31260 42017

Fundamentals of Interaction Design

Lecture 2, Week 2

A repeat lecture has opened Wednesdays: CB05B.01.013, 11am, starting from this week.

Podcast mentioned in week 1 lecture.

https://lexfridman.com/ai/

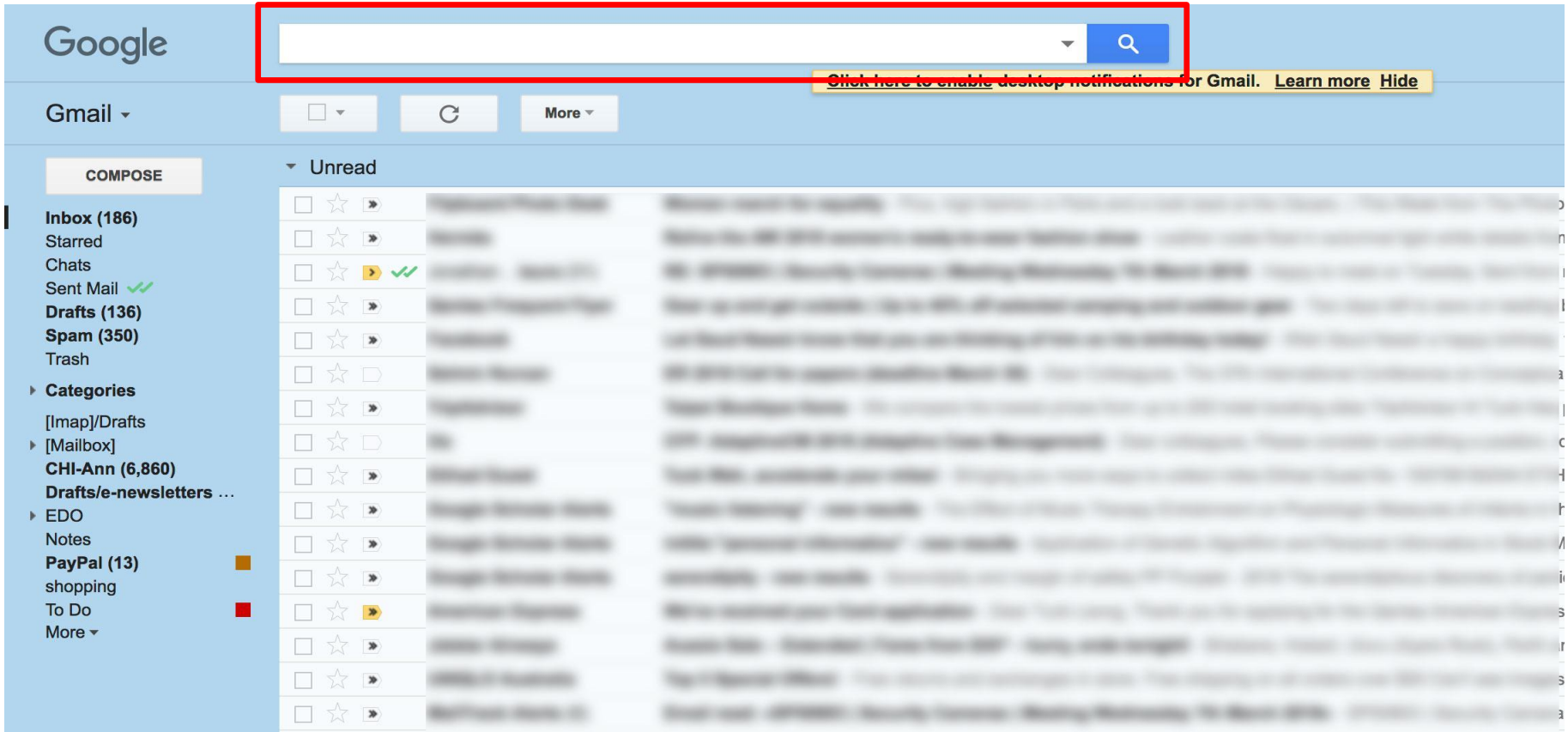
Or search AI Lex Fridman on phone podcast apps.

Week 1 recap and examples

Important design principles

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

Is this (in the red rectangle) a good example of visibility?



Visibility

- Let users know there is an opportunity to interact
- Make it reasonably predictable what will happen
- Provide cues and information, but do not overdo it

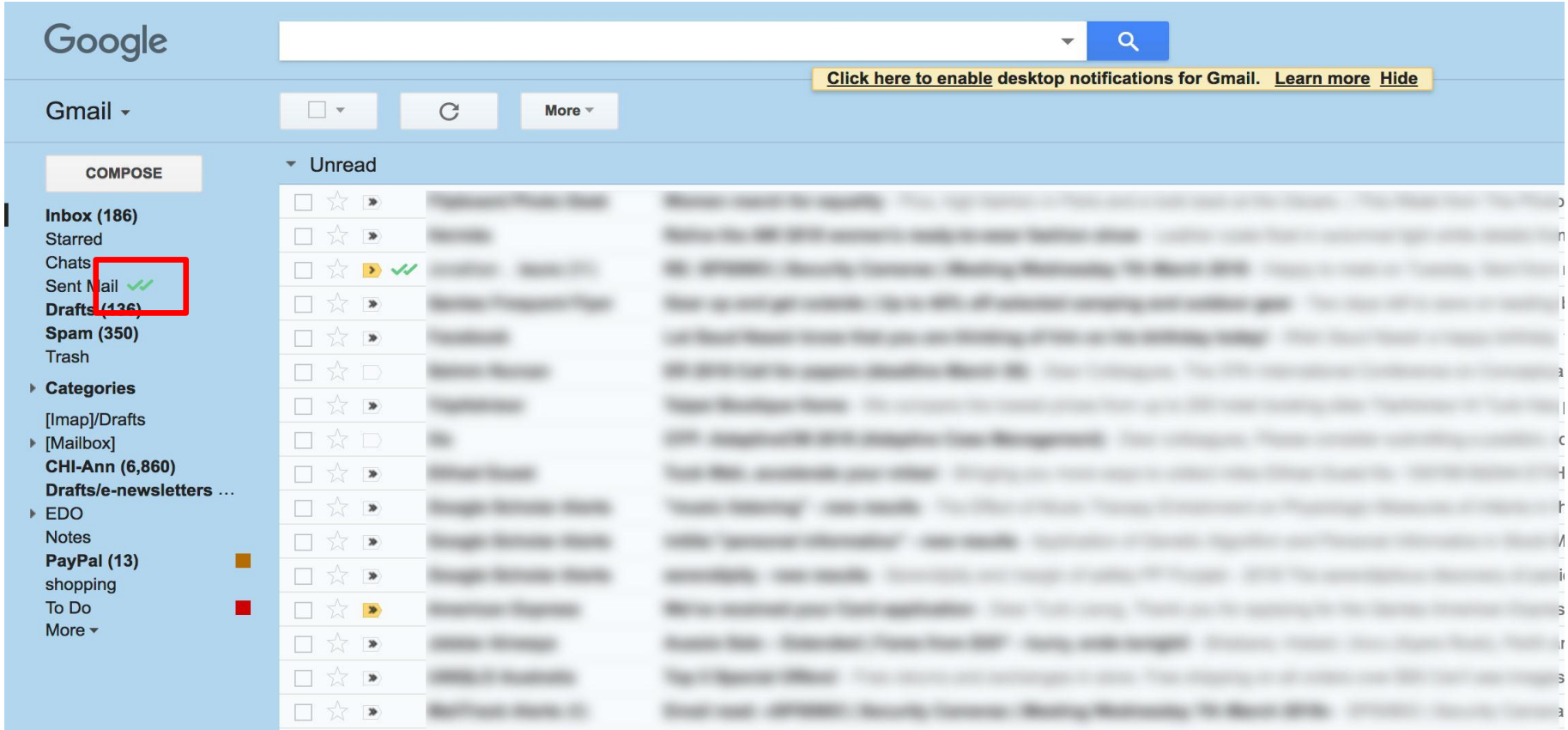
- Good visibility means that obvious prompts and cues are present which:
  - Lead the user through an interaction
  - Guide them through a series of tasks
  - Indicate what possible actions are available to them
  - Communicate the context of the situation

