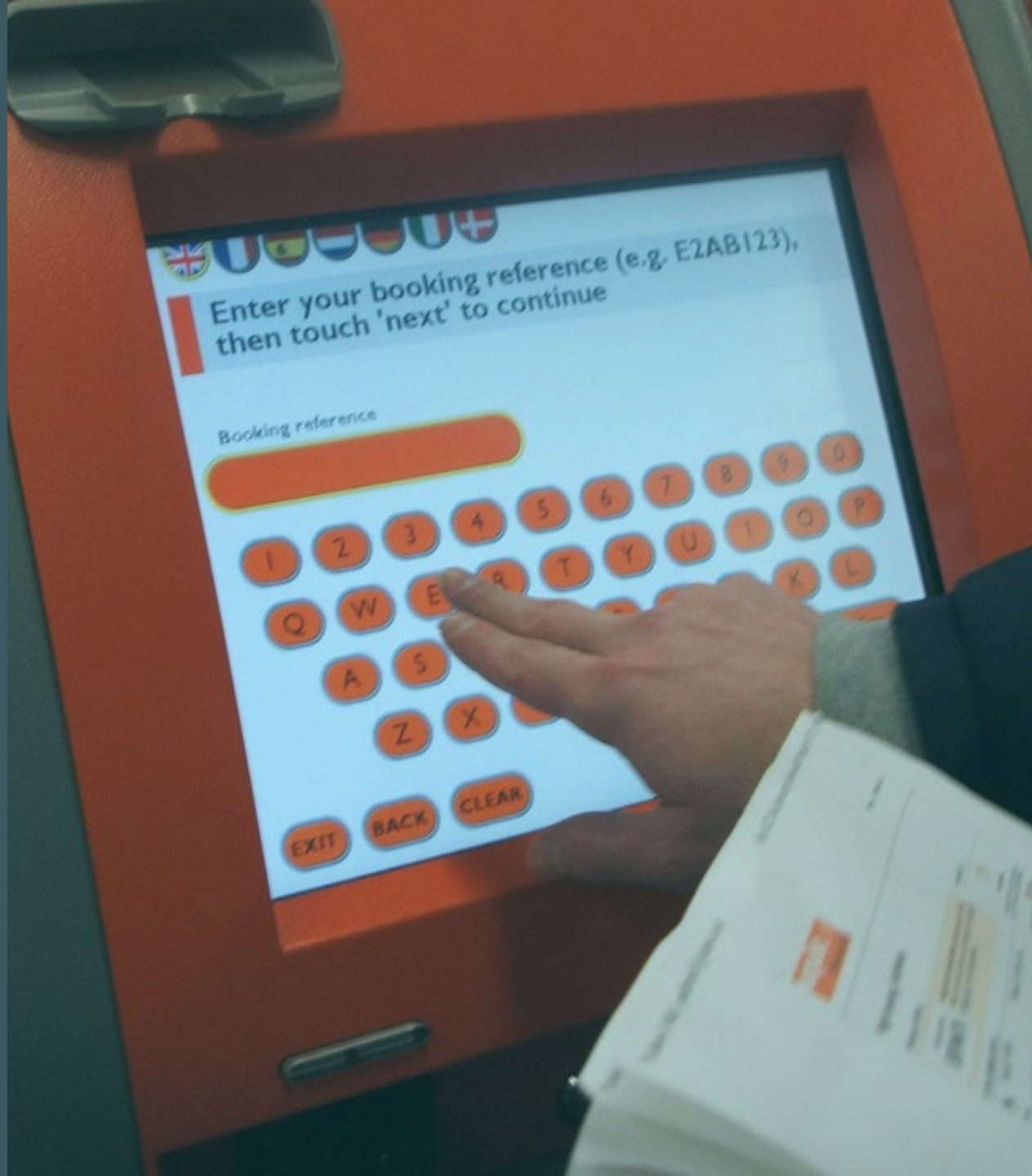
human computer interaction

Lecture 9:
Evaluating Without Users

Dmitrijs Dmitrenko



Good design vs Bad design

bad design
example

wave on...

share your observations...

...on X or per email!

Use hashtags **#HCISussex #GoodDesign #BadDesign**

Tag me @DoubleDmi

Your examples will be featured in lectures!

Now back to today's lecture...

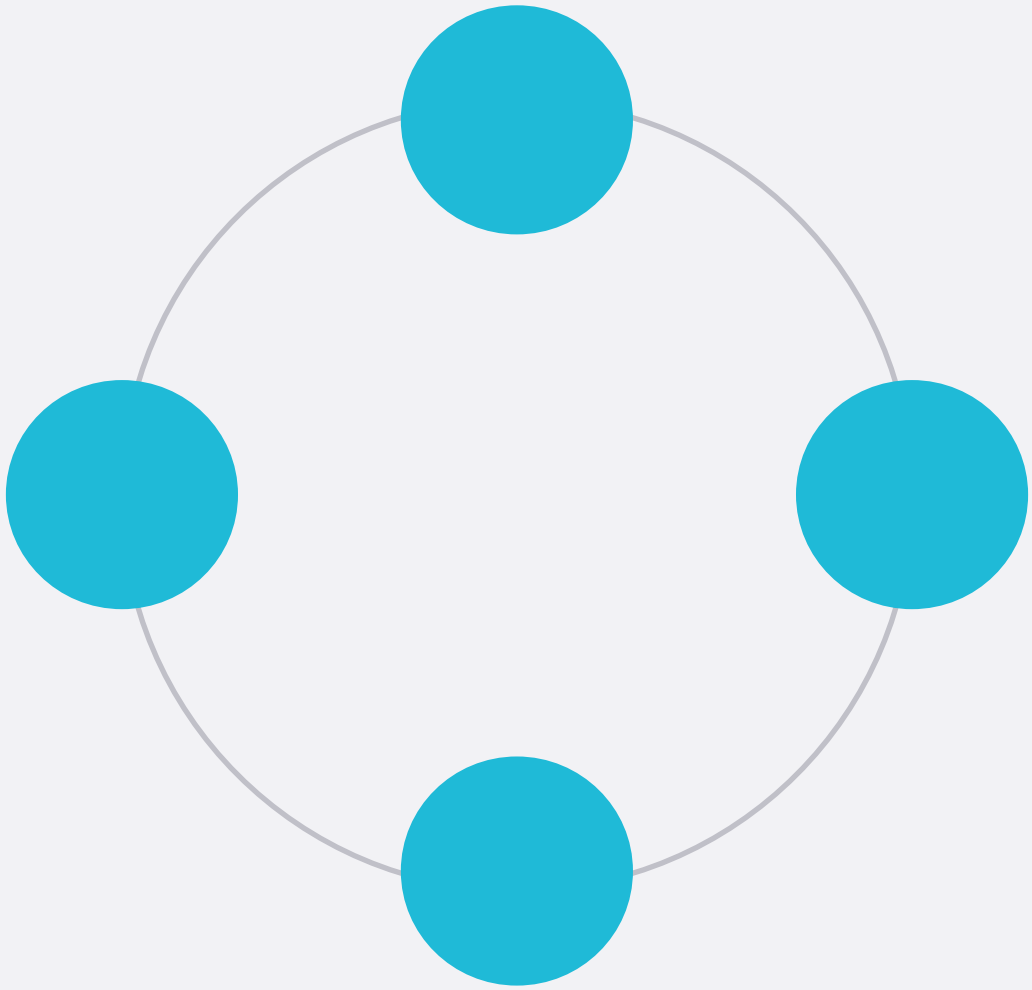
why, what, where & when to evaluate

- **why:** to check users' requirements, to **make improvements to a product**, to check whether users can use the product and whether they like it
- **what:** a conceptual model, **early prototypes** of a new system, more complete prototypes, 'finished' products
- **where:** in **natural and laboratory settings**
- **when:** **throughout design process**; finished products can be evaluated to collect data to inform new versions/products

