



# SKETCHING USER EXPERIENCE

ITPDP'26, L9

Dr. Minna Pakanen

Department of Digital Design and Information Studies

[mpakanen@cc.au.dk](mailto:mpakanen@cc.au.dk)



# Course Schedule 2/3

- L= lecture
- E=TØ sessions & practical exercises
- IW= Individual/group work
- A= Assignment hand ins
- P= Design or Demo presentation
- GIT= Delivered via gitlab.au.dk
- BS= Delivered via Brightspace
- I= Individual delivery
- G= Group delivery

	Week 8/12	Week 9/13	Week 10/14	Week 11/15	Week 12/16	Week 13/17	Week 14/18
Mon	L8 16/3 Concept Development (Simon)	L9 23/3 Sketching User Experiences (Minna) + 14-16 PROTOlab intro (Simon/Gustav)	IW 30/3 Work on sub-assignment 2	EX Tue 7/4 Pitch Workshop 11:30-14:30 (Anne/The Kitchen)	E10 13/4 Physical Prototyping (Simon)	L11 20/4 Prototyping & Academic writing + Related works Q&A (Clemens)	E12 27/4 Figma prototyping 12:00-15:00 (Guest: Maja & Julia)
Wed	E8 18/3 Ideation & concept development	24/3 12:00-16 PROTOlab intro (Simon/Gustav)	Easter break 2/4-6/4	P Thu 9/4 Design pitches 10:00-12:00 (All)	15/4 Supervision 10-11:30 (Simon) + watch Academic writing + Related works video (Bs)	E11 21/4 Academic writing Exercises (TAs)	IW 29/4 Work on sub-assignment 4
IW	20/3 Supervision session 9-11 (TAs)	E9 25/3 Sketching humans and storyboards (Minna + TAs)		L12 22/4 GUI Design (Minna)	1/5 Supervision 10-11:30 (Simon)		
	- Finish Fusion 360 & AI and AID tooling exercises and watch the PROTOlab video by 23 <sup>rd</sup> + read articles		- Sketch storyboards	- Prepare PPT & pitches for 3 ideas for Thu - Finish sub-assign. 2	- Watch the video and read the articles before next Mon and Wed lectures	- Start gathering related works - Finish sub-assignment 3	- Finish sub-assignment 4



# TODAY

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- Interaction and UX design
- Externalisation and design

## Break

- A bit more about scenarios
- Storyboards
- Sketching UX in storyboards
- Concept selection



# INTERACTION DESIGN (IXD)

Design of the user interaction and experiences that occur during using a product

## 4. User experience evaluation

### 1. User research

- Interview
- Observation
- Shadowing
- Remote studies

1.1. Creating personas & scenarios + sketching storyboards



### 2. UI sketching

- wireframing

### 3. UI graphics & interaction design

- Aesthetics
- Interactive content design
- User experience design



# USER EXPERIENCE (UX) DESIGN

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A good user experience is one that meets a particular user's needs in the specific context where a person uses the product



# INTERACTION DESIGN (IXD)

Design of the user interaction and experiences that occur during using a product

## 4. User experience evaluation

### Why?

#### 1. User research

- Interview
- Observation
- Shadowing
- Remote studies

1.1. Creating personas & scenarios + sketching storyboards

### What?

#### 2. UI sketching

- wireframing

### How?

#### 3. UI graphics & interaction design

- Aesthetics
- Interactive content design
- User experience design





# EXTERNALISATION AND DESIGN

Alan Dix & Layda Gongora (2011)

# EXTERNALISATION?

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- Is an active shaping of the world as an *intellectual* resource
  - a uniquely human ability & foundation of culture and civilisation
- Involves the **embodiment**, **representation** and **exploration** of our **own thoughts**, **feelings** and **interior life**
- The term **externalisation** itself reflects a **philosophical and practical** tension:
  - embodied interactions with external artefacts
  - process of making internal representations external
- In art and design this reflects dual views of **creativity as internal muse** or **embodied engagement**.

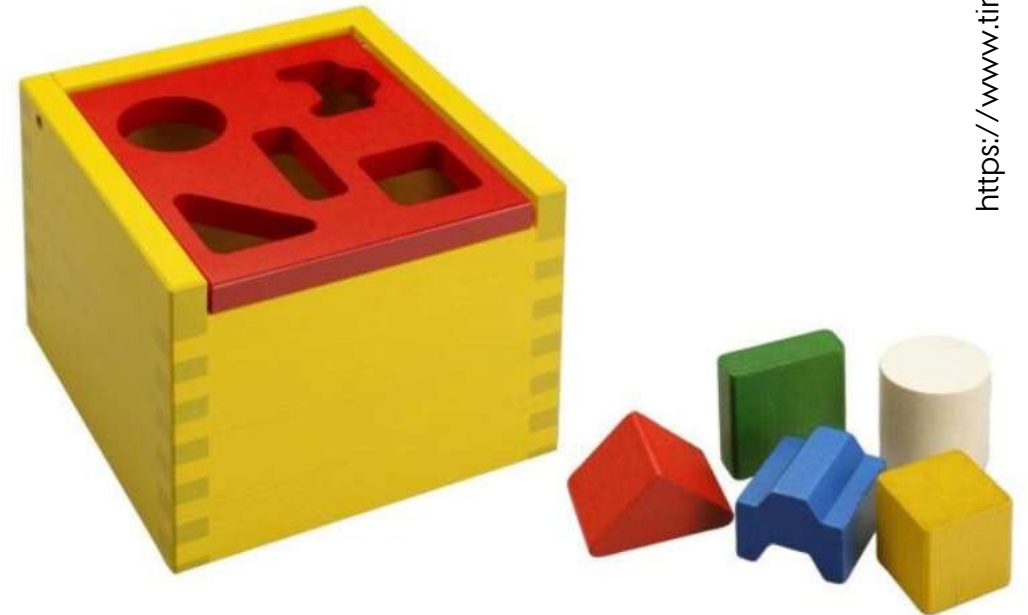


# KINDS OF KNOWING

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## Tacit knowledge

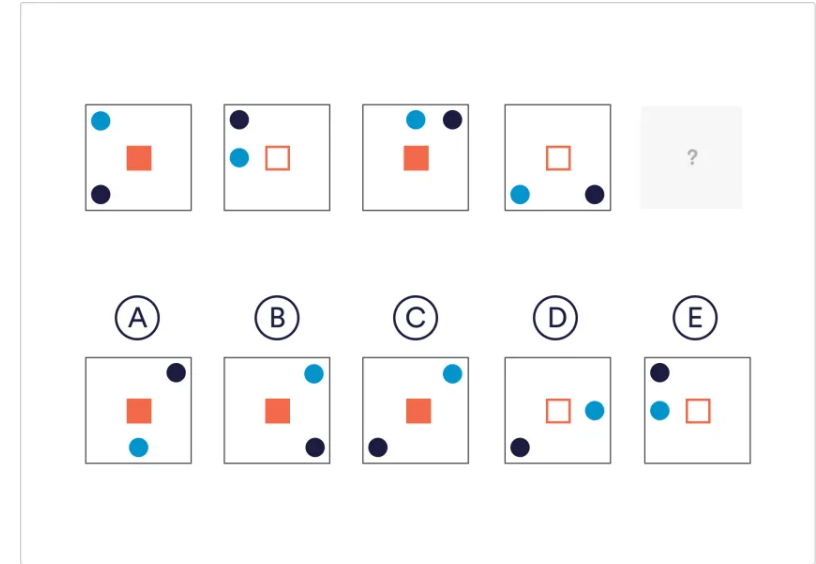
- Unconscious or *pre-noetic*
- Slowly building up through trial and error
- Relational



# KINDS OF KNOWING

## Explicit knowledge

- Conscious
- Rational/logical
- Learning through abduction or reasoning
  - a uniquely or at least largely human attribute



Tacit **or** Explicit?

or

Tacit **and** Explicit?

# 3-LEVELS OF EXPERT KNOWING

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- 1) knowing **in** action
- 2) reflection **in** action
- 3) reflection **on** action

(Donald Schön, 1984)



"knowing is **in** our action"

(Schön, 1984)

”reflection **in** action”

(Schön, 1984)

”reflection **on** action”

(Schön, 1984)

# EXTERNALISATION IN CRAFTS/PRODUCT DESIGN

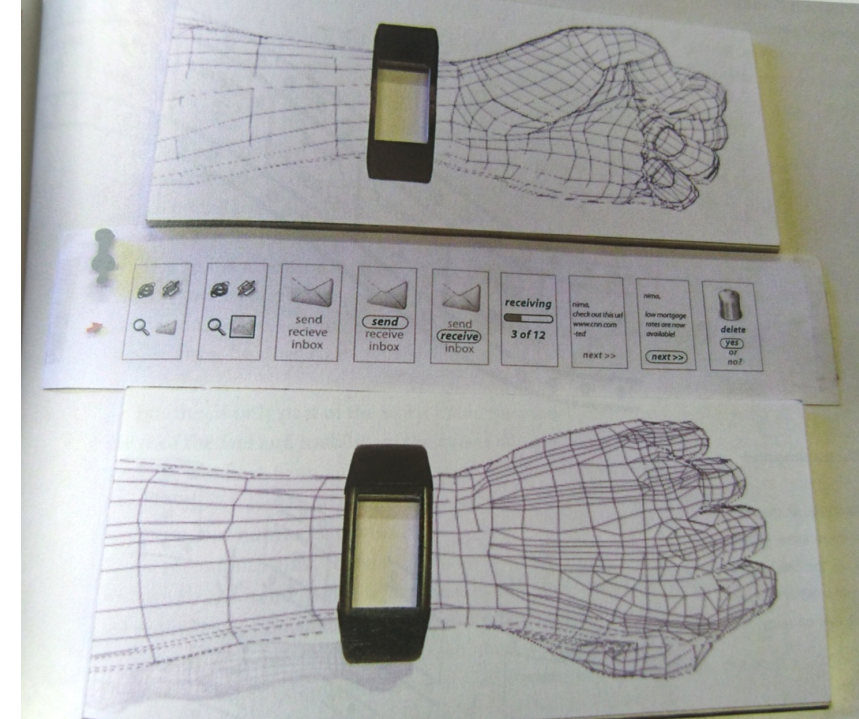
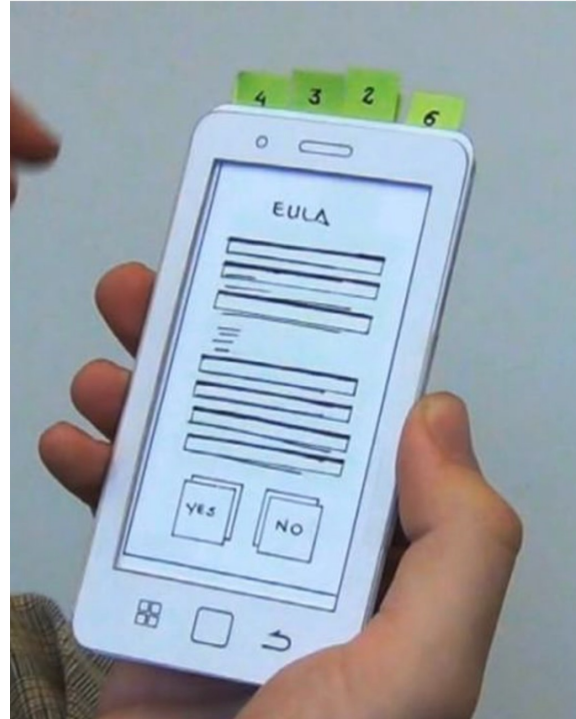
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- Sketches
- Mood boards
- Full-scale mock-ups in blue foam, cardboard, or 3D printing
- Production-line mold
- CAD and other forms of simulation or virtual walkthroughs



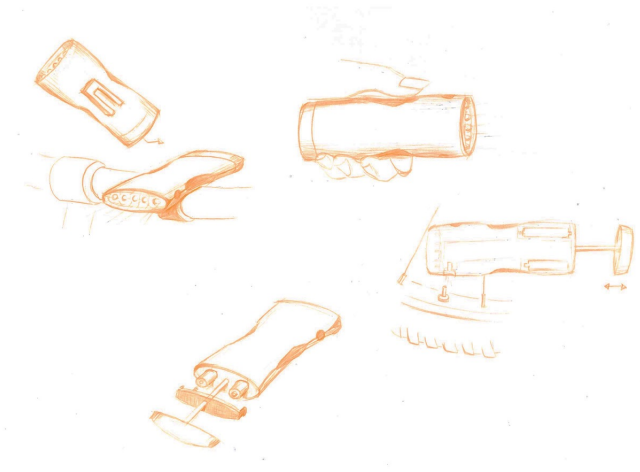
# EXTERNALISATION IN IXD

- Storyboards
  - Personas
  - Scenarios
  - Paper prototypes
- } This lecture

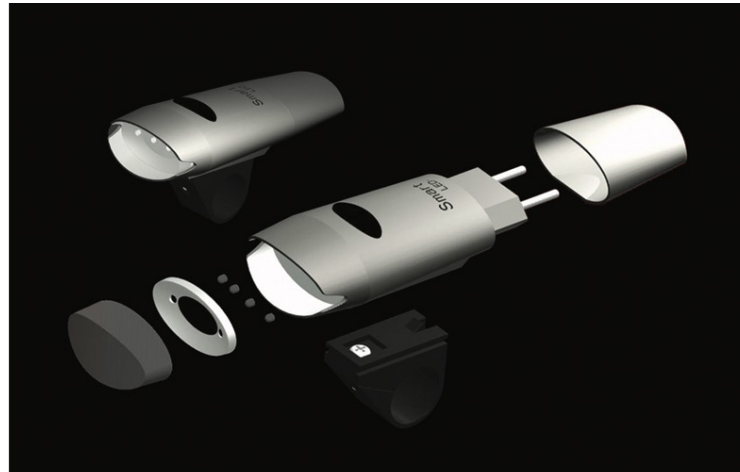


# EXTERNALISATION IN PRODUCT DESIGN

## Products



Sketches



Models



Prototypes



# EXTERNALISATION IN DESIGN PROCESS

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## Product Design

- Problem space
- Design space
- Process



# EXTERNALISATION IN **PROBLEM SPACE**

- **Mood boards** = values and ethos of the setting/ organisation



# EXTERNALISATION IN DESIGN SPACE

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- Series of alternative designs = sample of possible designs
- Focus on context with constraints
- Materials
  - Paper and pencil->abstract list of properties
  - Plasticine or cardboard and glue -> exploring the design space by way of example



# EXTERNALISATION IN DESIGN PROCESS

- Schedule
- Stages

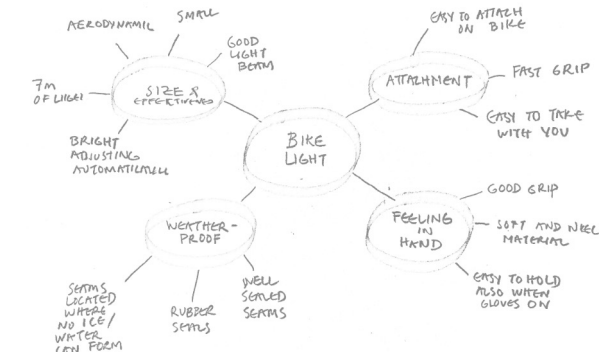
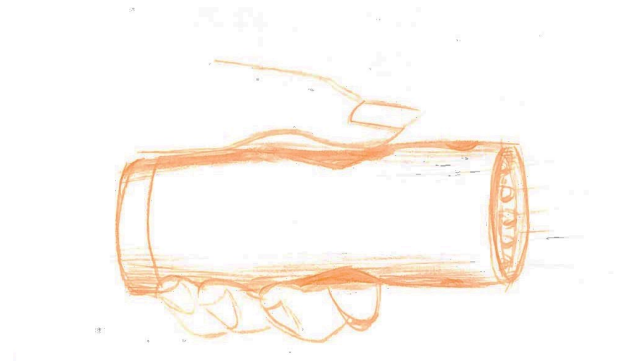


# PROPERTIES AND DIMENSIONS



## Representation

- Physical
  - the foam model
- Schematic
  - sketch or floor plan
- Symbolic
  - E.g., Mind map, equations on the blackboard

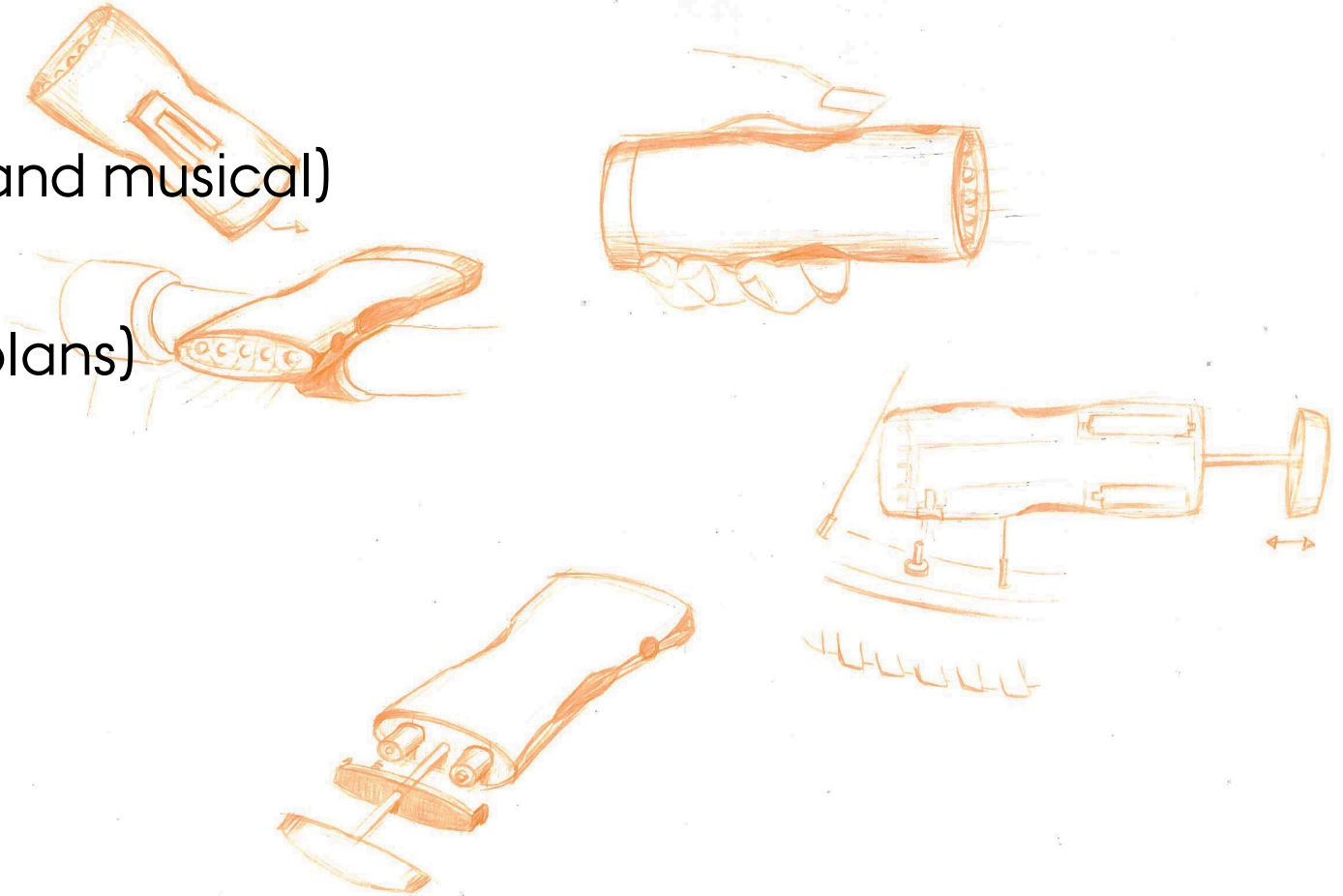


# PROPERTIES AND DIMENSIONS

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## Modality

- Written (also mathematical, and musical)
- Speech
- Drawn (sketches, diagrams, plans)
- Aural, olfactory, or tactile
- Body



