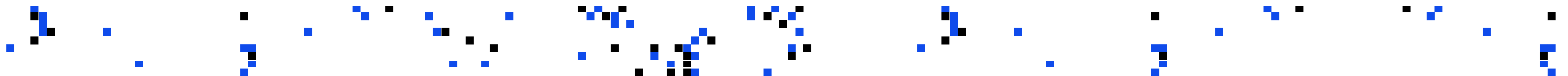# 31260 42017
Fundamentals of Interaction Design

Lecture 1, Week 1

Dr Wade Marynowsky, with thanks to Prof Elise Van den Hoven and Associate Professor Tuck Wah Leong

UTS

Housekeeping

- Be respectful
- Be on time
- Try to be quiet, e.g. mute devices

- UTS Online – source of all information
- UTS Online Discussion board – for Q&A outside tutorials

- Lectures will be available on UTS online before the lecture on Tuesday mornings
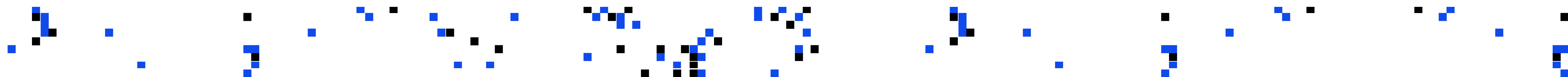
Subject Coordinator – Dr Wade Marynowsky

- Lecturer in School of Computer Science, FEIT, UTS

- Artist and Interaction Designer (IxD)

- Human-Computer Interaction (HCI)

- Human-Robot Interaction (HRI)

- User eXperience (UX) research

- User-Centred Design (UCD)

- Tangible, Embedded and Embodied Interaction
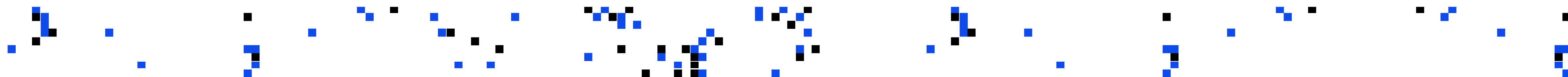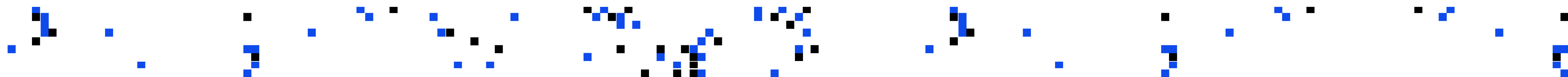
Subject Coordinator – Dr Wade Marynowsky


The Acconci Robot, 2012

Tutors

- Alejandra Keitel PhD   Alejandra.MeryKeitel@uts.edu.au
- Wade Marynowsky PhD   Wade.Marynowsky@uts.edu.au
- Suman Ojha   Suman.Ojha@uts.edu.au
- Daniel Ebrahimian   Daniel.Ebrahimian@uts.edu.au
- Domenique Van Gennip   Domenique.VanGennip@uts.edu.au
- Natassja Sundara   Natassja.Sundara@uts.edu.au

Tutors

- Daniel Ebrahimian - a part of UTS Unleashed!, who secured the first place in the Social Robotics League at RoboCup 2019!
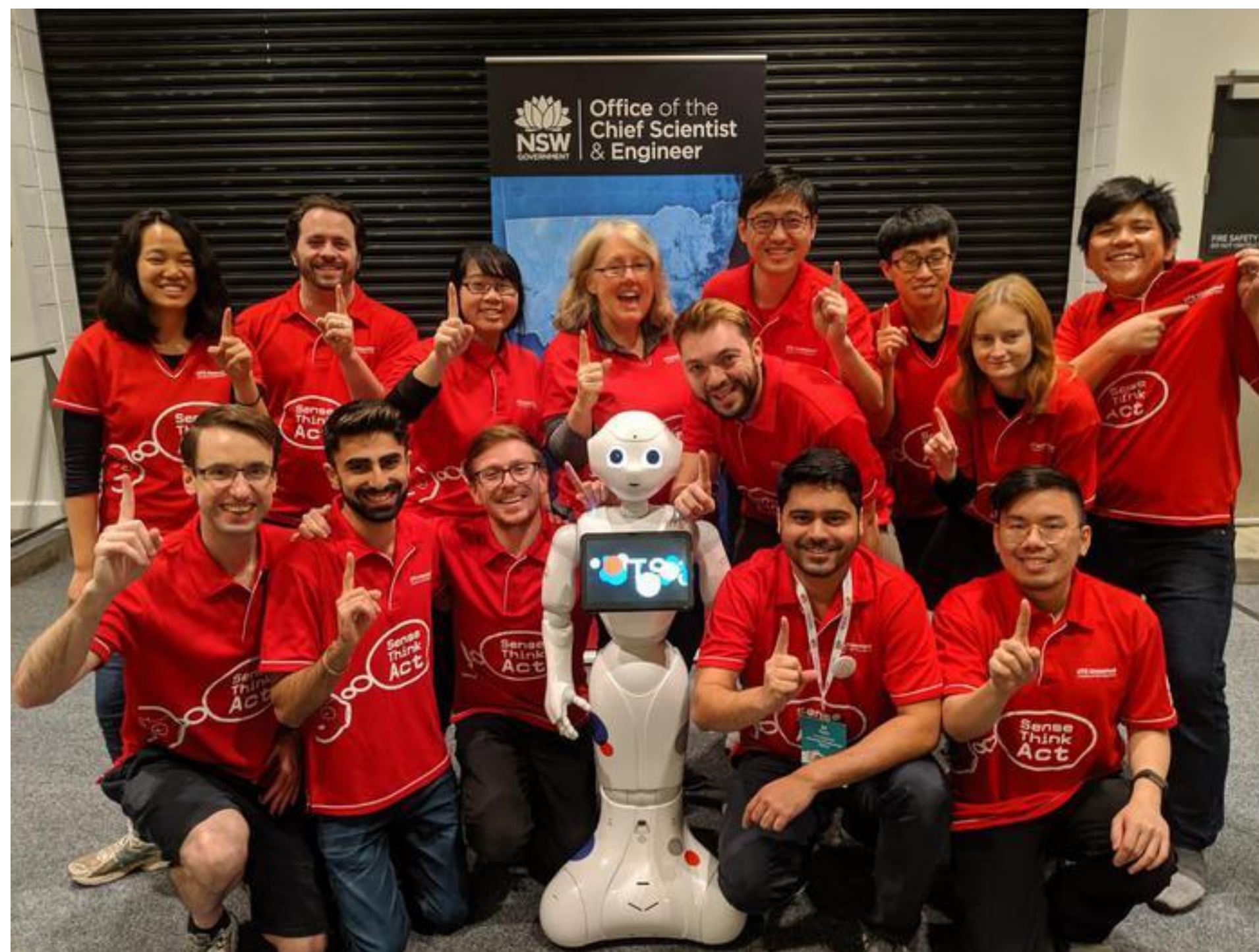
Interaction & Games Design society: "Facebook @utsixgdesign"

Edward Su

MIDes student

# Interaction & Games Design society: "Facebook @utsixgdesign"

Interactive Media Jam

It's a rapid prototyping competition costing $10 for members and $15 for non-members which includes catering over the weekend and t-shirts for the first 40 registrations. We will be providing mentors to help students create their projects so first-years and beginners shouldn't feel intimidated. $450 worth of prizes will be on offer as well.

Facebook event: https://www.facebook.com/events/452413942216011/

Eventbrite: https://www.eventbrite.com/e/interactive-media-jam-2019-tickets-63317489315?err=29&fbclid=IwAR0HpOmGCuYa5DVA_OE_FyHg8g95yCI03PHDH85IsQ2JFnPIm5UXZlVIXyU
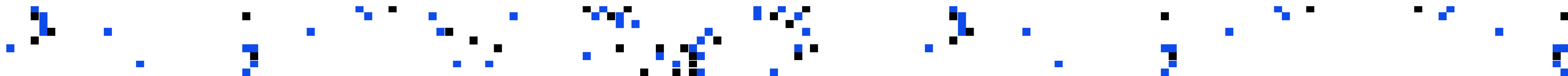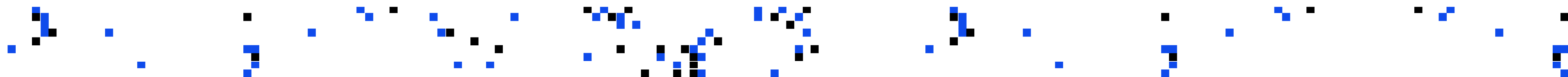
End of semester exhibition

Public exhibition

Date to be announced soon,

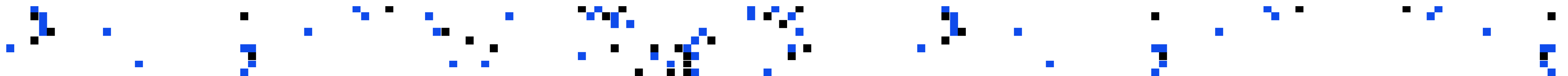With top students from other Interaction Design subjects.

Selection of FID top student projects, probably in November

This subject and future pathways

SC = Subject Coordinator, PC = Program Coordinator

- 31260 | 42017   Fundamentals of Interaction Design (SC: Dr. Wade Marynowsky)

- 31777 | 32509   Advanced Interaction Design   (SC: A/Prof Leong)

- 32405 | 41020   Human-Centred Design Methods   (SC: Prof Van den Hoven)

- Many more subjects, core and electives

- MAJ02092   Interaction Design (Major)   (UG PC: A/Prof Leong, PG PC: Prof Van

  den Hoven)

- C04222v1   Master of Interaction Design   (MIDes PC: Prof Van den Hoven)
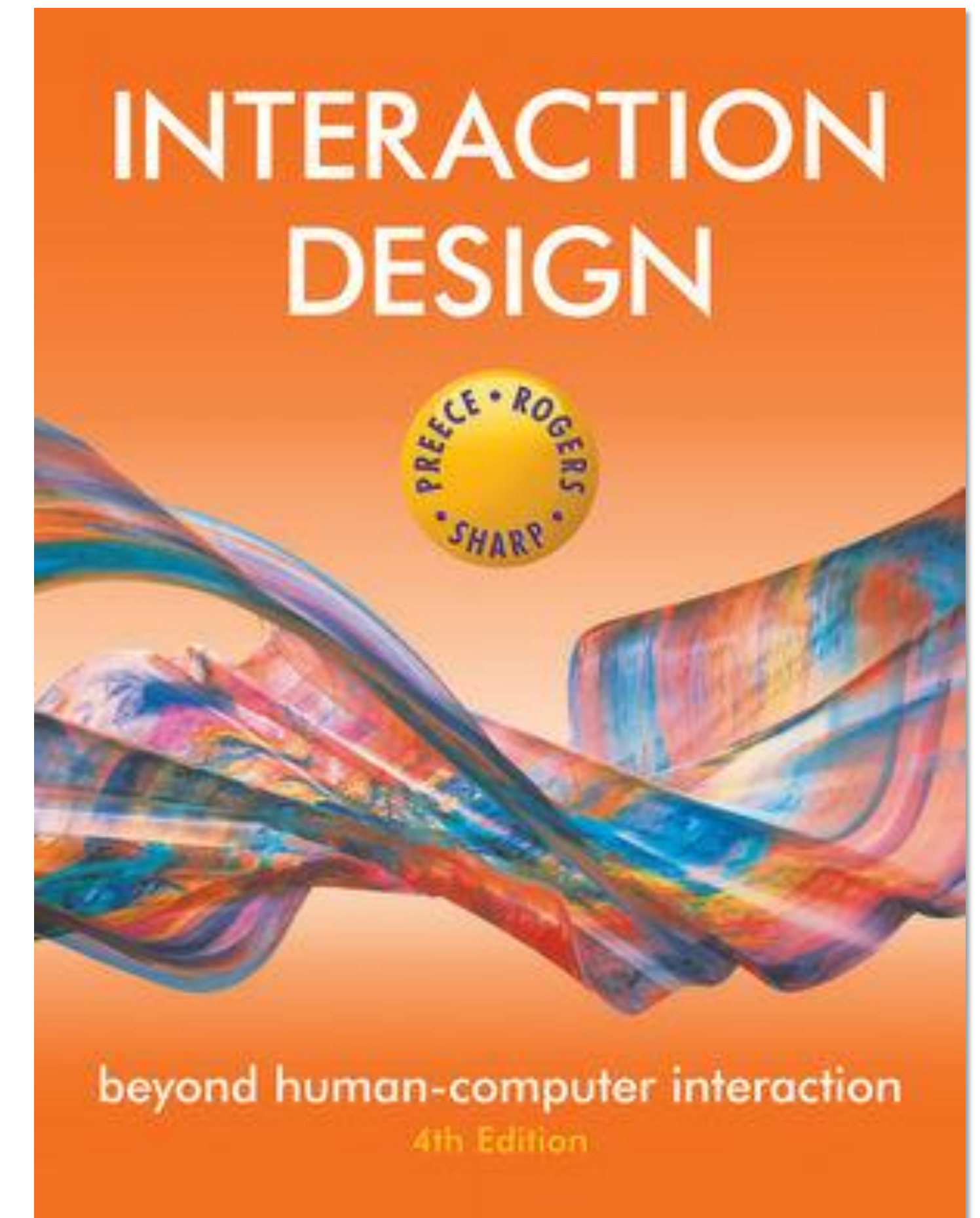
Textbook for this subject