Examples of visibility prompts and cues

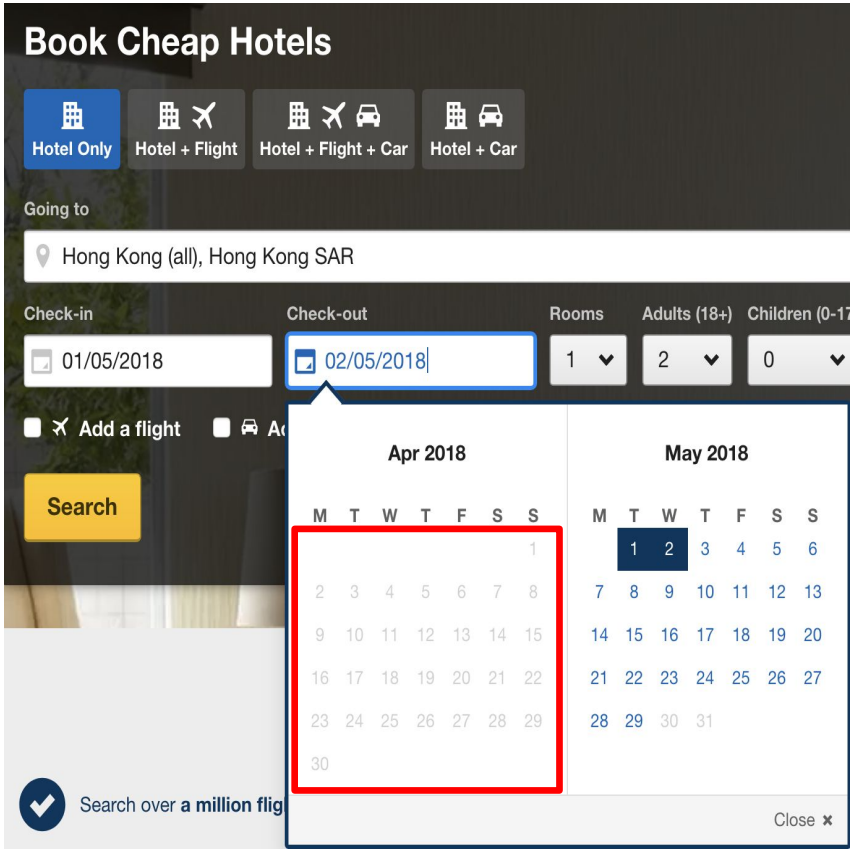
Does it stand out? Is it easy to locate?

- 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? (for example top right).
- How cluttered is the interface?

Is this (in the red rectangle) a good example of visibility?



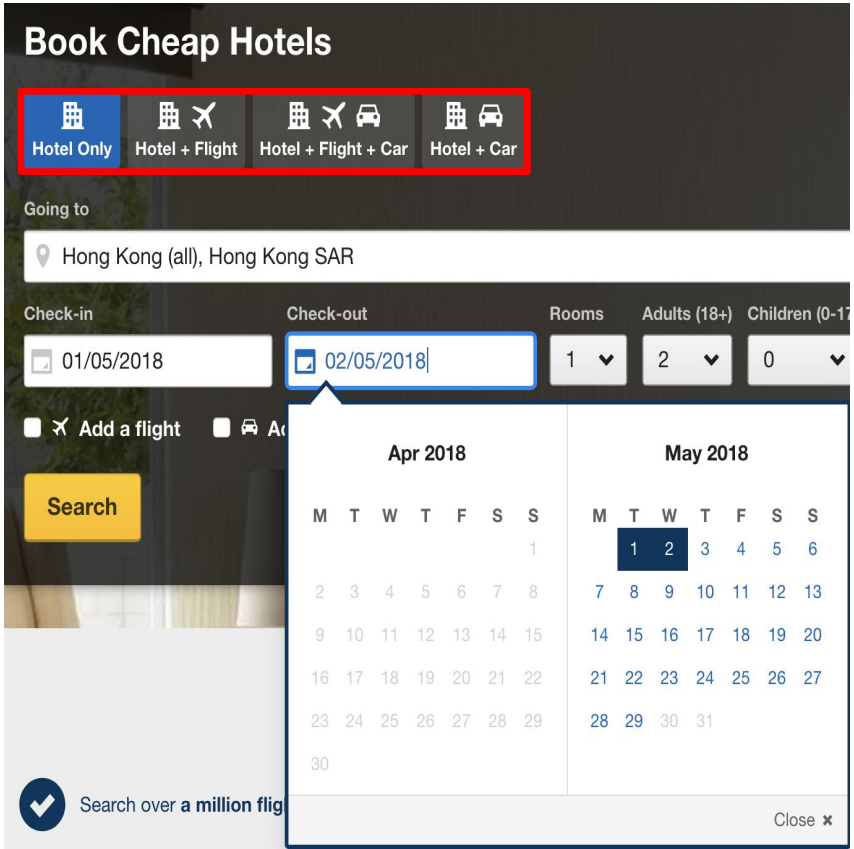
Q2. Is this (in the red rectangle) a good example of constraints?



Constraints

- Restricting the possible actions that can be performed at one point in time
- 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

Is this (in the red rectangle) a good example of consistency?



Consistency

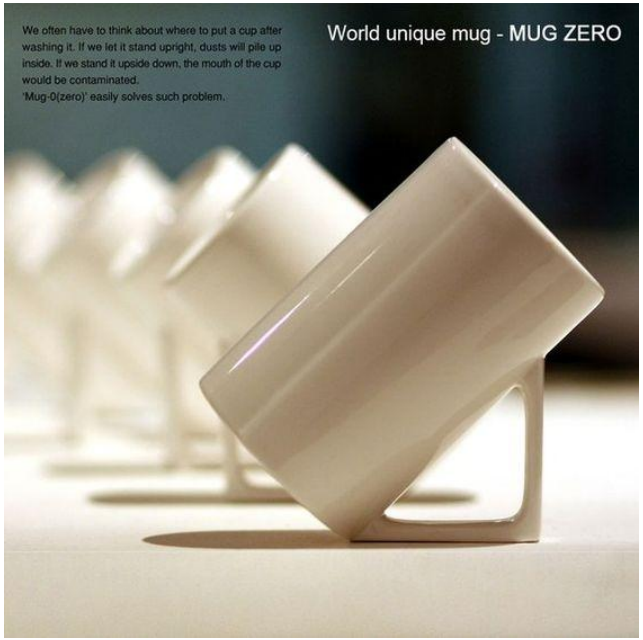
A comparison: a relationship between two interface/interaction elements

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
Components with different behaviours should have a different appearance

Affordances: to give a clue



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)

Signifier

- Used to reduce error in using something
- Something (e.g., sign, label, hints, short instruction), that is used when users are found to be unsure of how to interact with the design accurately or appropriately
- Often when affordances aren’t obvious or not well-designed - labels such as: “Tap here” or “touch to start” or “push not pull”

Image A: Is the ‘Tap side’ text a Signifier?

IMAGE A

IMAGE B

Image B: Is the ‘Surcharge’ text a Signifier?

IMAGE A

IMAGE B

Which design principle is this?

Which design principle is this?

Which design principle is this?

Which design principle is this?