# PROPERTIES AND DIMENSIONS

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## Persistence

- Persistent
  - the words written on a page, the clay model, or the sketch on the back of an envelope
- Ephemeral
  - the words in a conversation, the notes played on a keyboard, or the movements made during an improvisation session



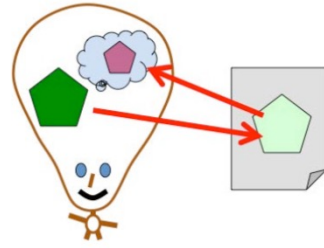
# **FUNCTIONS OF EXTERNALISATION**

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- 1) Informational**
- 2) Formational**
- 3) Transformational**
- 4) Transcendental**



Informational

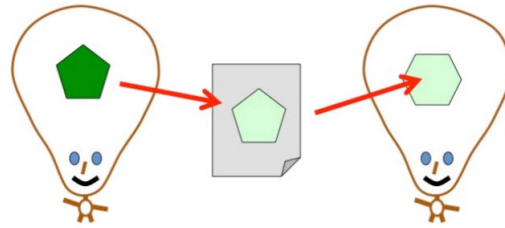


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Formational

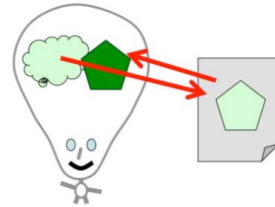


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Transformational

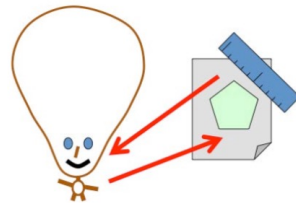


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Transcendental



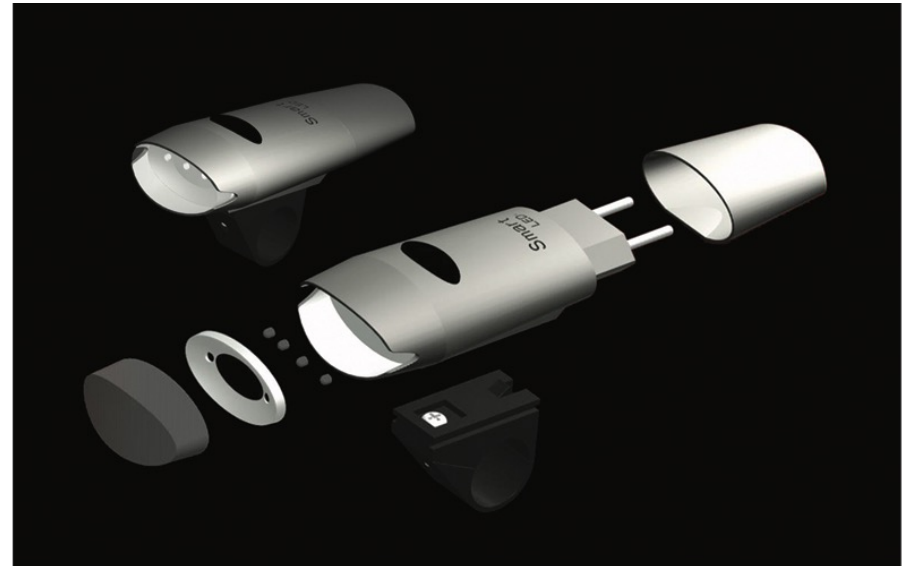
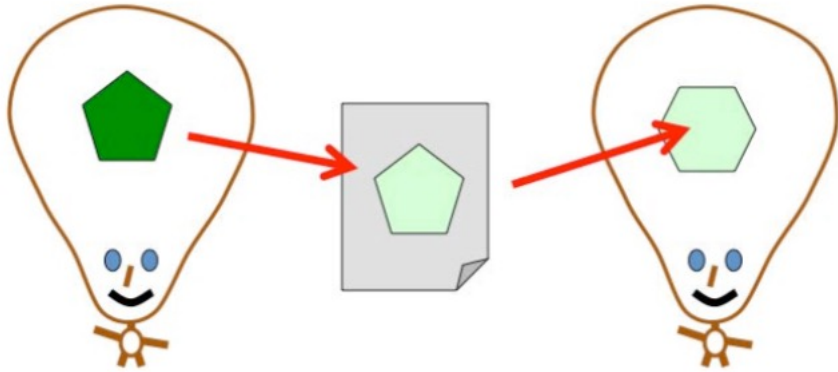
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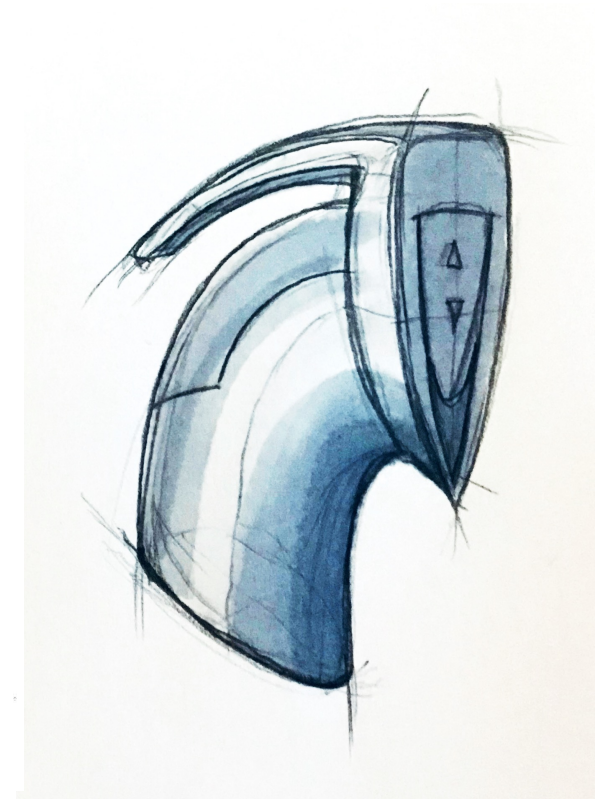
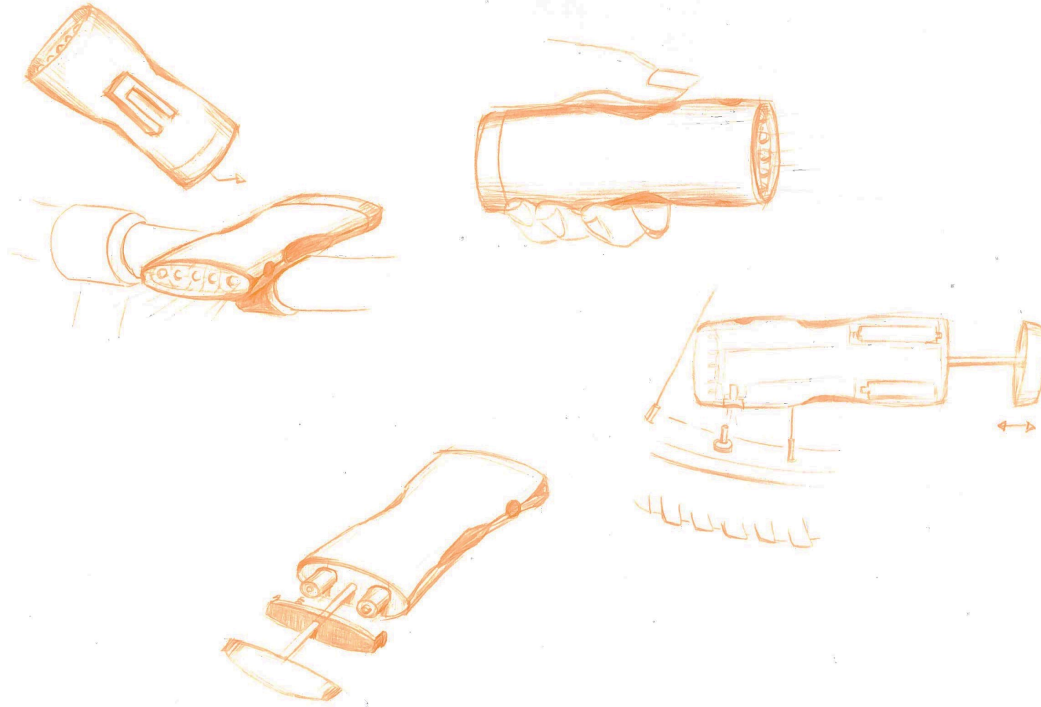
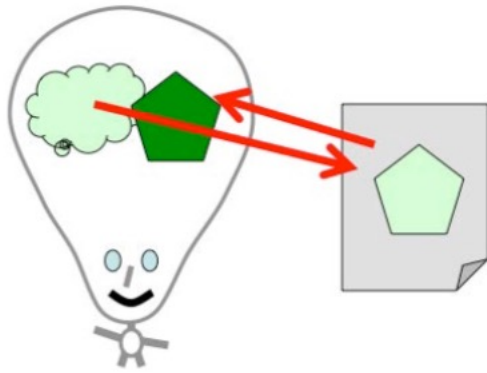
# INFORMATIONAL

- passing on to others already formed ideas



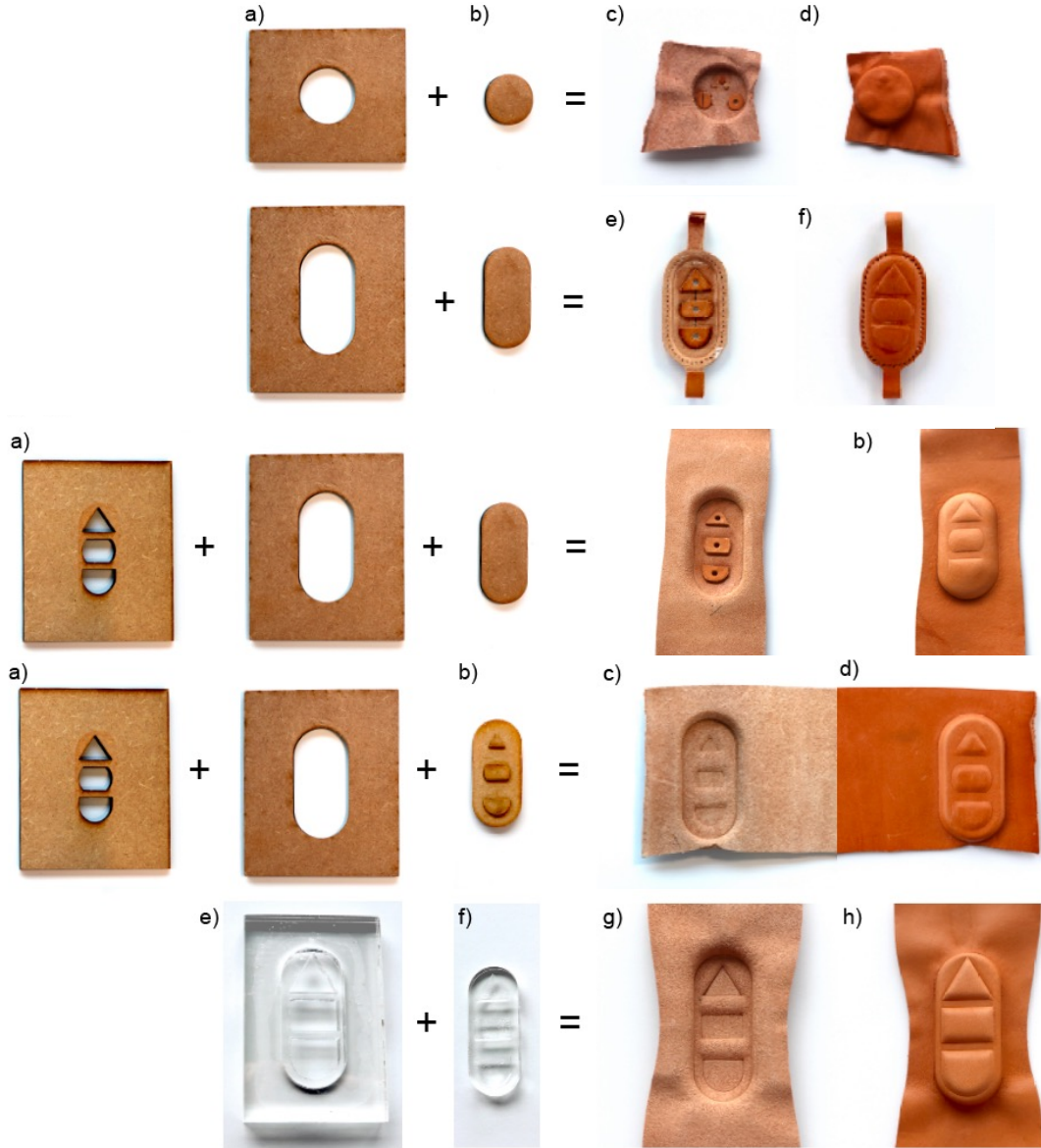
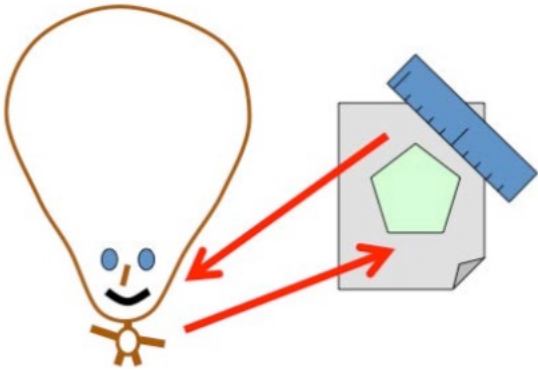
# FORMATIONAL

—  
- vague ideas becoming clearer by the process of externalisation



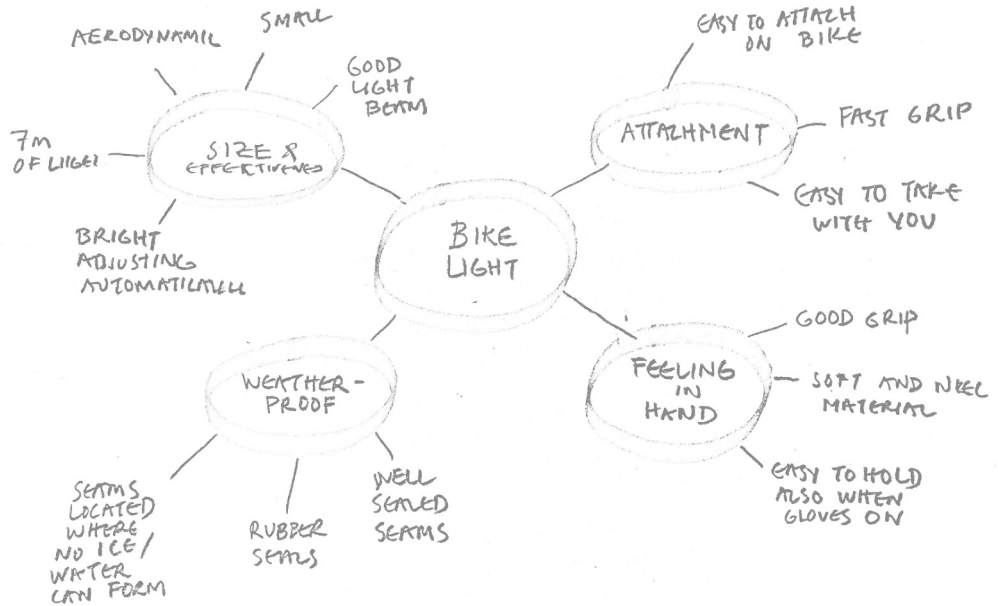
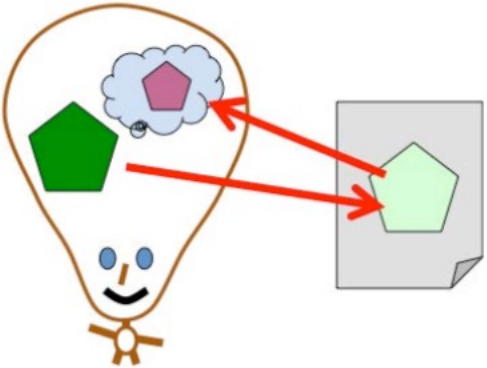
# TRANSFORMATIONAL

- thinking using materials



# TRANSCENDENTAL

- our thoughts and ideas become the object of thought



# TAPPING INTO TACIT

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## Rich personas and scenarios

- Appeal directly to our **tacit** understanding
- Deliberately **far more detailed** than crude user profiles
- **Include 'unnecessary' details** that make the people, and the physical situation **seem real to us**
- By **appealing to our imagination**, they spark our natural social and physical understandings in a way that an abstracted 'user group' cannot.