Interaction Design: Beyond Human-Computer Interaction

by Preece, Sharp & Rogers
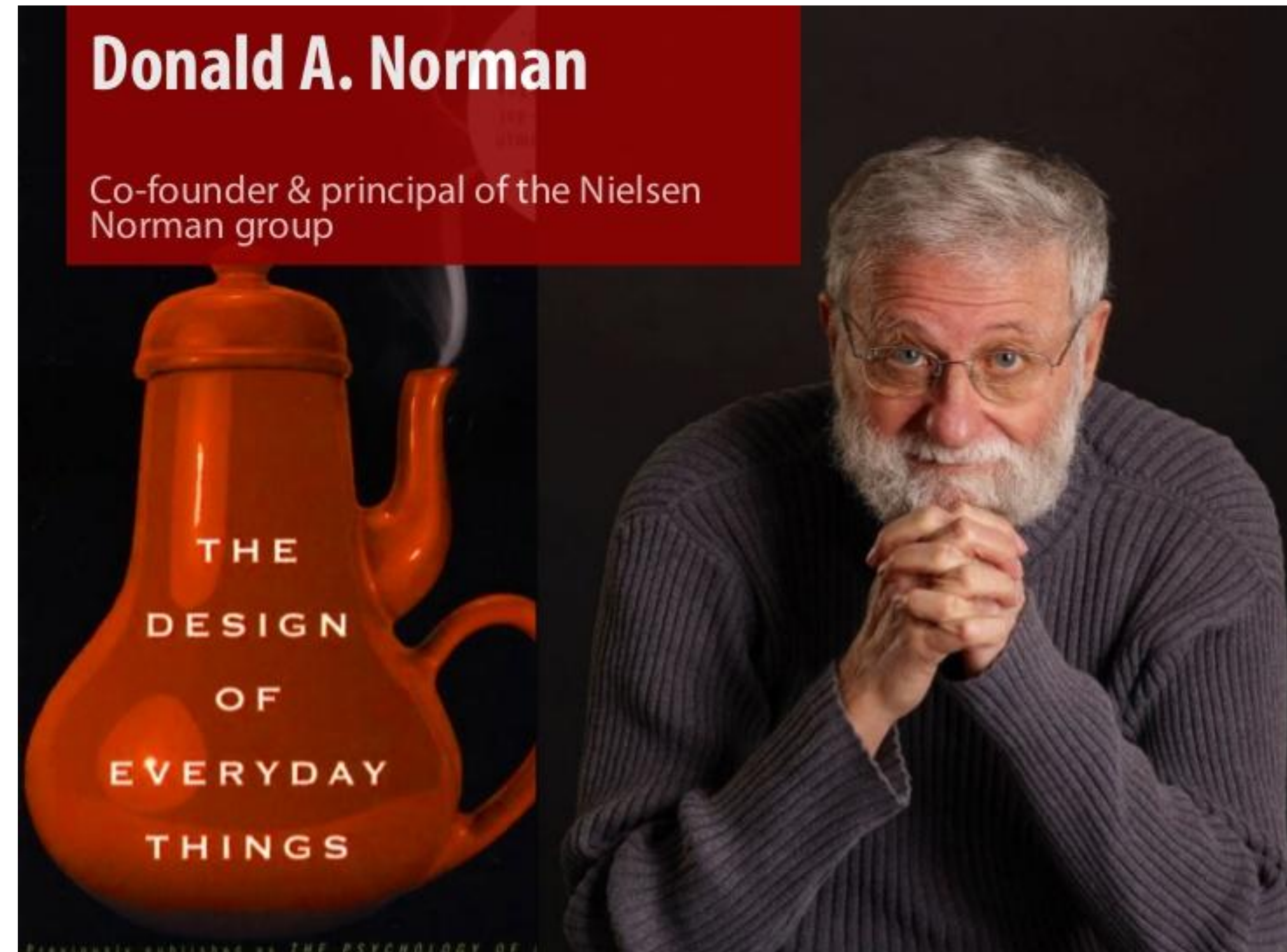
(2015) 4th Edition

E-book available in UTS Library

Essential reading

The design of everyday things

by Donald Norman

(1988) Doubled Currency
Revised (2013) MIT, Press.

Book available in UTS Library and
most retail stores.

Overall aim of this subject

Provide students with the fundamental theoretical and practical knowledge to

design interactions with digital technologies

that are **useful** and **usable**

Tips for passing and doing well in this subject

Attendance is crucial
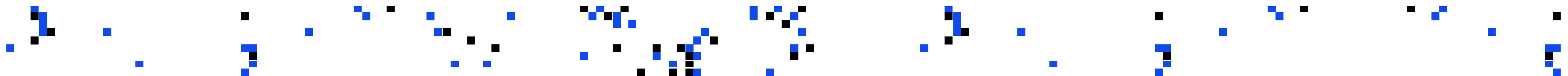
- take notes, engage, ask questions, participate

- a lot of assessment and formative feedback provided during tutorials

Proficiency in reading, writing and communicating in English

- A hurdle for some in the past

Readings, self exploration, supplementary research on concepts/ideas

- No excuses when Google is a verb (ie., something we *do*, and not just a brand)

Homework video: what is interaction design?
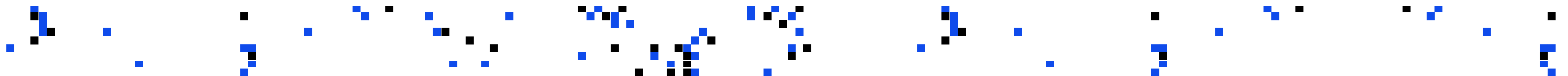
As technology advances, the way we use it evolves.

It's important to focus on enabling natural interactions...

https://vimeo.com/52861634

Discussion about video

- For most people, **what** do they think of when "Interaction Design" is mentioned?

- What seems to be the most important 'element' within Interaction Design? E.g., technology, tools, devices, people?

- What seems to be the one thing that appears to be problematic about current technologies, such as the phone?

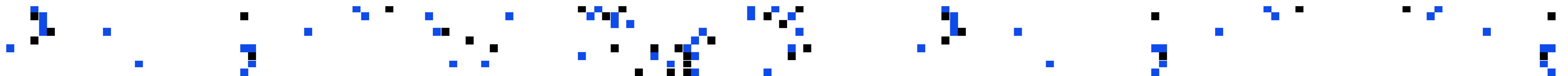# Interaction Design – broad definition

The design of interactions between people and products.

Commonly, the products include software like apps or websites.

Products can also be devices such as mobile phones, game consoles, watches, etc.

The goal of interaction design is to create products that enable the user to achieve their objective(s) in the best way possible.
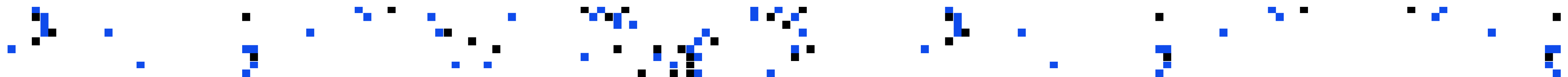
interaction-design.org

Interaction design – slightly narrower definition

"Interactive products containing embedded electronics

that respond to people's actions"

(Rogers, Sharp & Preece, Interaction Design, 2011)

Relies on:

- understanding of capabilities and desires of **people**
- kinds of **technology** available to interaction designers
- knowledge of how to identify **requirements**
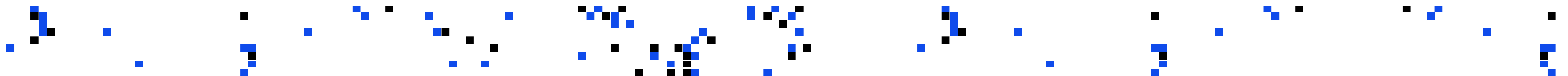- and evolve this into a suitable **design**

Interaction Design - recap

An interaction designer *choreographs* **how** people interact with digital technology.

Good interaction design supports people, it helps them:

- understand **what they can do** with digital technology;

- know **what is happening**, and
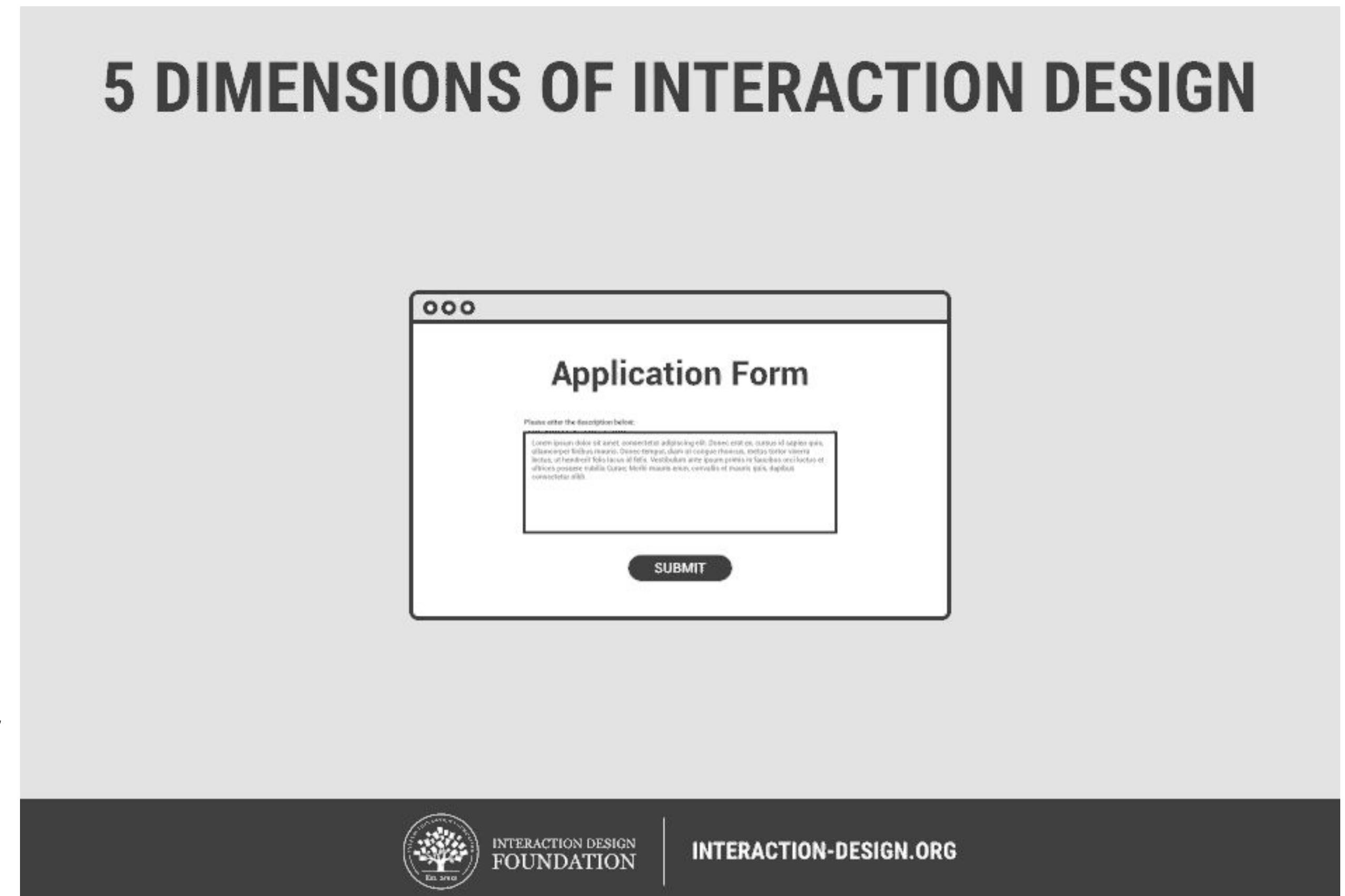
- be aware of **what has occurred before**.

5 dimensions of interaction design, including physical

1D Words

2D Visual representations

3D Physical objects or spaces

4D Time

5D Behaviour

Source:

https://www.interaction-design.org/literature/article/what-is-interaction-design

5 DIMENSIONS OF INTERACTION DESIGN

Application Form

SUBMIT

INTERACTION DESIGN FOUNDATION | INTERACTION-DESIGN.ORG

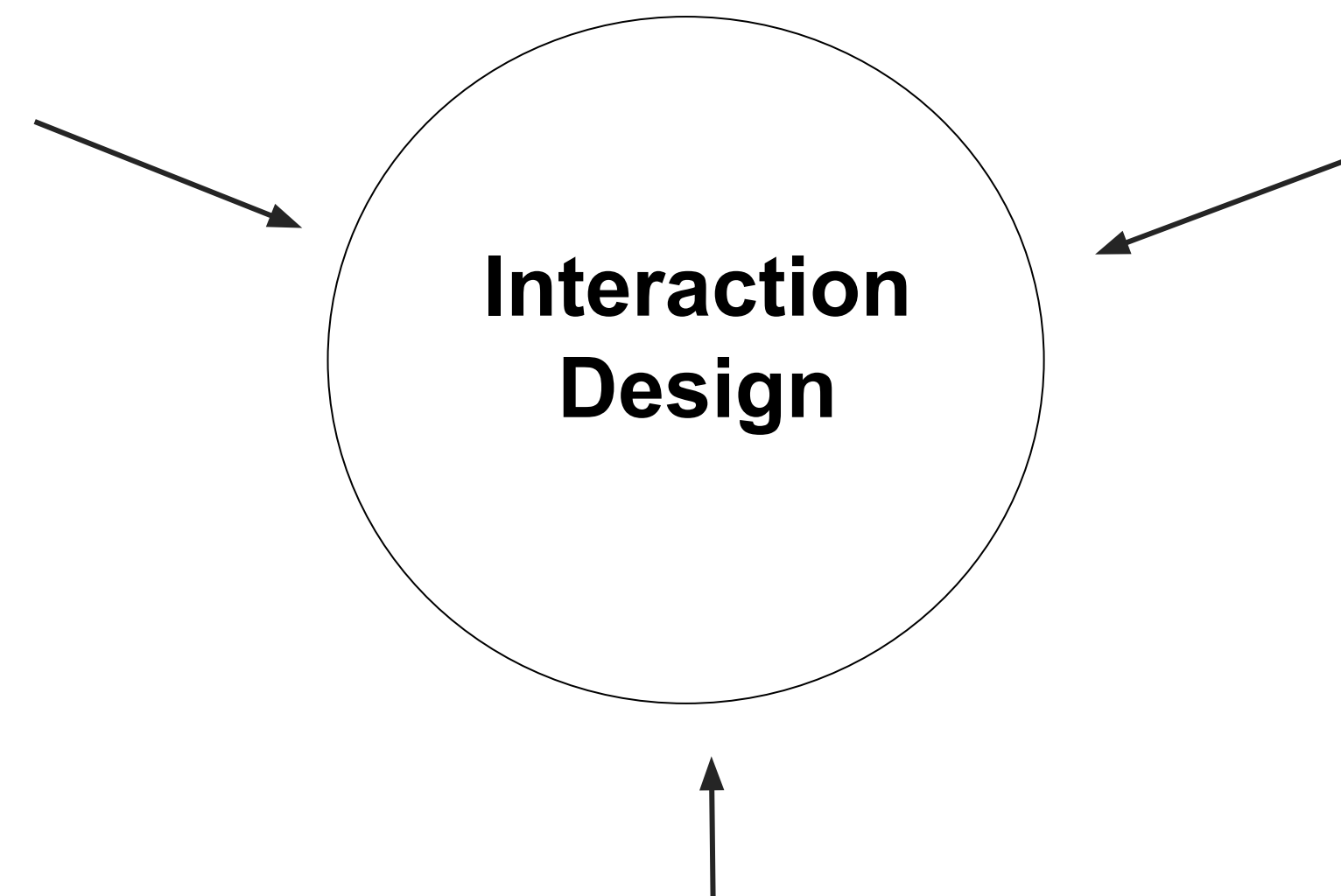# Relationship between IxD and other fields

(Preece et al., Interaction Design, 2015)

Academic disciplines
(e.g. psychology, social sciences, computing sciences, engineering, ergonomics)
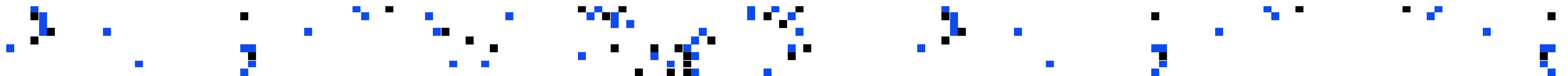
Design practices
(e.g. graphic design, product design, artist design, industrial design, film industry)