Donald Norman on affordances… and ‘Norman doors’

Usability Principles and Heuristics

Usability Principles

Usability principles

- Similar to design principles, except more prescriptive
- Mainly used as the basis for evaluating systems
- Provide a framework for heuristic evaluation
- **A ‘usability principle’ is a ‘heuristic’**

For more information, see Chapter 15 of the Interaction Design book

Usability design principles (Preece et al, 1994)

from software engineering

PRINCIPLE	DESCRIPTION
Know the user population	Being sympathetic to different user needs
Reduce the cognitive load	Design so that users don't have to remember large amounts of detail
Engineer for errors	People always make mistakes. The system can be designed both to prevent errors and to enable recovery from errors
Maintain consistency and clarity	From standard operations and representations and from using appropriate metaphors. A designer's understanding of what is 'clear' will depend on their understanding of their users

Usability design principles (Sommervile, 1995)

from software engineering

PRINCIPLE	DESCRIPTION
User familiarity	The interface should use terms and concepts which are drawn from the experience of the anticipated users
Consistency	The interface should be consistent in that, comparable operations should be activated in the same way
Minimal surprise	Users should never be surprised by the behaviour of a system
Recoverability	The interface should include mechanisms to allow users to recover from their errors
User guidance	The interface should incorporate some form of context sensitive user guidance and assistance

Usability design principles (Macaulay, 1995)

from Human-Computer Interaction for Software Designers

PRINCIPLE	DESCRIPTION
Naturalness	The user does not have to alter their approach to their work in order to interact with the system
Consistency	Expectations built up through the use of one part of the system are not frustrated by changes in another
Non-redundancy	The user needs to input only the minimum information for the systems operation
Supportiveness	The ‘dialogue’ assists the user to use the system
Flexibility	Different levels of user familiarity should be supported

Know the user population

This means being sympathetic to different user needs

From Preece et al. 1994

Know the user population

How is this User Interface (IU) sympathetic to the human (user)?

Know the user population

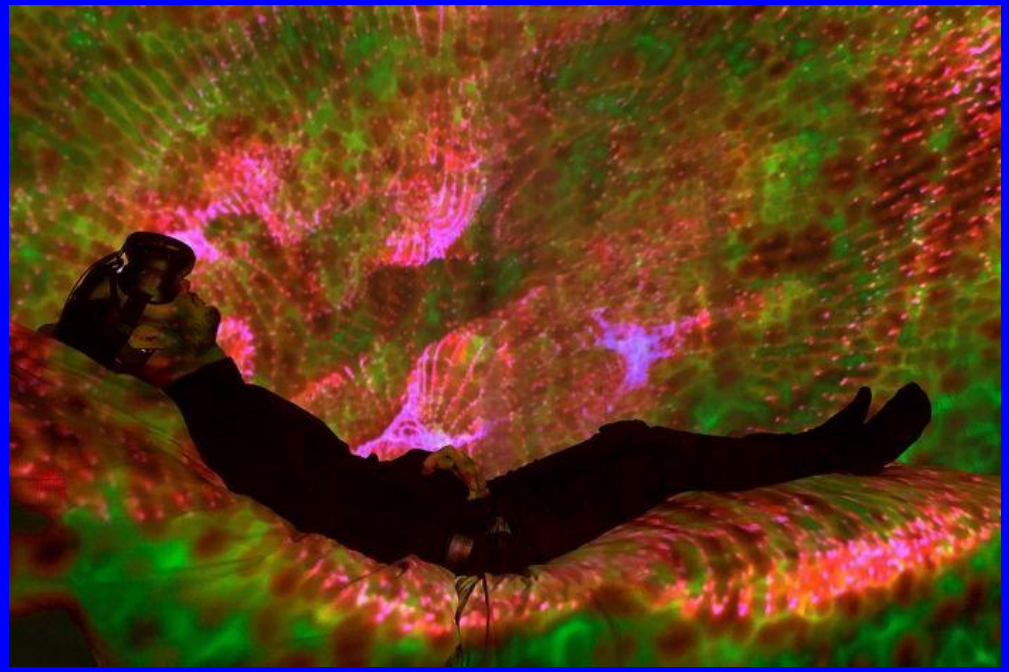
What is the interaction style?

Interaction Style

The concept of **Interaction Styles** refers to all the ways the user can communicate or otherwise interact with the computer system.

See: The Glossary of Human Computer Interaction for more, https://www.interaction-design.org/literature/book/the-glossary-of-human-computer-interaction/interaction-styles

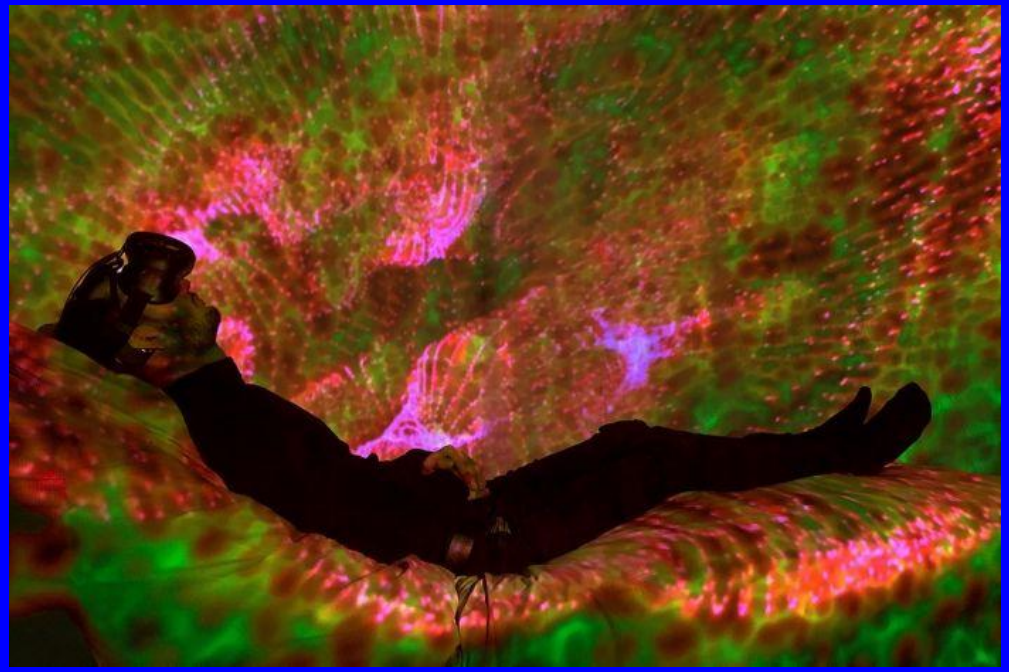
Know the user population



Can VR help people sleep by visualising brain waves?

https://www.abc.net.au/news/health/2019-07-24/virtual-reality-tool-investigated-to-promote-sleep/11323134

Know the user population



Who are the user population and what is the interaction style?

https://www.abc.net.au/news/health/2019-07-24/virtual-reality-tool-investigated-to-promote-sleep/11323134

User familiarity

The interface should use terms and concepts which are drawn from the experience of the anticipated class of user.

Ian Sommerville (1995) Software Engineering

User familiarity

Familiar metaphors can help: such as the iBooks app.
What is the anticipated class of user?