# EXAMPLE PERSONA

**Susa**

**Age:** 30

**Location:** Rovaniemi, Finland

**Job:** director of furniture shop

**Status:** engaged



Susa loves snow and sports and that is why she lives in Northern Finland in Rovaniemi just a few kilometers from the nearest slopes and ski tracks. She has a full-time job, so as an opposite to that, she wants to spend most of the weekends and evenings on skies or on a snowboard. She often goes there with her boyfriend, Jyri. They both love snowboarding on fresh snow on untouched slopes.

## **Needs and goals:**

She wants to be able to get to the untouched slopes immediately after the right type of snow has fell.

## **Activities:**

- Snowboarding outside of slopes
- Uses many weather apps with radar for the temperature and spotting the fresh snow
- Uses a navigation app in parallel to find the snowy hills.

## **Challenges:**

- There is no application that can tell her the consistency of the snow, so she needs to go out to test the snow
- The day is very short in Lapland during winter months so she cannot go outside of lighted slopes during the late afternoons or evenings
- Difficult to find slopes with fresh snow
- Difficult to navigate and use the weather app radar function at the same time while driving a car on slippery roads
- It is risky to snowboard alone outside of the slopes especially after sunset.



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# SCENARIOS

John M. Carrol (1999)

Peter Wright & John McCarthy (2010)

Susa's phone makes a 'bling' sound. Susa picks up her phone from her bag while sitting at her desk. There is a notification on the screen that says: "Snow, 2km south, air -2". Susa smiles and taps fast the notification with her index finger and the application opens an application window, Susa can see that there is heavy snow cloud passing one nice slide about 1, 5 km south to the city center. Susa checks the time and clock is 13.45. If she leaves now, she could have time for one slide before it gets dark. The problem is that her shift ends in three hours. She gets up from her chair and walks to her colleague's desk to see if she could leave now from the work. Colleague says that she does not mind as there are no any customers today. Susa goes back to her office and closes the door. She opens her wardrobe cabinet and takes her skiing outfit from there and puts it on. She then gets into her car.

Susa starts the car and heads towards south, her Lumi-app is giving oral instructions and is updating Susa's location on the map. The location is shared with Susa's colleague Jyri. Same time Jyri receives notification in his Lumi-app that Susa is heading south. Jyri opens messaging by tapping the icon with speech bubble. Susa's phone sends a message to Jyri. Susa picks it up by saying: 'Hi'. Jyri asks where is she going? Susa replies and says she will keep location sharing on so that Jyri knows where she is in case something happens.

Susa arrives to the hill and smiles as there is 10cm of perfect powder snow. She gets out of car and picks up her snowboard from the back of the car and puts it in her backpack. Then she starts climbing on the hill. That is a heavy job, but she manages to get to the top. She is now at the top of the hill. She is now at the top of the hill. Her app is updating with an audio message that says: "You are at the top of the hill. The snowboard is ready for use. The snowboard and her snowboard slides down the hill."




”a **written** outline of a film, novel, or stage work giving details of the plot and individual scenes”

(Oxford Dictionary of English, 2020)

# SCENARIOS

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## Stories about people and their activities often involving their use of technology

- *Setting* of the activity = the physical location in which the activities occur (e.g., an office or a sitting room)
- *Agents* and *actors*
- *Agents' goals* and *objectives*
- The plot that moves the *action* and *events* of the scenario on 
- State of the system in *use* with which the person is interacting with
- Be sufficiently dynamic to accommodate goals being changed by the events that occur throughout



# SCENARIOS

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## Why?

- Evoke reflection in design
- They are concrete and flexible
- They are multifaceted and have multiple views ... they promote a work-orientation
- (help envision, design, communicate, collaborate etc.)






(Carroll, 1999)



# SCENARIO

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## Example

- *Context of design* = 
- *Agents and actors* = 
- *Agents' goals and objectives* = 
- *The action and events* = 
- *State of the system in use* = 






Harry is interested bridge failures; as a child, he saw a small bridge collapse when its footings were undermined after a heavy rainfall. He opens the case study of the Tacoma Narrows Bridge and requests to see the film of its collapse. He is stunned to see the bridge first sway, then ripple, and ultimately lurch apart. He quickly replays the film and then opens the associated course module on harmonic motion. He browses the material (without doing the exercises), saves the film clip in his workbook with a speech annotation, and then enters a natural language query to find pointers to other physical manifestations of harmonic motion. He moves on to a case study involving flutes and piccolos.



# SCENARIO

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# EXPERIENCE-CENTERED SCENARIOS

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## Focus on










- People's activities
  - + their motivation
  - + feelings
  - + the meanings they make of the interactions
  - + social interactions around the activities in question
- Good stories have the power to stimulate imagination, engage interest, and highlight specific aspects of a situation (real or imagined)

(Wright & McCarthy, 2010)



# AN EXAMPLE SCENARIO

## Different elements

- *Context of design* = 
- *Agents and actors* = 
- *Agents' goals and objectives* = 
- *The action and events* = 
- *State of the system in use* = 
  
- People's activities
  - + their motivation 
  - + feelings 
  - + the meanings of interactions 
  - + social interactions around the activity 

Susa's phone makes a 'bling' sound. Susa picks up her phone from her bag while sitting on her desk. There is a notification on the screen that says: "Snow, 2km south, air -2". Susa smiles and taps fast the notification with her index finger and the application opens. In the application window, Susa can see that there is a heavy snow cloud passing one nice hill just about 1, 5 km south of the city center. Susa checks the time and the clock is 13.45. If she would leave now, she could have time for one slide before it gets dark. The problem is that her shift ends in three hours. She gets up from her chair and walks to her colleague and asks if she could leave now from the work. A colleague says that she does not mind as there are not any customers today. Susa smiles and thanks her colleague. Susa goes back to her office and closes the door. She opens a wardrobe cabinet and takes her skiing outfit from there and puts it on. She then rushes into her car.

Susa starts the car and heads south, her Lumi app is giving oral instructions to her and is updating Susa's location on the map. The location is shared with Susa's boyfriend, Jyri. At the same time, Jyri receives a notification in his Lumi app that Susa is heading to the south. Jyri opens messaging by tapping the icon in a speech bubble. Susa's phone says: Jyri calling and Susa picks it up by saying: 'Hi'. Jyri asks where is she going. Susa replies and promises to keep location sharing on so that Jyri knows where she is in case something happens.










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Jyri is watching Susa's slide from the Lumi app as her skiing outfit has an action camera that activates when she is moving down the hill. He can be there with her and warn her if he sees something that she should be aware of by sending a vibration in her arm through the application. But the slide is going well and he can see Susa's cheerful jumps after the slide.



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”Constructing scenarios of use inescapably evokes reflection **in the context** of design.”

(Carroll, 1999)

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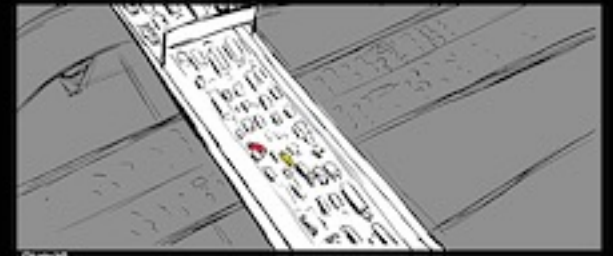
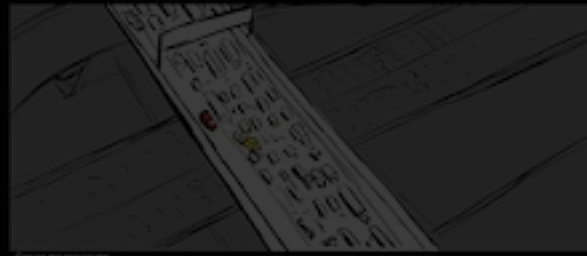
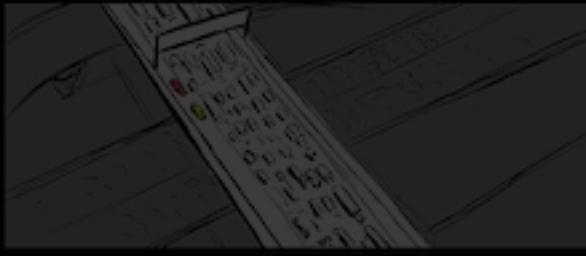
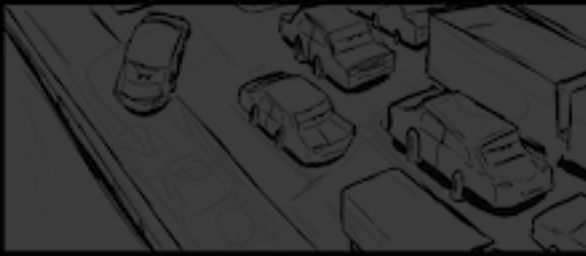
# STORYBOARDS

Corrie van der Lelie (2006) The value of storyboards in the product design process.  
Pers Ubiquit Comput (2006) 10: 159–162.DOI 10.1007/s00779-005-0026-

”a sequence of **drawings**, typically with some directions and dialogue, representing the shots planned for a film or television production.”

(Oxford Dictionary of English, 2020)

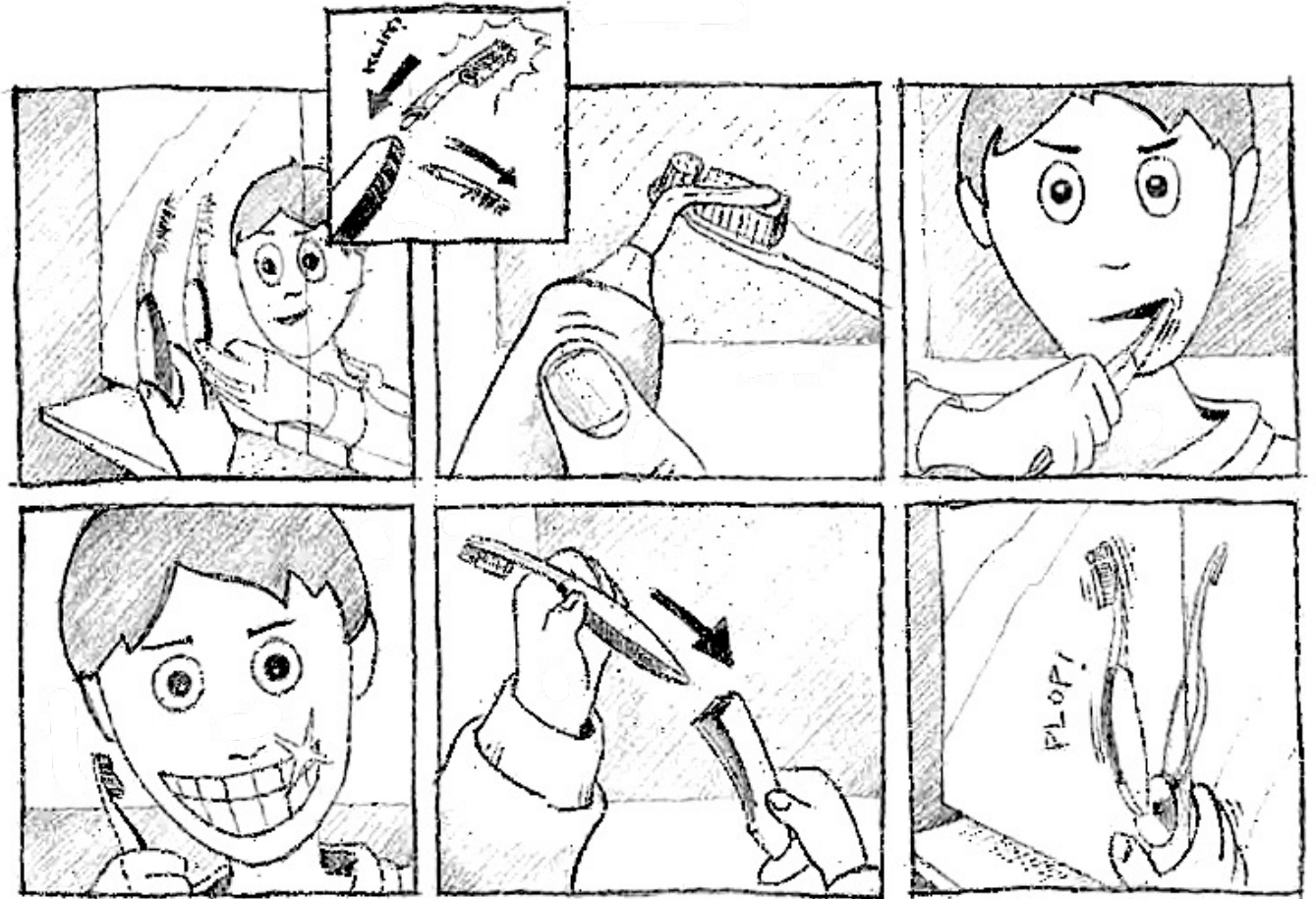




# STORYBOARDS

## =Visual scenarios

- Common visual language -> A tool for communication
- Product-user interaction + context + time
- Generating ideas and concepts based on the scenario
- Getting a feel of the interaction with the product



(Kettunen, 2001)

# VISUALISATION MANNER

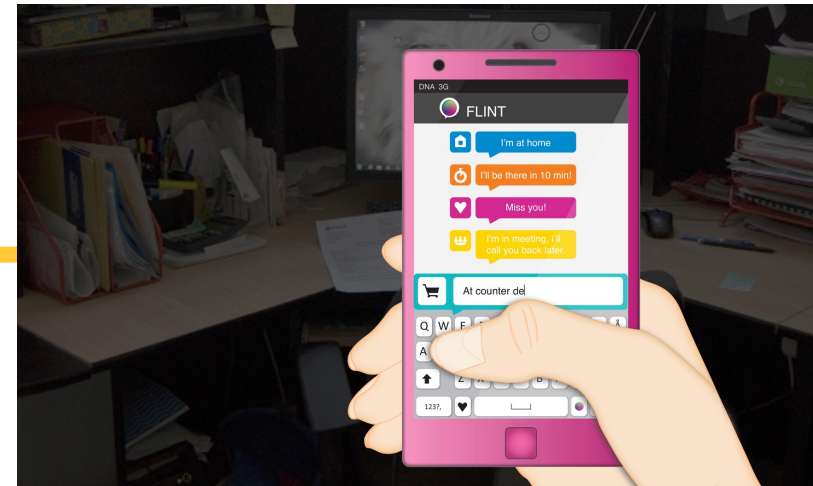
---

## Early phase



Sketchy

## Late phase



Visually detailed & refined

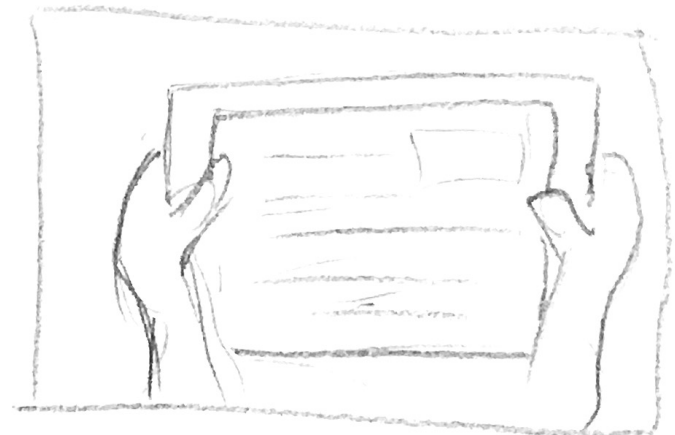
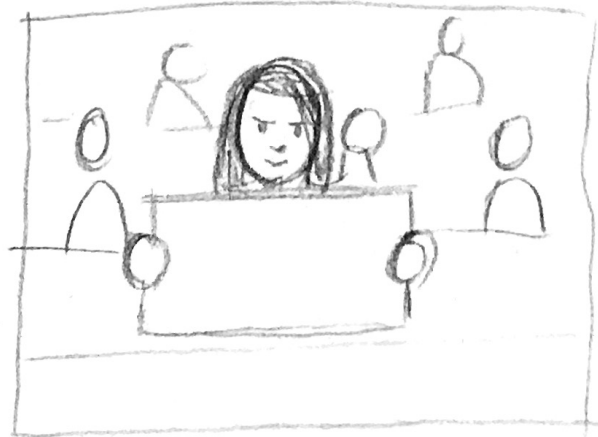
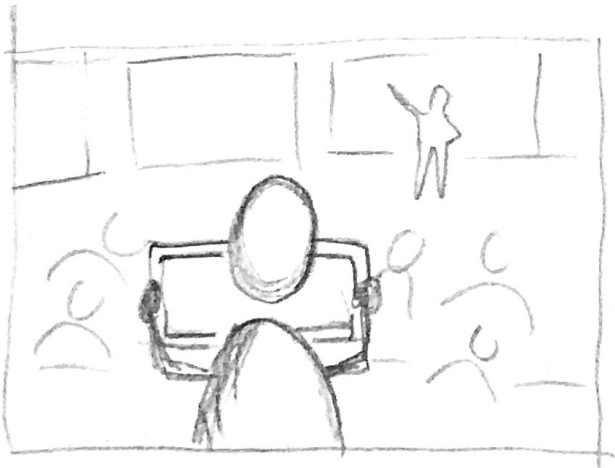