Interaction Design

Interdisciplinary fields
(e.g. HCI, Human Factors, Cognitive Engineering, Cognitive Ergonomics, CSCW, Information Systems)
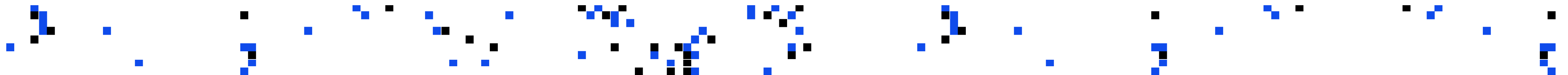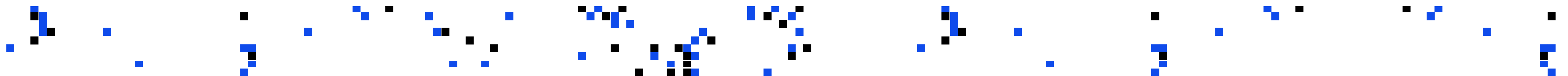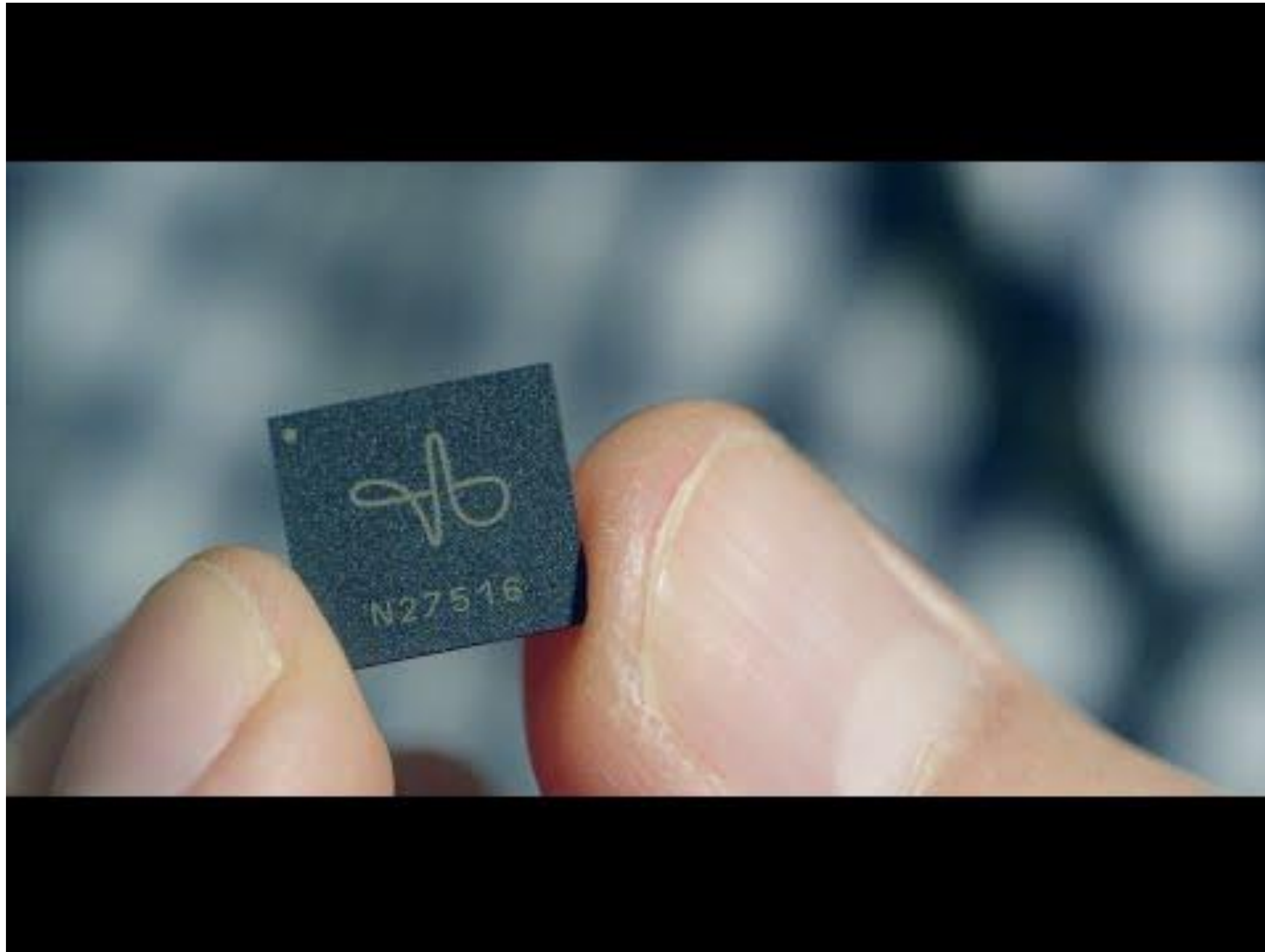
Interaction Designer: Ivan Poupyrev

Ivan Poupyrev is an award-winning inventor, scientist and designer. Working at the forefront of interaction design, he blends digital and physical realities in everyday objects, devices and the living environment.

Ivan is currently heading up a team at the Google's Advanced Technology and Projects (ATAP), where he is focussed on designing for our future digital lifestyle. Previously at Walt Disney Imagineering Research Division and Sony Corporate Research Labs in Tokyo, his work has garnered attention at international science conferences such as ACM SIGGRAPH, CHI and has received critical acclaim in the worldwide press including New York Times, Wired magazine, Time, MIT Technology Review and, notably, Fast Company magazine which described his as "one of the best interaction designers in the world".
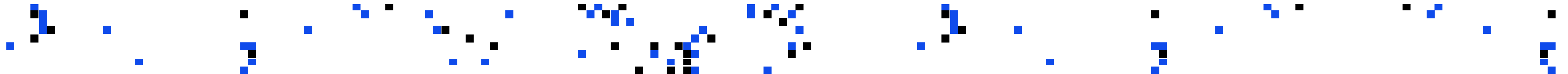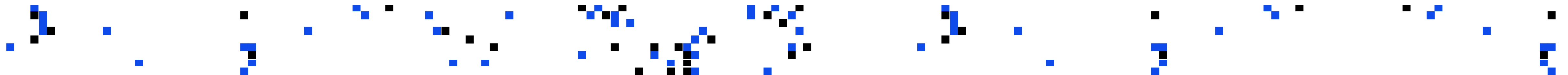
Interaction Designer: Ivan Poupyrev

Interaction Designer: Ivan Poupyrev

https://www.theverge.com/2017/9/25/16354712/google-project-jacquard-levis-commuter-trucker-jacket-price-release-date

Interaction Designer: Ivan Poupyrev (watch in your own time)

Examples of Physical interaction design - 1

Prof Elise Van den Hoven, PhD students
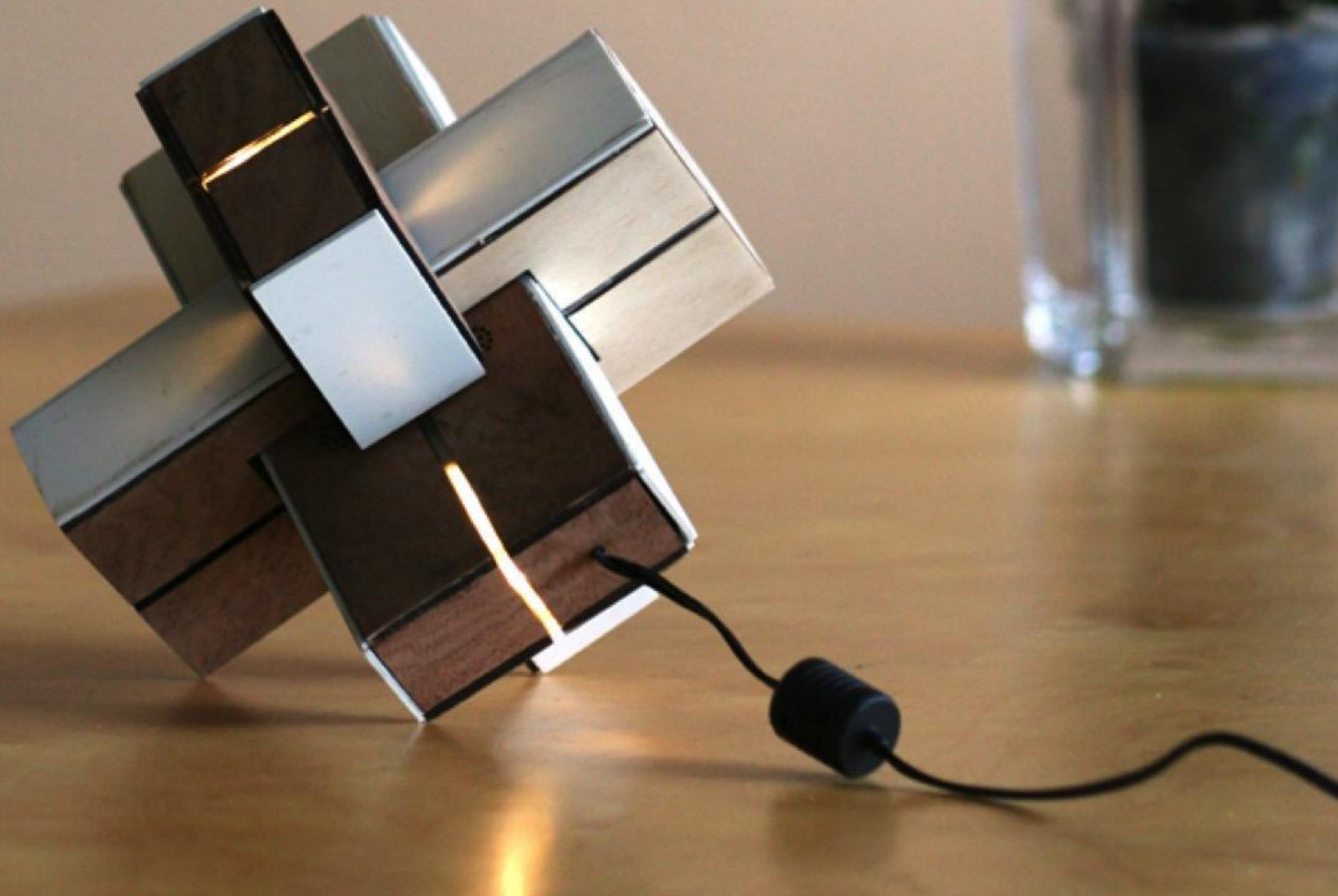

Circadian   **Martijn ten Bhömer**

Publications: ten Bhömer & van den Hoven (2013). Personal and Ubiquitous Computing journal

Award: Best TU/e Industrial Design master thesis 2011

Cueb   **Connie Golsteijn**

Publications: Golsteijn & van den Hoven (2013). Personal and Ubiquitous Computing journal
                       Golsteijn & van den Hoven (2012). ACM Interactions magazine, Mar/Apr 2012

Nomination: Top 3 Gerrit van der Veer prize 2011 (best Dutch HCI thesis)

Exhibitions: Dutch Design Week 2011
                       NS Try-out Festival 2011

Examples of Physical interaction design - 1

Prof Elise Van den Hoven, PhD students

StoryBeads — **Lizette Reitsma**

Publications:
Reitsma, Smith & van den Hoven (2013). Culture & Computing conference
Smith, Reitsma, van den Hoven, Kotze & Coetzee (2011). Culture & Computing conference

Invited demo: Indigenous Knowledge Technology Conference (2011), Windhoek, Namibia

FireFlies — **Saskia Bakker**

Publications a.o.:
Bakker, van den Hoven & Eggen (2015). Human-Computer Interaction
Bakker, van den Hoven & Eggen (2015). Personal and Ubiquitous Computing

# Introducing Design Principles and Design Concepts

Two of the most import characteristics of good design...

Discoverability

Is it possible to figure out **what** actions are possible, and **where** and **how** to perform them?

Understanding

What does it all mean?
How is it supposed to be used?
What do all the different controls and settings mean?

Source: Norman, DA (2013), The design of everyday things, MIT Press.
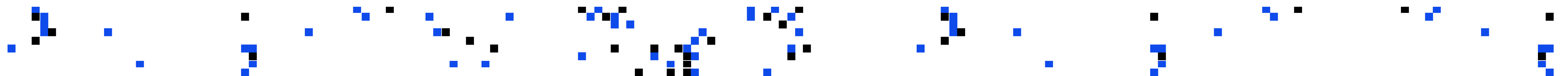
Design principles, design concepts and usability principles are carefully used to support <u>discoverability</u> and <u>understanding</u>

What can I do?
Where can I act?
How can I act?

What does each choice mean?
How do I use the technology?
What is the current status?
What are the consequences of my (inter)actions?

Discoverability

Understanding

Influenced by your:
goals, cognitive and physical abilities, environment, and context of use.

Case Study:
Ballistic missile threat… true story

Emergency Alert: 13 January 2018

Shortly after 8am, Hawaii time, scores of Hawaii residents received an emergency mobile phone alert: "BALLISTIC MISSILE THREAT INBOUND TO HAWAII. SEEK IMMEDIATE SHELTER. THIS IS NOT A DRILL."

The message was sent by the Hawaii Emergency Management Agency (HEMA) **in error**, and was a false alarm.

It took 38 minutes for this to be rectified with a follow-up message from authorities. Meanwhile, Hawaii and the rest of the US were in a major panic.

