Design Principles
Analytical Evaluation

Unit 3

Eleonora Mencarini, PhD
eleonora.mencarini@unitn.it
Prof. Antonella De Angeli, PhD
antonella.deangeli@unitn.it

Who am I?

I am a HCI researcher at the Fondazione Bruno Kessler, in the **i3 research group**.

- PhD in HCI (from Unitn - DISI)
- MA in Communication Science from the University of Siena.
- Working experience as interaction designer.

My research topics

PhD Thesis: “Designing wearables for outdoor sports”

Body in interaction

Co-design

Sports & Outdoors

Wearable devices

Design Principles
Analytical Evaluation

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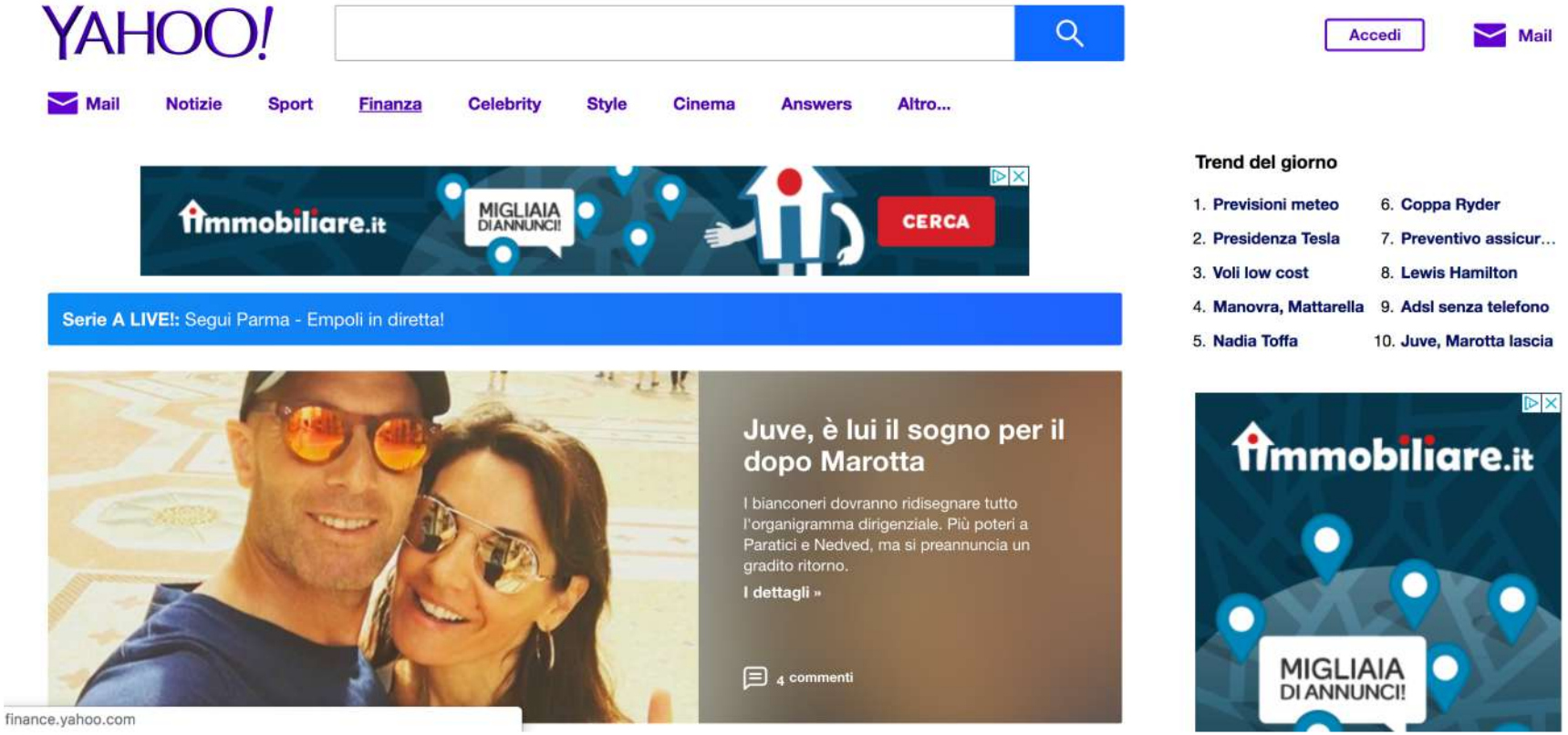
Learning outcomes

- Fundamental design principles
- Usability heuristics
- Develop
  - Awareness of how to apply them in design
  - Critical ability to evaluate design

Design Principles

- Generalizable 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 at the interface
- Derived from a mix of theory-based knowledge, experience and common-sense