# ANALYSIS PHASE

---

## Using storyboard to consider:

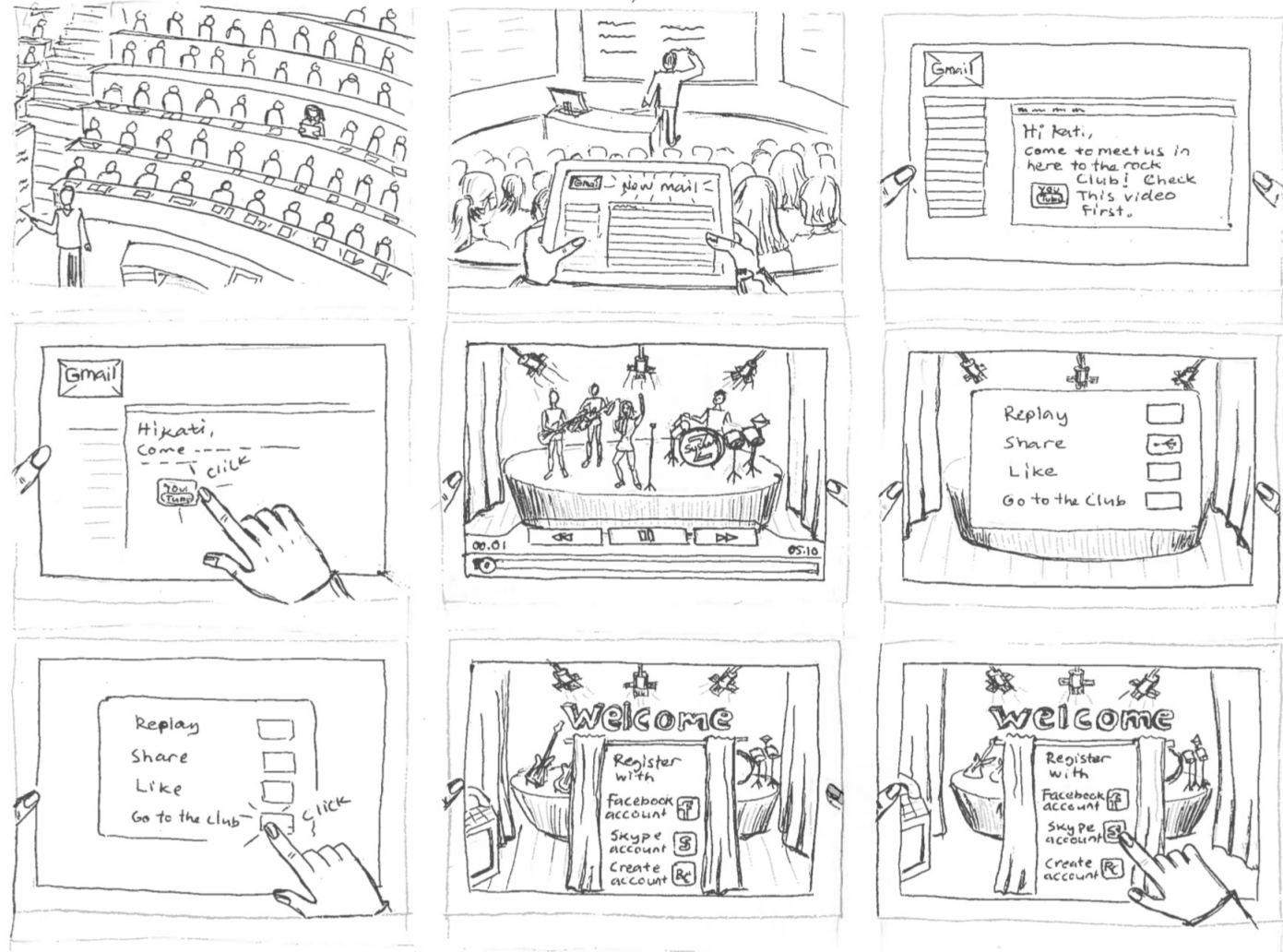
- Defining function and intended behavior (technical, psychological, social, economic, cultural)
- Where, when, what, why, with who, for how long?
- Situations, atmosphere, feelings ...



# SYNTHESIS PHASE

## Explore & integrate

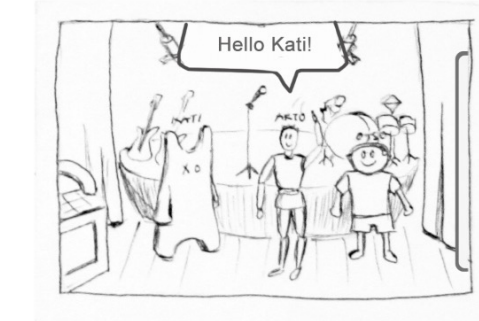
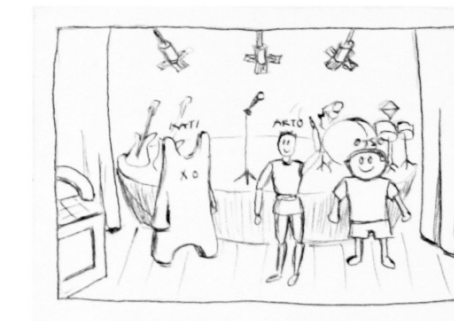
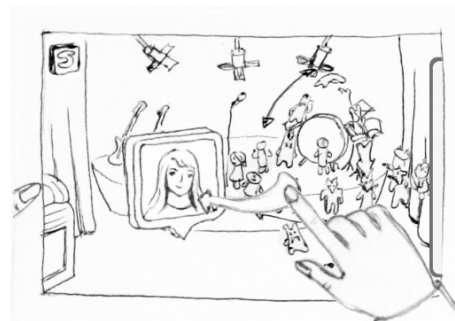
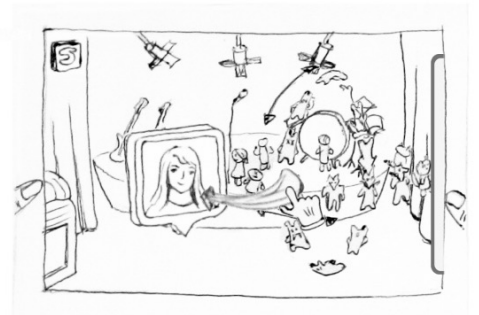
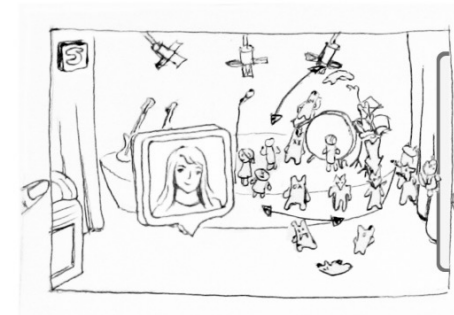
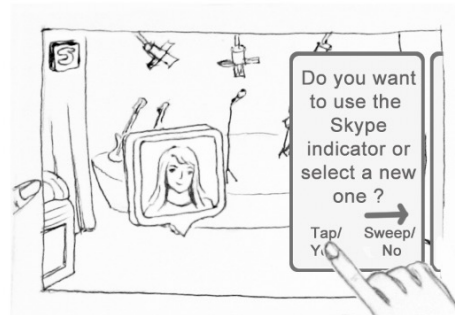
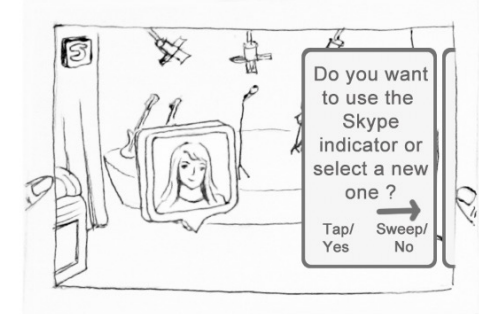
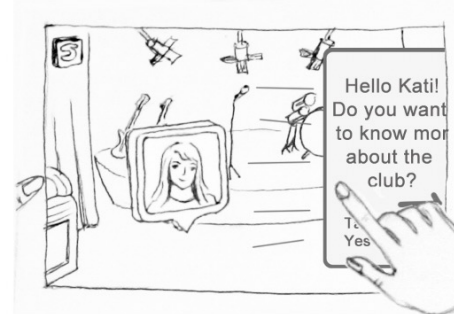
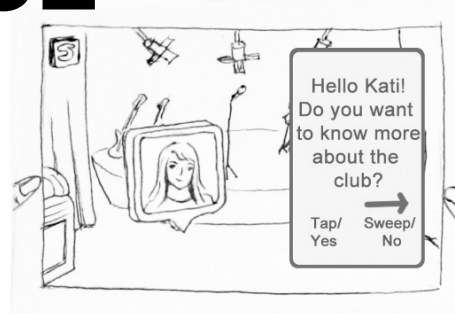
- Generating ideas and concepts based on the scenario
- Getting a feel of the interaction with the product
- Details are not yet important



# SIMULATION PHASE

## Evolving into

- Create coherent narrative
- Focus on the storyline
- Adding details



# STORYBOARDS IN EVALUATION PHASE

## The storyboard used for:

- walkthrough with future users
- Evaluating ideas based on the scenario
- Allows studying product and its values and qualities



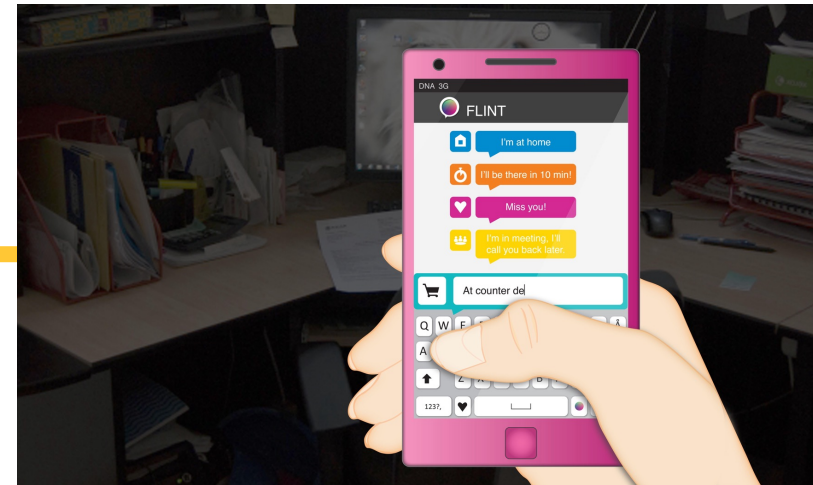
# VISUALISATION MANNER

Affects to user feedback



Sketchy

Evokes comments and suggestions



Visually refined

Is accepted as final 'as is'



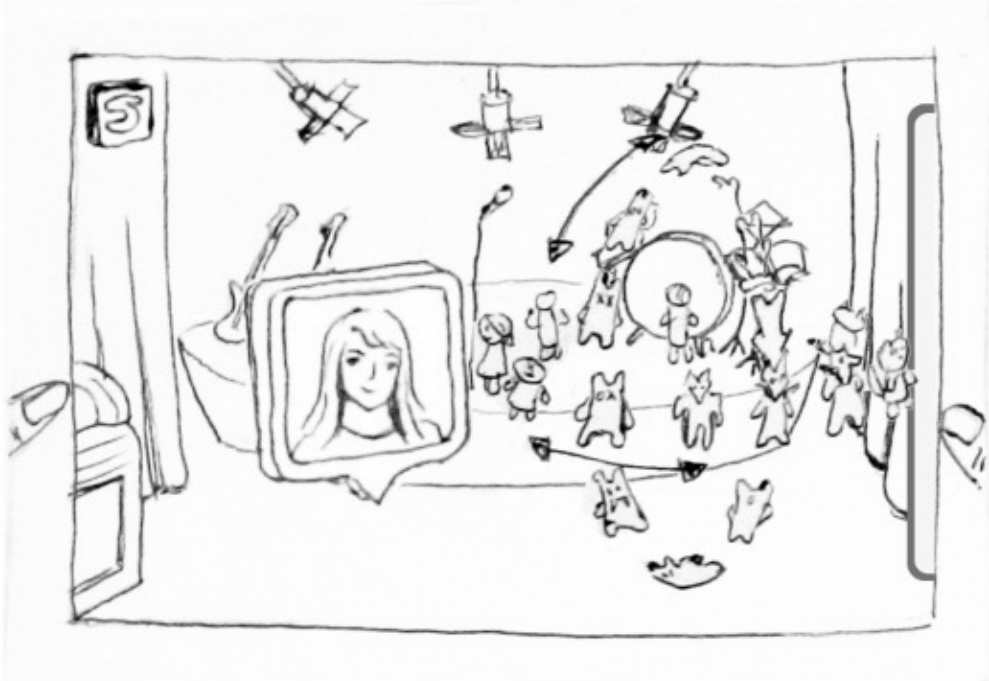
# VISUALISATION MANNER

## Drawing vs. tracing



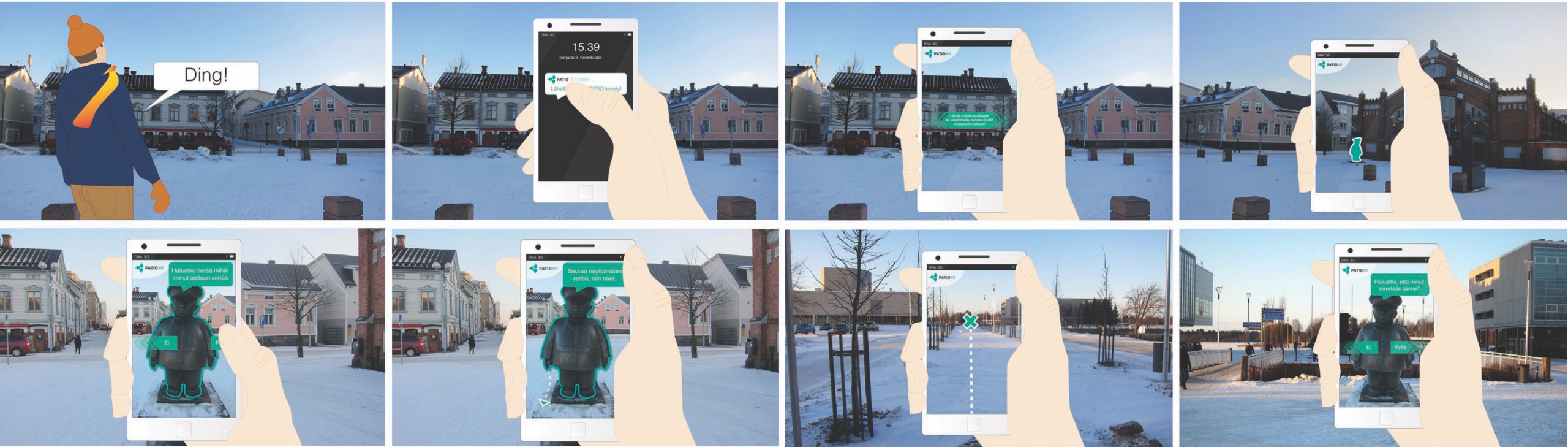
# VISUALISATION MANNER

## Drawing vs. tracing



# EVALUATION PHASE

## Example storyboard: Evaluation of the AR application



Note that many pictures are missing in between!