Source: https://en.wikipedia.org/wiki/2018_Hawaii_false_missile_alert
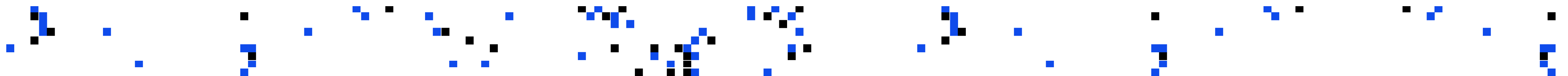
Supports discoverability… does NOT support understanding
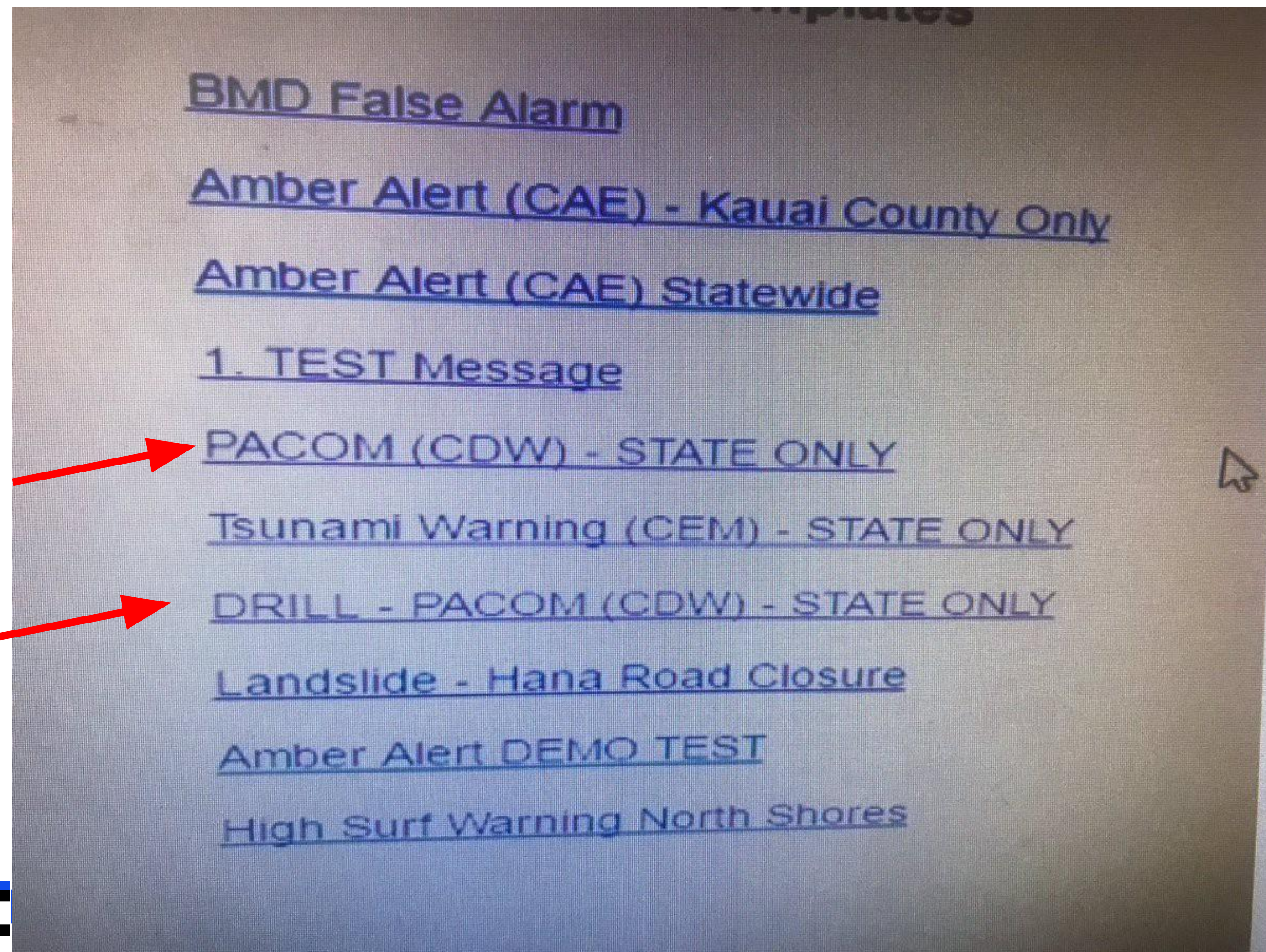
Soon after, there was an independently run contest on design crowdsourcing site Freelancer.

The competition was to design a better interface.

The winning entry suggests a fingerprint scan before entering any 'Missile Warning' option.

No more missile alert errors!

Knowing how to use and apply design principles, concepts, and usability principles

- Can help ensure good design

- Can help ensure usable design

- Can be used to understand Human-Computer Interactions:
  - to explain problematic interactions
  - to explain successful interaction

Source: https://www.freelancer.com/contest/Hawaii-needs-yoUI-1233608-byentry-19011327.html
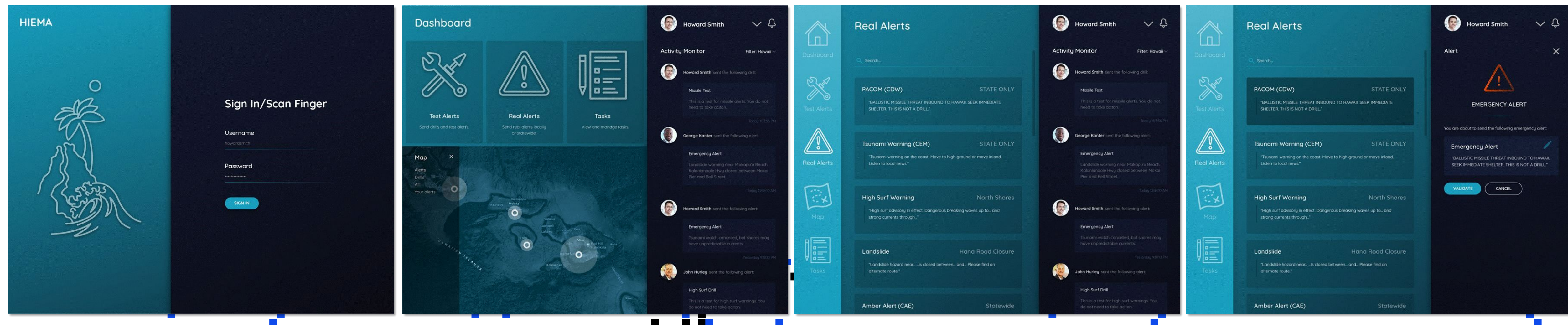
Fundamental Design Principles

Design principles

- Generalisable abstractions for thinking about different aspects of design

- The do's and don'ts of interaction design

- What to provide and what not to provide in the interface

- Derived from a mix of theory-based knowledge, experience and common-sense

Important design principles

- Visibility
- Feedback
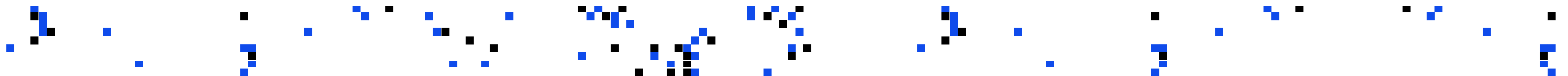- Constraints
- Consistency
- Affordances
- Mapping
- Signifiers

Important design principles

- **Visibility**
- Feedback
- Constraints
- Consistency
- Affordances
- Mapping
- Signifiers

baddesigns.com

Important design principles

- **Visibility**
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*baddesigns.com*
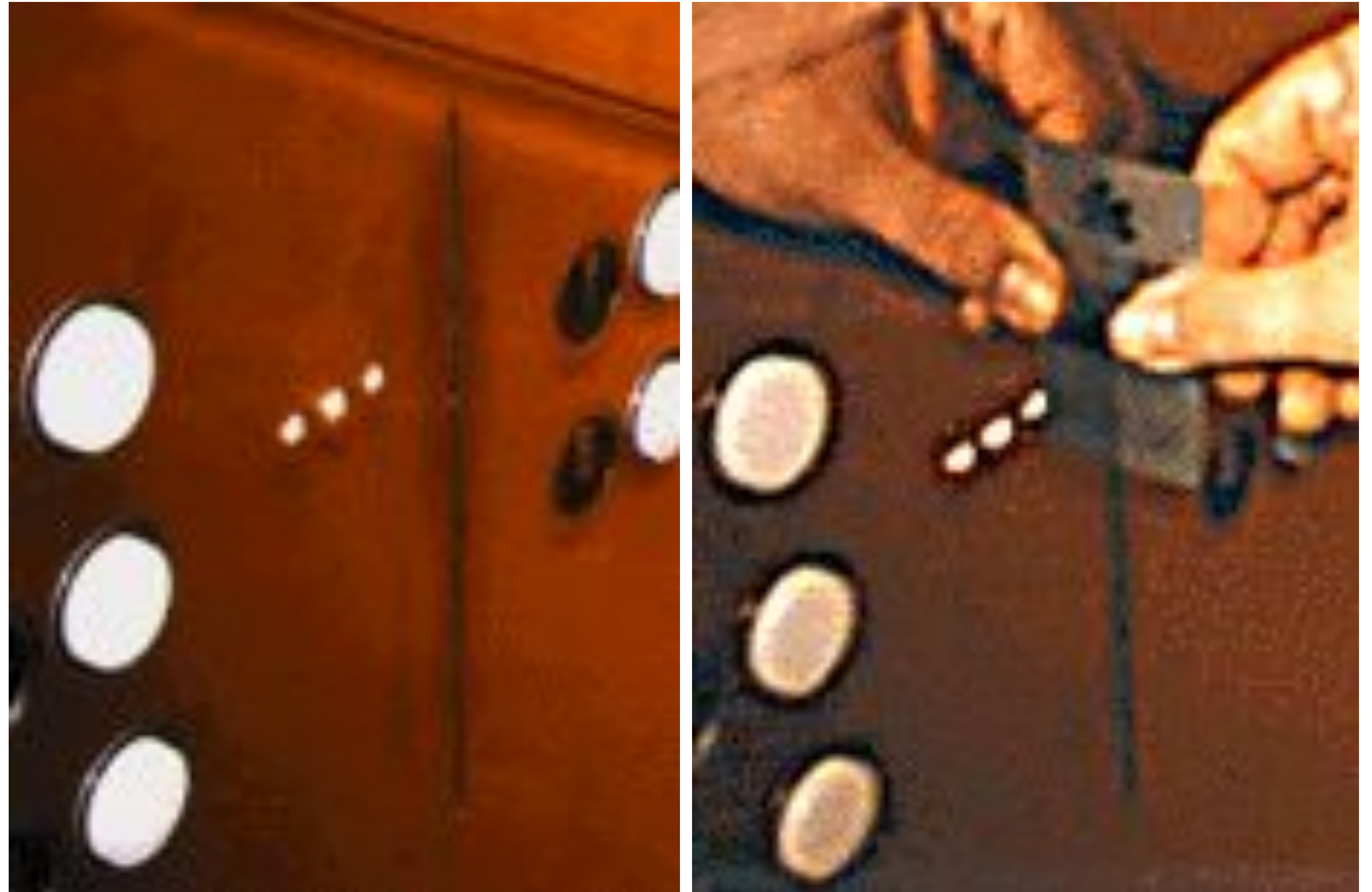
Visibility

- Let users know there is an opportunity to interact: leading to discoverability and understanding

- Make it reasonably predictable what will happen

- Provide cues and information, but do not overdo it

- Good visibility means that obvious prompts and cues are present which:

  - Lead the user through an interaction

  - Guide them through a series of tasks

  - Indicate what possible actions are available to them

  - Communicate the context of the situation

Visibility
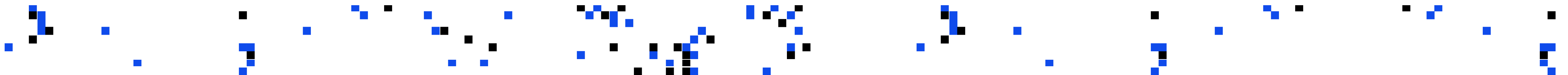
Visibility prompts and cues

Does it stand out? Is it easy to locate?

- Use of colour - does the colour grab attention?

- Contrast - is it easy to see given the background colour?

- Size - how big is it compared to the other elements on the interface?

- Prominence in placement - where is it placed on the interface? The centre?

- Is the placement/location consistent with similar interfaces?

