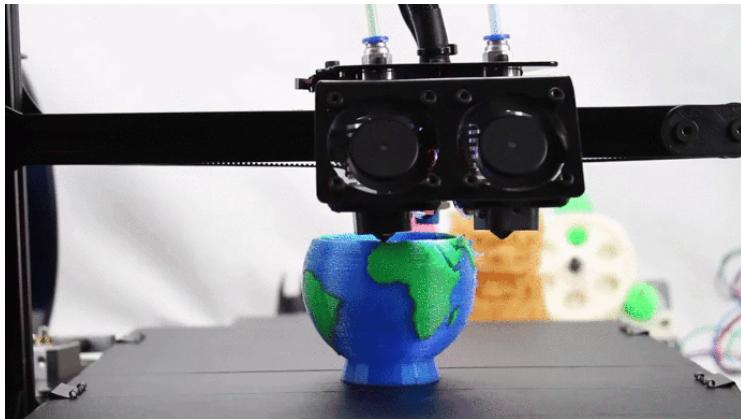


Why?



- Cheap
- Quick
- Checks your logic/scenario

TYPE: Rapid Prototyping





cont



mBall

Problem



- Sketches von Interfaces zeigen oft nur Bildschirminhalt.
 - Wie sieht aber das gesamte Szenario aus?
 - In welchem Kontext geschieht die Systemnutzung?
 - Wie wird Natural Interaction (e.g. Gesten) dargestellt?
- Und: Wie fühlt es sich an?

Experience Prototyping



Buchenau, Marion, and Jane Fulton Suri. "Experience prototyping." In Proceedings of the 3rd conference on Designing interactive systems: processes, practices, methods, and techniques, pp. 424-433. ACM, 2000.

Experience Design



- Link between the satisfaction of psychological needs and the design of interactive products
- Instead of only focusing on aesthetics and functionalities, design *for experiences that are created while interacting with the product*
- Experience designers do not only answer the questions what ("do goals") and how ("motor goals") we do something, but stress the question about why we do it ("be goals")

Hassenzahl, M. Experience Design: Technology for all the Right Reasons. Morgan & Claypool, San Rafael, USA, (2010).

Experience Story



- Important to create a meaningful and convincing experience story, before implementing an idea through a technology

Experience Prototyping



- Experience prototypes are interactive representations of concepts
 - Implementation can vary (between an hour and a month)
 - Important that they can be actively used and are able to communicate at least parts of the designed experience
-
- Buchenau, M. and Suri, J.F. Experience prototyping. In Proc. DIS 2000, ACM Press (2000), 424-433.

Experience Story 1



One evening, Florian is sitting at the living room table with his wife Anna and his son Felix, planning their vacation. Last year **the long ride to their holiday destination was awfully boring** for Felix. This year, everything is supposed to be better. „We will really go on holidays together”, Anna says. “Felix, while we are driving, you can help me to **find places we would like to visit.**”

Experience Story 2



During the trip Felix is curious, what there is to see along the way. **Using the periscope he is able to take a look at the sights ahead.** He discovers a castle close to them, which he absolutely wants to see. Felix is a big fan of the middle age and brave knights. Eager to share his discovery, he tells his parents about the castle. „Let me have a look at it, too”, Anna says. **While taking turns looking through the periscope, they talk about the castle and who might have lived there hundreds of years ago.**

Experience Story 3



"Wow, it is great!" Felix says. He would really like to visit the castle. Anna browses through some **more information on the display in the car** and spots that they offer tours. They can already hear two knights fighting with their swords. This trip is a real adventure for Felix, who is happy to spend some fun time with his parents.

Storyboard



1. "This year, we will go on holidays, *together!*"



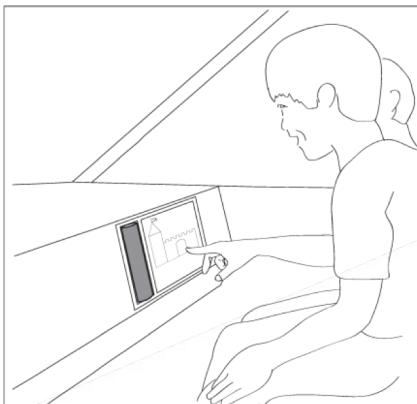
2. "Let's see what's on the way."