# SHOWING THE CONTEXT

—  
Photo  
+ tracings  
+ colors



# SHOWING THE CONTEXT

—  
Photo  
+ tracing  
+ colors



23<sup>RD</sup> MARCH 2026

MINNA PAKANEN



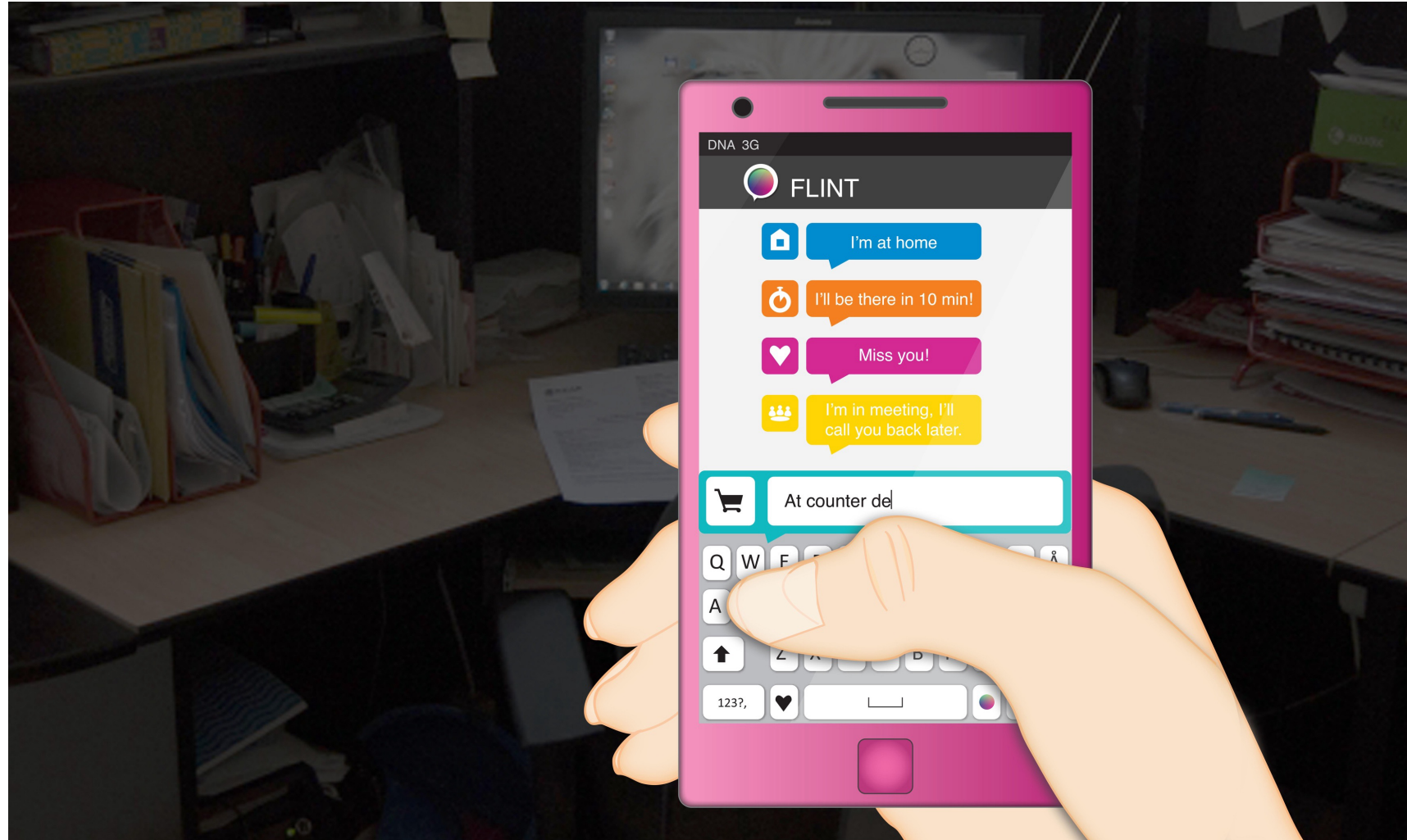
# SHOWING THE CONTEXT

—  
Photo

+ dimming

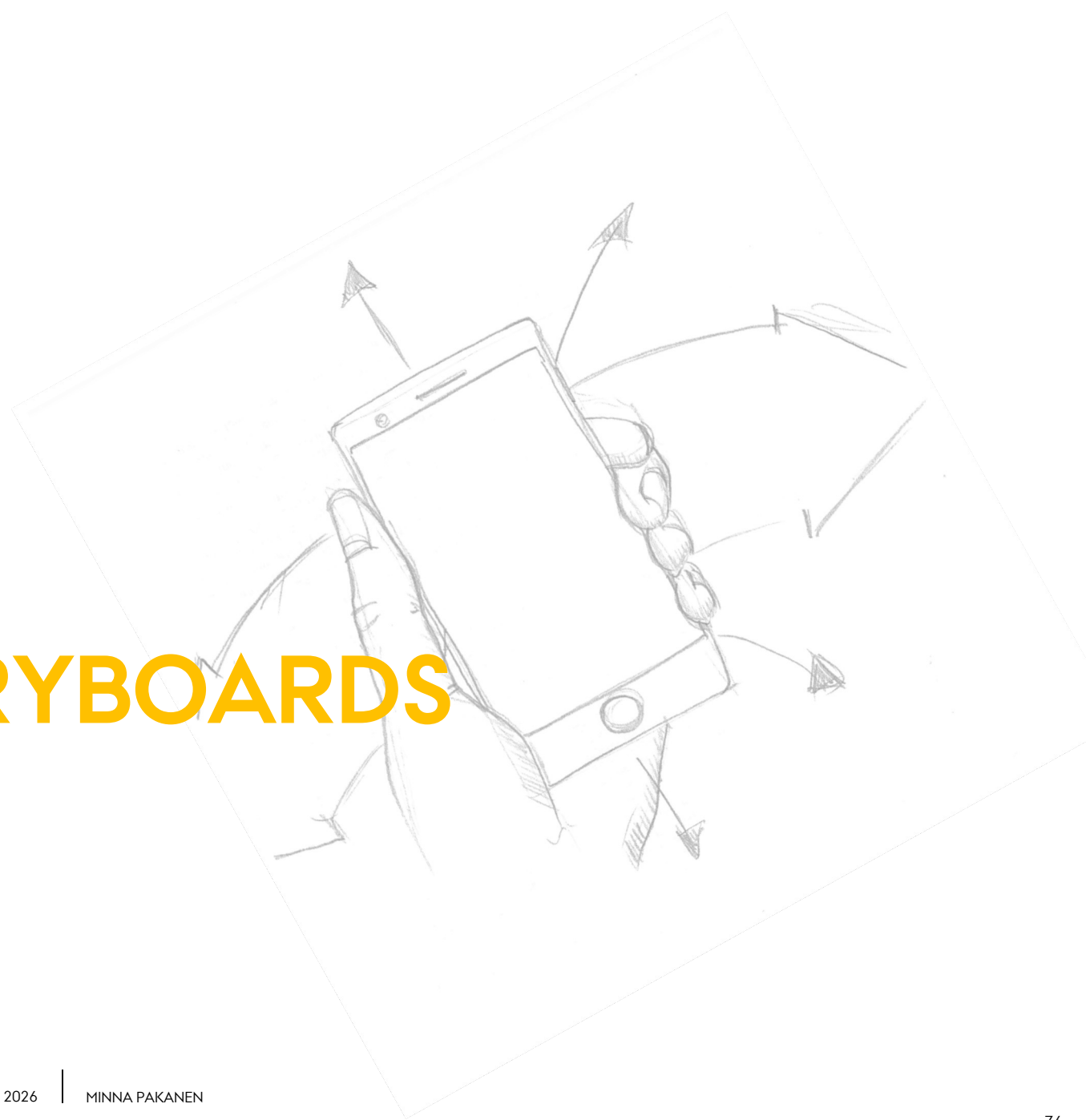
+ tracing

+ colors





# SKETCHING STORYBOARDS



# SKETCHING STORYBOARDS

Basic humans + a bit of context + things to interact with

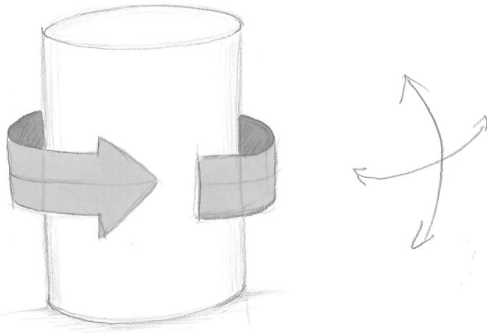
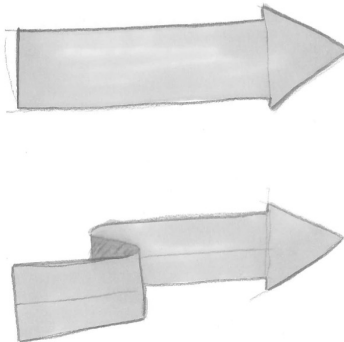
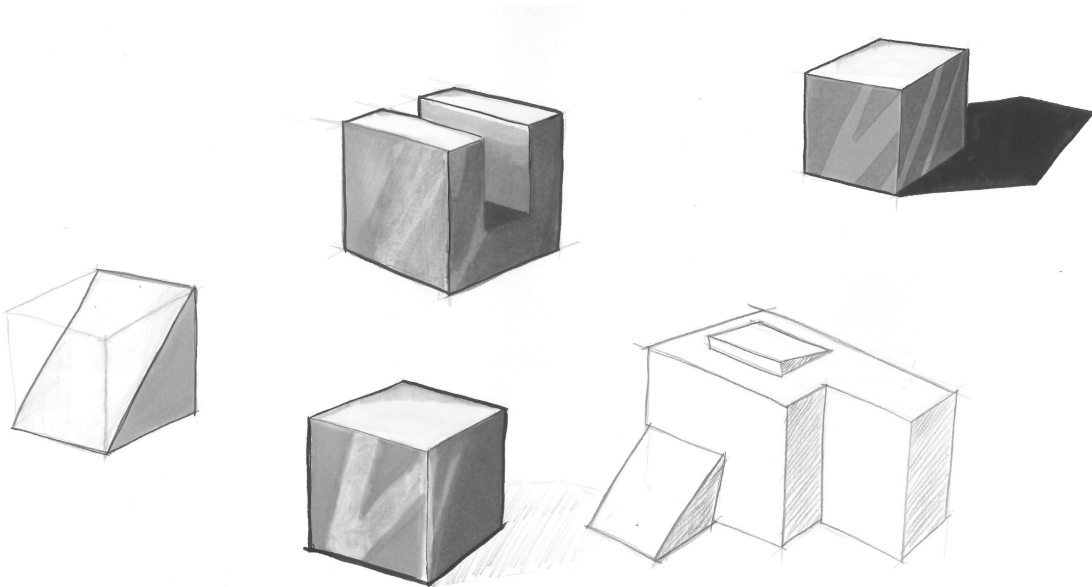
Remember to zoom in and out!



(Baskinger, 2008)



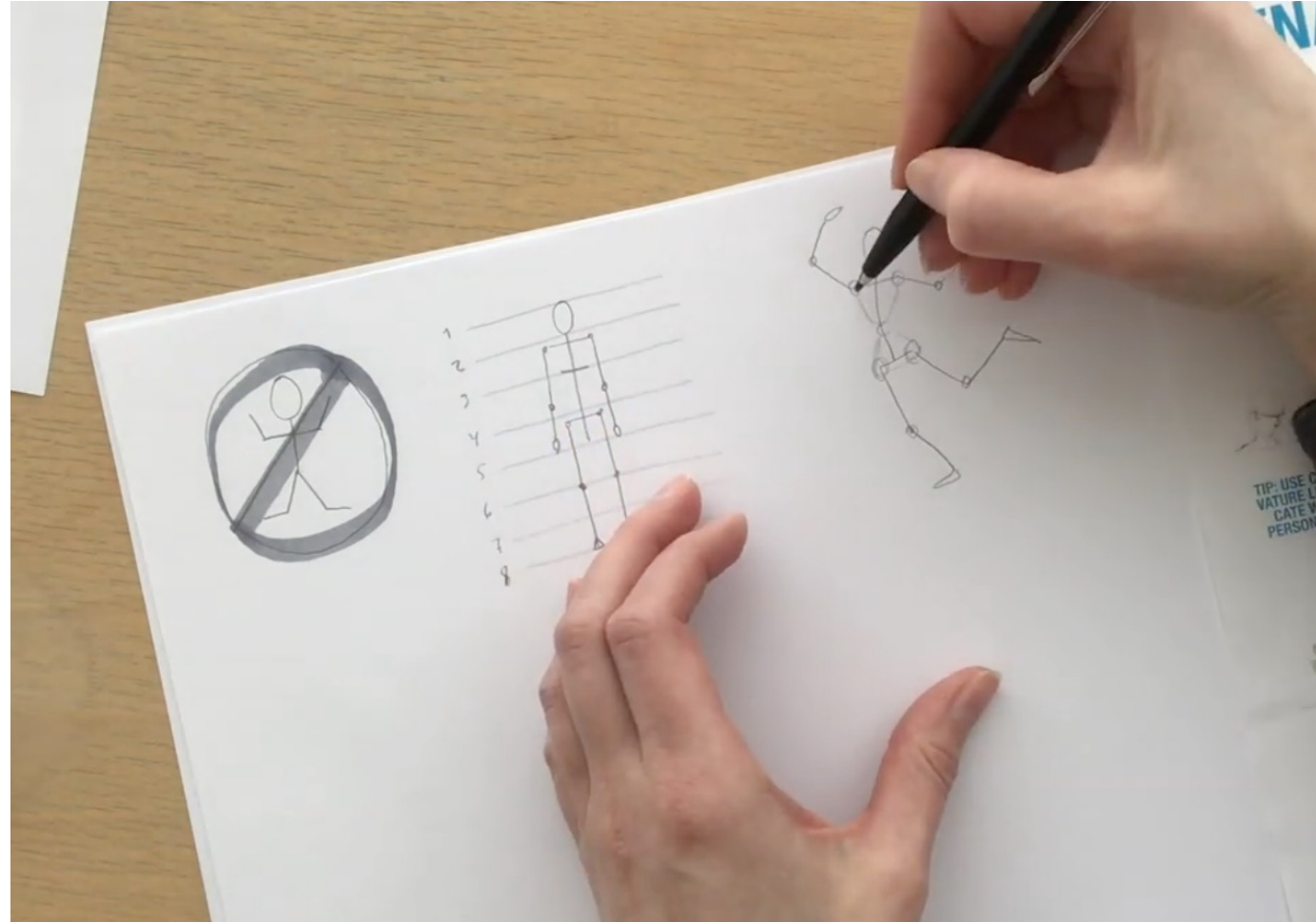
# BASIC SHAPES



# HUMANS

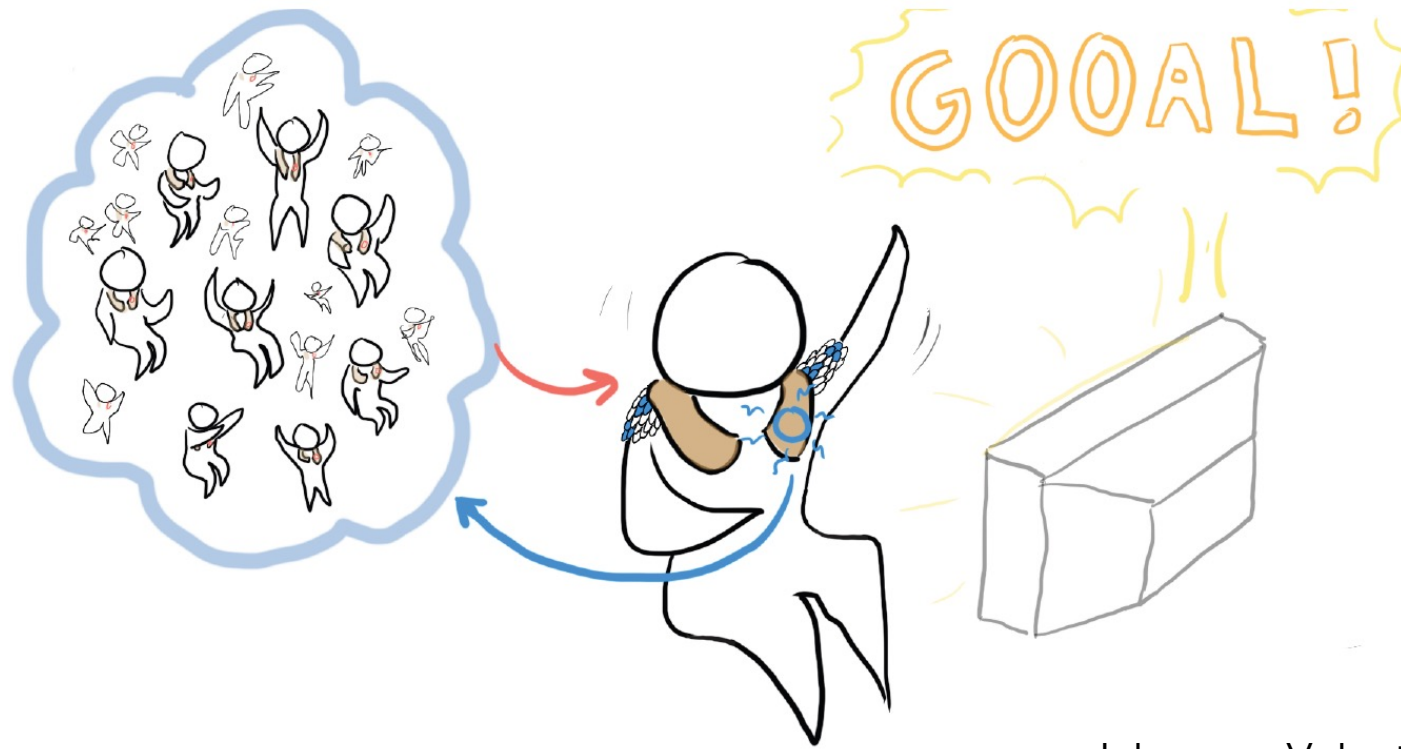


(Baskinger, 2008)



# EXAMPLE

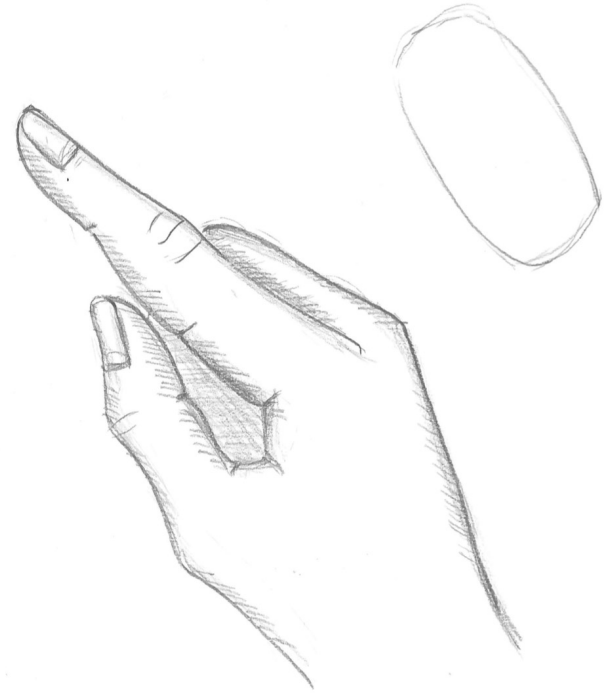
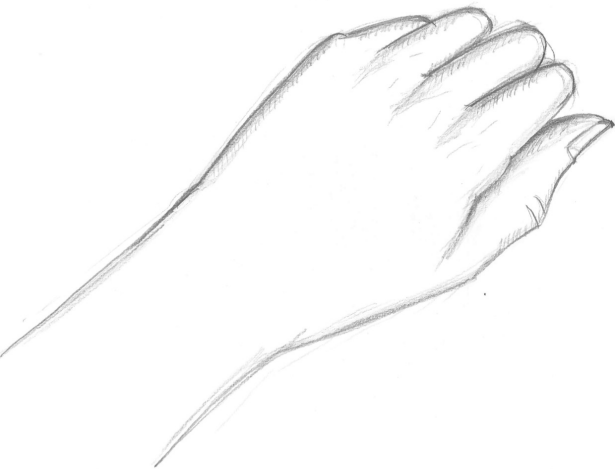
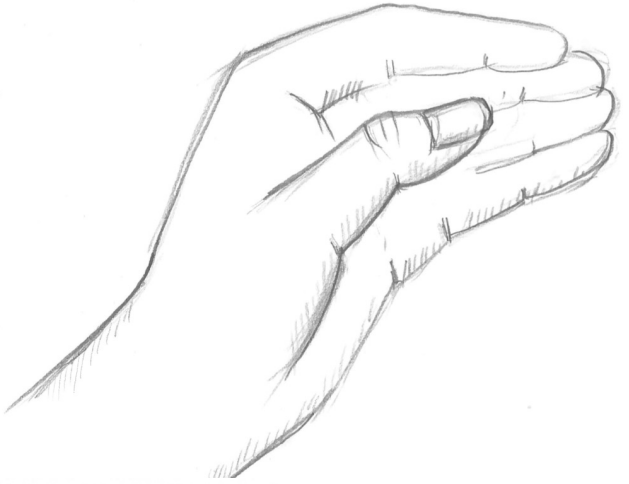
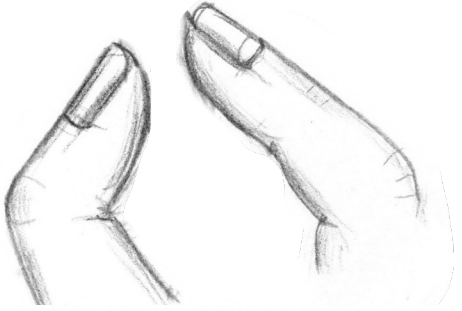
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Johannes Valentin Berg & Rasmus Hvilshøj