- How cluttered is the interface? E.g. www.msy.com.au/home.php

Visibility
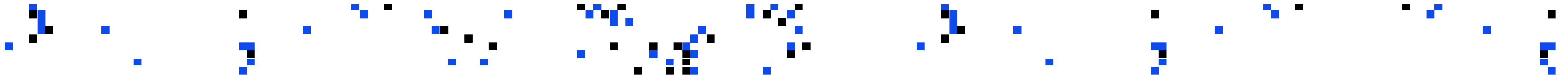
Important design principles

- Visibility
- **Feedback**
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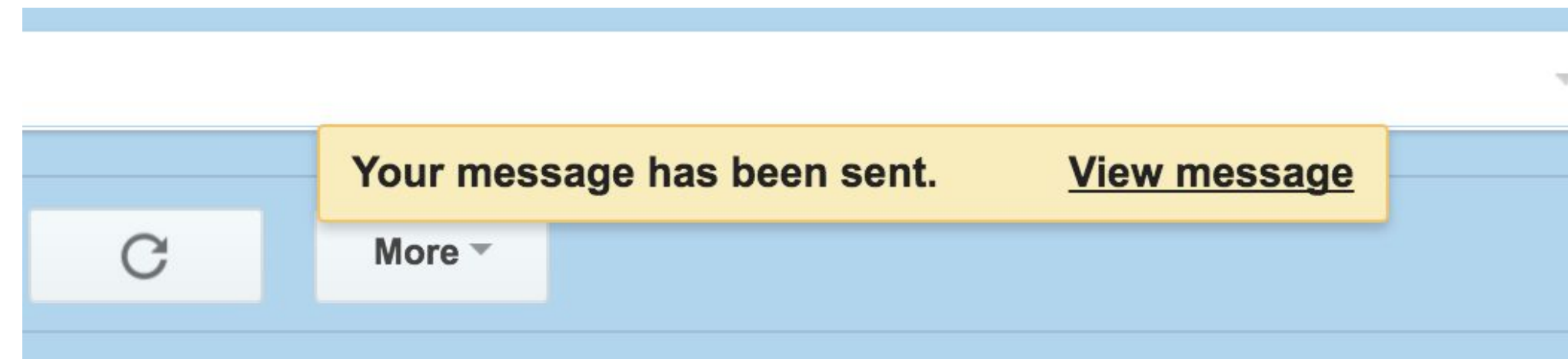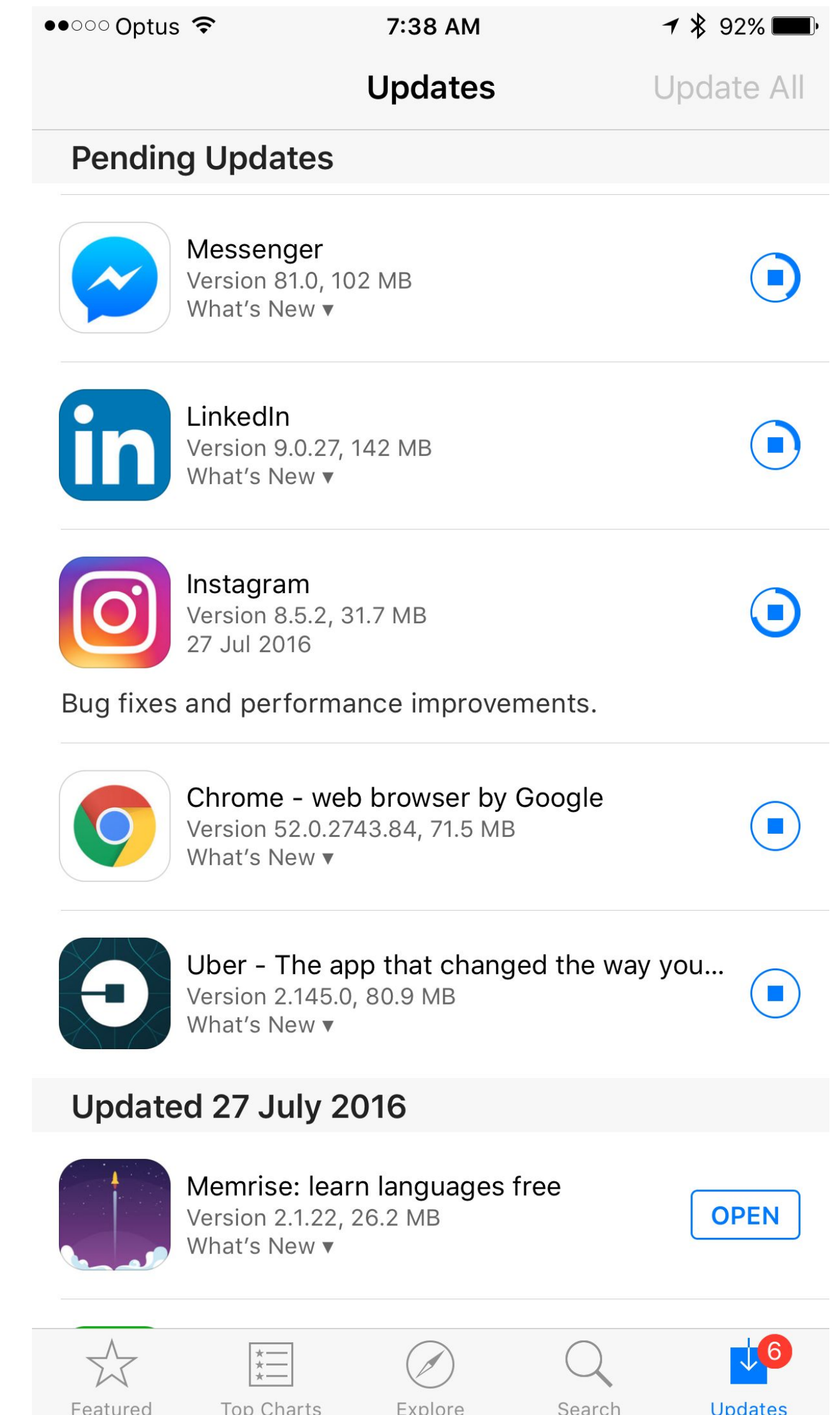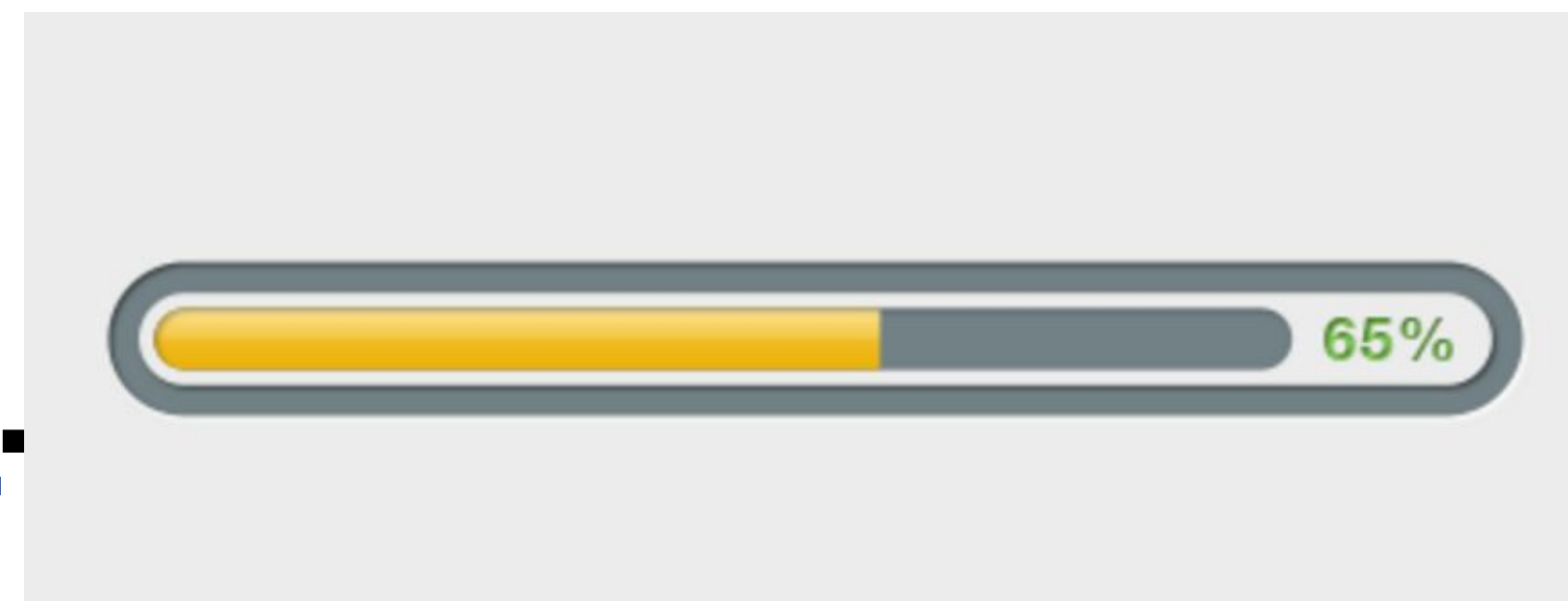
Feedback

- Feedback communicates **what action has been done** and **what has been accomplished**, allowing the person to continue with the activity.

- Feedback must be **immediate and informative**:

  - Location: where am I?

  - Current status: what's happening, and is it still happening?

  - Future status: what will happen next?

  - Outcomes and results: what have just happened?

- Feedback can include sound, highlighting, animation and other visual effects, text, tactile feedback – as well as combinations
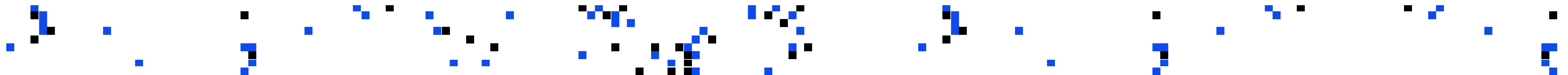
# The following statements describe examples of feedback.

A. You decide to download a file. As soon as you start the download a progress bar appears.

B. You are using Gmail to send an email. As soon as you hit send you see a text message that says, "Your message has been sent".

C. You are playing an video arcade game where you have a plastic 'gun' to kill zombies. When you successfully hit a zombie, the zombie explodes into a green mess and the plastic gun vibrates.
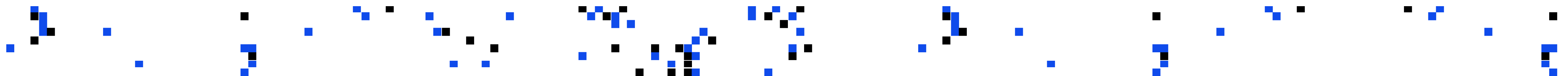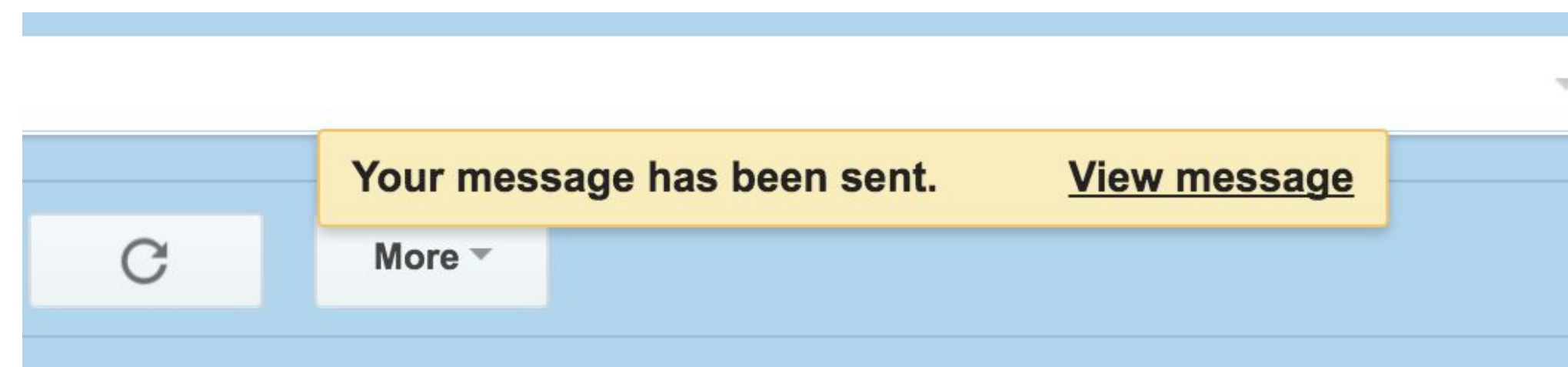
Examples of feedback.

A. You decide to download a file. As soon as you start the download a progress bar appears.
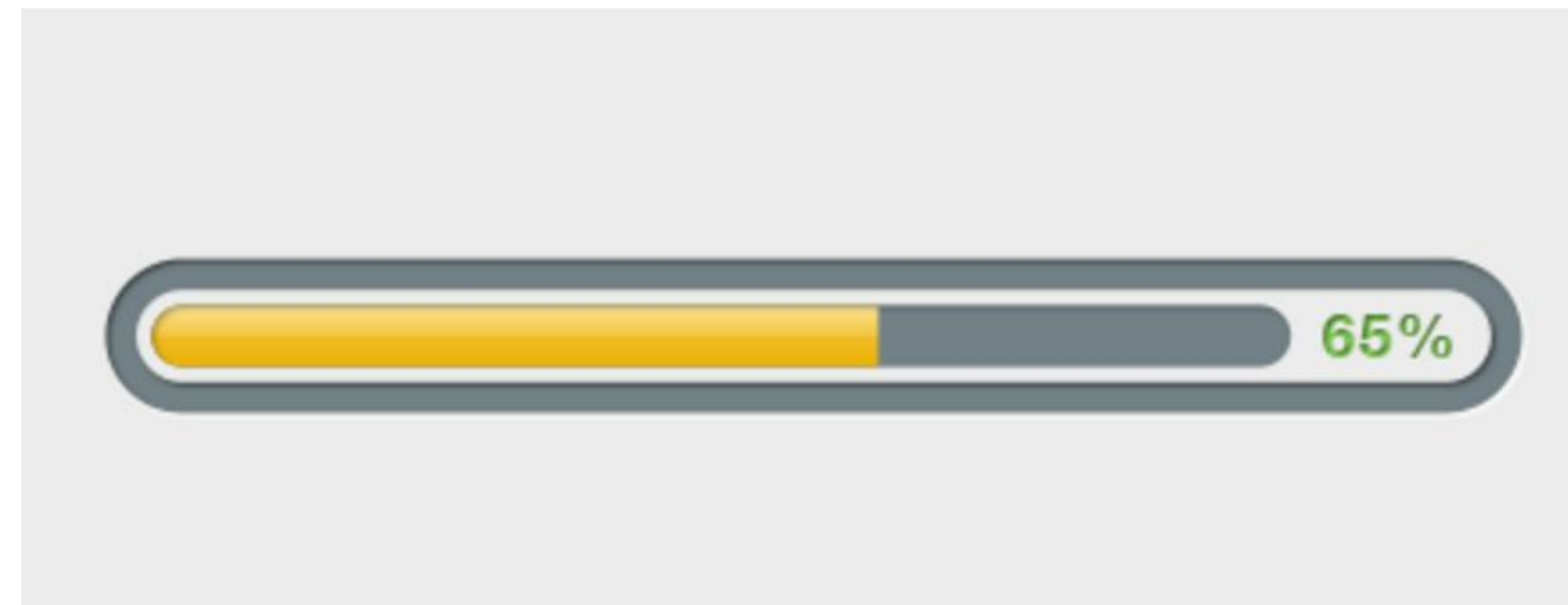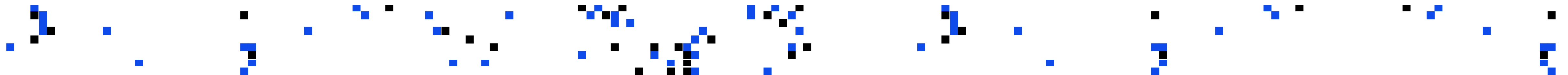
Examples of feedback.

B. You are using Gmail to send an email. As soon as you hit send you see a text message that says,
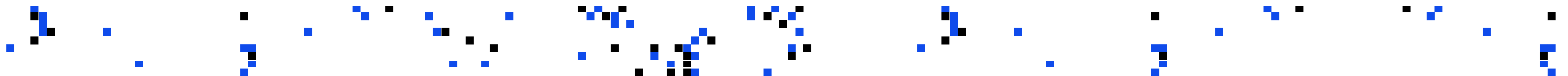
"Your message has been sent".