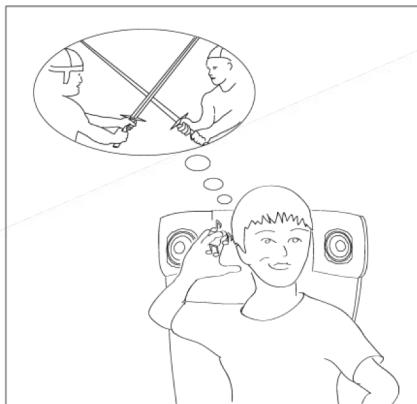
3. "Wow, there is a huge castle!"



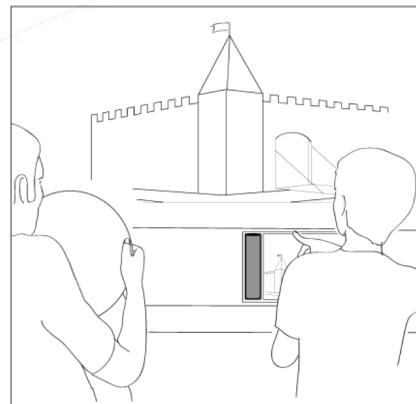
4. "Let me have a look at it, too!"



5. "We can take a tour in the castle."



6. "I can hear the knights fighting!"



7. "Let's stop to see the castle."



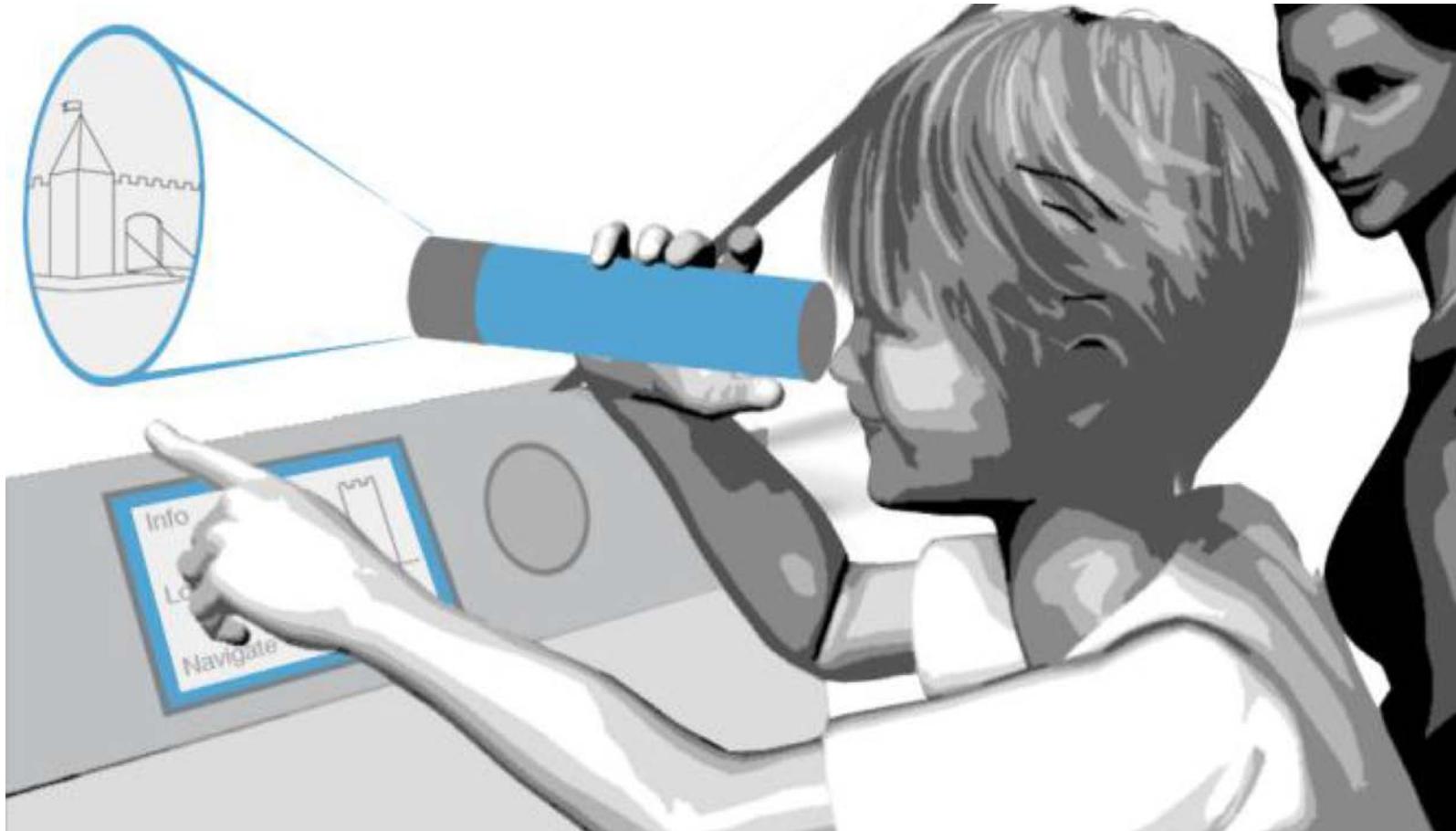
8. "This was one exciting trip!"