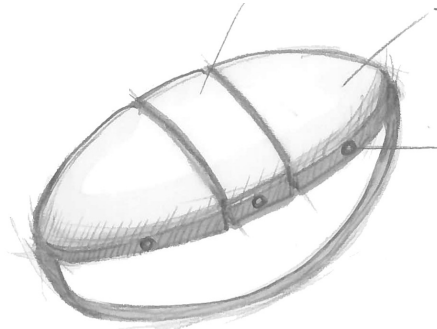
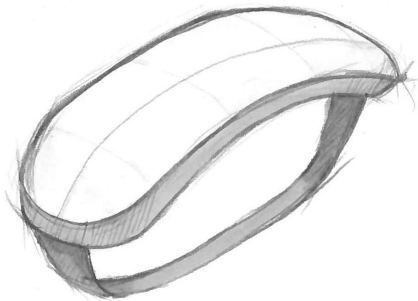
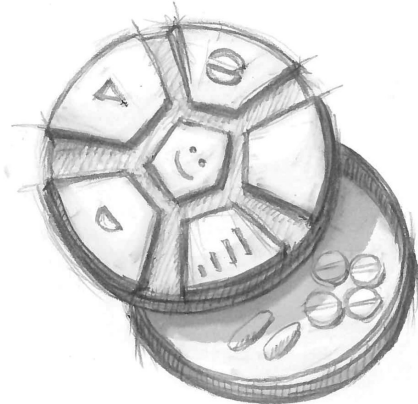
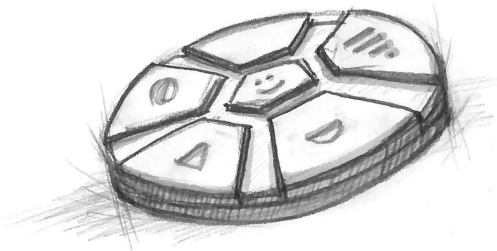


# HANDS AND FINGERS

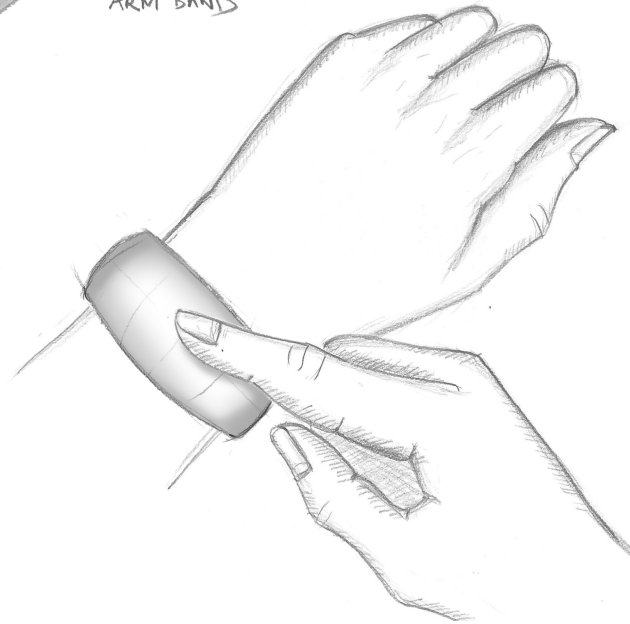
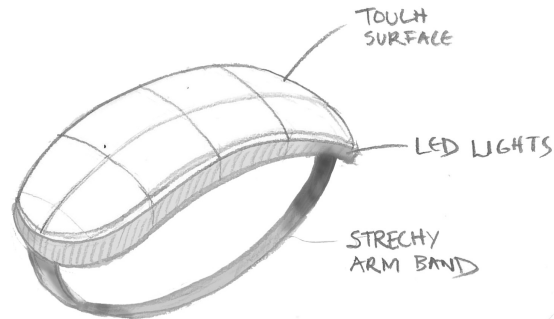
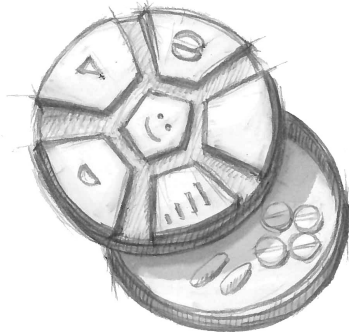
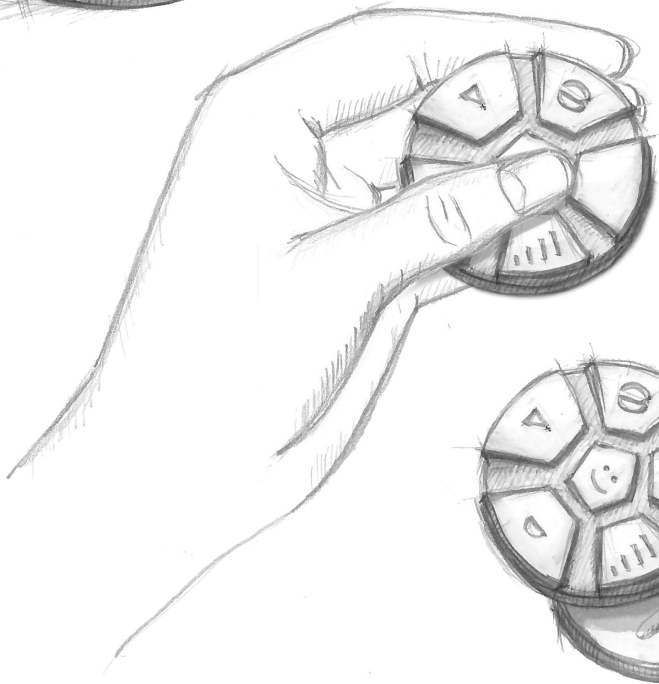
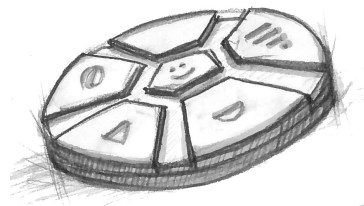


# DEVICES

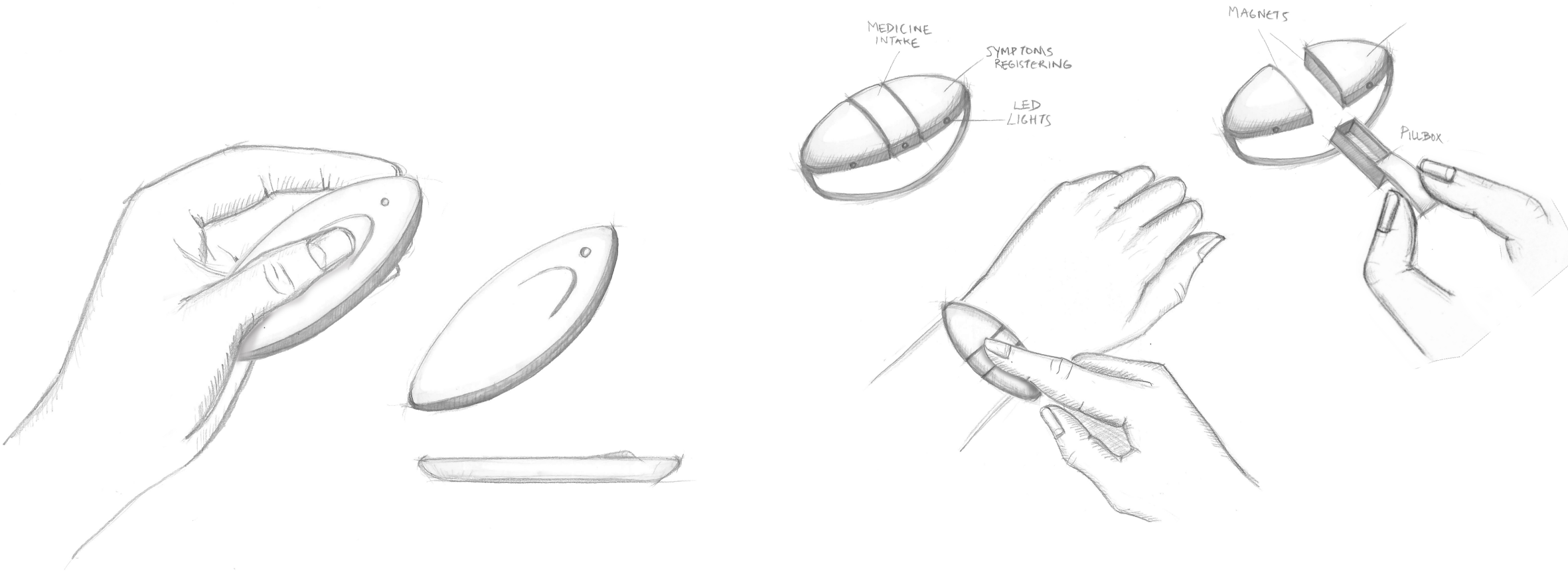
—



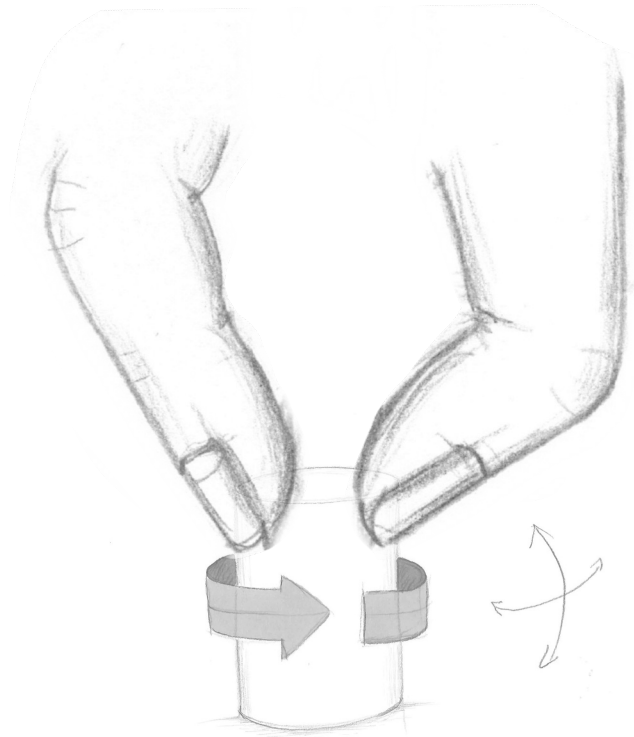
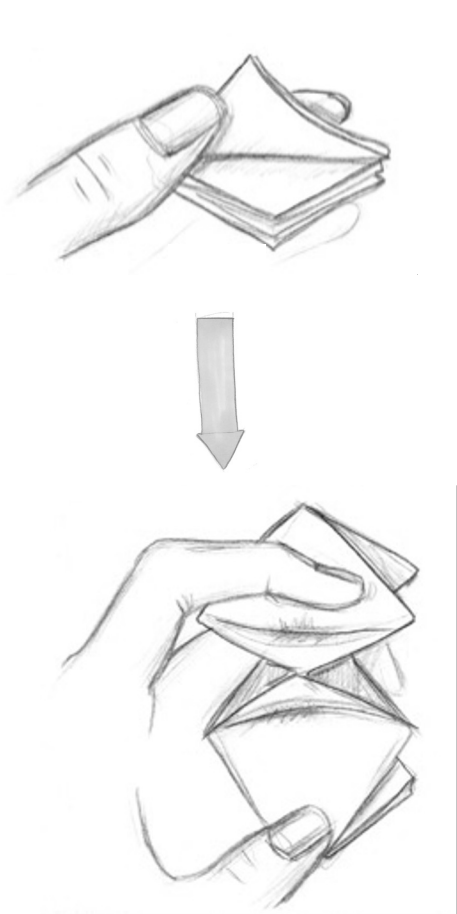
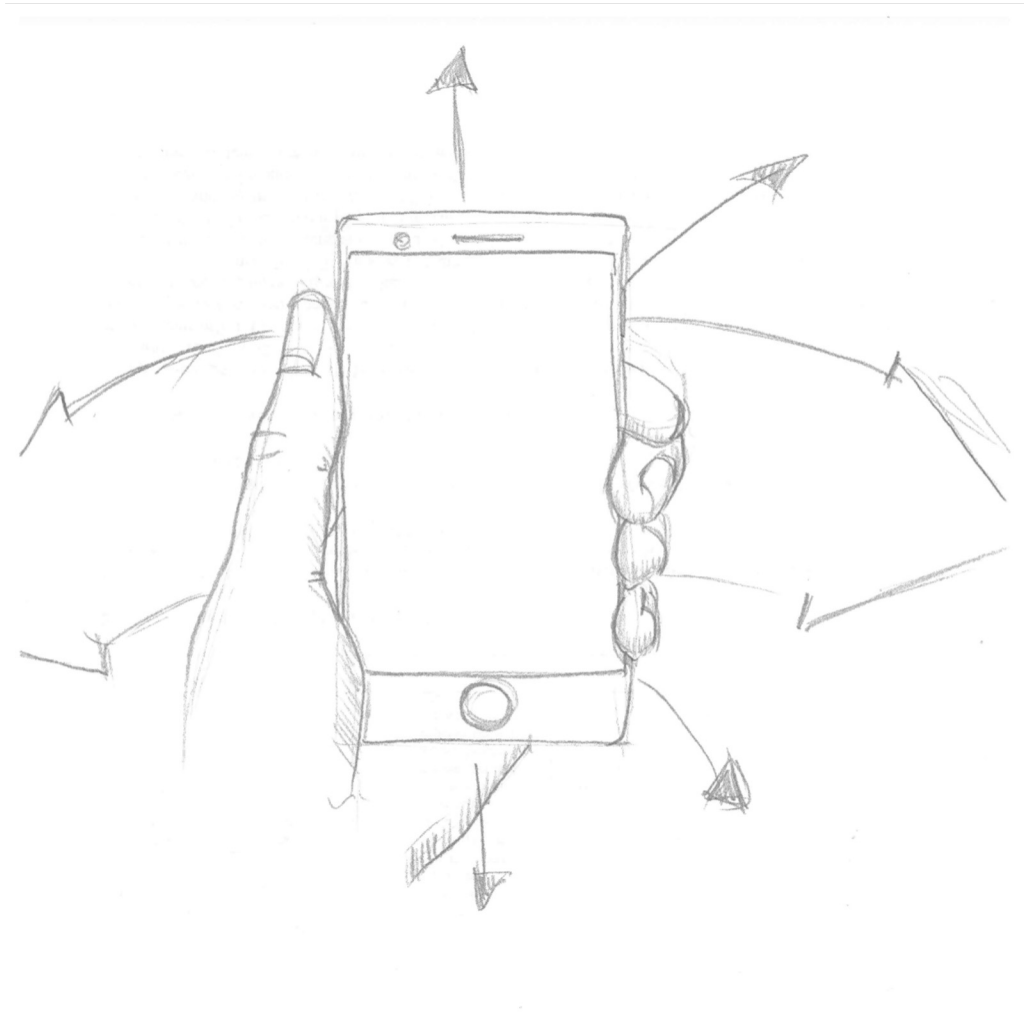
# HANDS + DEVICES = INTERACTION



# HANDS + DEVICES = INTERACTION

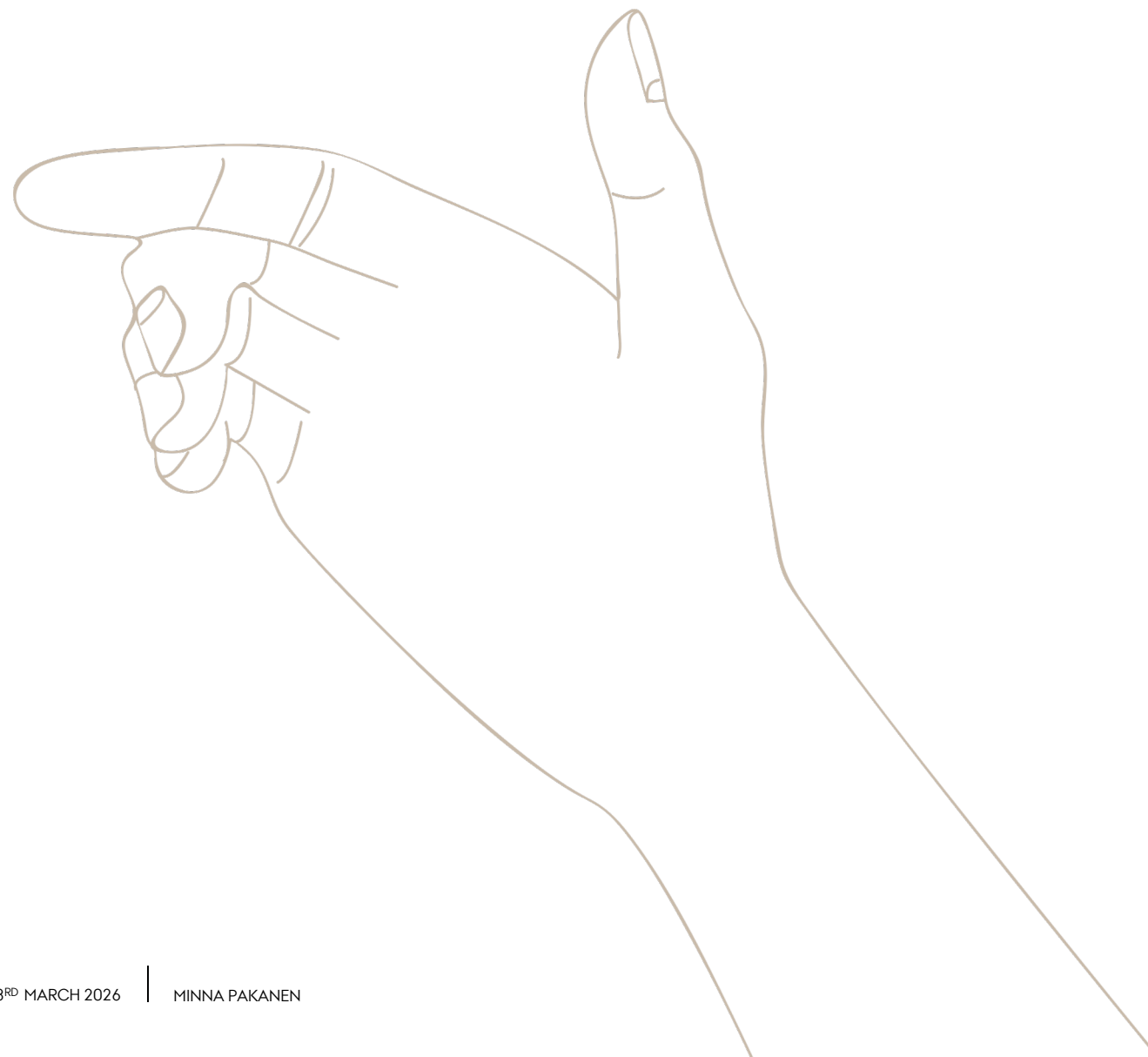


# SHOWING INTERACTION





# TRACING



# TRACING

## Constructing the context and people



You can also create a suitable picture of the context with AI!