Examples of feedback

C. You are playing an video arcade game where you have a plastic 'gun' to kill zombies. When you successfully hit a zombie, the zombie explodes into a green mess and the plastic gun vibrates.
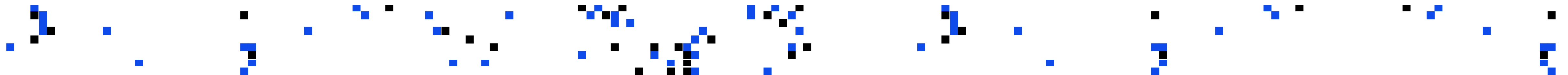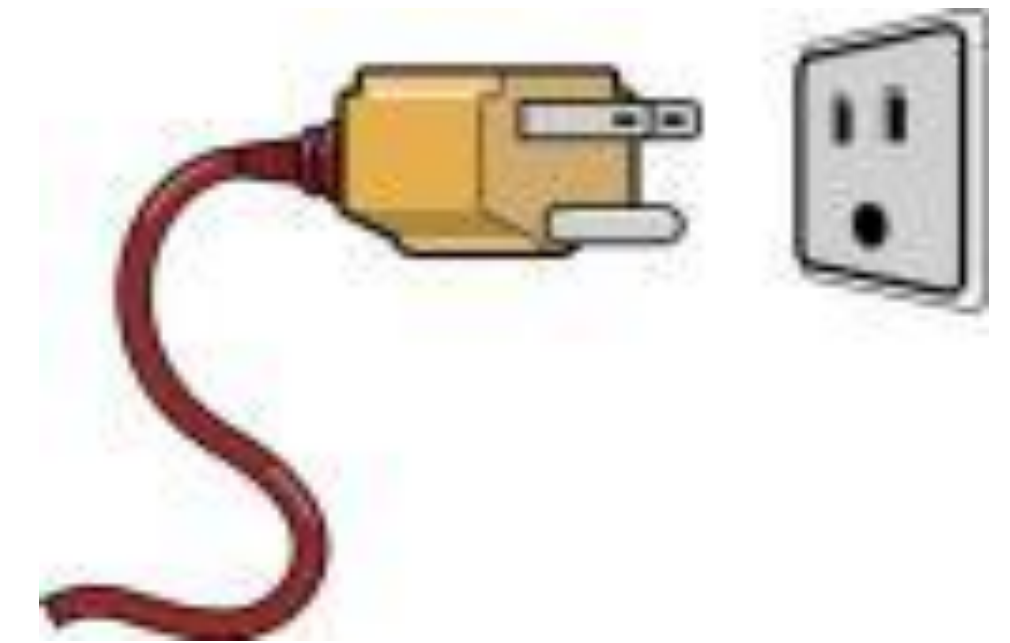
Examples of feedback
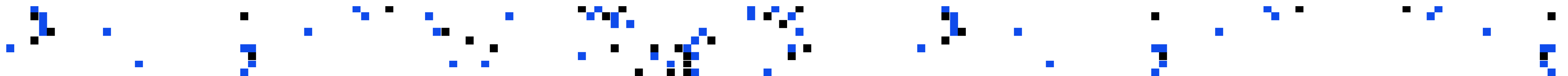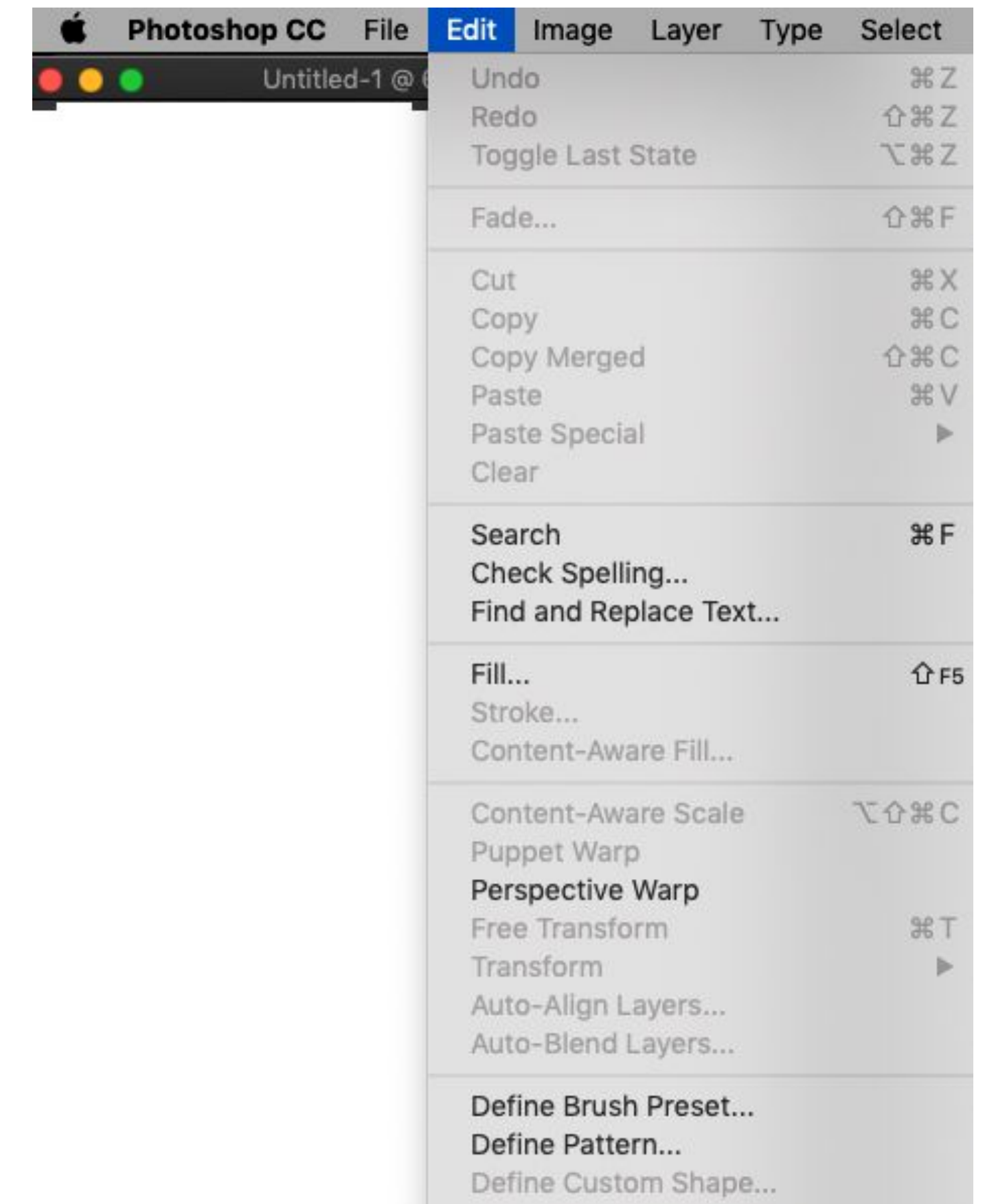
Can you think of other examples of feedback?

Important design principles

- Visibility
- Feedback
- **Constraints**: **physical**, cultural, logical and semantic
- Consistency
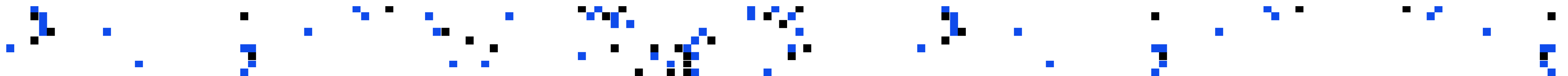- Affordances
- Mapping
- Signifiers

Constraints

- Restricting the possible actions that can be performed

- Help prevent user from selecting incorrect options (and making errors)

- In an interface: usually limiting choices
  - E.g. 'forcing' conformance to particular formats, such as greying out options

Four types of constraints

- physical constraints restrict the physical movement of things

- cultural constraints are abstract, and rely on learned conventions

- logical constraints rely on people's common-sense reasoning about the world to deduce possible actions

- Recent addition (Norman, 2013): semantic constraints rely on the meaning of the parts of a system to dictate the possible relationships

Important design principles

- Visibility

- Feedback

- Constraints

- **Consistency**: internal and external

- Affordances

- Mapping

- Signifiers
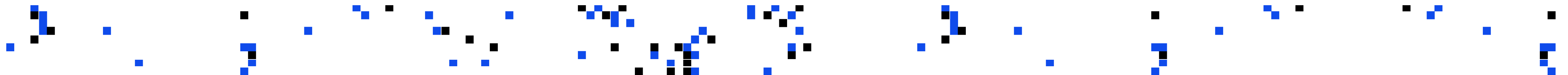
Consistency

A comparison: a relationship between two interface/interaction elements
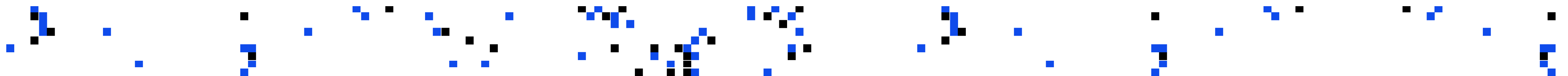
Consistency can be in terms of:
- appearance (looks the same)
- visual metaphors, icons, elements used
- steps needed to accomplish similar interactions, or
- standard conventions

Components with similar behaviours should have a similar appearance
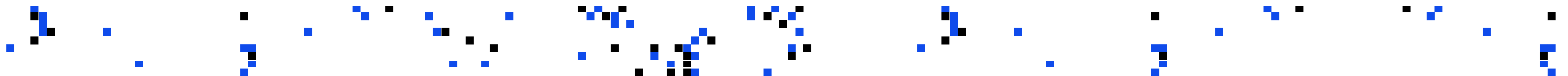- For example, always use Ctrl key plus first initial of the command for an operation: Ctrl+C for Copy, Ctrl+S for Save

Components with different behaviours should have a different appearance

Benefits of consistency

- Easier to learn

- Easier to use

- Users are also able to focus the task at hand or the content on-screen, instead of being distracted by 'shiny new objects' at every click, tap or swipe

- What happens when consistency breaks down?

Internal and external consistency

- **Internal consistency** refers to designing operations to behave the same **within** an application

    - Difficult to achieve with complex interfaces

- **External consistency** refers to designing operations, interfaces, etc., to be the same **across** applications and devices

    - Very rarely the case, based on different designer's preferences

Internal and External Consistency

- **Internal consistency** refers to designing operations to behave the same within an application

  - Difficult to achieve with complex interfaces

- **External consistency** refers to designing operations, interfaces, etc., to be the same across applications and devices

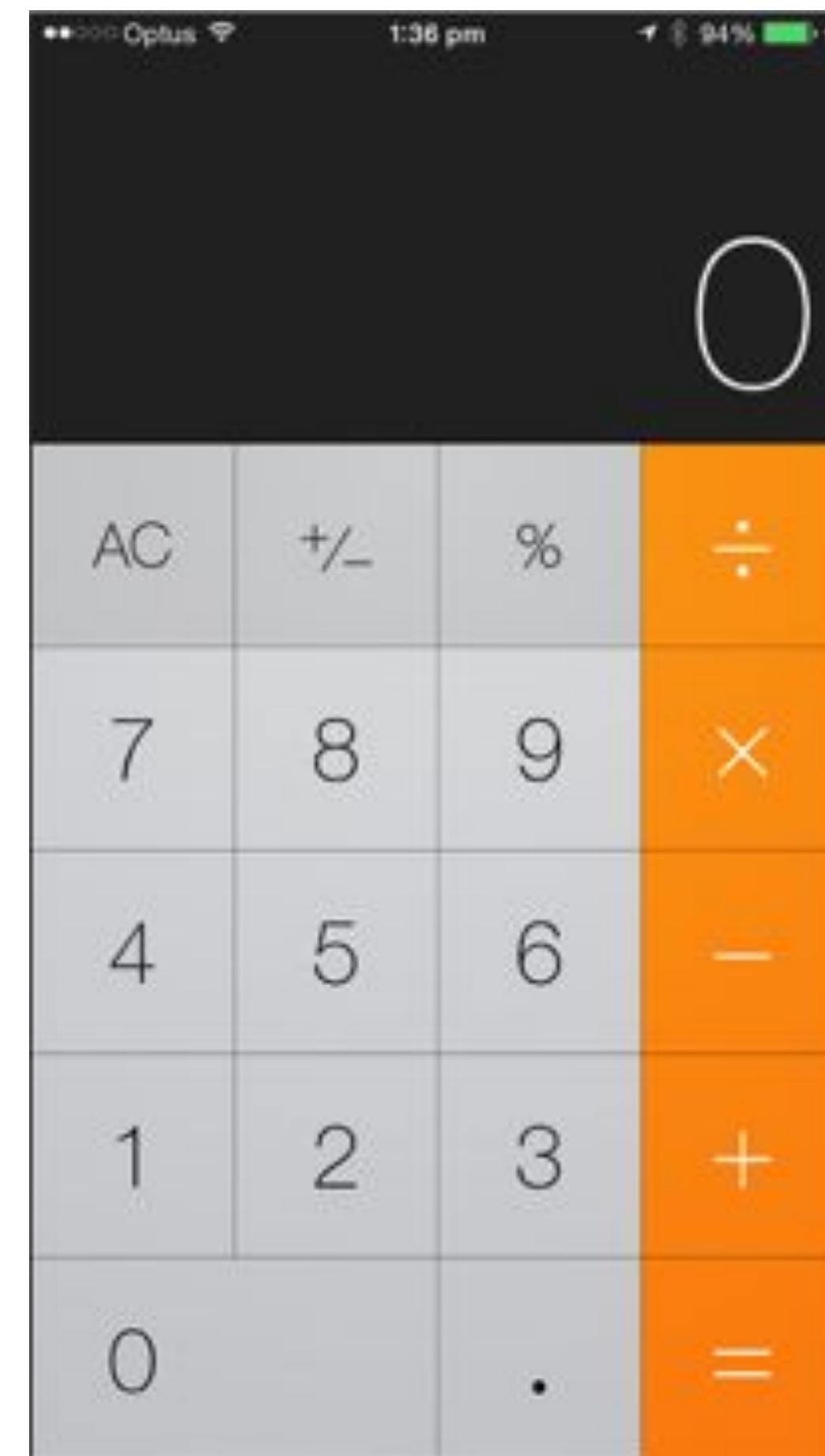 - Even harder to achieve and very rare, based on different designers' preferences

QUESTION:
What type of consistency is this?

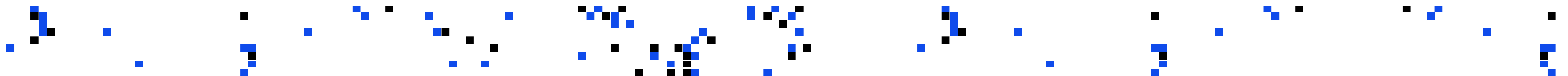# External and/or internal consistency?

phones, remote controls

calculators, computer keypads

Important design principles

- Visibility
- Feedback
- Constraints
- Consistency
- **Affordances**
- Mapping
- Signifiers

push

affordance handle
form meets **function**

pull

yankodesign.com

Affordances: to give a clue

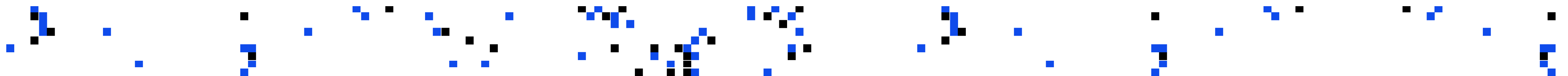Refers to an attribute of an object that allows people to know how to use it

- e.g. a mouse button invites pushing, a door handle affords pulling

Norman (1988) used the term to discuss the design of everyday objects

Has been popularised in interaction design to discuss how to design interface objects

- e.g. icons to afford clicking on, a certain on-screen arrow invites swiping over it

"Affordances" are both useful for physical objects (real affordances) as well as virtual objects (perceived affordances)

Physical affordances

How do the following physical objects afford action? Are they obvious? If so, what makes it obvious?
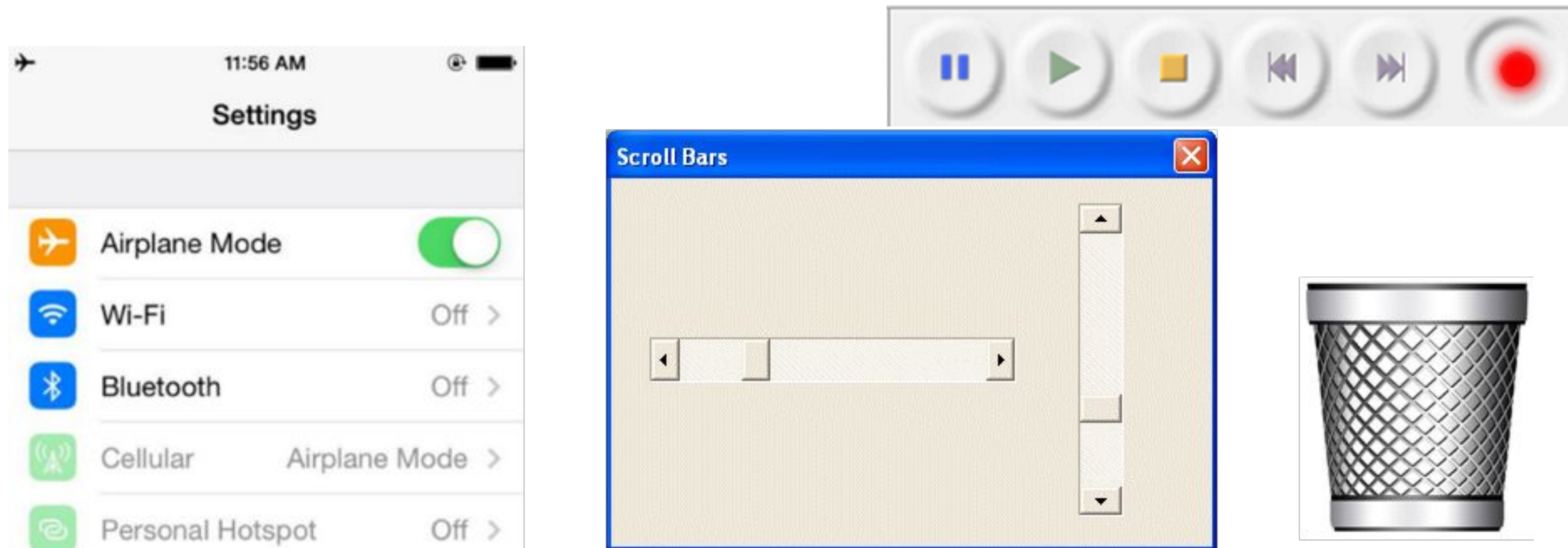
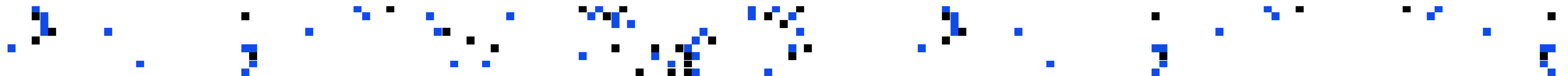# Virtual affordances

How do the following screen objects afford?