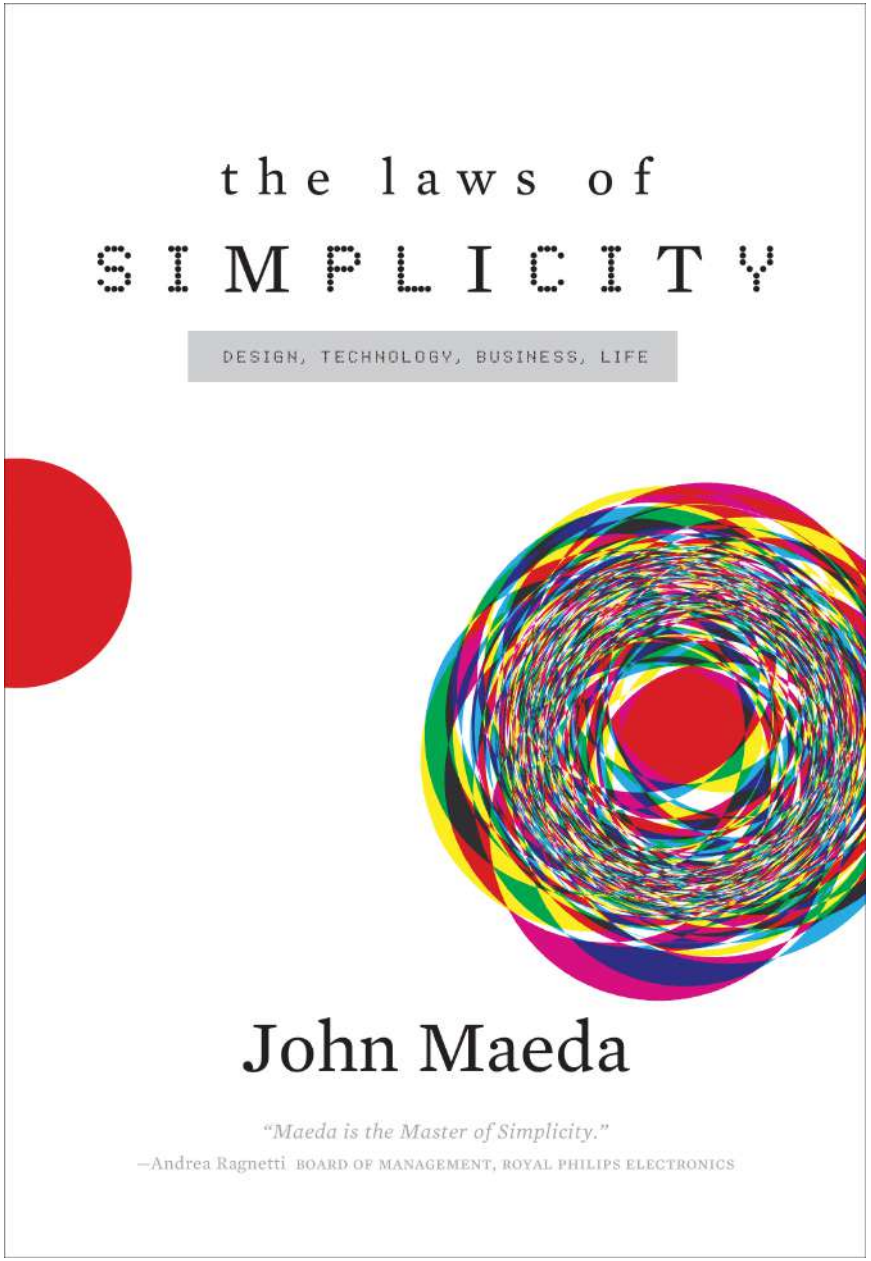
Which one do you prefer?



Which one do you prefer?

01 - Simplicity

- Usability
  - Simple things work better (strong correlation with usability)
  - Processing fluency
- UX
  - Simple things are more beautiful (strong correlation between simplicity and aesthetic)


the laws of
SIMPLICITY
DESIGN, TECHNOLOGY, BUSINESS, LIFE
John Maeda
"Maeda is the Master of Simplicity."
—Andrea Ragnetti BOARD OF MANAGEMENT, ROYAL PHILIPS ELECTRONICS

Design factors for *simplicity*

- Visual clutter
- Number of Colours
- Symmetry
- Figure-ground contrast

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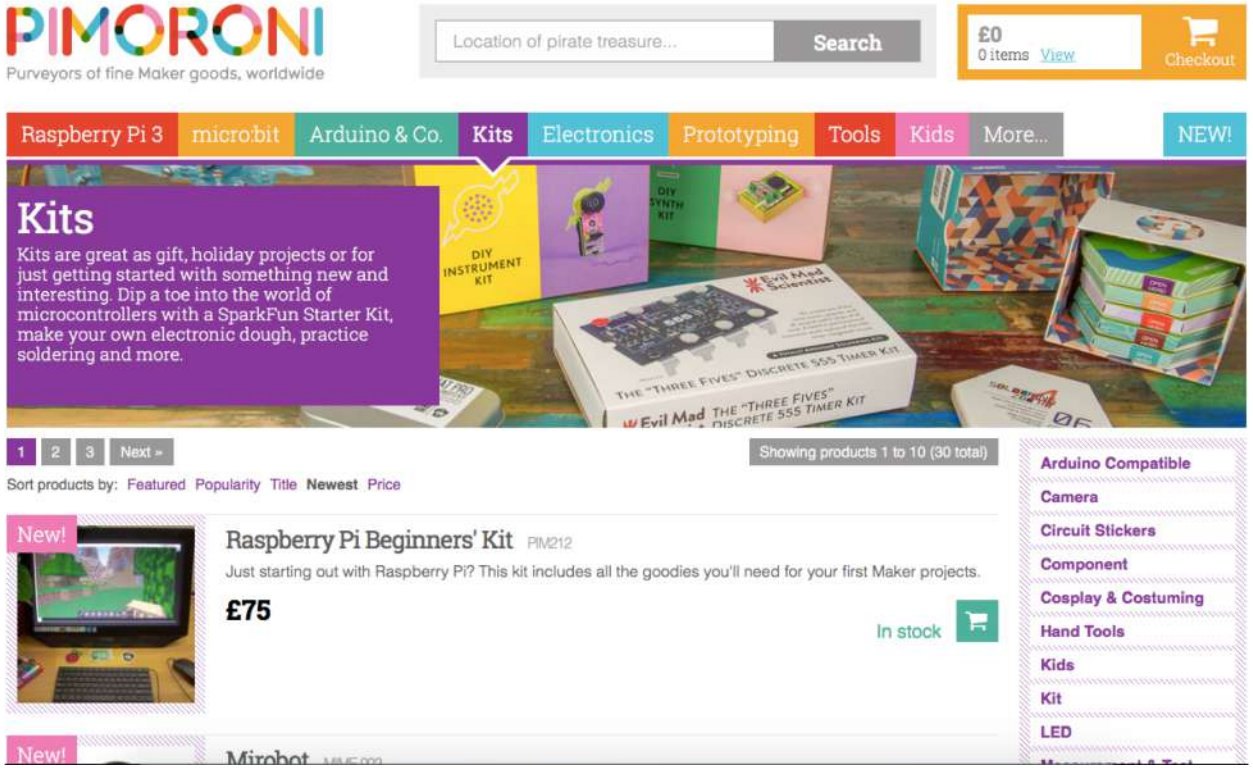