User familiarity

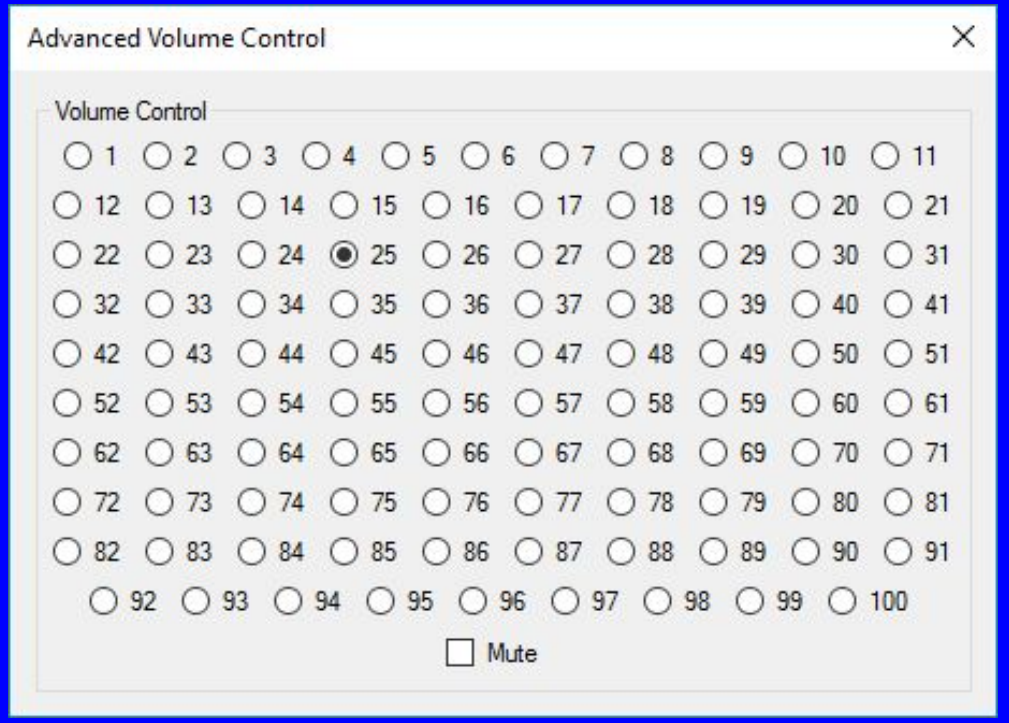
Familiar metaphors can help: such as Rebirth for the iPad.
What is the anticipated class of user?
How would you improve this IU?

Reduce cognitive load

Design so that users do not have to remember large amounts of detail

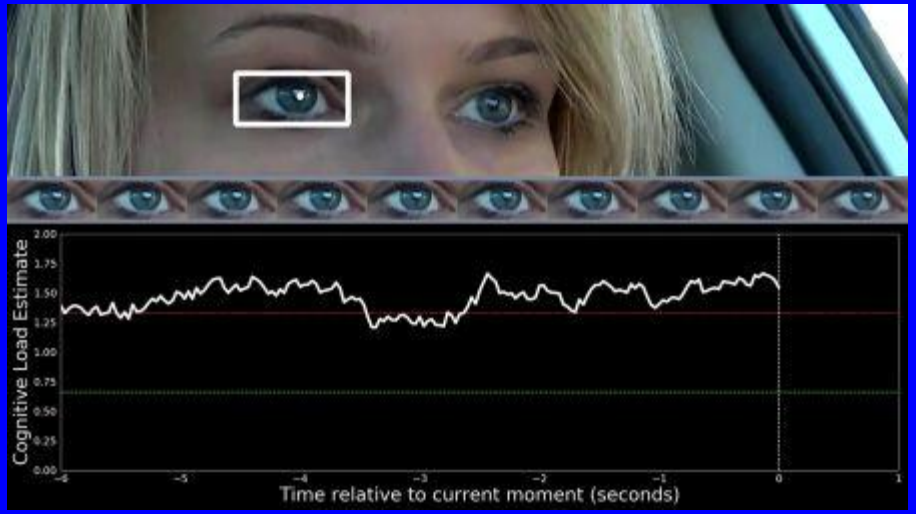
From Preece et al. 1994

Reduce cognitive load



Can you think of an alternative for volume control?

Reduce cognitive load



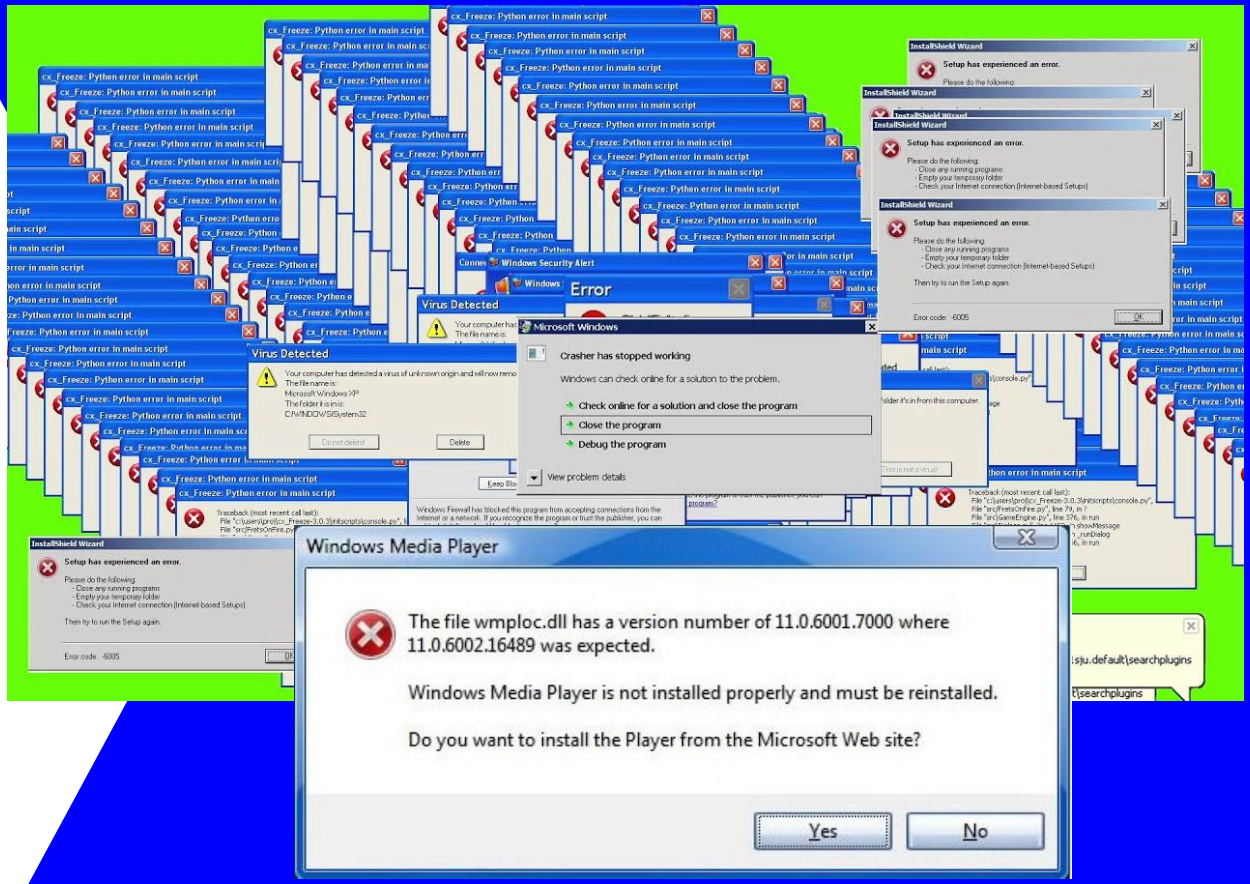
Cognitive Load estimation research, Human Centred AI
https://hcai.mit.edu/

Engineer for errors

People always make mistakes. The system can be designed both to prevent errors and to enable recovery from errors