What if you were a novice user? Would you know what to do?
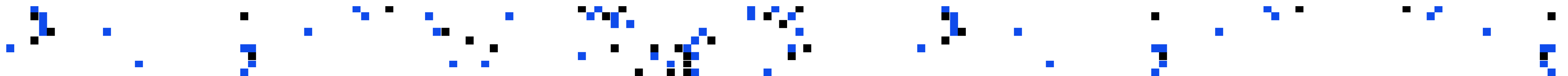
Anti-affordances

To give a clue what not to do…

Important design principles

- Visibility
- Feedback
- Constraints
- Consistency
- Affordances
- **Mapping**, often uses Gestalt principles
- Signifiers

Mapping

The **relationship** between the elements of two sets of things.

An important concept in the design and layout of controls and displays (ie., GUIs)

Good mapping depends on:
- Visibility
- Consistency
- Appropriate use of Gestalt Principles

1. Placement and proximity
- using Gestalt principles to map controls to functions
- related controls are grouped together
- controls should be close to the item being controlled

2. Connections and correlations. Match of something to the:
- real world
- known/common conventions

3. Allows users to figure out relationships (or actual function) without memorising

4. Allows users to intuitively figure out "what is it?", "where am I?", "where can I go?" and "what can I do?"
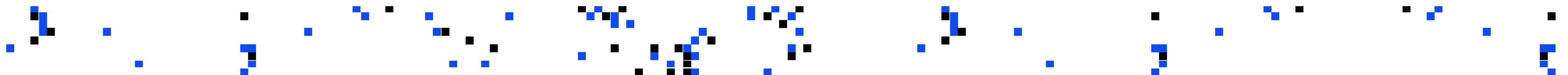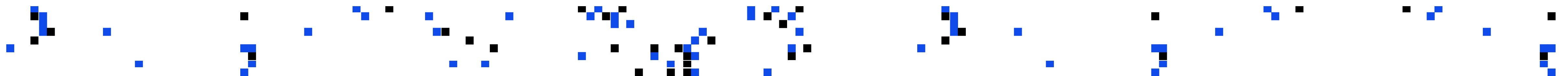
Gestalt Principles

Gestalt is a psychology term, which means "unified whole". It refers to theories of visual perception developed by German psychologists in the 1920s

These theories attempt to describe how people tend to organise visual elements into groups (or unified wholes)

1. Simplicity
2. Closure
3. Symmetry and order
4. Figure / Ground
5. Uniform connectedness

6. Common regions
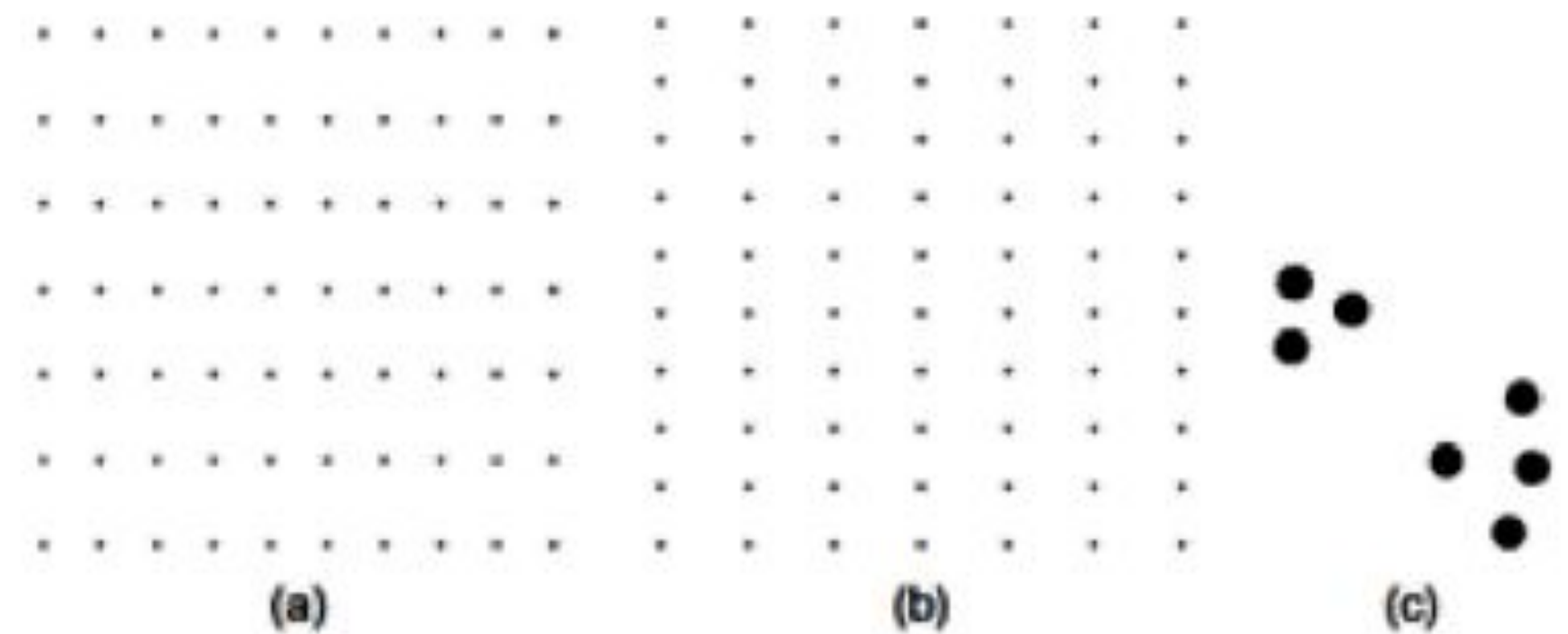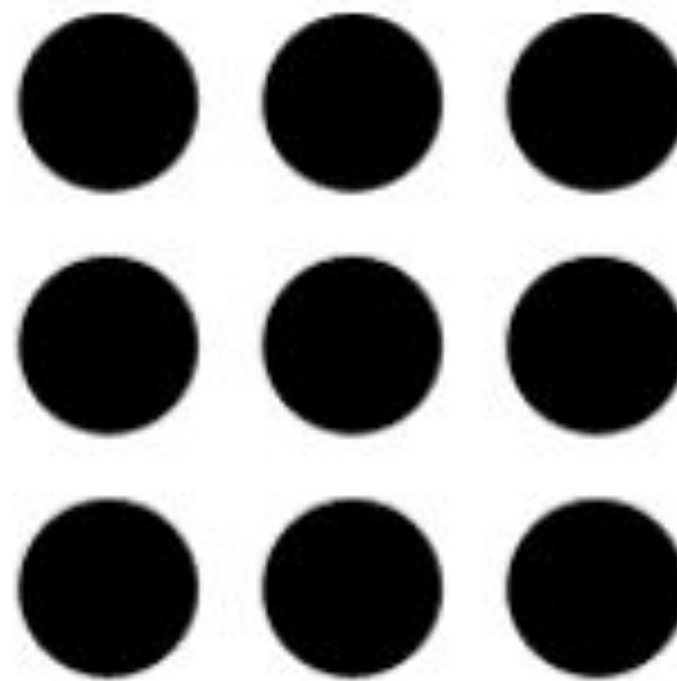7. Proximity
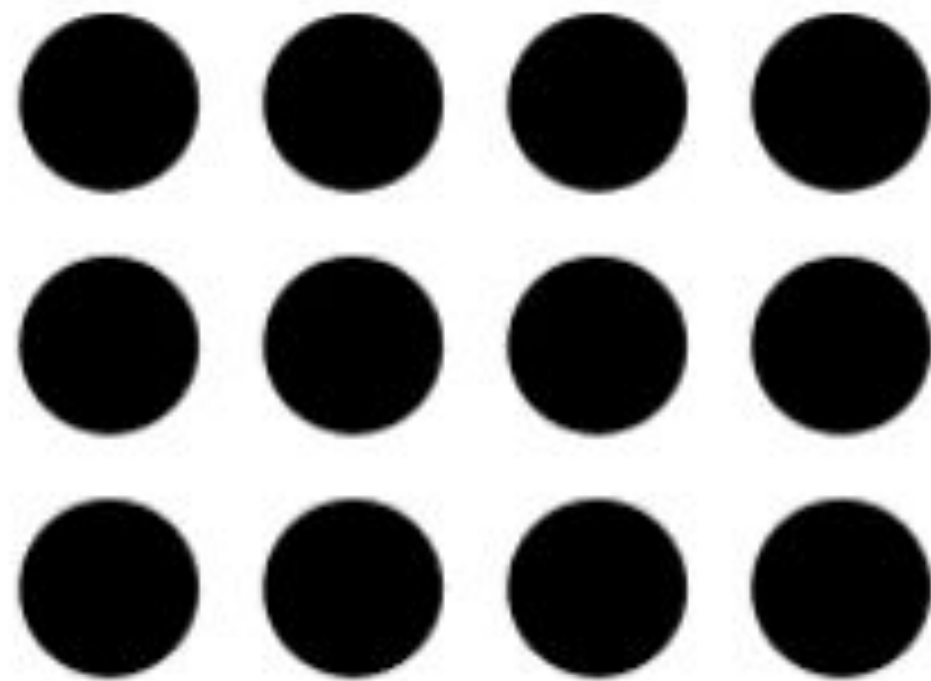8. Parallelism
9. Similarity
10. Focal points

Common regions (Gestalt Principle)

Elements are perceived as part of a group if they are located within the **same closed region**
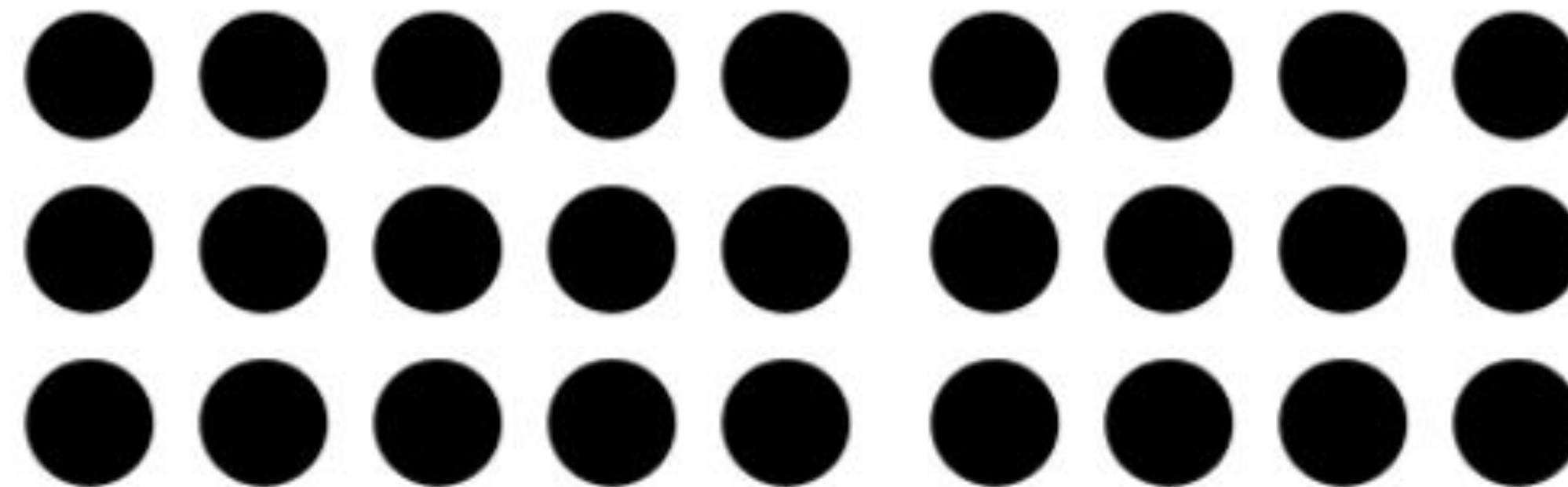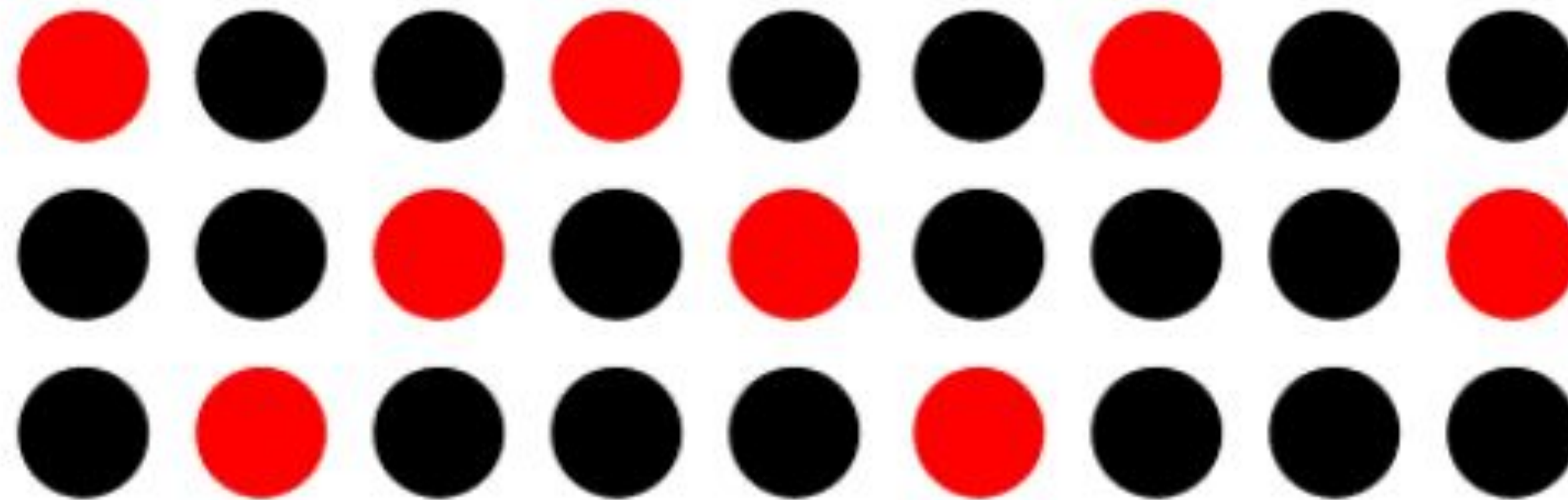
Proximity (Gestalt Principle)