# RESPECT COPYRIGHTS!



Hetkiä by Maija Louekari, 2003  
competition entry to Marimekko



Markus Leppo in Helsinki ja helsinkiläiset, 1966

<https://yle.fi/uutiset/3-6921730>



# THINK TWICE BEFORE GENAI!



Vesa-Matti Väärä, 2020

GenAI illustration, 2026

Use of AI is problematic also point of view of your learning and consumption of natural resources!



# RESPECT COPYRIGHTS!

---

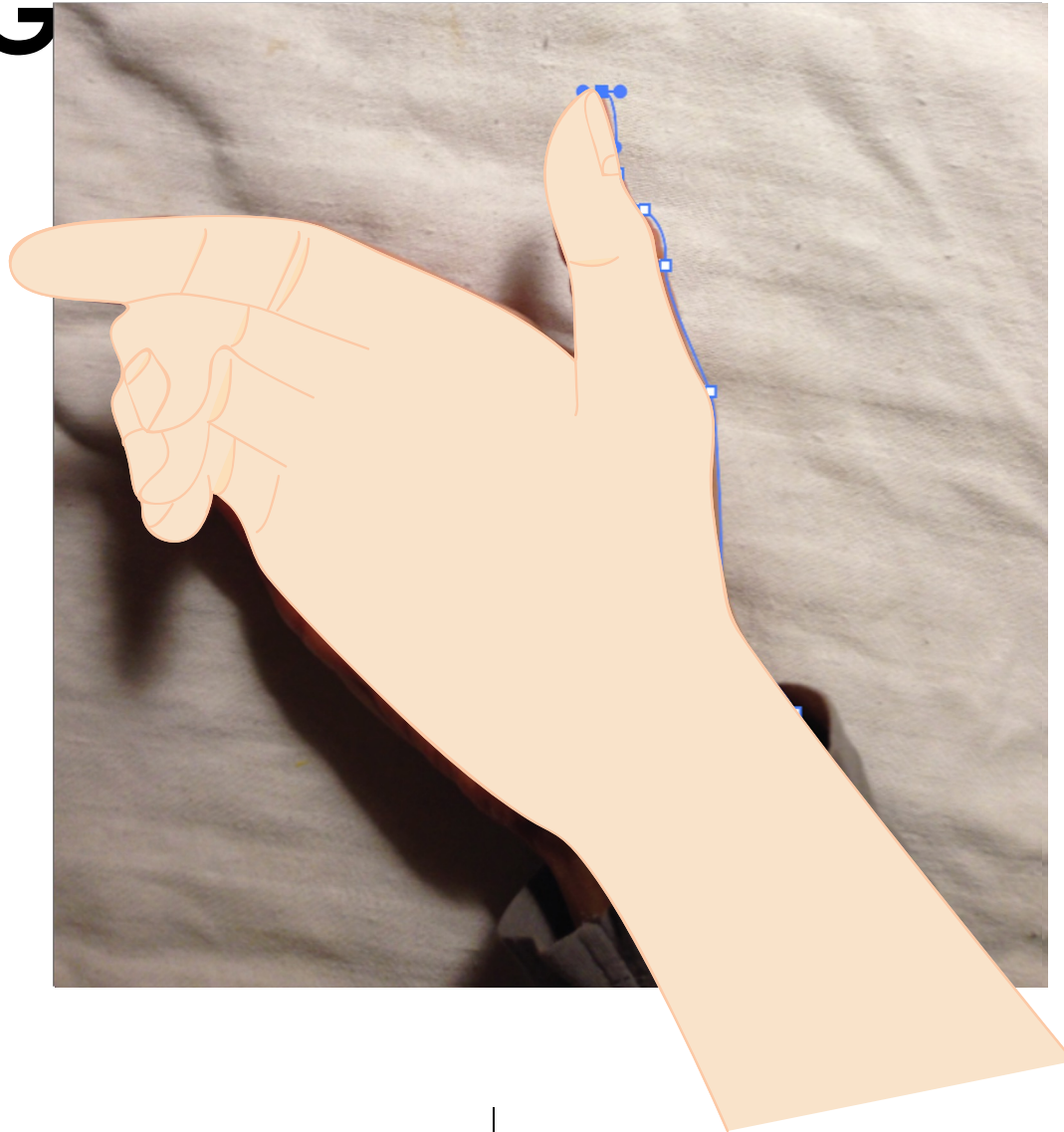
To avoid violating other peoples copyrights when tracing and especially if you use photos in the background:

- a) Take the pictures yourself
- b) Use royalty-free photos (Stock Adobe, Shutterstock, Getty Images, etc.)
- c) Combine many sources (combine images well and use only small pieces from each)
- d) (Buy the right to use the photos)

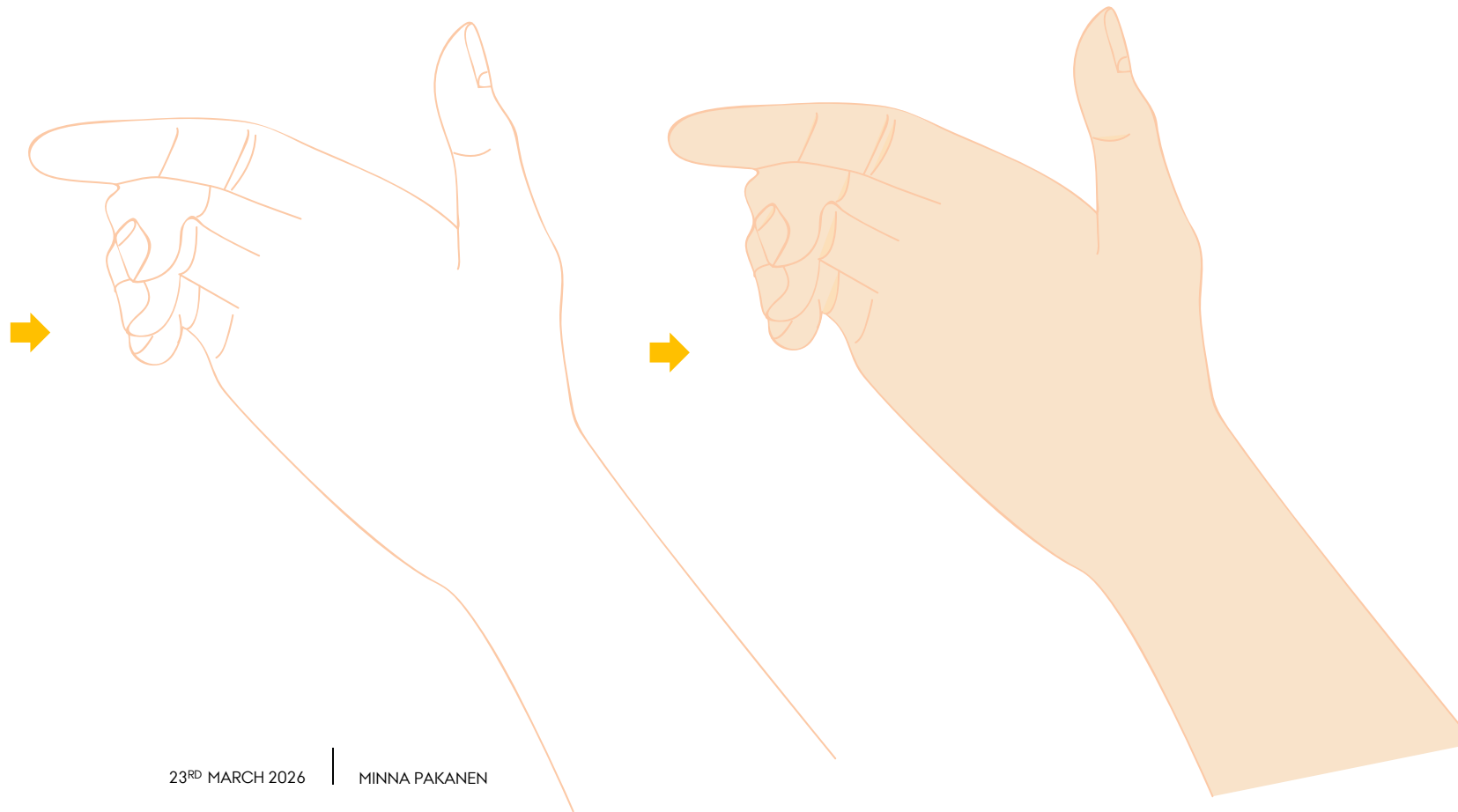
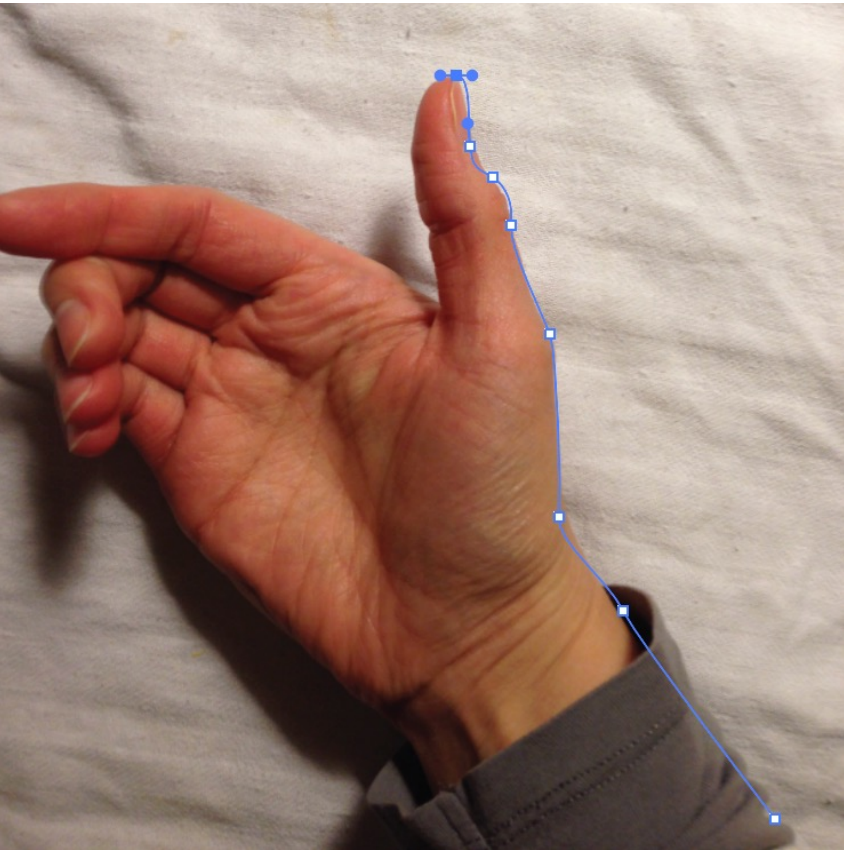


# LINE TRACING

—  
An example

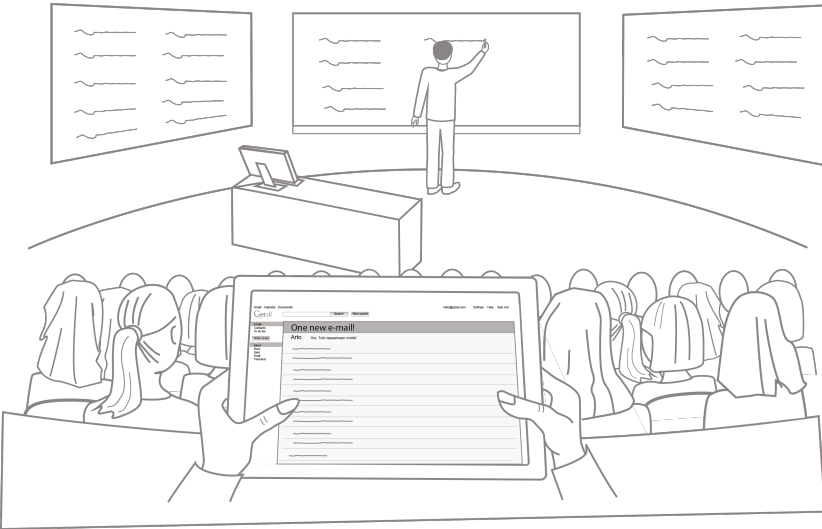


# LINE TRACING + COLORING



# NO COLOR VS. GREYSCALE VS. COLORS?

—  
Depends on the case

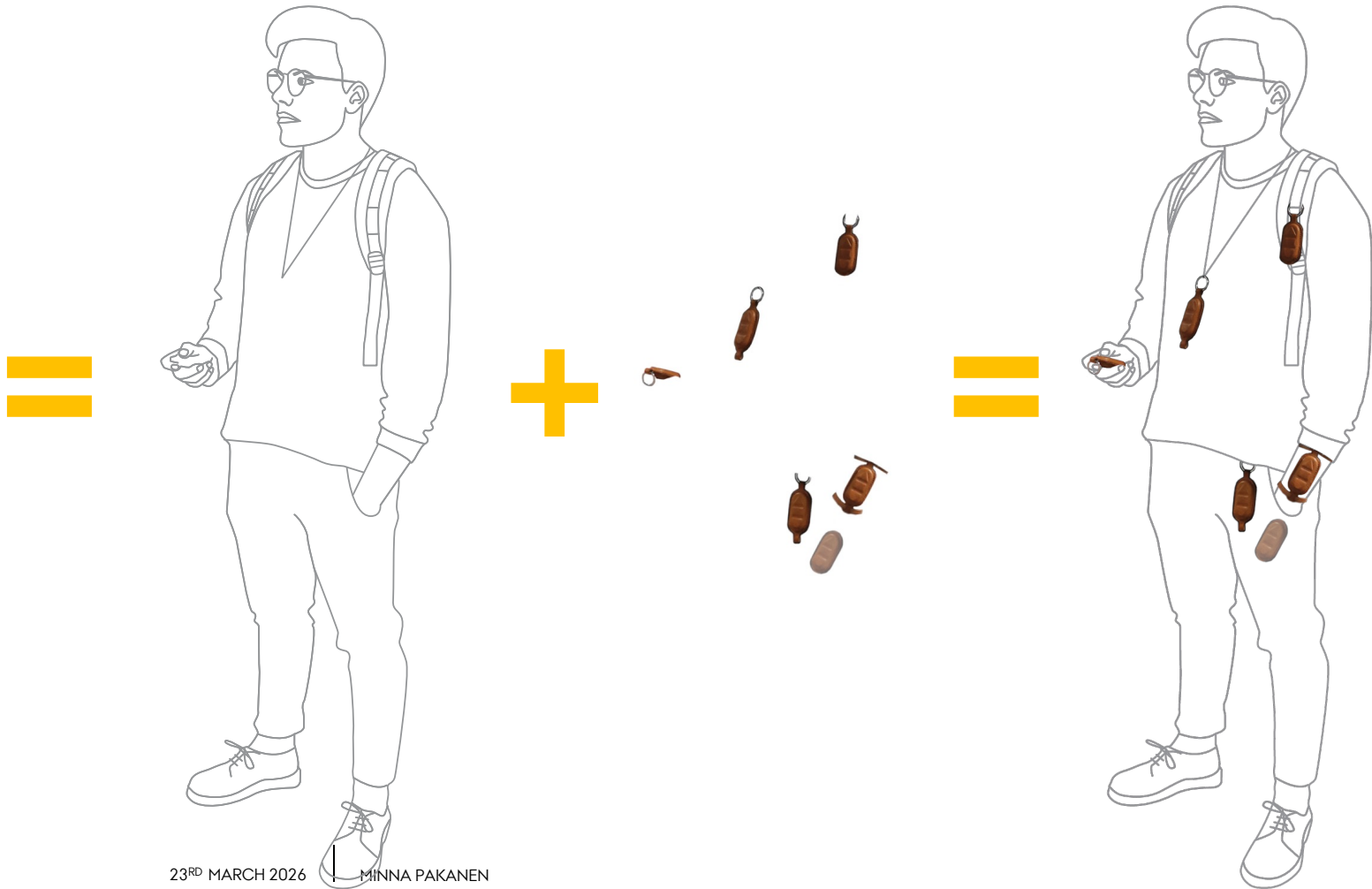


# LINE TRACING

—  
An example



# LINE TRACING + PICTURES OF THE PRODUCT



# LINKS

---

Illustrator tutorials on tracing and drawing any shape:

<https://youtu.be/j69a3-shkGE>

<https://youtu.be/RbbQI2sU-ag>

<https://www.youtube.com/watch?v=Rk-JGsriJ4o>



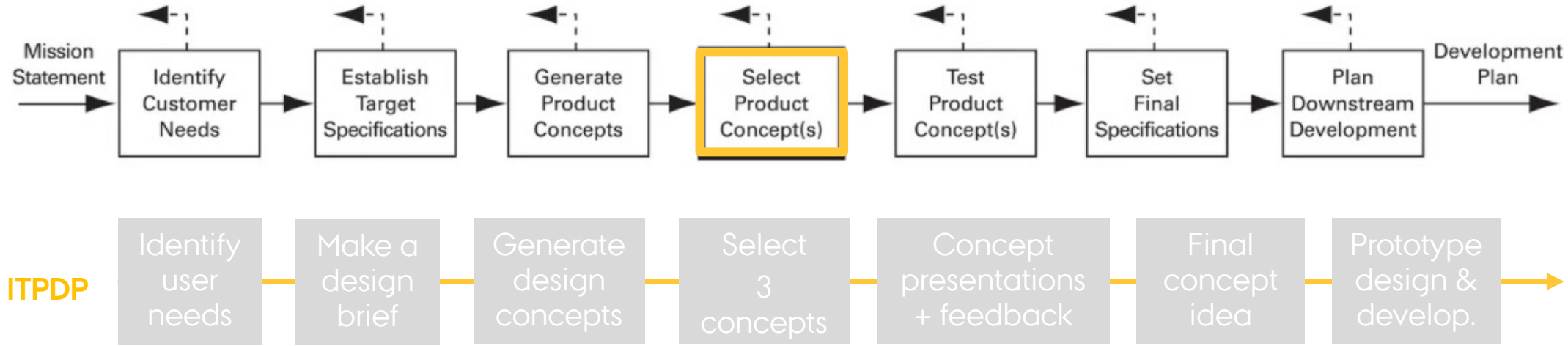


# CONCEPT SELECTION

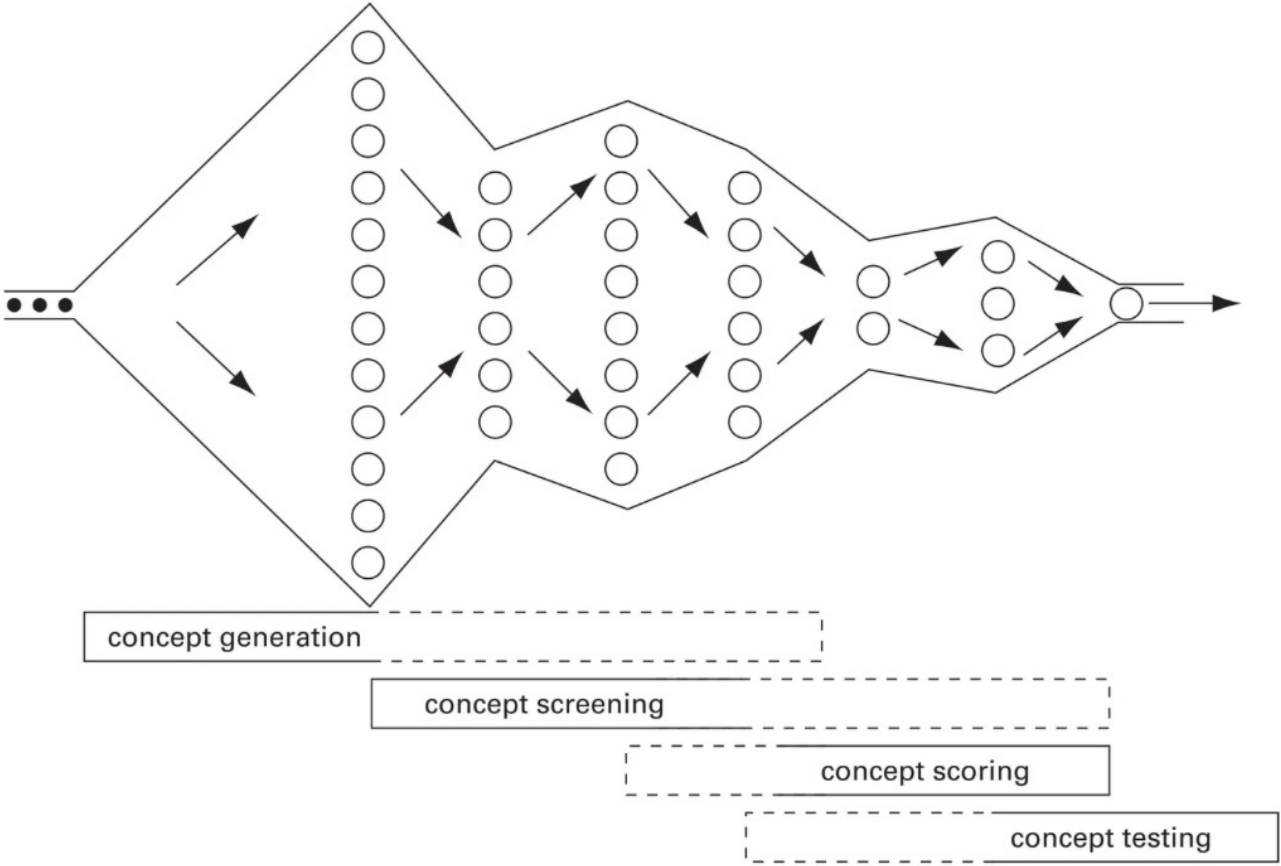
Ulrich, K. T., & Eppinger, S. D. (2016). Product design and development. McGraw-hill.  
(Pages 146-156)

<https://www.slideshare.net/slideshow/productdesignanddevelopmentkarltulrichstevendeppingeredisi/266164184>

# CONCEPT SELECTION



# CONCEPTS



# WAYS OF SELECTING CONCEPTS

---

## Choose what fits the best to the design phase and case

- *External decision* = Customer, client or other external entity
- *Product champion* = An influential member (head of design) of product design team chooses the concept based on personal preference
- *Intuition* = Concept is chosen by its perceived feel, and it's fit to the case
- *Multivoting* = Each member votes for (3-5) concepts with • or I, the most voted concept/s wins
- *Pros & cons* = The team lists strengths and weaknesses of each concept and makes a group decision
- *Decision matrices* = The team rates each concept against prespecified selection criteria, also possible to compare your concepts against existing product
- *Prototype & test* = Developed prototypes are evaluated against each other by users.





# CONCEPT SCREENING MATRIX

## 6-step process

0. Conduct multivoting to select ideas for concept screening
1. Prepare the selection matrix
2. Rate the concepts
3. Rank the concepts
4. Combine and improve the concepts
5. Select one or more concepts
6. Reflect the results and the process

Selection Criteria	A Master Cylinder	B Rubber Brake	C Ratchet	D (Reference) Plunge Stop	E Swash Ring	F Lever Set	G Dial Screw
Ease of handling	0	0	-	0	0	-	-
Ease of use	0	-	-	0	0	+	0
Readability of settings	0	0	+	0	+	0	+
Dose metering accuracy	0	0	0	0	-	0	0
Durability	0	0	0	0	0	+	0
Ease of manufacture	+	-	-	0	0	-	0
Portability	+	+	0	0	+	0	0
Sum +'s	2	1	1	0	2	2	1
Sum 0's	5	4	3	7	4	3	5
Sum -'s	0	2	3	0	1	2	1
Net Score	2	-1	-2	0	1	0	0
Rank	1	6	7	3	2	3	3
Continue?	Yes	No	No	Combine	Yes	Combine	Revise

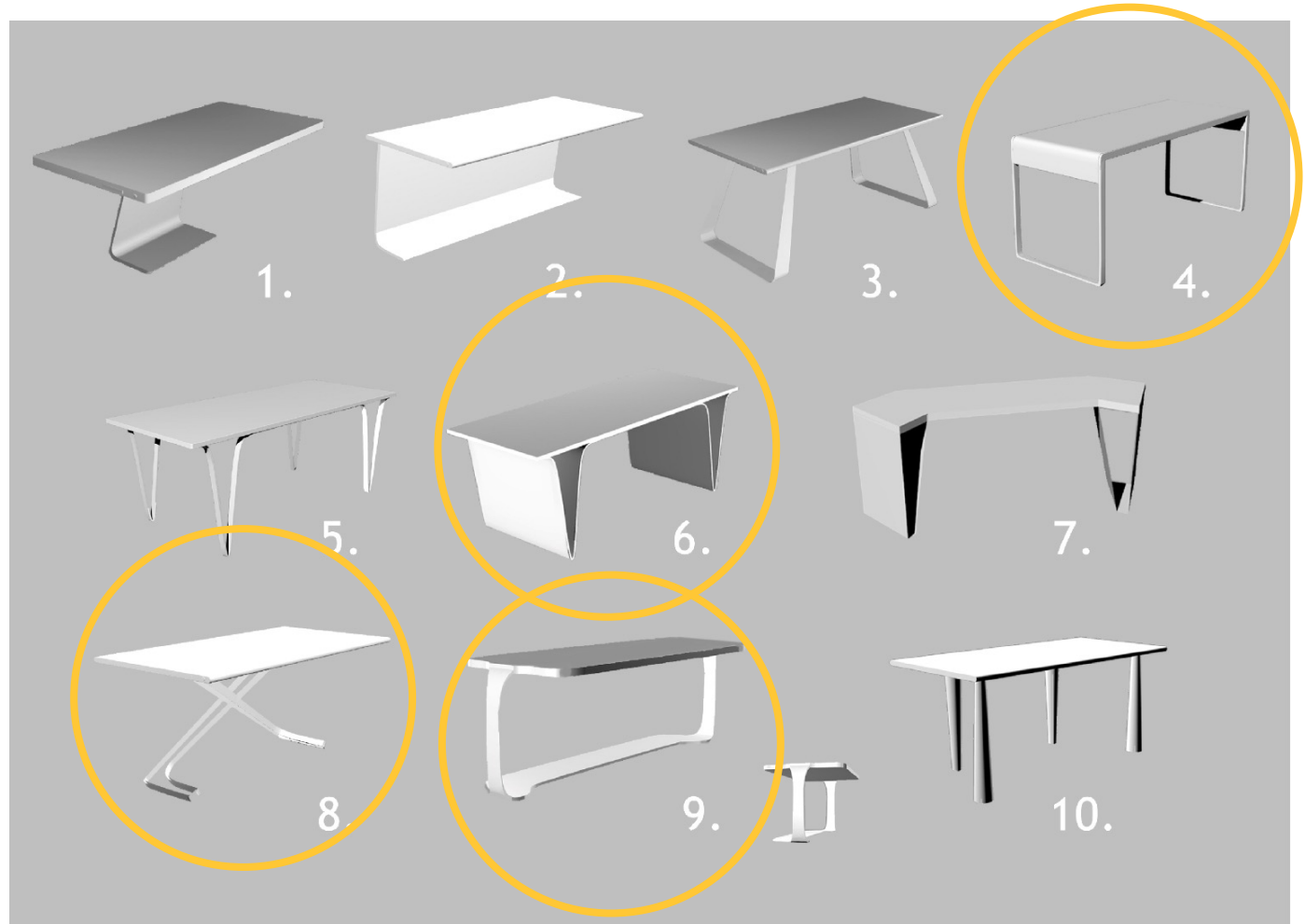
Note that matrices **always focus on the customer/ user needs** and other decisions criteria defined based on the case!



# EXAMPLE 1

## Multivoting

- I conducted multivoting with a few classmates to narrow down the number alternatives
- Each could vote for max 3 concepts



# EXAMPLE 1

## Concept screening

4 concepts presented with images and short textual descriptions (each in own A4 )

Selection criteria drawn from user studies and competition requirements

+ = Better than reference  
 - = Worse than reference  
 0 = Same as reference

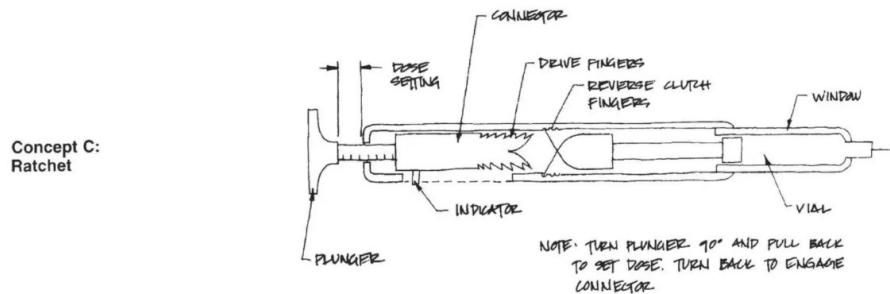
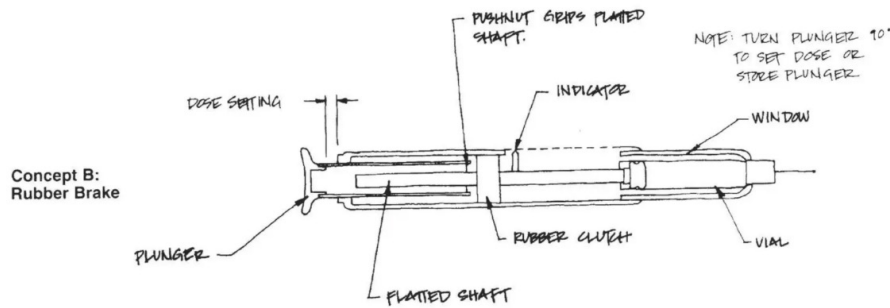
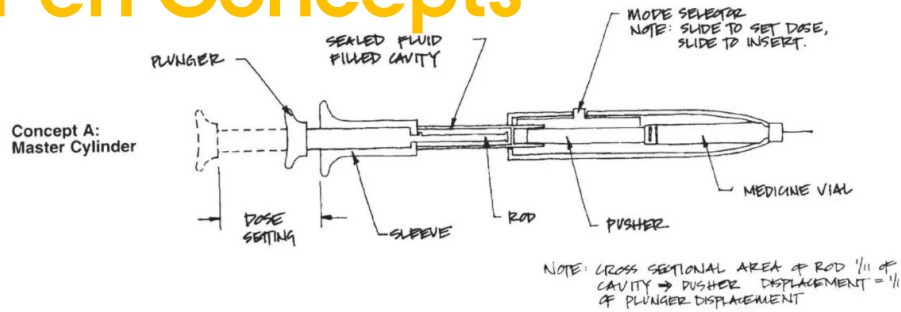
	X-pöytä	W-pöytä	Mutka	Lehti	Mybox vertailukonsepti
Adjustability	+	+	-	+	0
Storage space	0	+	-	+	0
Cleanability	0	0	-	+	0
Aesthetics	+	+	+	+	0
Multifunctionality	0	0	0	0	0
Novelty	+	+	0	+	0
Ergonomics	+	0	0	+	0
Durability	+	+	+	+	0
Likeness	+	+	+	+	0
Storability	+	-	-	+	0
Score	7	5	-1	9	0
Rating	2	3	4	1	-

Reference product that the concepts are evaluated against

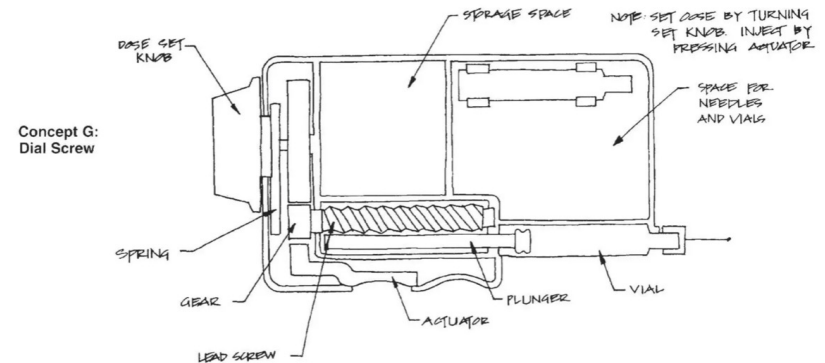
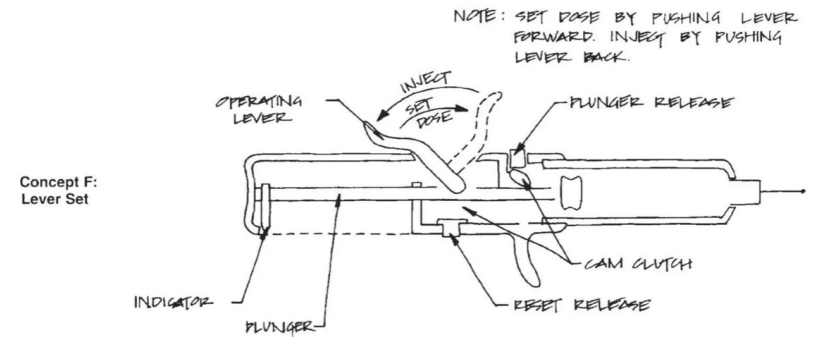
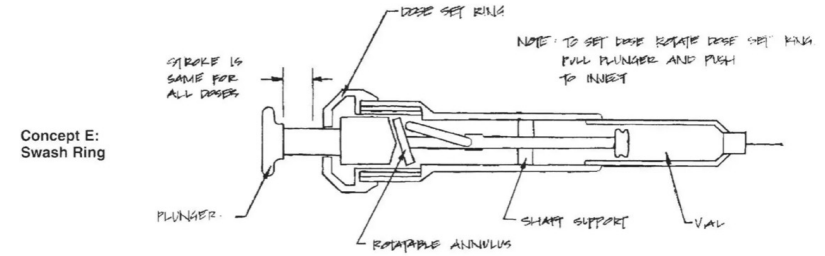
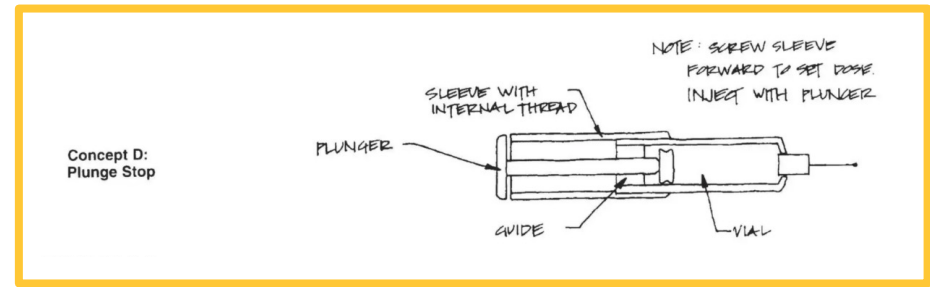


# EXAMPLE 2

## Novo Pen Concepts



## Reference product



# EXAMPLE 2: SELECTION MATRIX

Selection Criteria	A Master Cylinder	B Rubber Brake	C Ratchet	D (Reference) Plunge Stop	E Swash Ring	F Lever Set	G Dial Screw
Ease of handling	0	0	-	0	0	-	-
Ease of use	0	-	-	0	0	+	0
Readability of settings	0	0	+	0	+	0	+
Dose metering accuracy	0	0	0	0	-	0	0
Durability	0	0	0	0	0	+	0
Ease of manufacture	+	-	-	0	0	-	0
Portability	+	+	0	0	+	0	0
Sum +'s	2	1	1	0	2	2	1
Sum 0's	5	4	3	7	4	3	5
Sum -'s	0	2	3	0	1	2	1
Net Score	2	-1	-2	0	1	0	0
Rank	1	6	7	3	2	3	3
Continue?	Yes	No	No	Combine	Yes	Combine	Revise



# REFERENCES

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- Carroll, J. (Ed.) (1999). *Five Reasons for Scenario-Based Design*. IEEE Proceedings of the 32nd Hawaii International Conference on System Sciences
- Dix, A., & Gongora, L. (2011, October). Externalisation and design. In *Proceedings of the second conference on creativity and innovation in design* (pp. 31-42).
- Ulrich, K. T., & Eppinger, S. D. (2016). Product design and development. McGraw-hill. **(Chapter 8, pp. 146-156)**.  
<https://www.slideshare.net/slideshow/productdesignanddevelopmentkarltulrichstevendeppingeredis/266164184>
- Van der Lelie, C. (2006). The value of storyboards in the product design process. *Personal and ubiquitous computing*, 10(2-3), 159-162.
- Wright, P., & McCarthy, J. (2010). Experience-centered design: designers, users, and communities in dialogue. *Synthesis Lectures on Human-Centered Informatics*, 3(1), 1-123. **(pages: 33-34)**



# SKETCHING HUMANS & STORYBOARDS

Sketching tutorial in class. Bring your pencil/s, pens, and 3 shades of grey markers with you!

25th March  
10.00-12.00