From Preece et al. 1994

Engineer for errors

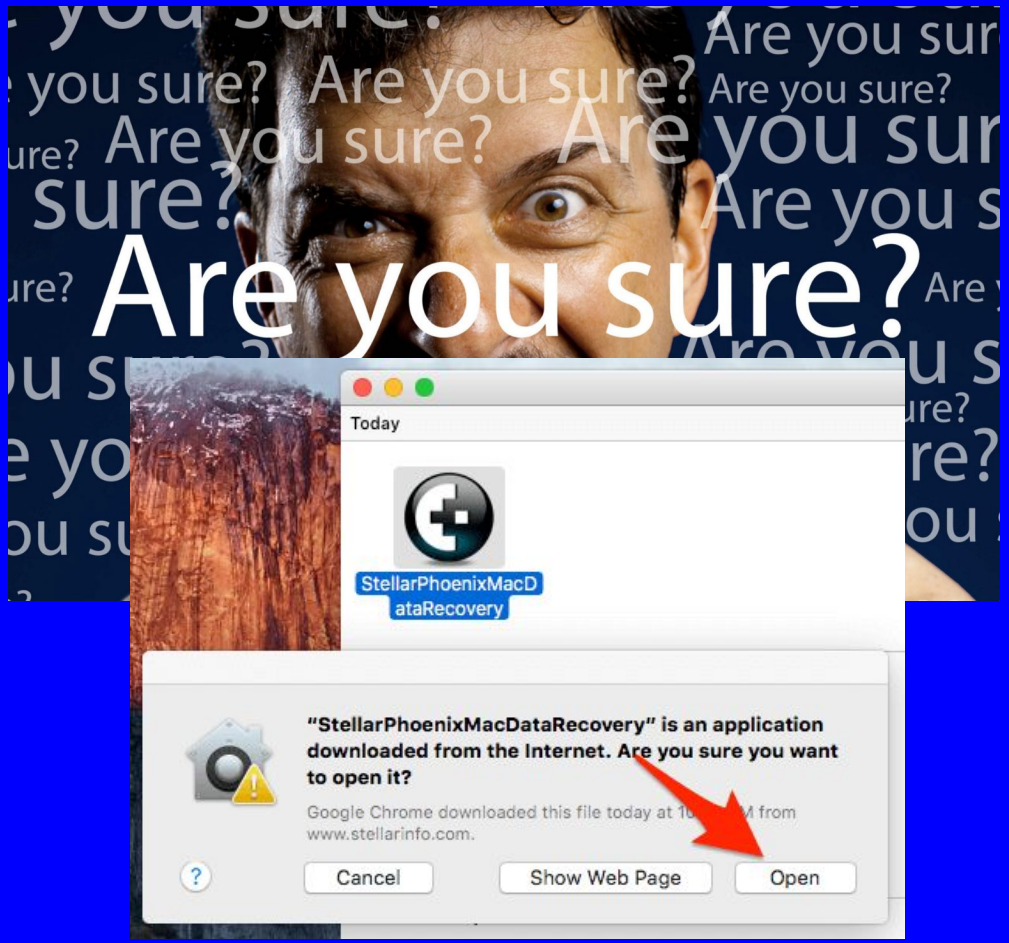


Recoverability

The interface should include mechanisms to allow users to recover from their errors.

Ian Sommerville (1995) Software Engineering

Recoverability

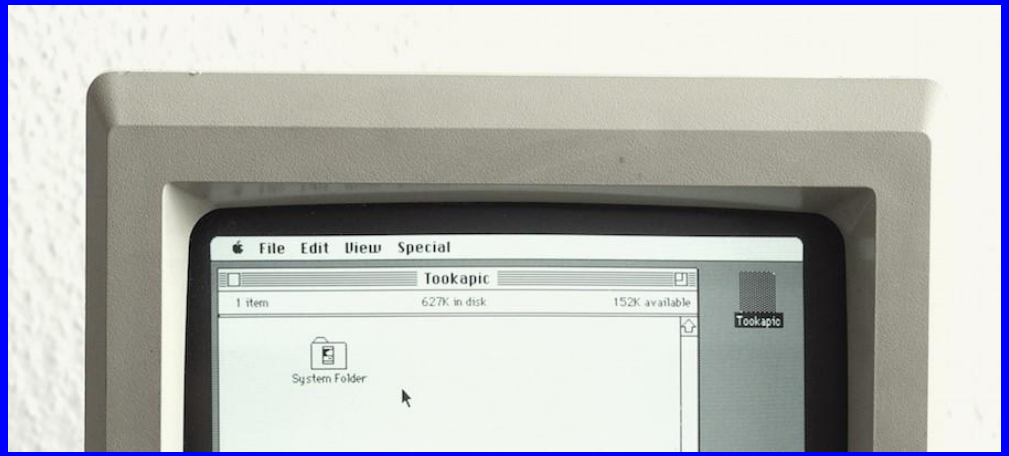


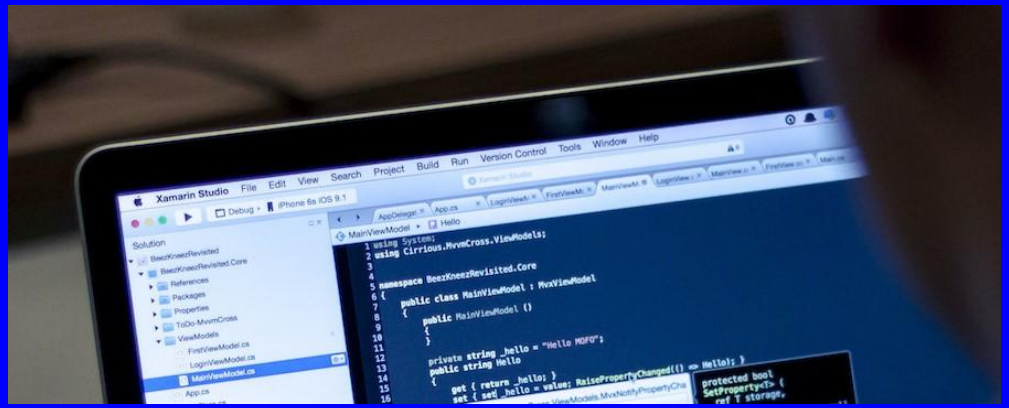
Maintain consistency and clarity

Emerges from standard operations and representations and from using appropriate metaphors. A designer’s understanding of what is ‘clear’ will depend on their understanding of their users.

From Preece et al. 1994

Maintain consistency and clarity





The look of Mac OS over time. Mac OS Menu Bar stays consistent.

Consistency

The interface should be consistent in that comparable operations should be activated in the same way.

Ian Sommerville (1995) Software Engineering

Minimal surprise

Users should never be surprised by the behaviour of a system.

Ian Sommerville (1995) Software Engineering

Minimal surprise

User guidance

The interface should incorporate some form of context - sensitive user guidance and assistance.

Ian Sommerville (1995) Software Engineering

User guidance

How do you guide users in an open world?

Naturalness

The user does not have to alter their approach to their work in order to interact with the system

Linda Macaulay (1995) Human-Computer Interaction for Software Designers.

Naturalness

Natural interactions (touch, gesture and voice recognition) enable users to interact with computer systems in an intuitive way.

Flexibility

Different levels of user familiarity should be supported

Linda Macaulay (1995) Human-Computer Interaction for Software Designers.

Flexibility

Allow users to forgo mouse-clicks by providing them with keyboard shortcuts.

Non-redundancy

The user needs to input only the minimum information for the systems operation

Linda Macaulay (1995) Human-Computer Interaction for Software Designers.

Usability Heuristics

10 Usability Heuristics for User Interface Design *(Nielsen, 2001*)*

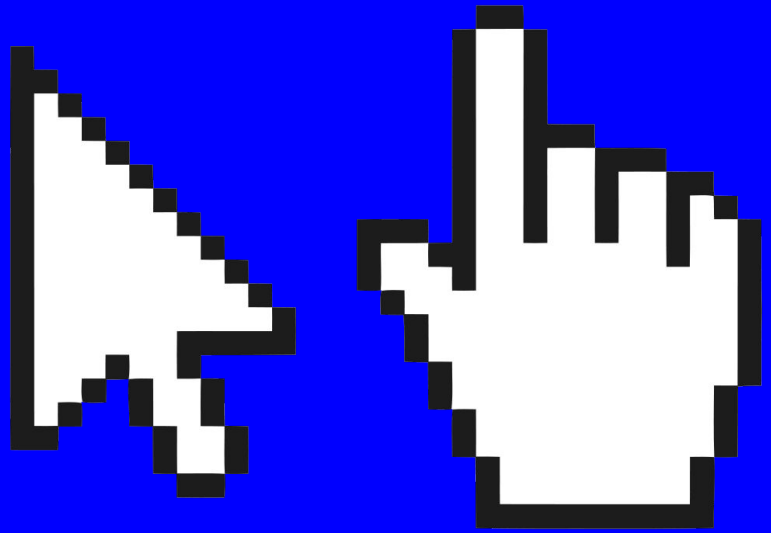
1. Visibility of system status
2. Match between the system and the real world
3. User control and freedom
4. Consistency and standards
5. Help users recognise, diagnose and recover from errors
6. Error prevention
7. Recognition rather than recall
8. Flexibility and efficiency of use
9. Aesthetic and minimalist design
10. Help and documentation