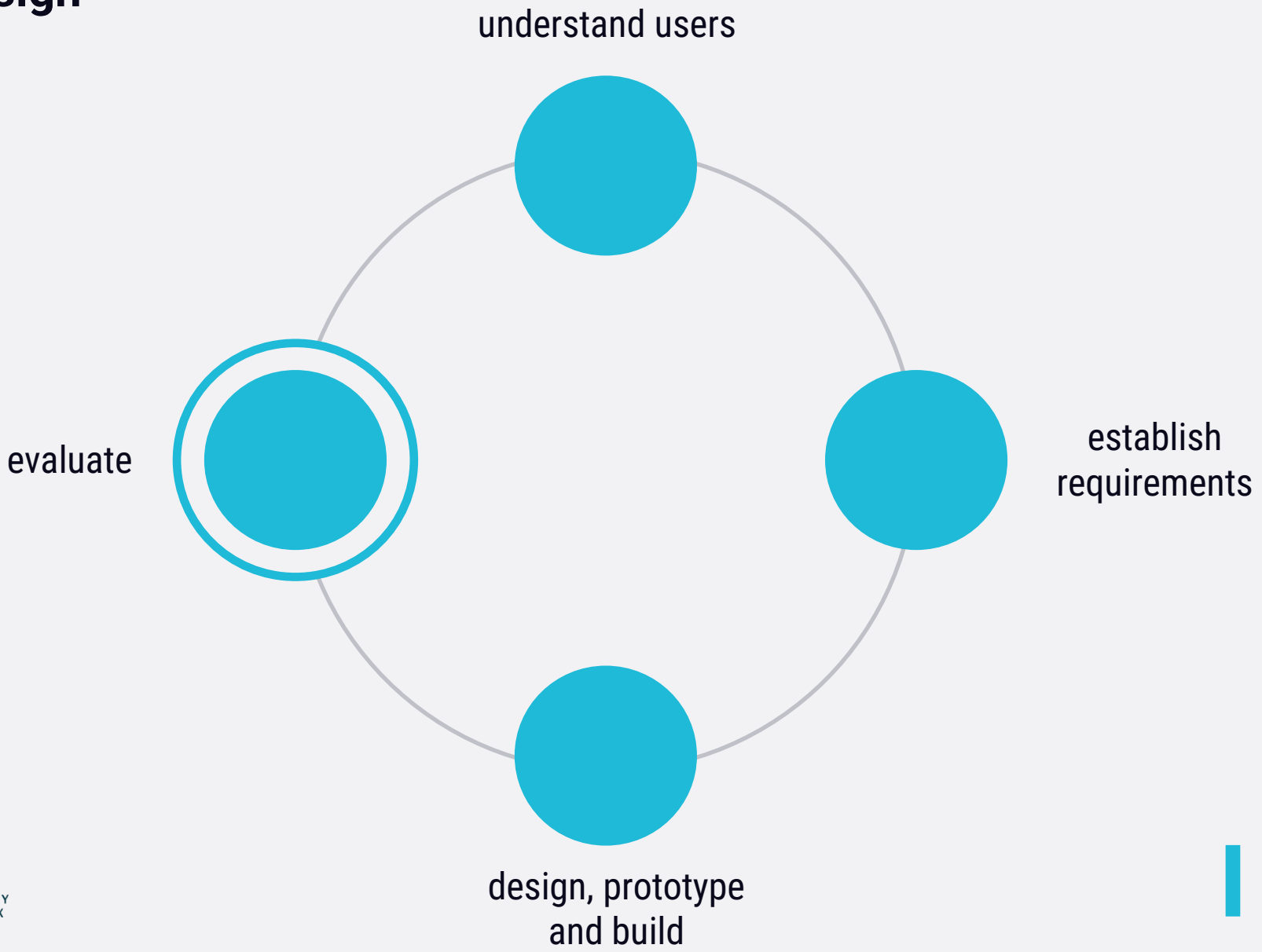
last week:

data analysis

user-centred design



user-centred design



types of evaluation

- involving users:
  - **controlled settings** involving users, e.g. usability testing & experiments in laboratories or living labs
  - **natural settings** involving users, e.g. field studies to see how the product is used in the real world

- **not involving users:**
  - any settings not involving users, e.g. expert inspections; to analyse, model & predict aspects of the interface

evaluation
methods

method	controlled settings	natural settings	without users
observing	x	x	
asking users	x	x	
asking experts		x	x
testing	x		
modeling			x

evaluation
without users

- **expert inspections**/critiques can be **formal or informal**
- experts use their knowledge of users & technology to review software usability
  - **heuristic evaluation** is a review guided by a set of heuristics
  - **cognitive walkthroughs** involve stepping through a pre-planned scenario noting potential problems (Nielsen & Mack, 1994, p. 6)
- **use models/formulas** to derive various measures of user performance (e.g. GOMS, Fitts' Law)

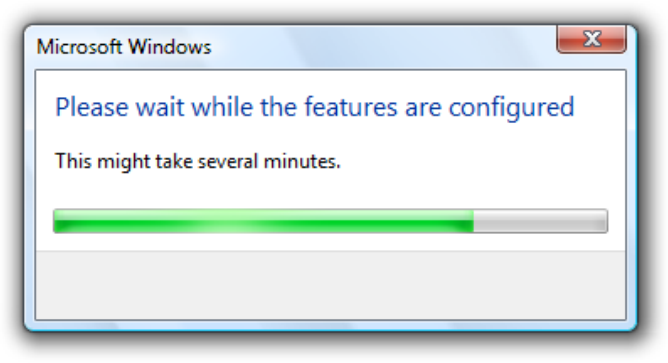
heuristic evaluation

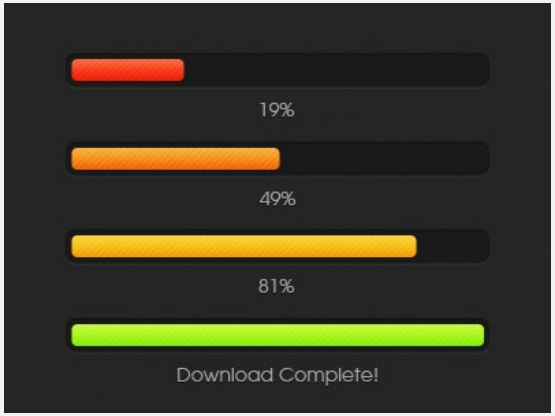
- developed by Jakob Nielsen in the early 1990s
- based on heuristics (rules of thumb) distilled from an empirical analysis of 249 usability problems
- heuristics are **closely related to design guidelines**
- original heuristics have been **revised** by Nielsen and others **for current technologies** such as mobile devices, wearables, virtual worlds, etc.
- heuristic evaluation involves **experts examining** a design to see if guidelines are violated

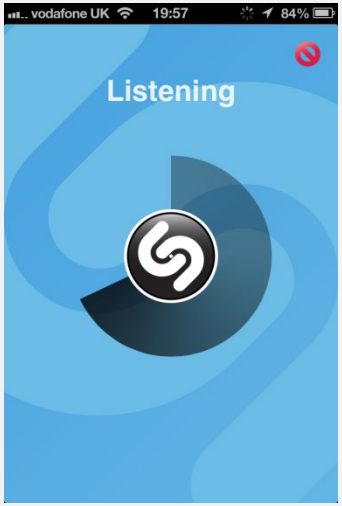
Nielsen's heuristics
(revised 2014 for current technology)

1. visibility of system status
2. match between system & real world
3. user control & freedom
4. consistency & standards
5. error prevention
6. recognition rather than recall
7. flexibility & efficiency of use
8. aesthetic & minimalist design
9. help users recognise, diagnose & recover from errors
10. help & documentation