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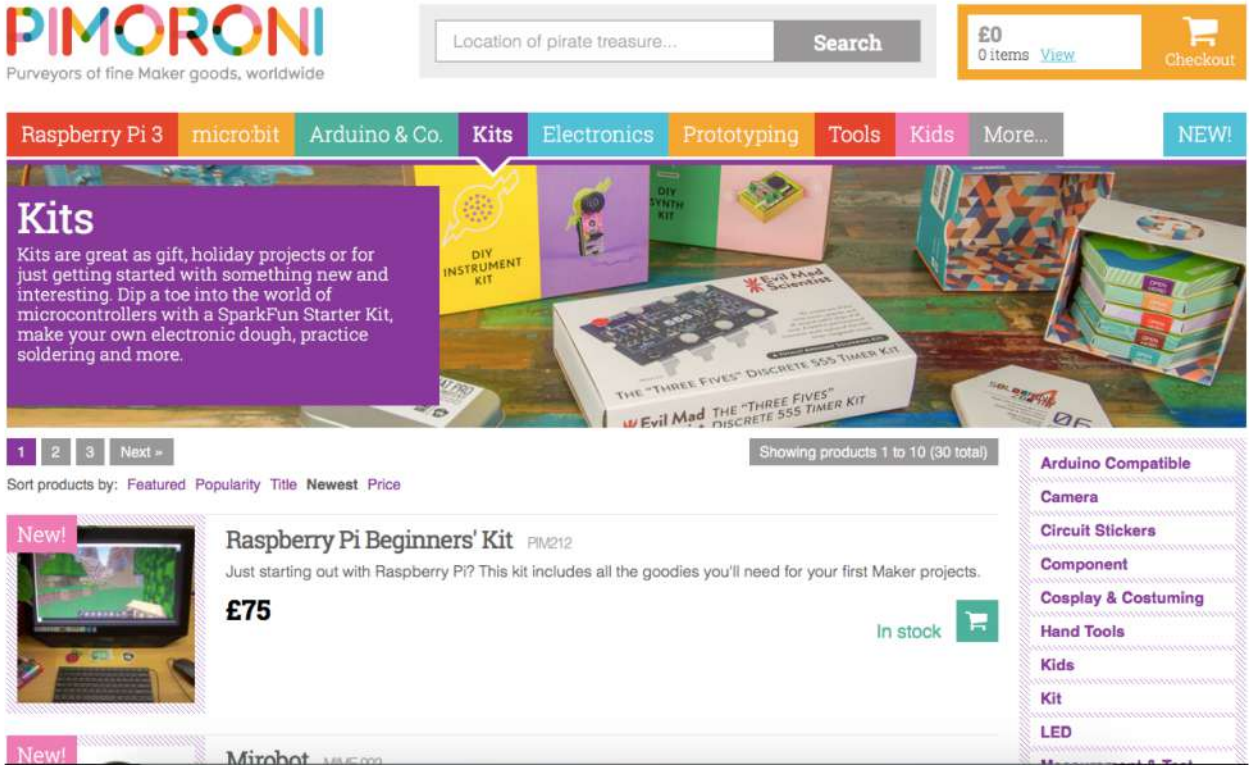