**Study and understand these heuristics - www.nngroup.com/articles/ten-usability-heuristics*

Visibility of system status

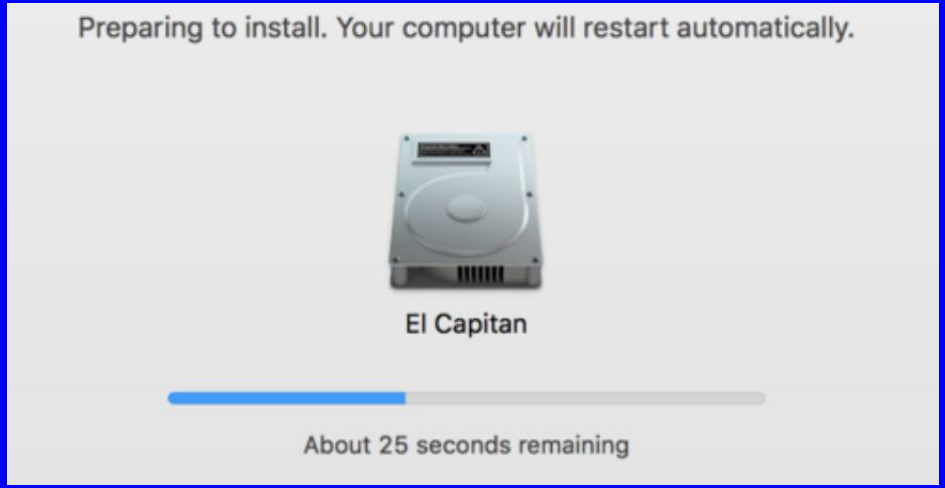
Users should always be informed of system operations with easy to understand and highly visible status displayed on the screen within a reasonable amount of time.

Visibility of system status



The cursor graphic goes from representing an open-hand to a gripped hand when the user…….

Visibility of system status

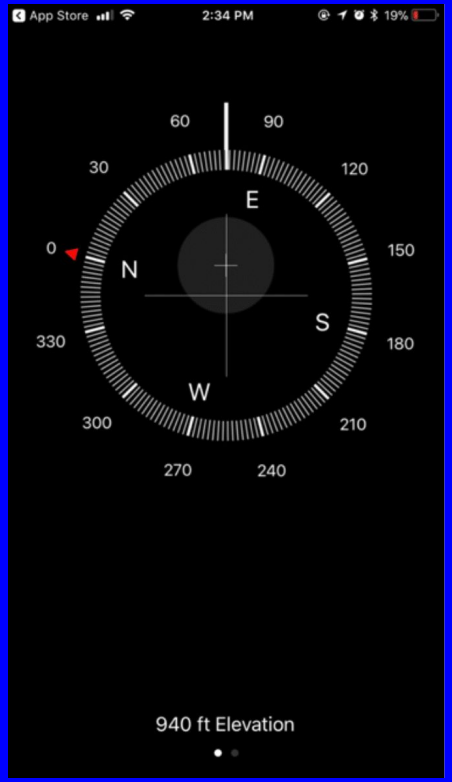


OS installation status

Match between the system and the real world

Designers should endeavor to mirror the language and concepts users would find in the real world based on who their target users are.

Match between the system and the real world



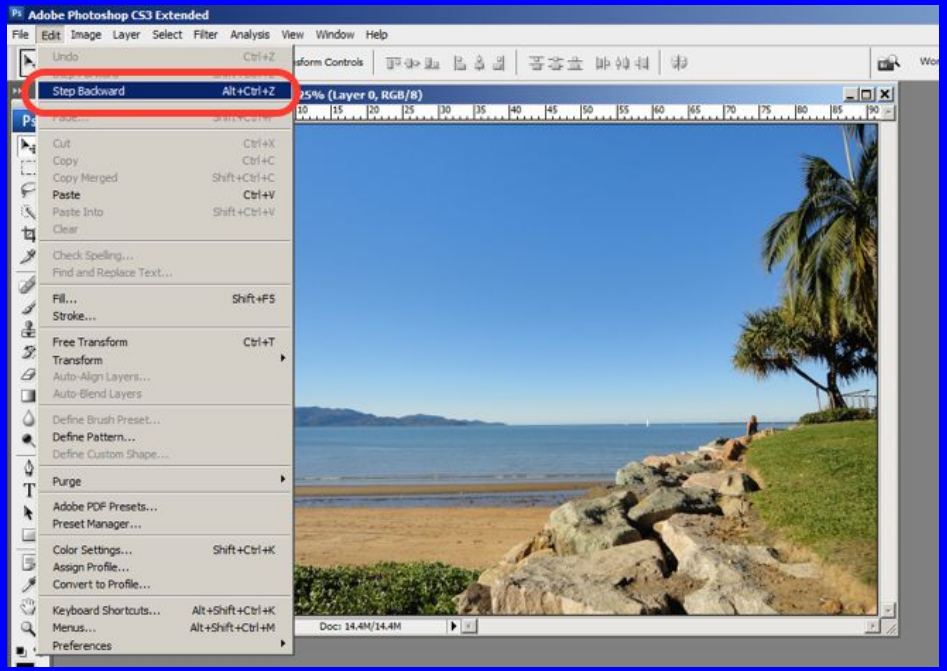
UI elements in a compass app (left) are similar to a compass in the real-world (right) and make it easy for users to understand the app's use and function.

Match between the system and the real world

User control and freedom

Offer users a digital space where backward steps are possible, including undoing and redoing previous actions.

User control and freedom



The users are in control as they can take a Step Backward or Step Forward under the Edit menu, or alternatively they can use Photoshop's keyboard shortcuts like Alt+Ctrl+Z, for example.

Consistency and standards

Interface designers should ensure that both the graphic elements and terminology are maintained across similar platforms.

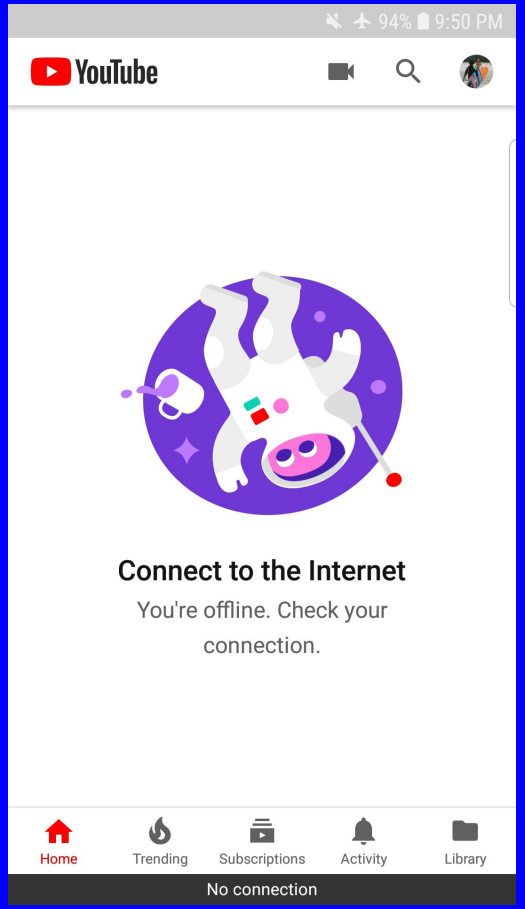
Consistency and standards

Graphic elements and terminology are maintained across platforms.

Help users recognise, diagnose and recover from errors

Designers should assume users are unable to understand technical terminology, therefore, error messages should almost always be expressed in plain language to ensure nothing gets lost in translation.