Interaction Concept



1. One of the passengers takes the telescope-shaped device and directs it towards the outside.
2. When looking into it, the outside environment will be visible through the Periscope.
3. When the user turns around, the visible part of the environment will change depending on the direction the Periscope is pointed at.
4. Additionally, the Periscope shows points-of-interest (POIs) that may be not visible when looking out of the window.
5. These can be further explored and are augmented with additional information, such as a picture and a name.

Sketch

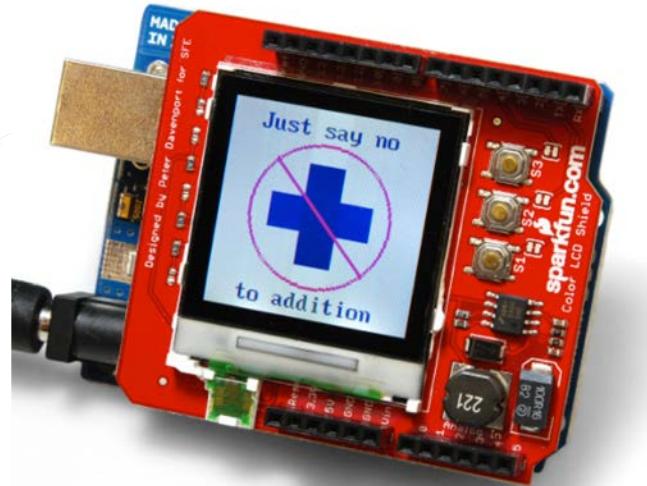


Preliminary Prototype

low-resolution/low-fidelity



- Plastic toy telescope
- Placed a small 0.96" TFT display that was controlled by an Arduino microcontroller at the far end of the telescope
- Random pictures of buildings on a SD card, which were retrieved by the Arduino and displayed on the screen as a slide show
- 1 day