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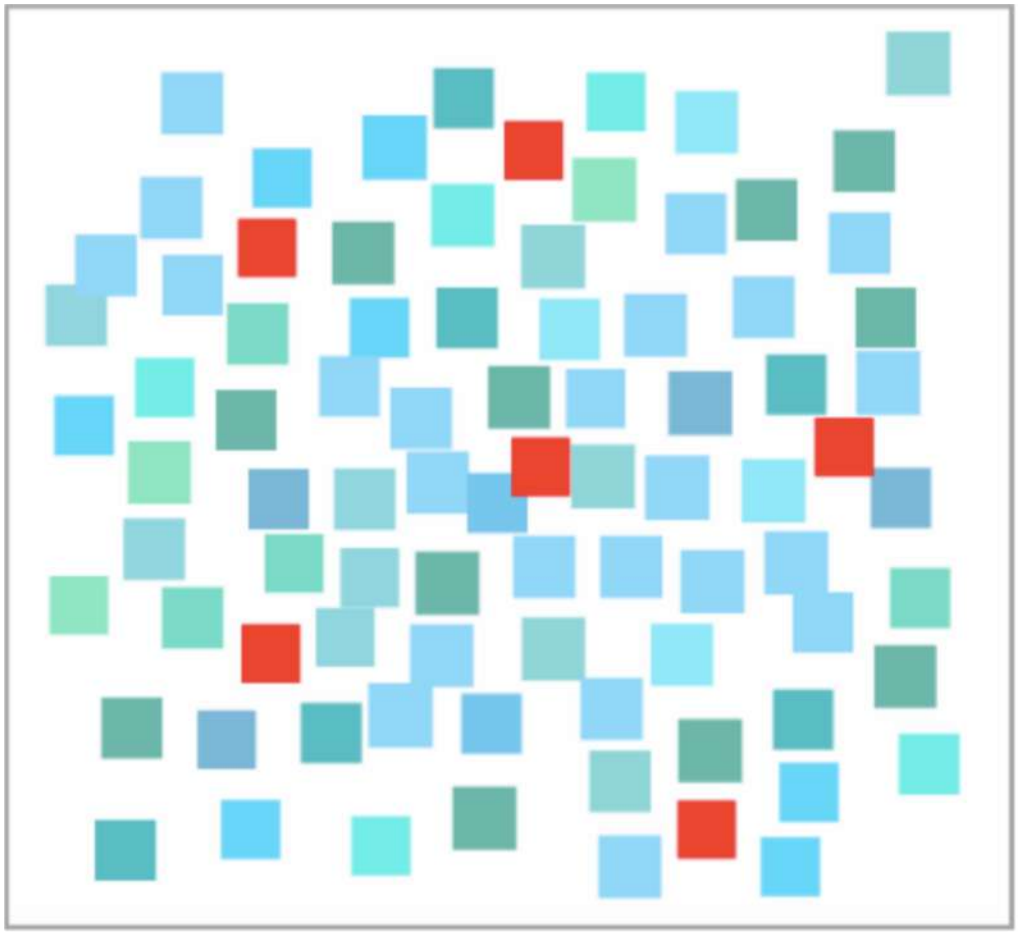

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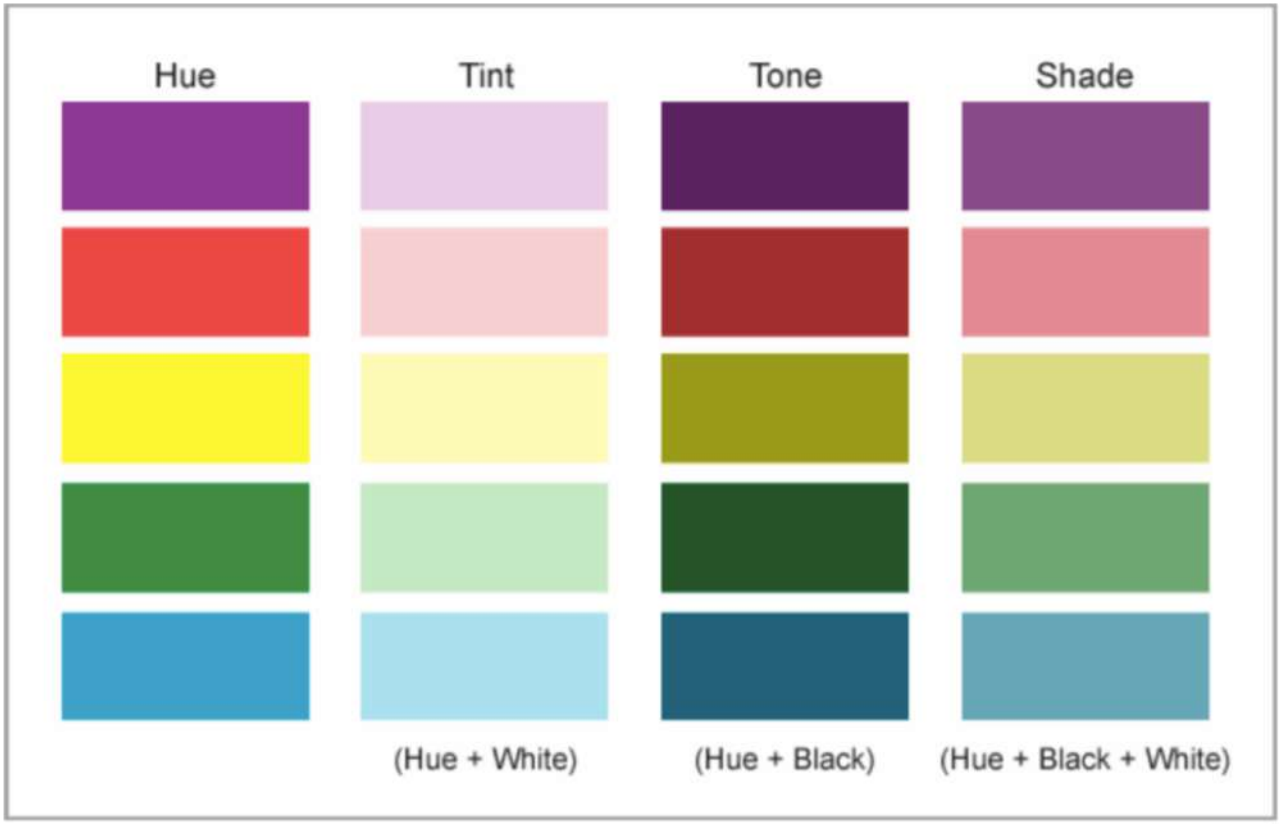