1. visibility of system status



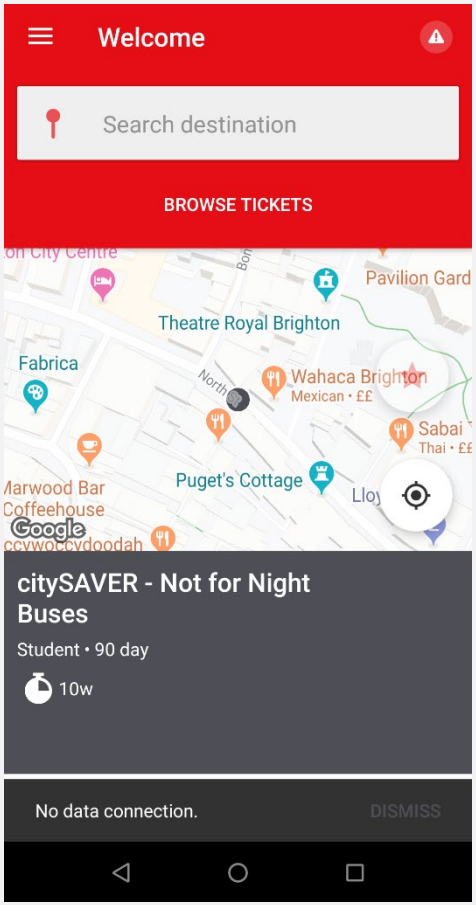


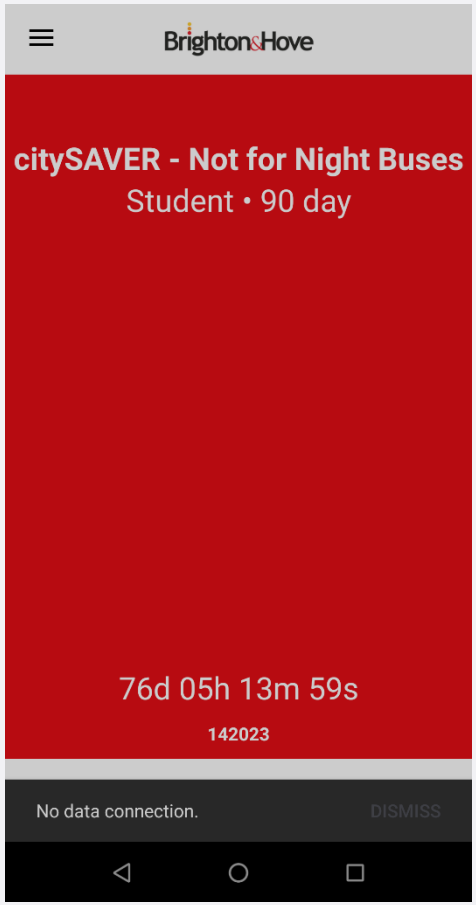


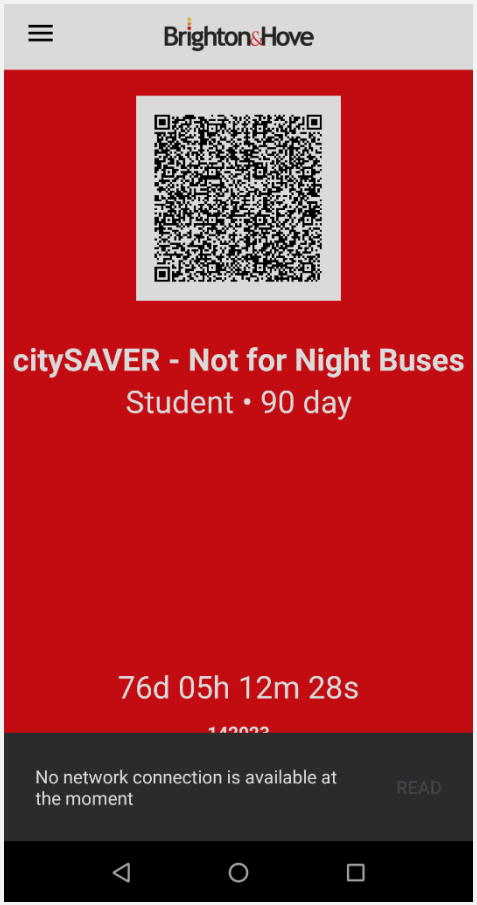
what: the system should always keep users informed about what is going on.

how: through appropriate feedback within reasonable time (e.g. progress bars to show that an action is currently being carried out, or feedback messages shown when an action has been completed).

1. visibility of system status



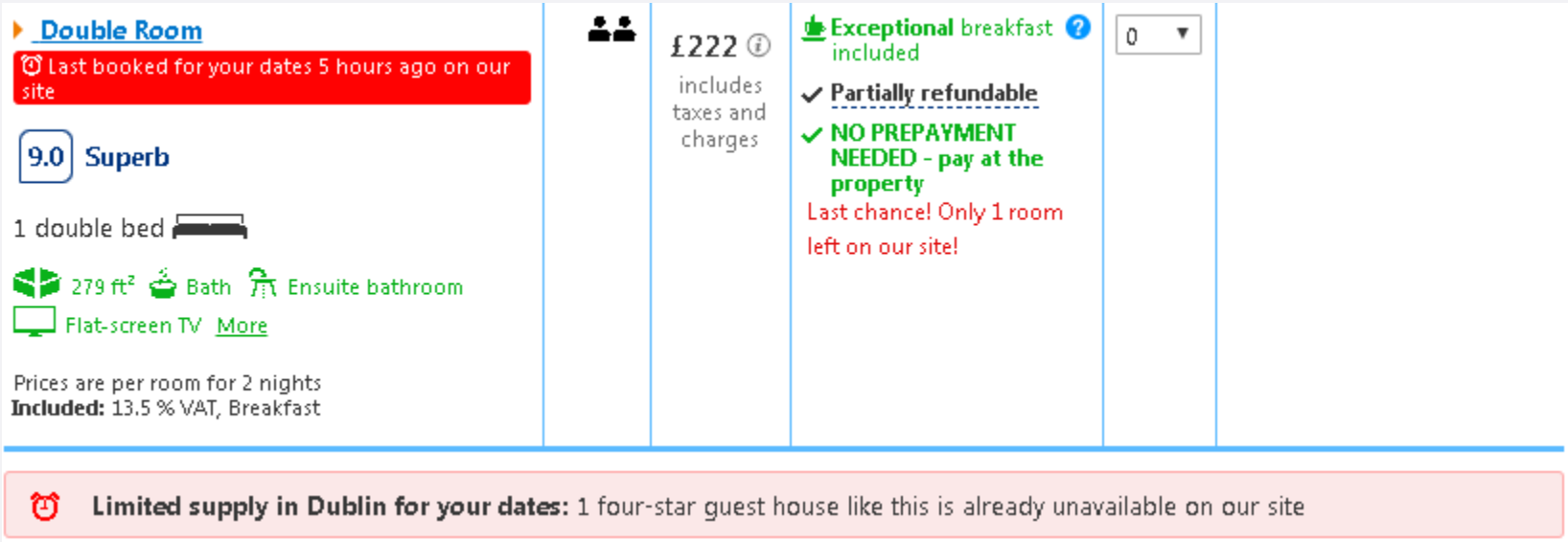




Source: B&H Buses

1. visibility of system status:
too much of it…

Sometimes there is too much visibility…



Source: www.booking.com

1. visibility of system status:
too much of it…

Source: YouTube/Design Theory

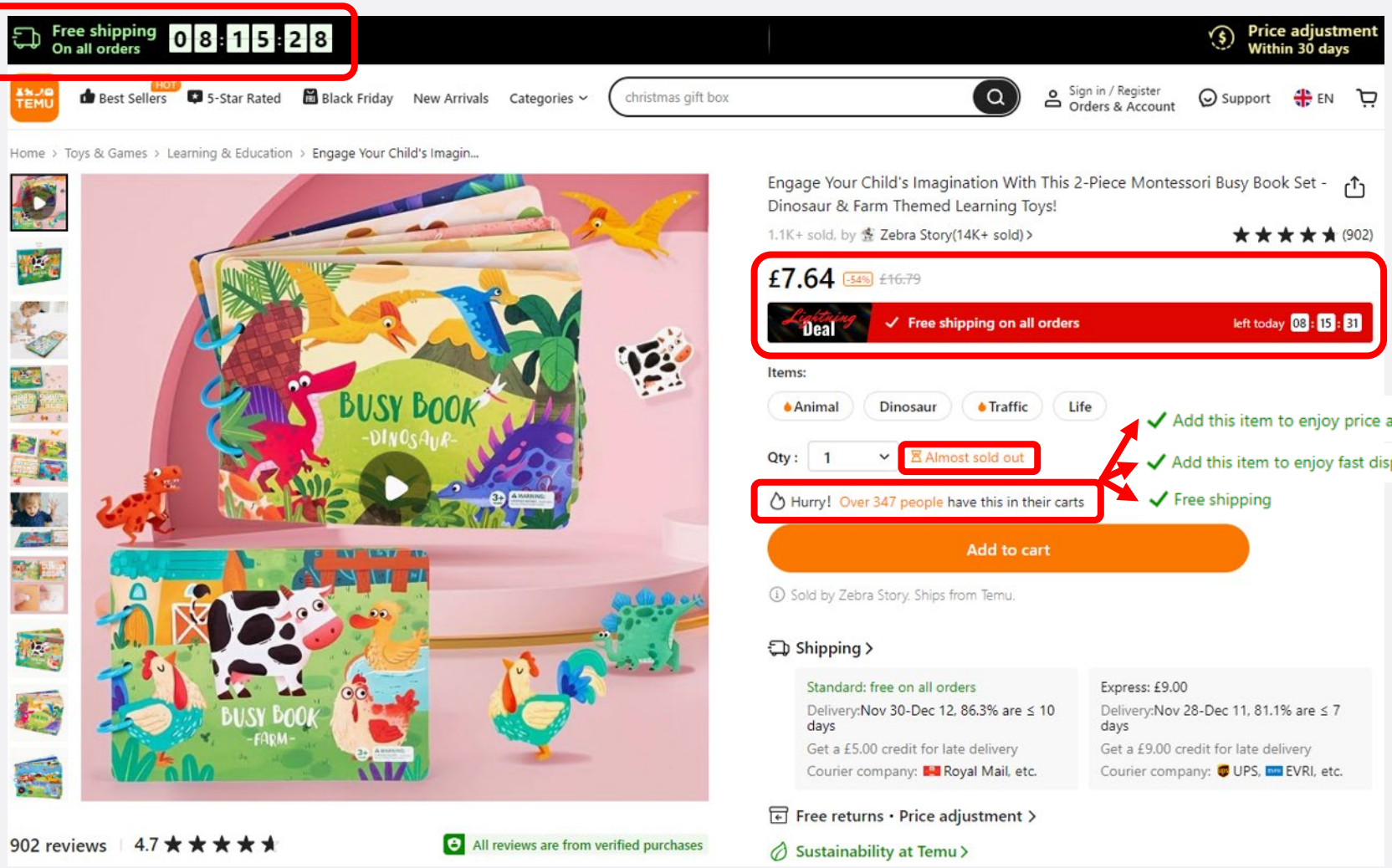
1. visibility of system status:
too much of it…