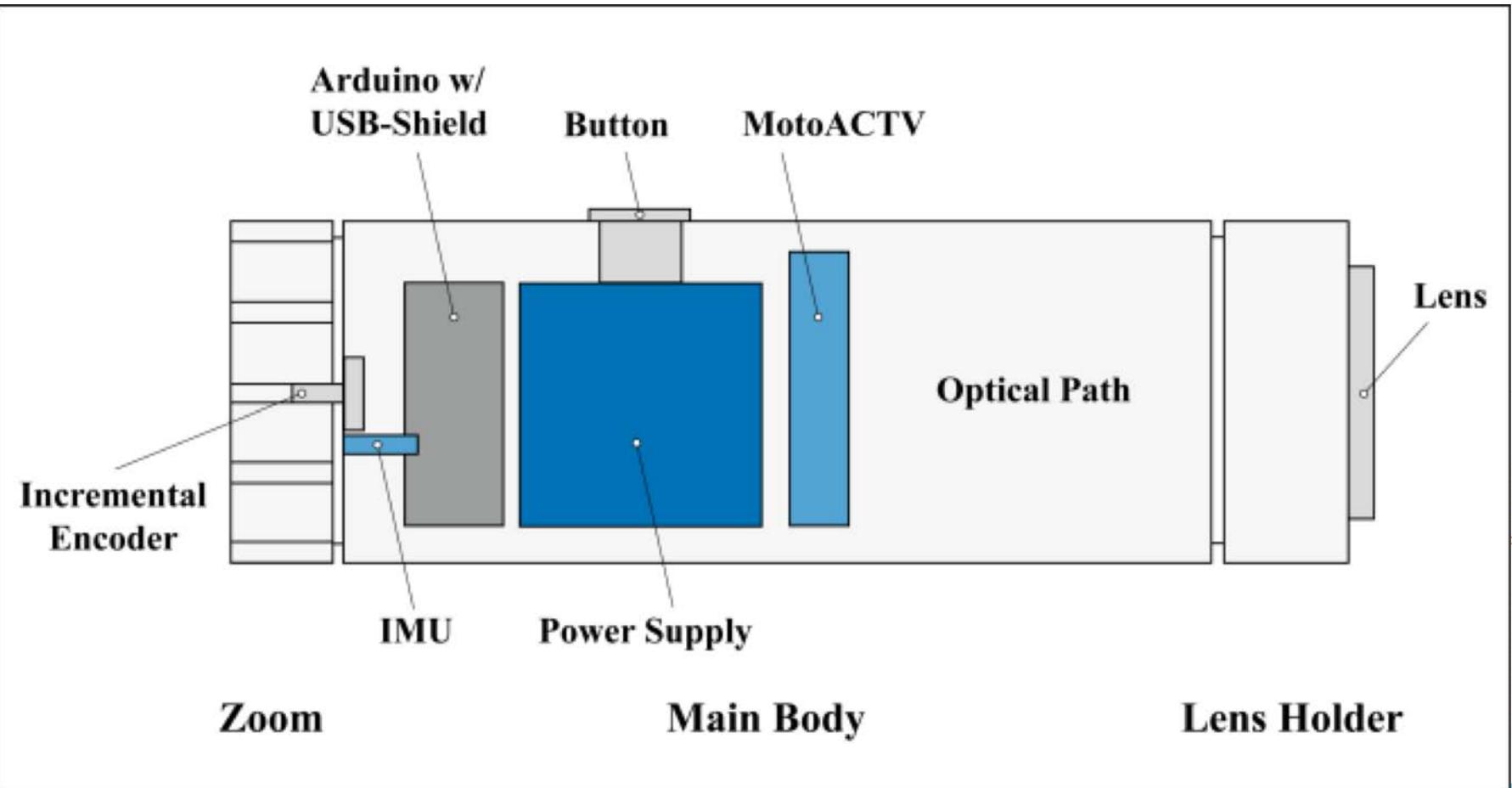
First Functional Prototype

high-resolution/mid-fidelity



Second Functional Prototype

high-resolution/high-fidelity



Second Functional Prototype

high- resolution/high-fidelity



Based on
„The Periscope – An Experience Design Case Study”
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How to Prototype?



1. What are the **key elements** of your idea?
2. What **questions** about the key elements do you want to answer?
3. What prototype makes most sense to **answer** these questions?
4. **Make** a prototype.
5. **Test** your prototype.
6. See where your prototype **fails** – then, start again.

What not to do?



1. Diving into the First Good Idea
2. Falling in Love with Your Prototypes
3. Wasting Time Explaining and Pitching
4. Prototyping Without a Purpose
5. The Failure Roadblock

Noch Fragen...