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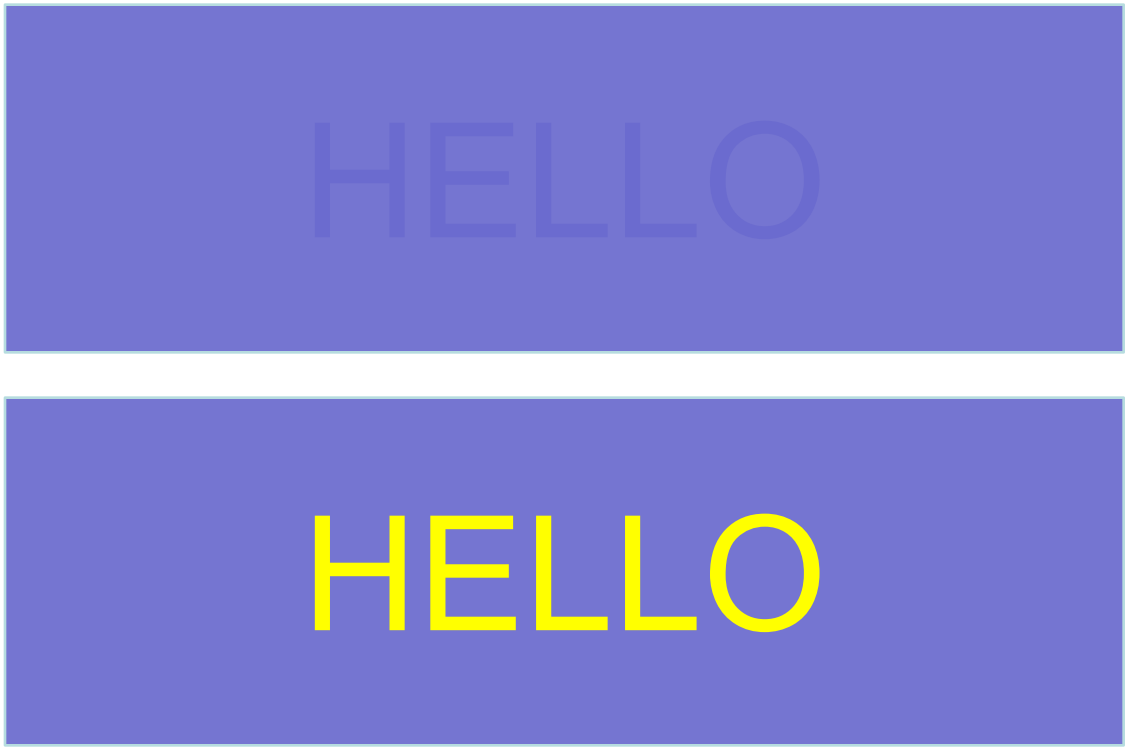


Exercise

For each principle:

- I present a principle
- You have 0.5 minutes to think of an interface that is a good or bad example for that principle

02 - Visibility

Visibility is concerned with making **relevant parts** of the design visible – making the **tasks at hand easy to see and find**.

All the **functional parts** must be visible and must provide a **clear message** about what the user can do through them.

02 - Visibility

From: www.baddesigns.com

This is a control panel for an elevator:

- How does it work?
- Push a button for the floor you want…
- Nothing happens
- Push any other button…
- Still nothing.
- What do you need to do?

02 - Visibility

…you need to insert your room card in the slot by the buttons!

How would you make this action more visible?

From: www.baddesigns.com

02 - Visibility

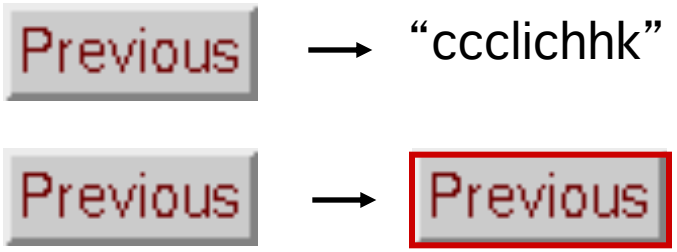
From: www.baddesigns.com

You could

- make the card reader more obvious
- provide an auditory message that says what to do (which language?)
- provide a big label next to the card reader that flashes when someone enters
- make the lights near the reader blink when someone pushes a button

03 - Feedback

- Sending information back to the user about what s/he has done and what the system is doing
- Includes sound, highlighting, animation and combinations of these
  - e.g. when screen button clicked on provides sound or red highlight feedback:



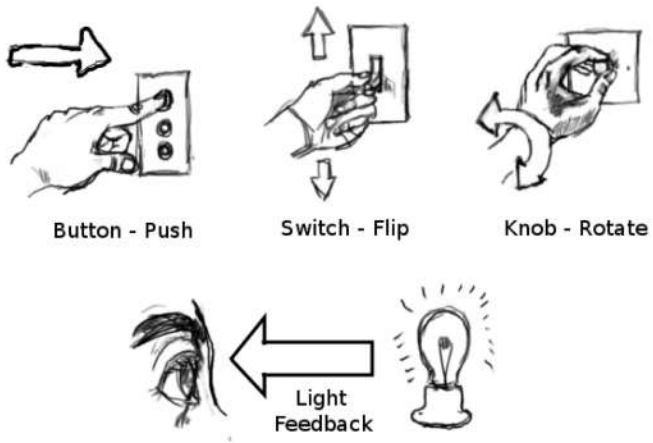
04 - Affordances

- Are real and perceived properties of an object that tell us how to use it
  - Perceived > e.g., children perceive affordances differently from adults
- Work as an invitation to use an object in a specific way
  - e.g. a mouse button invites pushing, a door handle affords pulling
- Much popular in interaction design to discuss how to design interface objects
  - e.g. scrollbars to afford moving up and down, icons to afford clicking on

04 - Affordances

Affordances to pull or push doors

04 - Affordances



Affordances for different ways to manipulate objects

04 - Affordances

“La caffettiera del masochista”, Italian translation of “Design of everyday things” by D. Norman

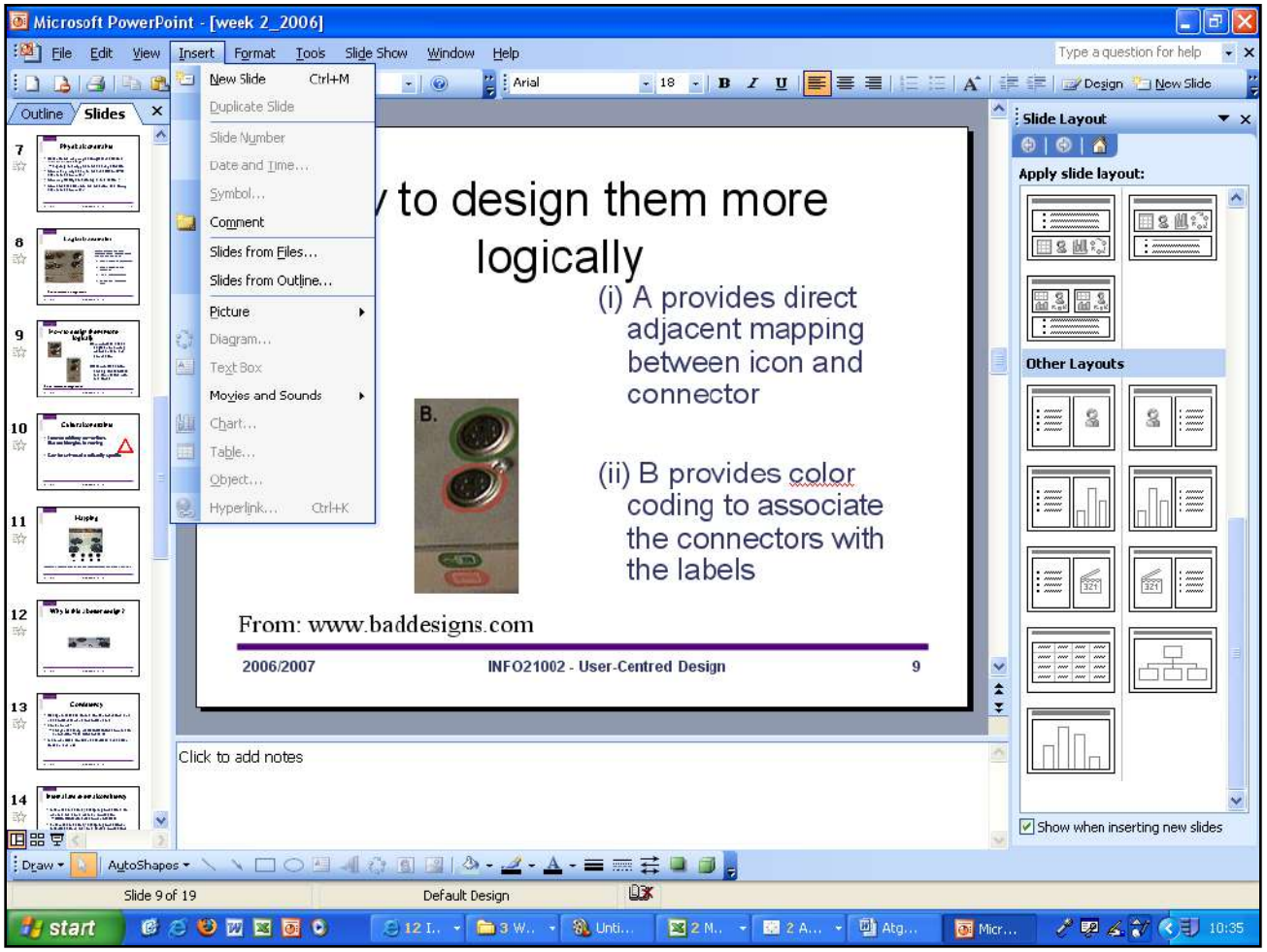
05 - Constraints

- Restrict the possible actions that can be performed
- Help prevent user from selecting incorrect options and incur in errors
- Three main types (Norman, 1999)
  - Physical
  - Cultural
  - Logical

Physical constraints

- Refer to the way physical features restrict the use of objects
  - E.g. only one way you can insert a key into a lock
  - How many ways can you insert a CD or DVD into a computer?
  - How physically constraining is this action?