Summary

The results of these studies supported the idea that scarcity's enhancement of value is mediated by assumed expensiveness. Study 1 found that scarcity enhanced the desirability of art prints only when subjects had been primed to think about the prints' prices. Study 2 found that scarcity enhanced the perceived expensiveness and desirability of a wine only when subjects were not told how much it cost. These results suggested that a scarcity effect can be created by inducing people to think about the scarce commodity's price and that such an effect can be eliminated by prohibiting people from assuming that the commodity is more expensive when it is scarce. Although each study is inconclusive by itself, when combined with one another and with Verhallen's (1982, 1984) studies, they provide fairly strong evidence that scarcity effects on desirability are mediated by assumed expensiveness.

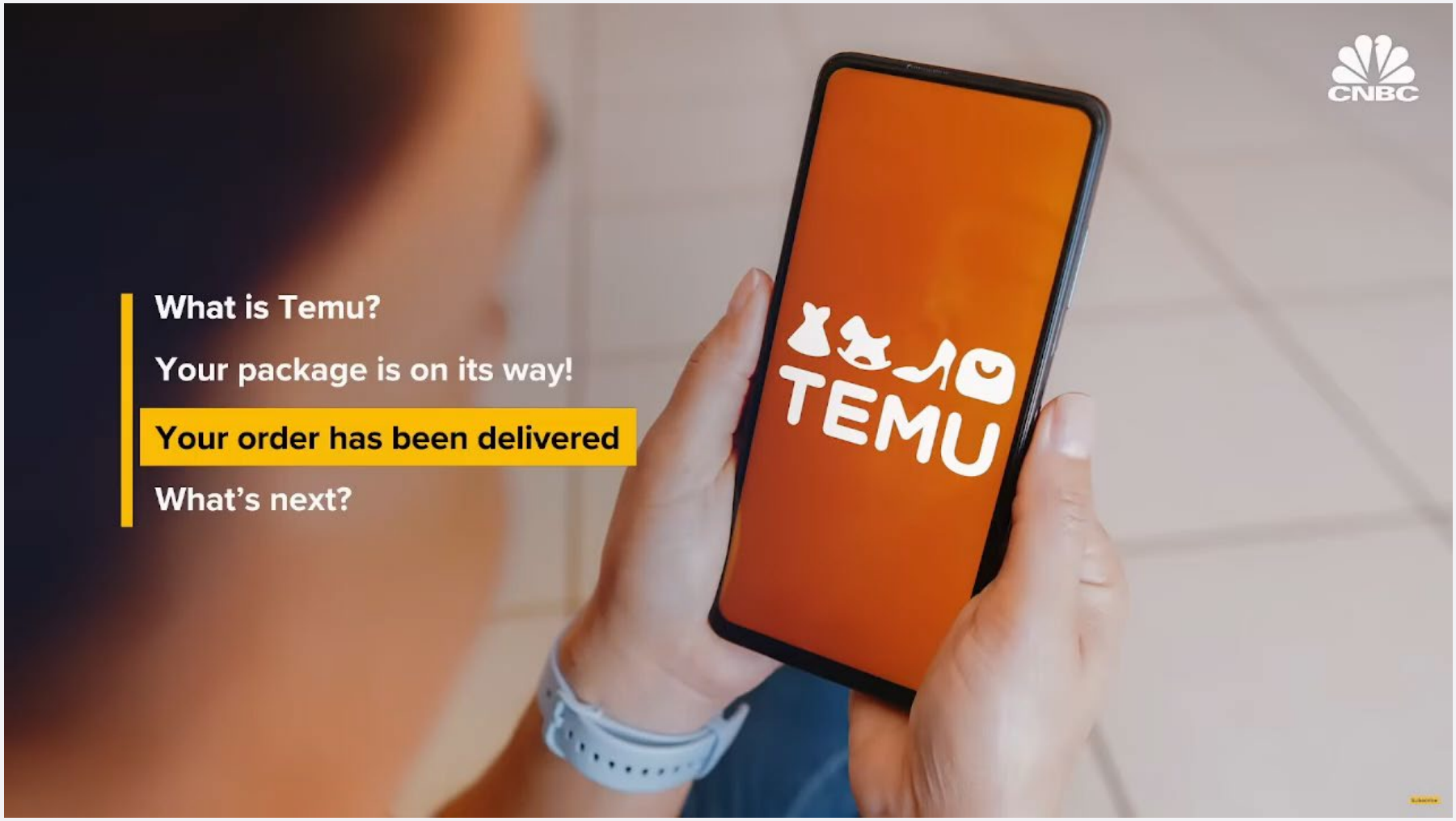
Source: Lynn, M., 1989. Scarcity effects on desirability: Mediated by assumed expensiveness?. *Journal of economic psychology*, *10*(2), pp.257-274.

1. visibility of system status:
too much of it...



Source: www.temu.com

1. visibility of system status:
too much of it…



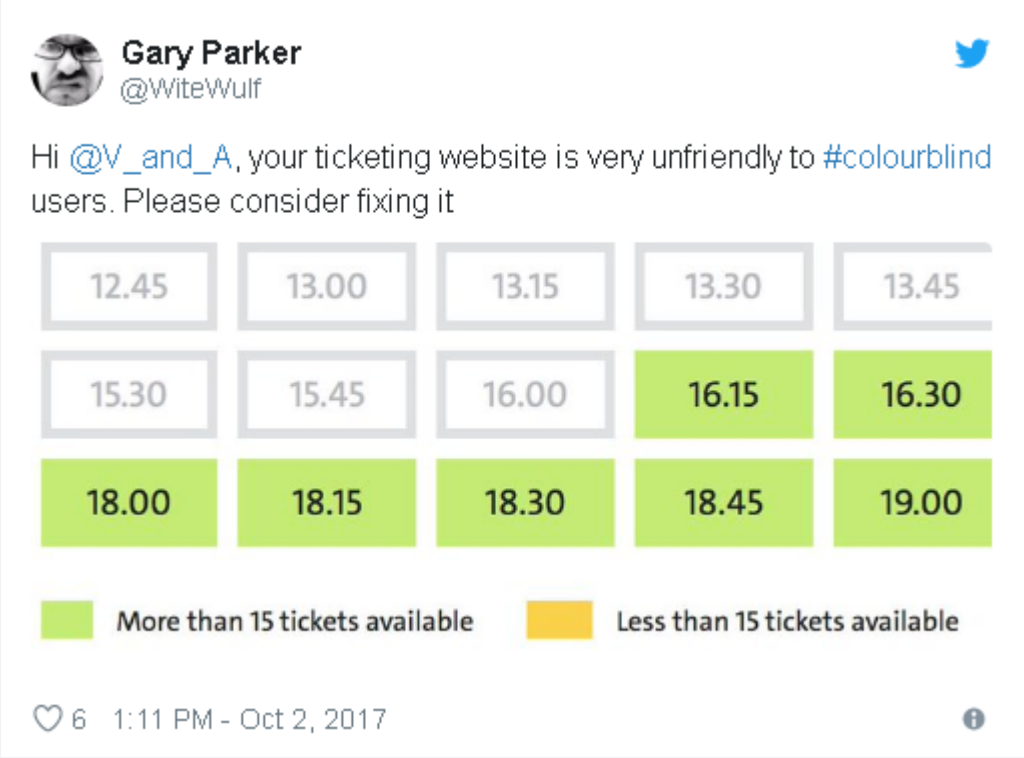
Source: YouTube/CNBC

1. visibility of system status:
too much of it…

This study investigates factors that affect consumer continuous use intention toward online group buying and the degree that reciprocity and reputation of social exchange, trust, and vendor creativity affect consumer satisfaction and intention toward online purchasing. Data from 215 valid samples was obtained using an online survey. The research model is assessed using partial least squares (PLS) analysis. The results show that the intention to engage in online group buying is predicted collectively by consumer satisfaction, trust, and seller creativity. Consumer satisfaction with online group buying is predicted primarily by trust, followed by consumer reciprocity. The proposed research model explains 67.7% of variance for satisfaction and 39.7% of variance for intention to engage in online group buying. The results suggest that reciprocity, trust, satisfaction, and seller creativity provide considerable explanatory power for intention to engage in online group buying behavior.