Help users recognise, diagnose and recover from errors

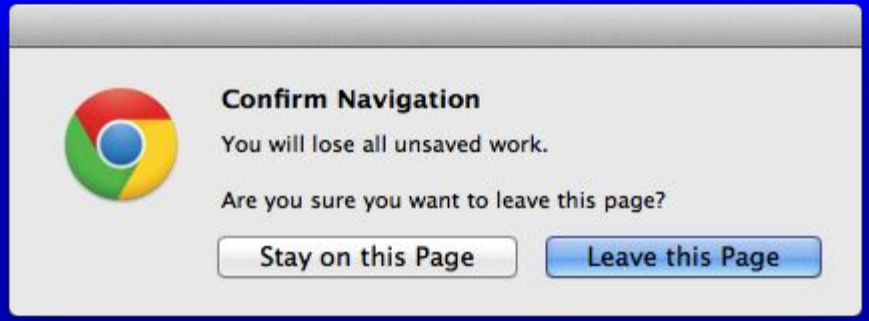


Error prevention

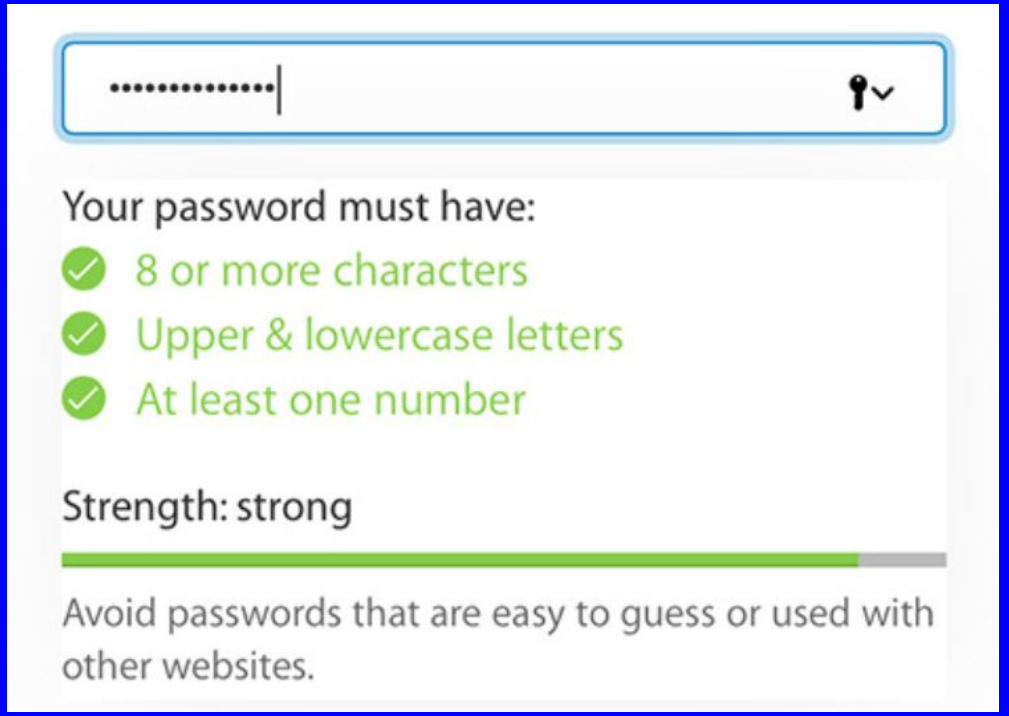
Even better than good error messages is a careful design which prevents a problem from occurring in the first place.

Either eliminate error-prone conditions or check for them and present users with a confirmation option before they commit to the action.

Error prevention



Error prevention



Recognition rather than recall

Minimize cognitive load by maintaining task-relevant information within the display while users explore the interface.

Human attention is limited and we are only capable of maintaining around five items in our short-term memory at one time.

Recognition rather than recall

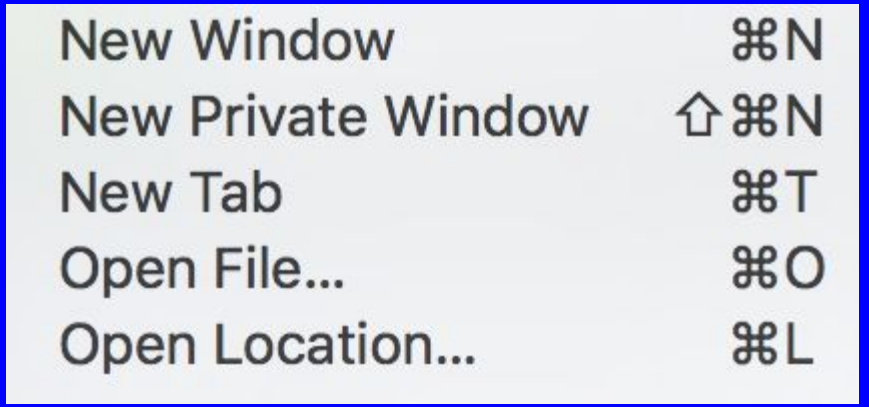
Good Example: iPhone Ring/Silent switch

Flexibility and efficiency of use

Faster navigation can be achieved by using abbreviations, function keys, hidden commands and macro facilities.

Users should be able to customize or tailor the interface to suit their needs so that frequent actions can be achieved through more convenient means

Flexibility and efficiency of use



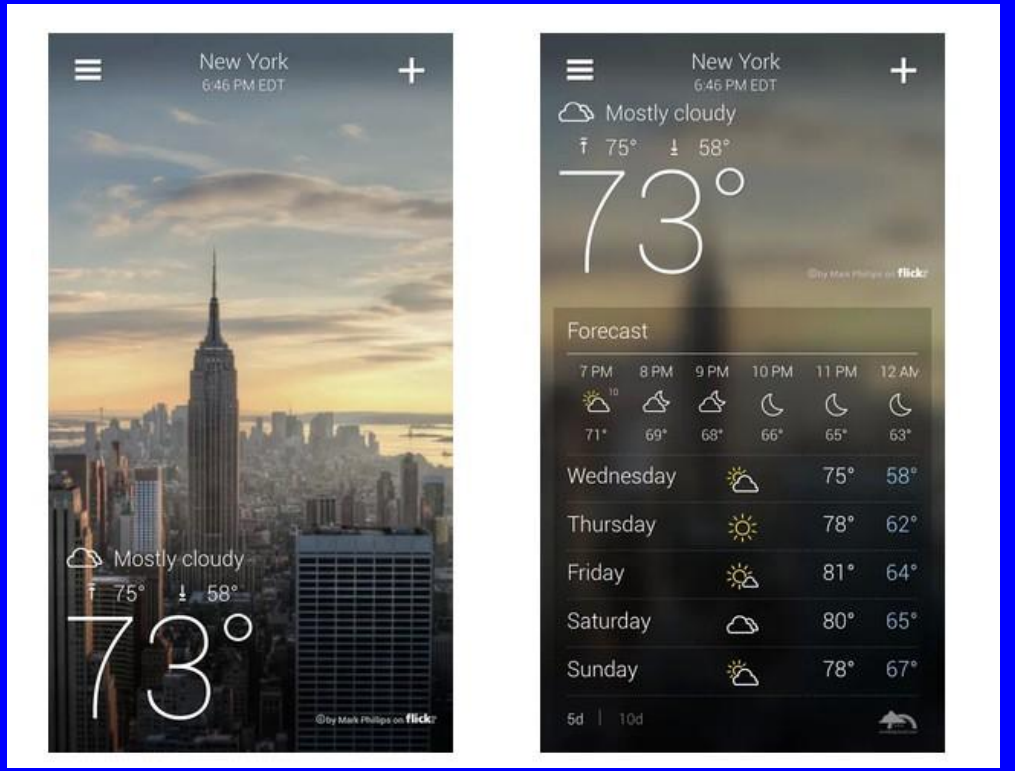
Click commands and shortcuts

Aesthetic and minimalist design

The display must be reduced to only the necessary components for the current tasks.