Objects that are closer together are perceived as more related than objects that are further apart.
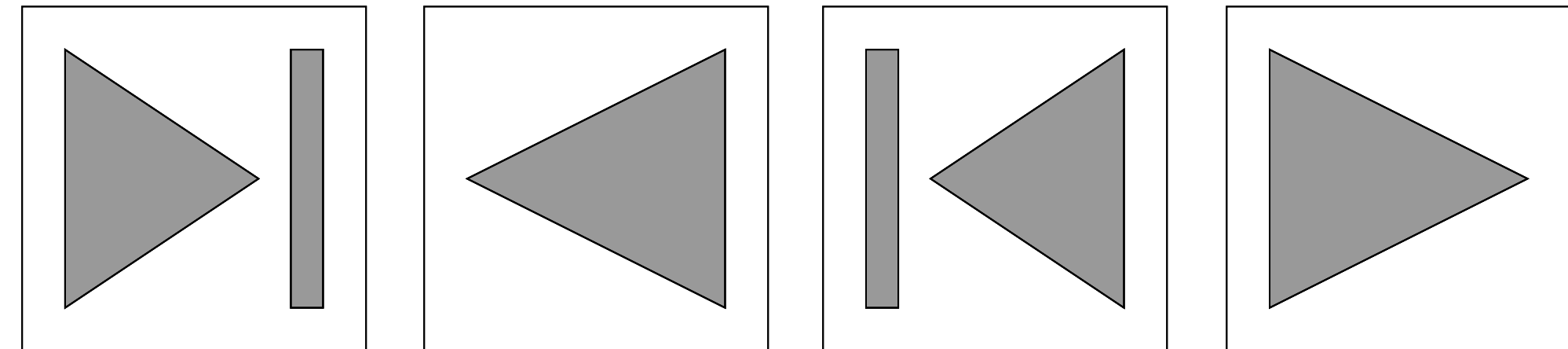

(a)   (b)   (c)

Similarity (Gestalt Principle)

Elements that share similar characteristics (eg. colour, shape, size, texture) are perceived as more related than elements that do not
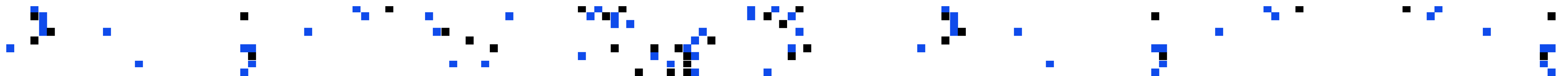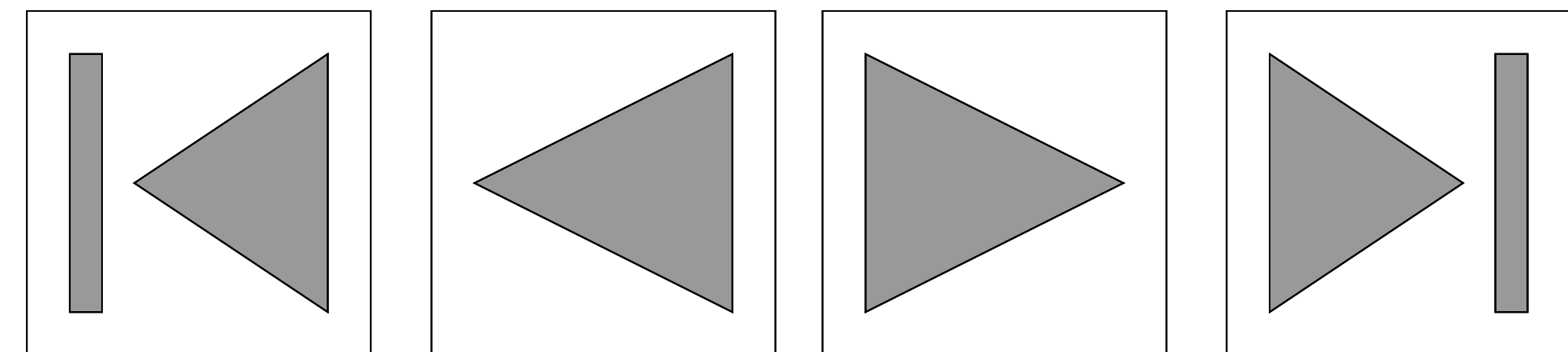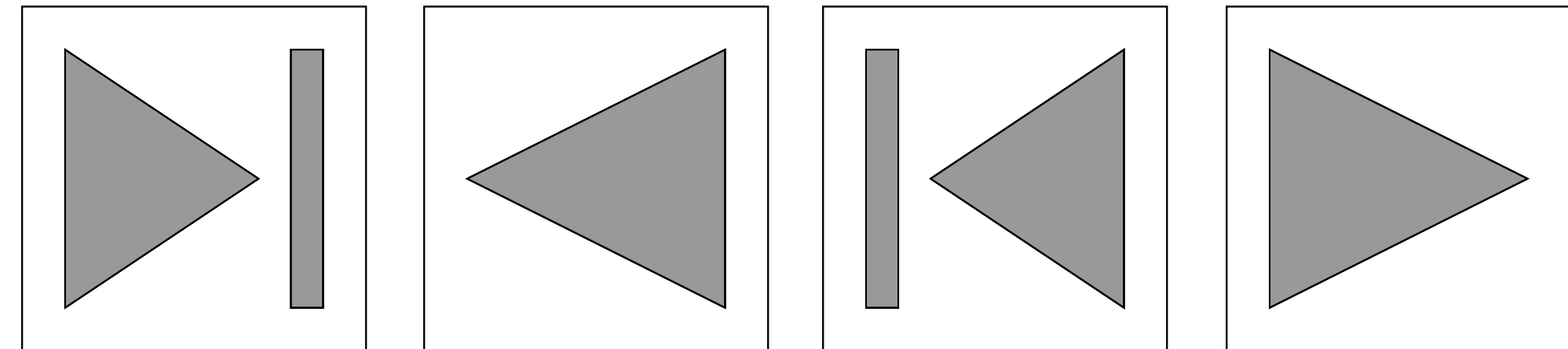
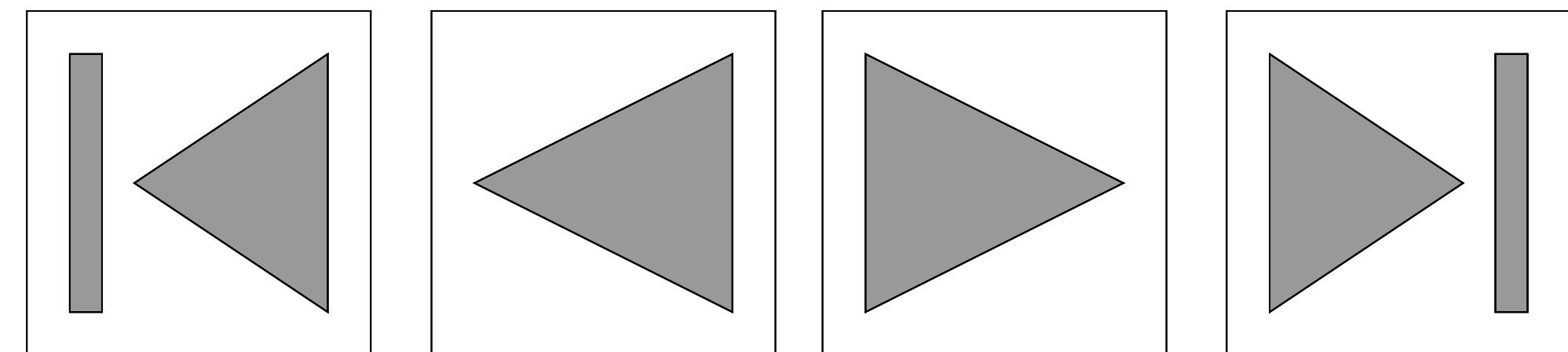# Which is the better mapping?

1.

2.

Mapping

Relationship between controls and their movements and the results in the world
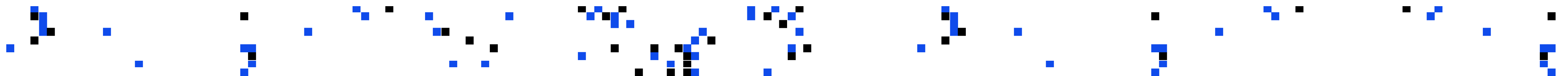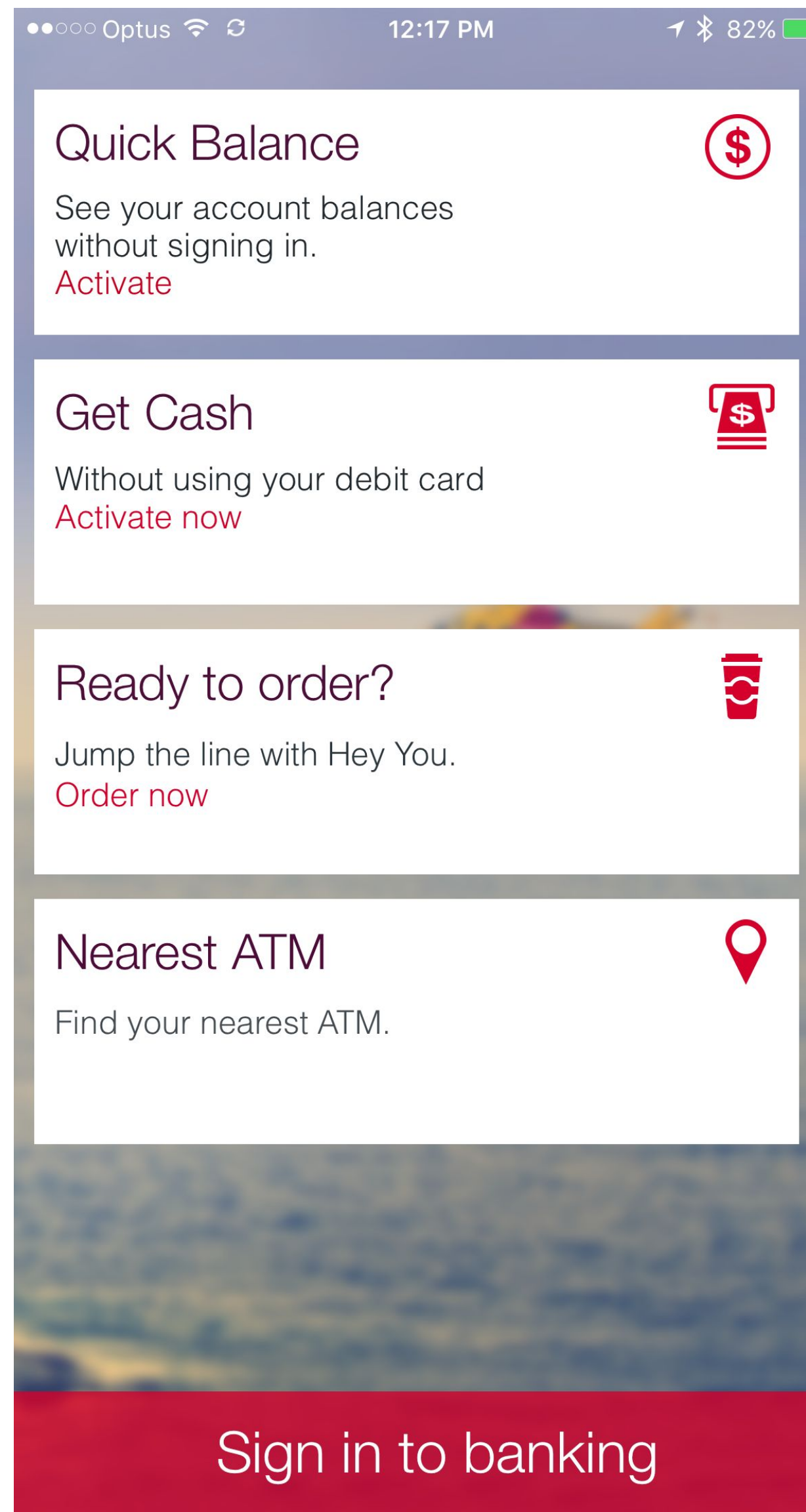
1. A poor mapping:

2. A better mapping:

The control buttons are mapped better onto the sequence of actions of fast rewind, rewind, play and fast forward

Mapping examples

- Mappings to known icons

- Visibility and Gestalt Principles can help with mappings because the white background 'groups' each tab, while also 'mapping' them together

- Mapping is often related to the design of controls

  Good mapping allows users to know where to act and the correct things to do

Important design principles

- Visibility
- Feedback
- Constraints
- Consistency
- Affordances
- Mapping
- **Signifiers**

Signifiers

Affordances: what actions are possible.

Signifiers: where the action should take place

- Good design communicates clearly the purpose, structure, and operation of the device to the users

Signifiers are signals

- E.g. signs, labels, and drawings, such as "push," "pull," or "exit" on doors, or arrows and diagrams indicating what is to be acted upon or in which direction to gesture

In design, signifiers are more important than affordances

Designers must:

- provide signifiers so that users can understand how to use a product or service
- Provide some sign of what it is for, what is happening, and what the alternative actions are
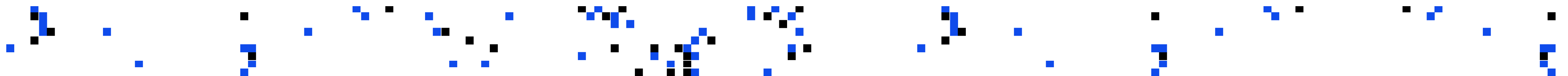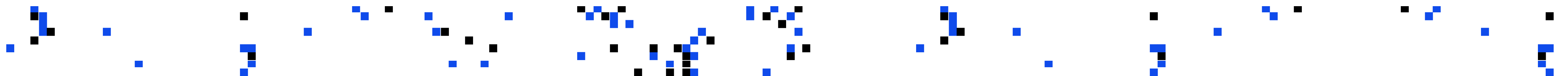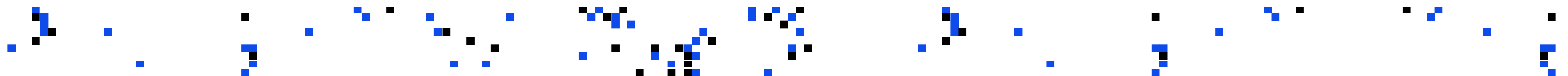
With signifiers

Without signifiers

Interaction Designer: **Hiroshi Ishii**

https://tangible.media.mit.edu/

The Tangible Media Group, led by
Professor Hiroshi Ishii, explores the
Tangible Bits & Radical Atoms visions
to seamlessly couple the dual world
of bits and atoms by giving dynamic
physical form to digital information
and computation.

Interaction Designer: **Hiroshi Ishii** (watch in your own time)

Questions?