Source: Shiau, W.L. and Luo, M.M., 2012. Factors affecting online group buying intention and satisfaction: A social exchange theory perspective. *Computers in Human Behavior*, *28*(6), pp.2431-2444.

1. visibility of system status



What happens if designers forget about colour-blindness?

Normal colour vision:

Red-blind protanopia:

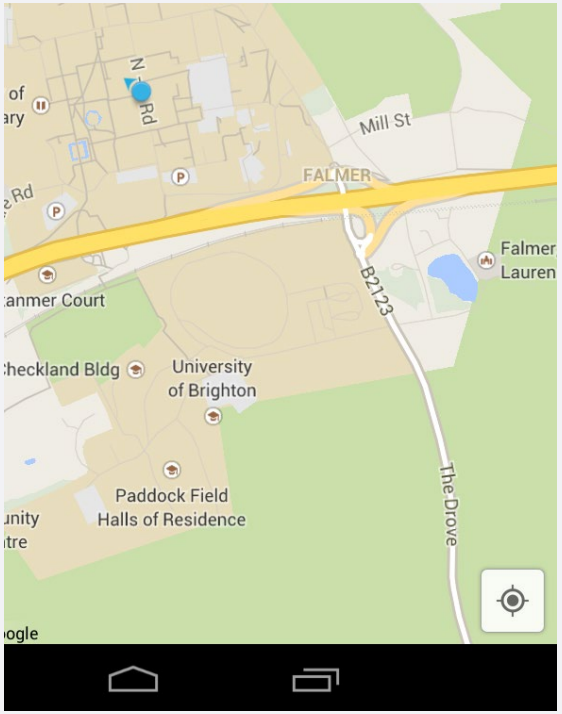
Green-blind deuteranopia:

2. match between system and real world

what: the system should speak the users' language, with words, phrases and concepts familiar to the user, rather than system-oriented terms

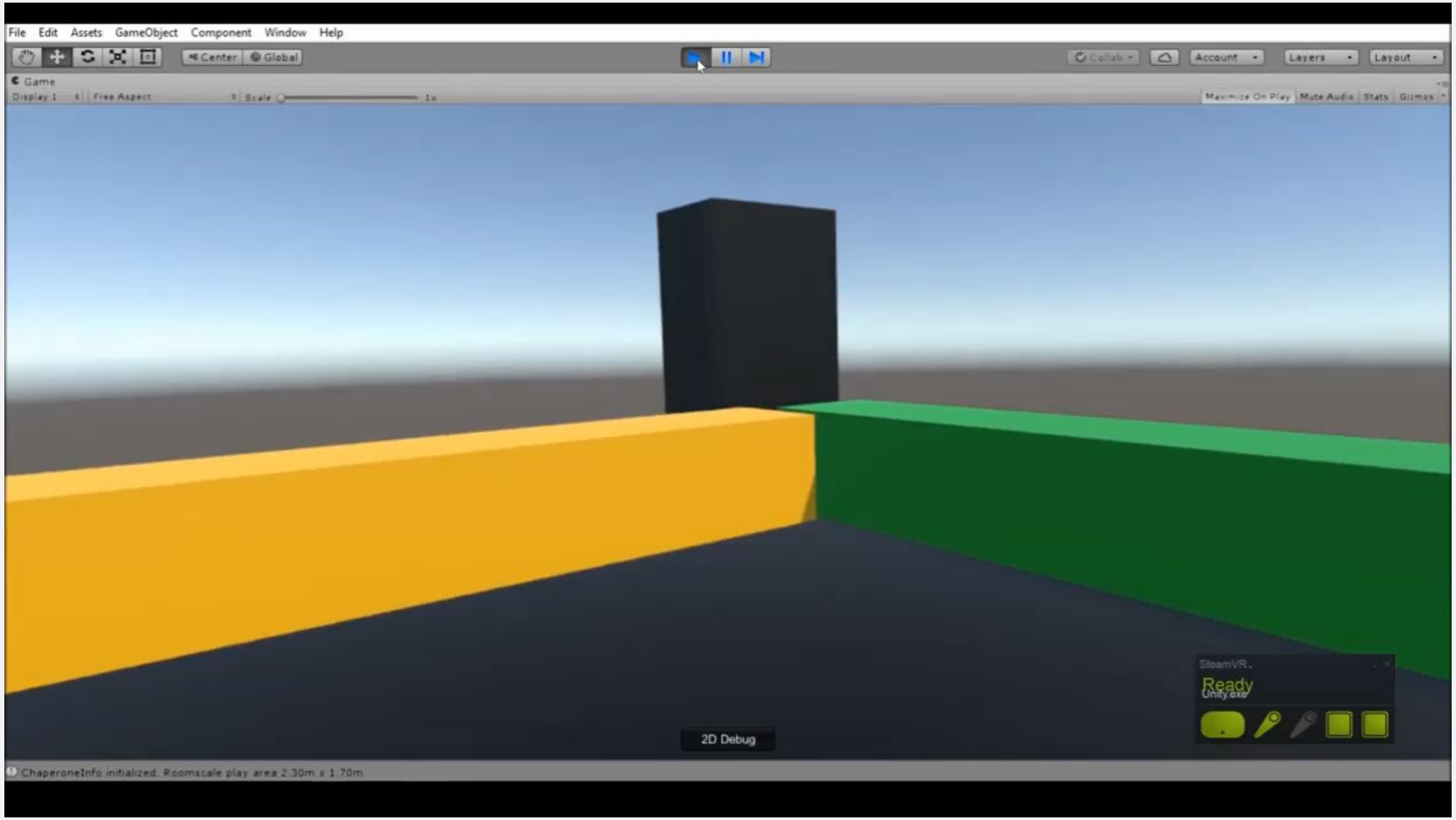
follow real-world conventions, making information appear in a natural and logical order