Physical constraints



Cultural constraints

- Learned arbitrary conventions shared by a society or a smaller group of people
  - e.g., red triangles for warning

Cultural constraints / colours

Cultural constraints / affordances

Cultural constraints / context

Alarm icon

Context: workplace, factories

WiFi icon

Libraries, offices, public spaces

Logical constraints

Exploits people's everyday common sense reasoning about the way the world works

This is the rear of a PC case

- Where do you plug the mouse?
- Where do you plug the keyboard?
- Top or bottom connector?
- Do the colour coded icons help?

From: www.baddesigns.com

How to design them more logically

A. provides direct adjacent mapping between icon and connector

B. provides colour coding to associate the connectors with the labels

From: www.baddesigns.com

06 - Mapping

Relationship between controls, their movements and the results in the world

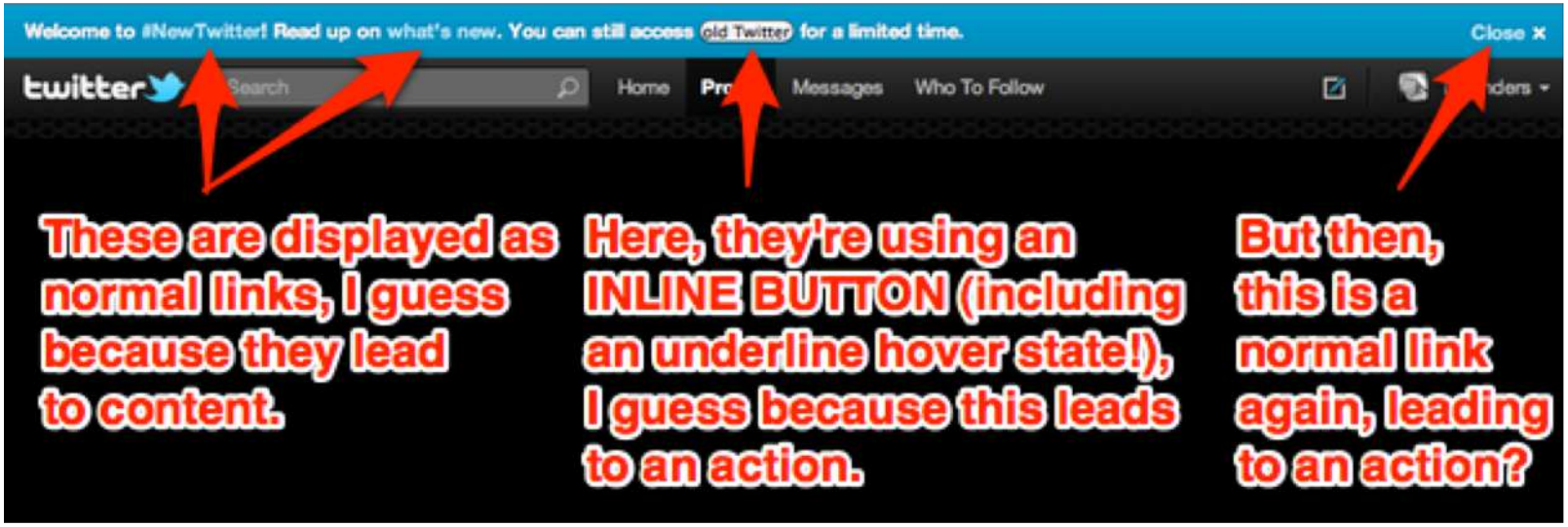
Is this a better design? Why?

07 - Consistency

- Design interfaces should have similar operations and use similar elements for similar tasks
  - e.g., always use ctrl key plus first initial of the command for an operation – ctrl+C, ctrl+S, ctrl+O
- Consistent interfaces are easier to learn and use
- Consistency can be Internal and External

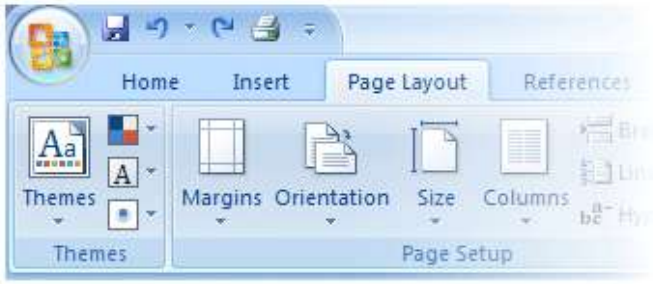
Internal consistency

- Designing operations to behave the same within an application
  - Difficult to achieve with complex interfaces