Whilst providing clearly visible and unambiguous means of navigating to other content.

Aesthetic and minimalist design



Simplify interfaces by removing unnecessary elements or content that does not support user tasks.

Help and documentation

Even though it is better if the interface can be used without documentation, it may be necessary to provide help and documentation.

Any help information should be *easy to search*, *focused* on the user's task, list of *concrete steps*, and *not too large*.

Comparing usability principles

Preece et al, 1994	Sommervile, 1995	Macaulay, 1995	Nielsen, 2001
know the user population			
reduce cognitive load	user guidance	supportiveness	recognition rather than recall help and documentation
engineer for errors	recoverability		help users recognise, diagnose and recover from errors; error prevention
maintain consistency and clarity	consistency	consistency	consistency and standards
	user familiarity		
	minimal surprise		
		naturalness	
		non-redundancy	
		flexibility	flexibility and efficiency of use
			match between system and real world
			user control and freedom
			aesthetic and minimalist design

Interaction designers of the week:

Leah Buechley

Leah Buechley is a designer, engineer, and educator. Her work explores integrations of electronics, computing, art, craft, and design. She has done foundational work in paper and fabric-based electronics. Her inventions include the LilyPad Arduino, a construction kit for sew-able electronics. She currently runs a design firm, Rural / Digital, that explores playful integrations of technology and design.

Previously, she was an associate professor at the MIT Media Lab, where she founded and directed the High-Low Tech group. Her work has been featured in publications including The New York Times, Boston Globe, Popular Science, and Wired. Leah received a PhD in computer science from the University of Colorado at Boulder and a BA in physics from Skidmore College. At both institutions she also studied dance, theater, fine art, and design.

Leah was the recipient of the 2017 Edith Ackerman award for Interaction Design and Children.

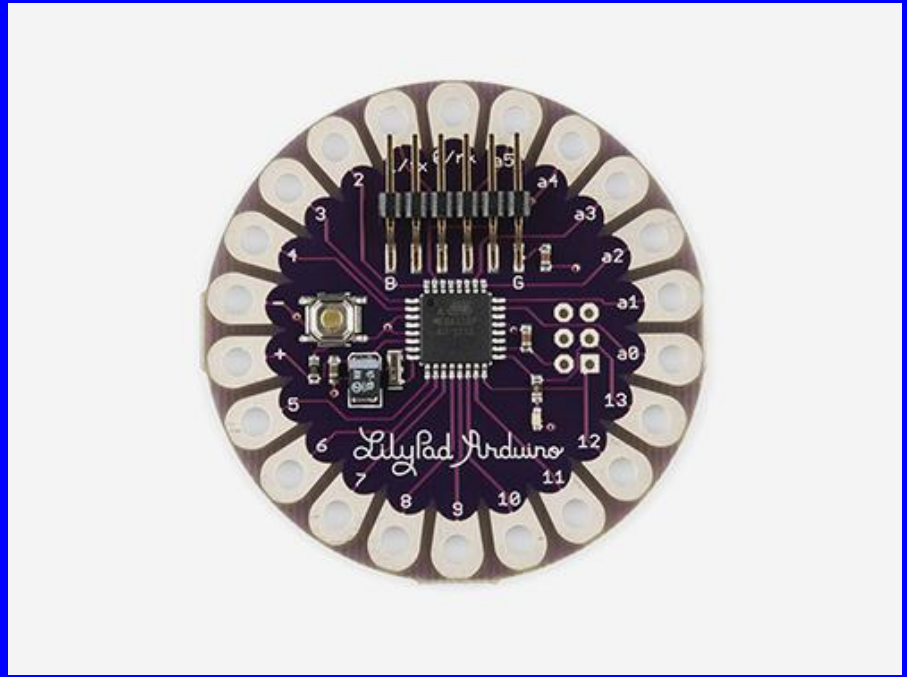
For more information read interview in the textbook pg.445.

http://leahbuechley.com/

Interaction designers of the week:

Leah Buechley

LilyPad Arduino



https://www.arduino.cc/en/Main/ArduinoBoardLilyPad/

Interaction designers of the week:

Neri Oxman

Neri Oxman is an architect, designer, inventor and professor at MIT, where she is the founding director of The Mediated Matter Group.

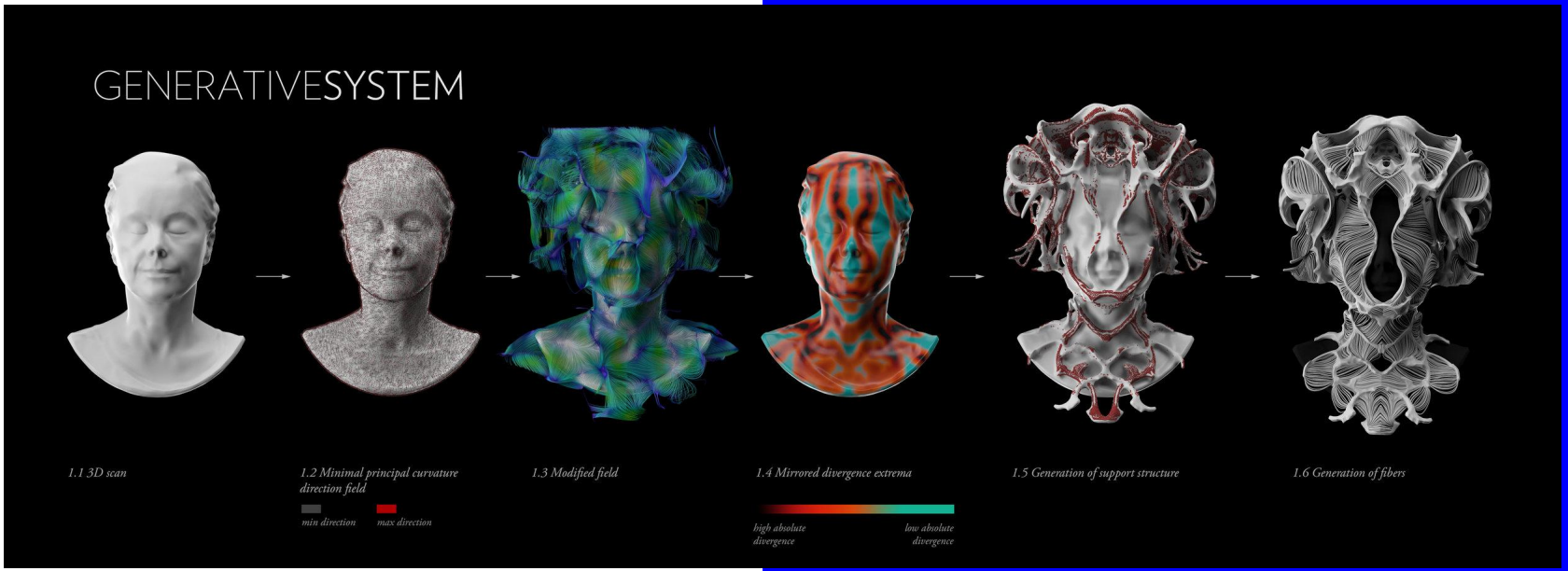
The group applies this knowledge to design, from the micro scale to the building scale. Oxman coined the term “Material Ecology” to describe the study, design and digital fabrication of buildings, products and systems that integrate environmentally aware, computational, form-generating processes and digital production.

Her team’s work was presented at the White House and the World Economic Forum, and it is in the permanent collections of Cooper Hewitt, MoMA, SFMOMA, Pompidou, MFA and others.

Design at the Intersection of Technology and Biology | Neri Oxman | TED Talks

Interaction designers of the week:

Neri Oxman with Bjork



https://deskriptiv.com/rottlace-bjork

Interaction designers of the week:

Neri Oxman ‘Vespers series 2’

Mediated Matter group MIT

https://deskriptiv.com/vespers-series-2