how: choose appropriate interface metaphors and familiar names for functions



2. match between system and real world

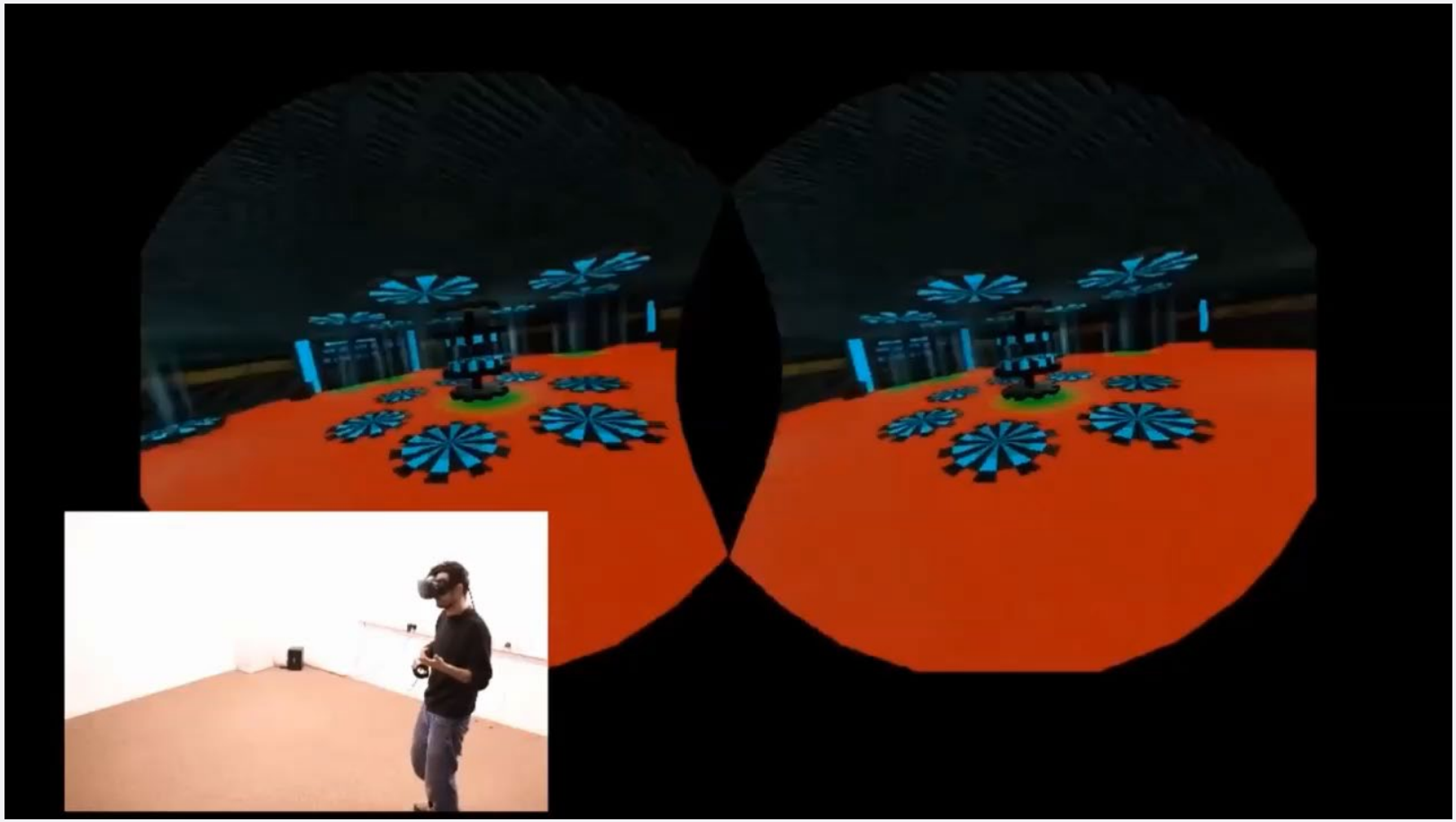
VR teleportation ≠ real world



Source: https://www.youtube.com/watch?v=GozB7zlD1wQ

2. match between system and real world

NaviFields ≈ real world



Source: http://sro.sussex.ac.uk/id/eprint/70845/1/NaviField.pdf

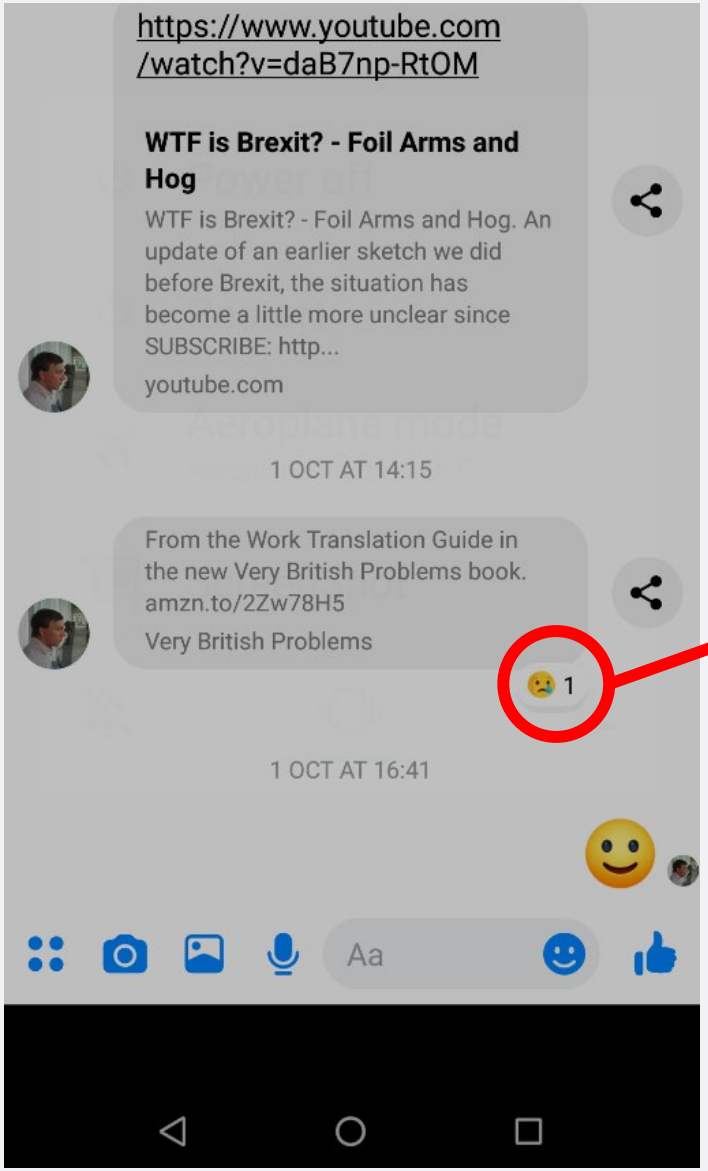
3. user control and freedom

what: users often choose system functions by mistake and will need a clearly marked "emergency exit" to leave the unwanted state without having to go through an extended dialogue

how: provide undo and redo buttons and a range of clear navigation options

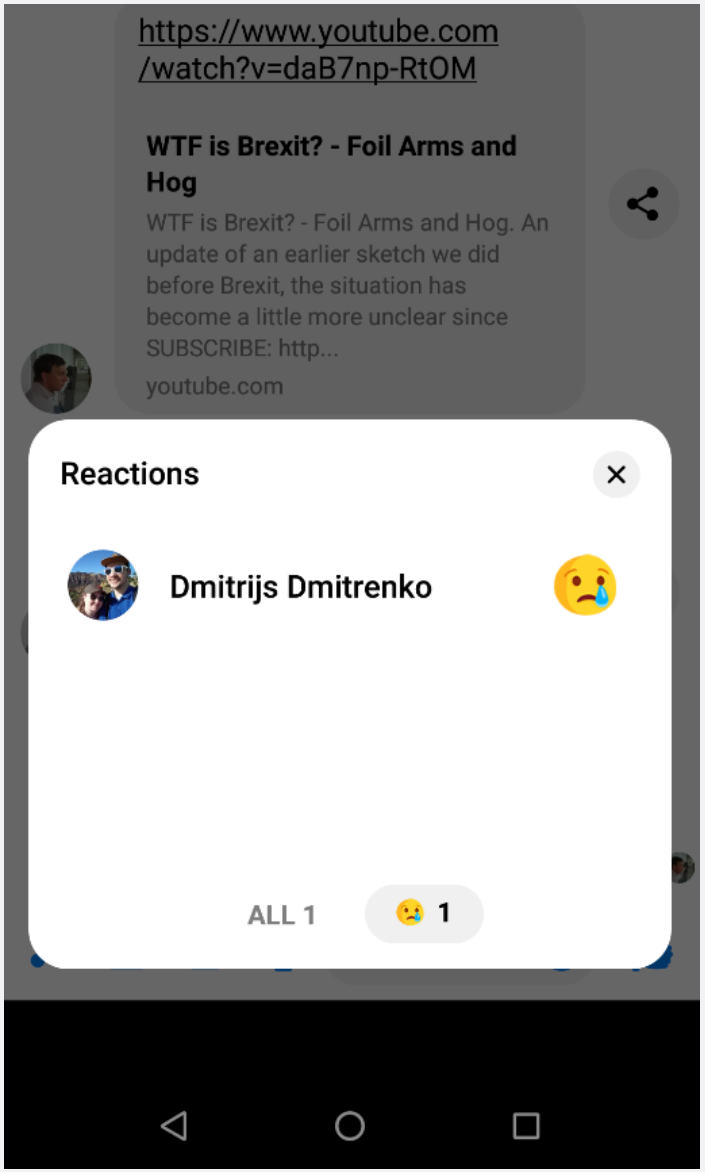
You are here: Homepage » Home & Furniture » View all Furniture »