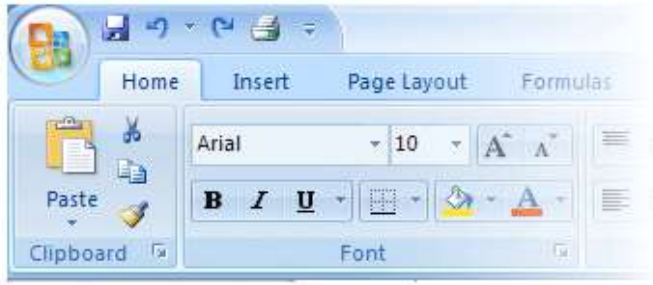


Internal consistency

Microsoft Word



Microsoft Excel



Microsoft Powerpoint

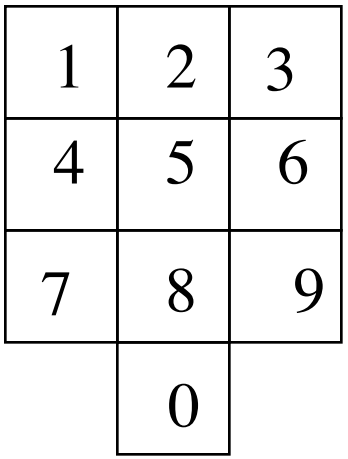
External consistency

- Designing operations and interfaces to be the same across applications and devices
  - Very rarely the case, based on different designers' preferences
  - Brand Identity (e.g. Windows vs. Mac closing button)

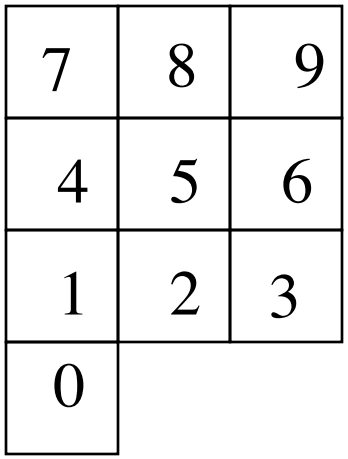
External inconsistency

Keypad numbers layout

(a) phones, remote controls

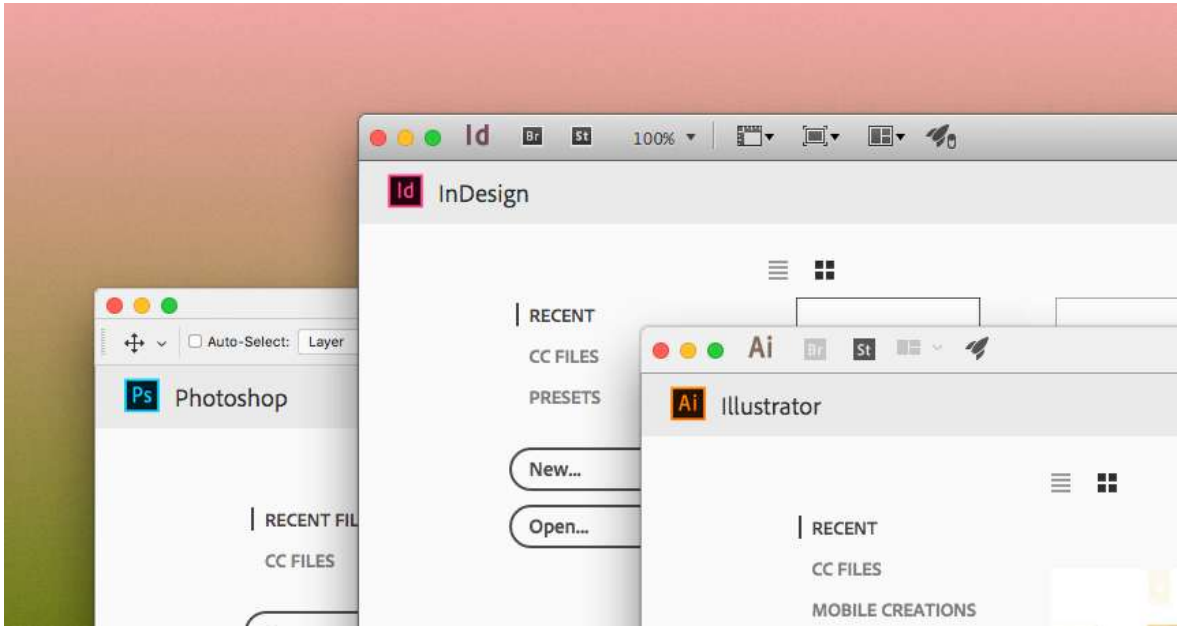


(b) calculators, computer keypads



External inconsistency

Adobe Creative Suite



Illustrator, Photoshop, Indesign do not have the same operations, nor interfaces.

E.g.
Ctrl+Z doesn't work on Photoshop

Usability Heuristics

- Similar to design principles, except more prescriptive
- Used mainly as the basis for evaluating systems
- Provide a framework for heuristic evaluation

Usability heuristics (Nielsen, 2001)

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

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

Severity Ratings for Usability Problems

0	I don't agree that this is a usability problem at all
1	Cosmetic problem only. Need not be fixed unless extra time is available on project
2	Minor usability problem: fixing this should be given low priority
3	Major usability problem: important to fix, so should be given high priority
4	Usability catastrophe: imperitave to fix this before product can be released

by Jakob Nielsen on January 1, 1995

https://www.nngroup.com/articles/how-to-rate-the-severity-of-usability-problems/

Key points

- Design principles
  1. Simplicity
  2. Visibility
  3. Feedback
  4. Affordances
  5. Constraints
  6. Mapping
  7. Consistency
  8. Heuristics

Recommended reading

- Preece J., Sharp H., Rogers Y. (2015) *Interaction Design: Beyond Human-Computer Interaction*, cap. 1-15

- More on design principles
  - Norman D. (1988) *The design of everyday things*
  - http://designingwebinterfaces.com/6-tips-for-a-great-flex-ux-part-5

- More on Usability Heuristics
  - https://www.nngroup.com/articles/ten-usability-heuristics/