3. user control and freedom



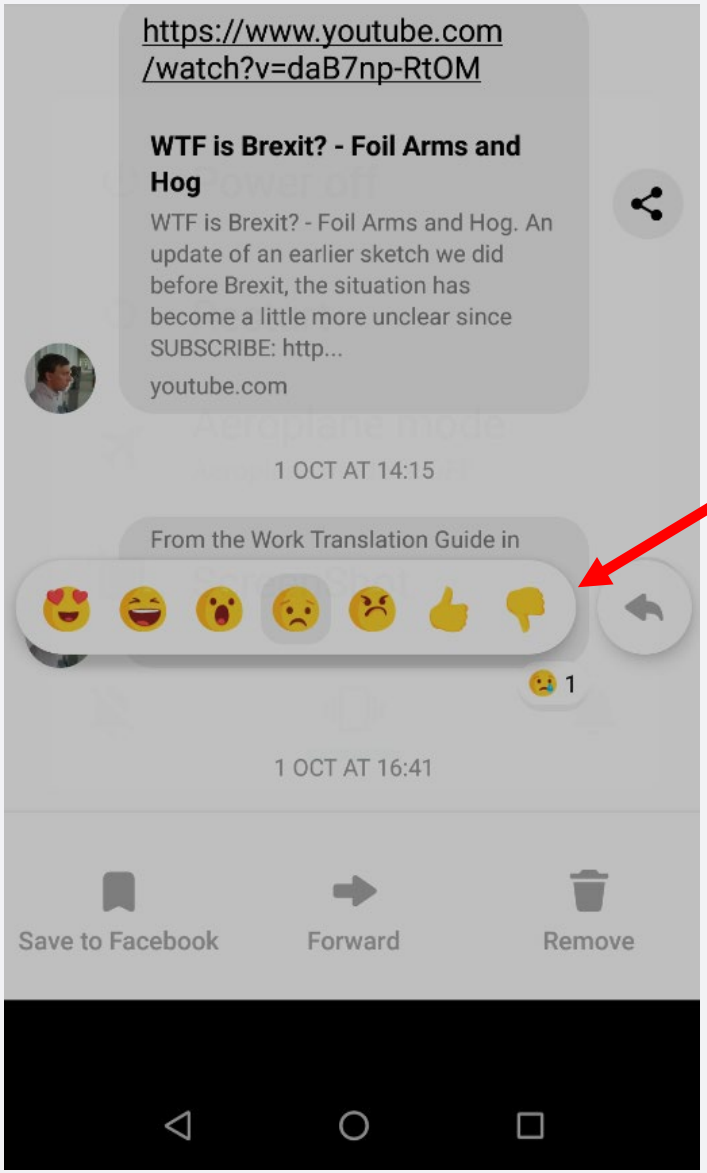
OMG! How do I undo this?

3. user control and freedom



After tapping the emoji…

3. user control and freedom



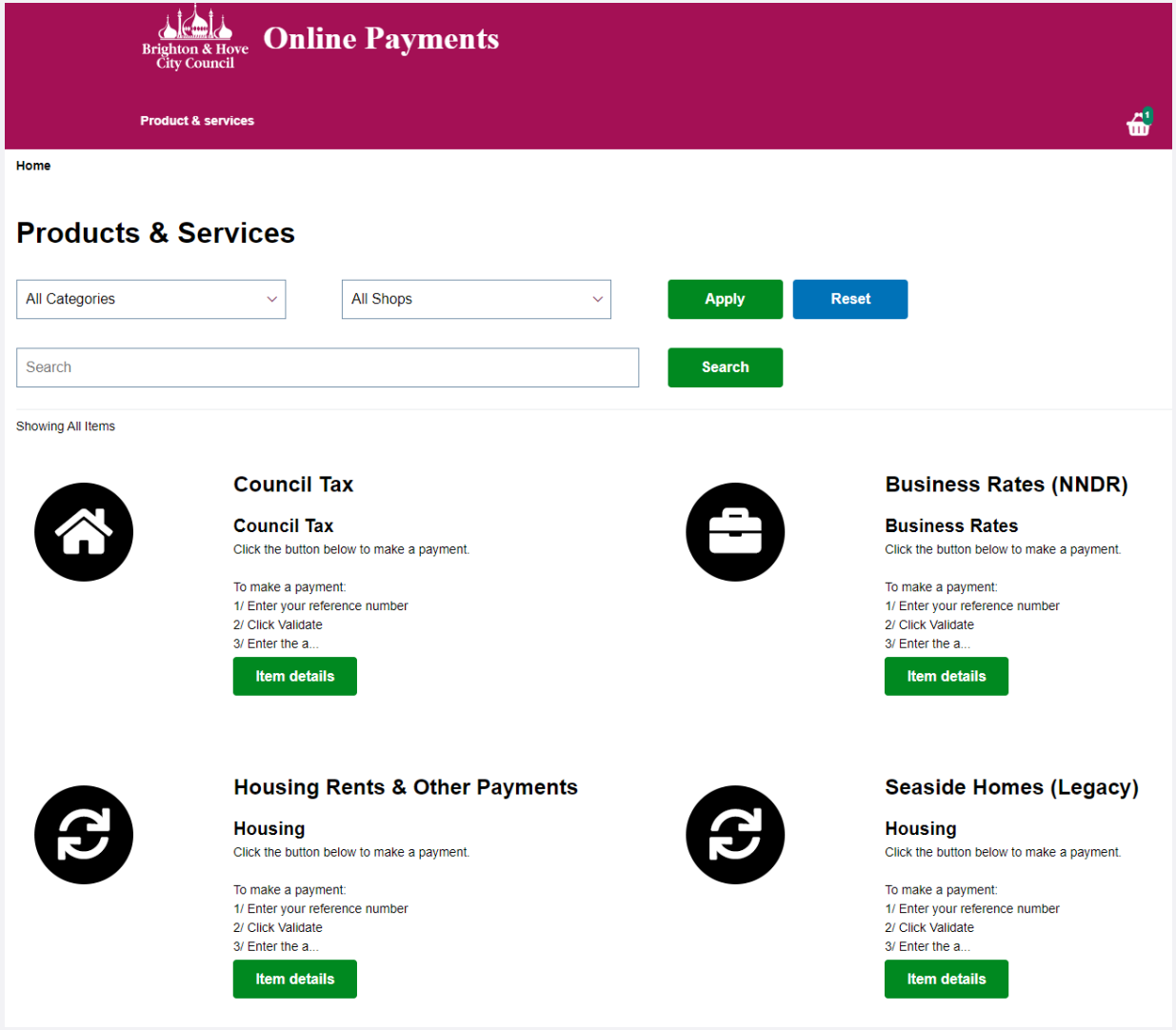
After tapping and holding the message...

Finally, I was able to undo my mistake!

Not a great sense of control (aka agency)!

Quiz time!

Which heuristic is violated here?



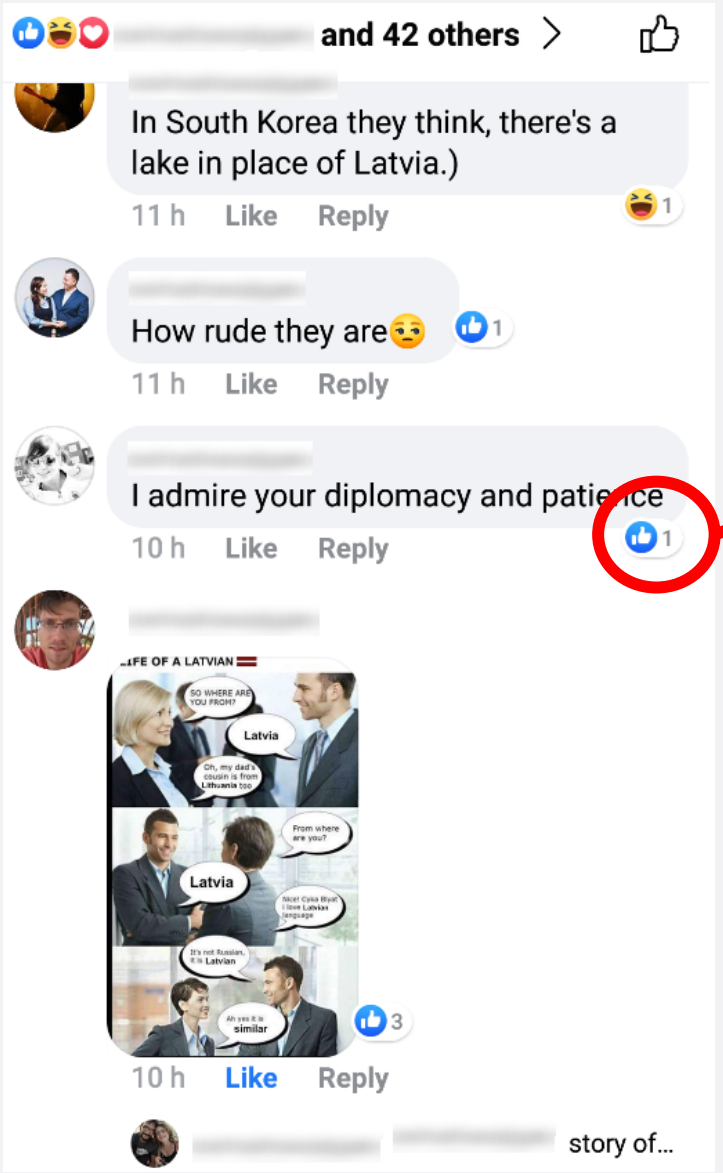
1. visibility of system status
2. match between system & real world
3. user control & freedom

4. consistency and standards

what: users should not have to wonder whether different words, situations, or actions mean the same thing

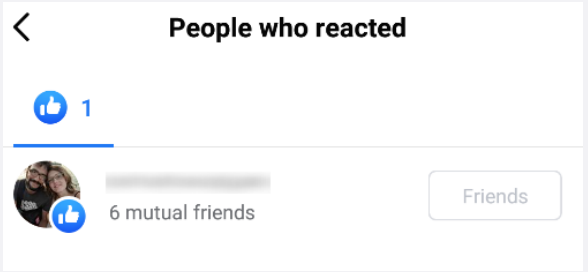
how: follow platform conventions, adhere to existing standards for names and icons

4. consistency and standards

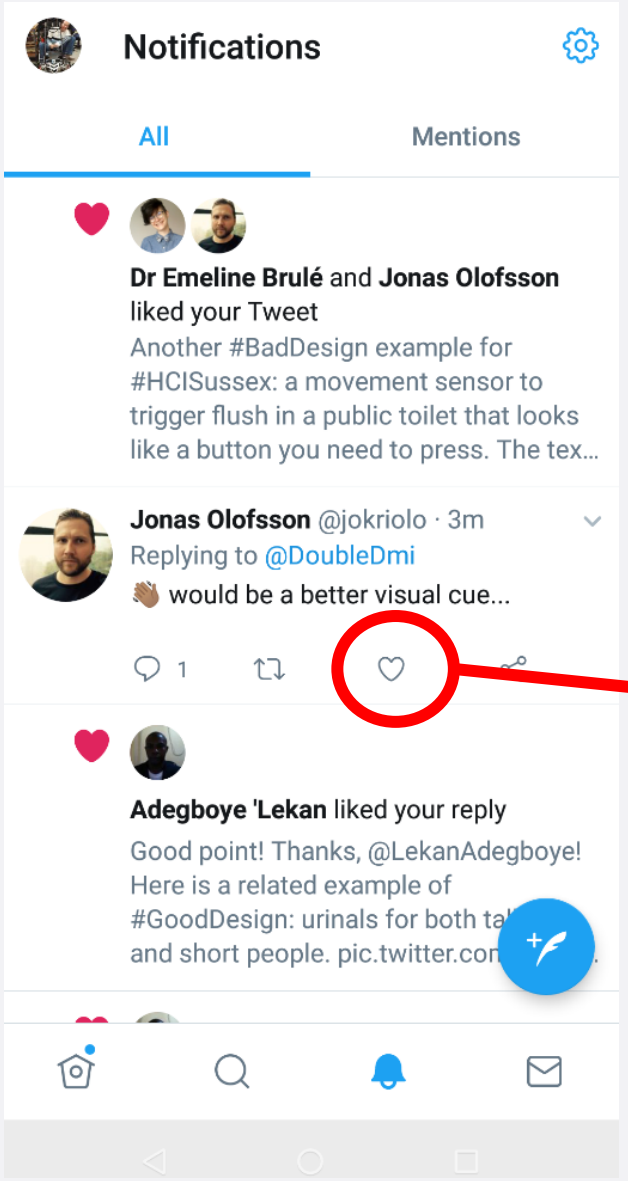


Facebook:

Tapping a "like" button will show who liked the comment



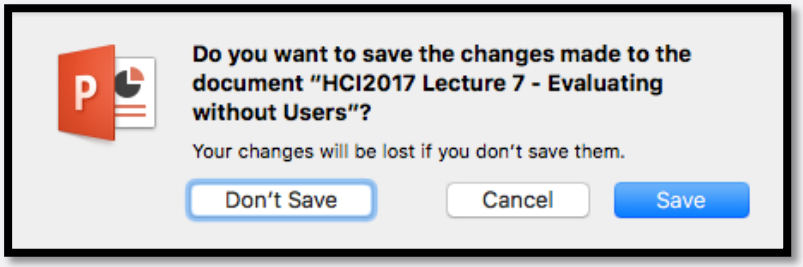
4. consistency and standards

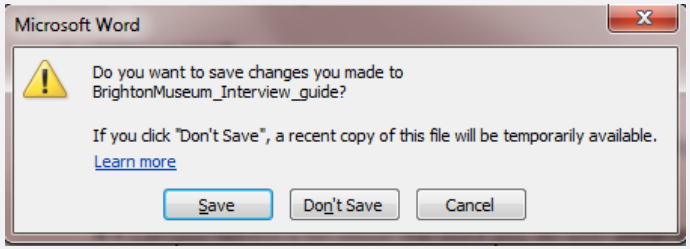


Twitter:

Tapping a "like" button will <u>unlike the tweet</u>

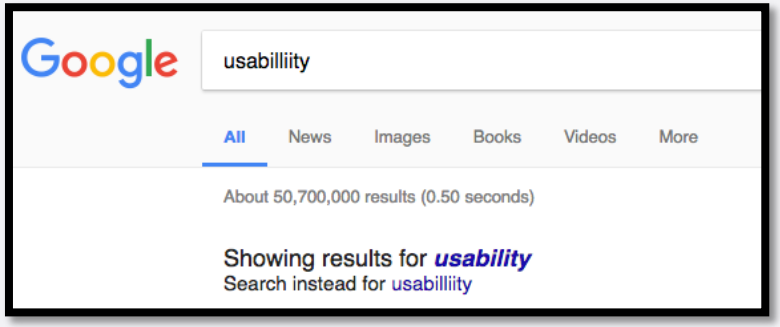
5. error prevention





what: even better than allowing recovery from errors is a careful design that prevents a problem from occurring in the first place

how: either eliminate error-prone conditions or check for them and present users with a confirmation option before they commit to the action (e.g. cancel options, restricting entry or auto correct functions)



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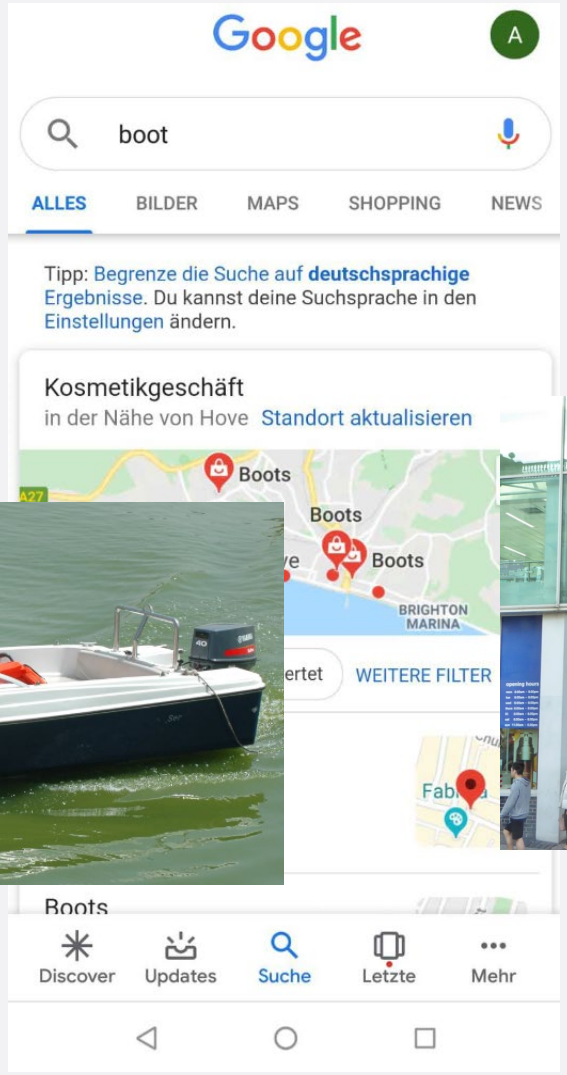

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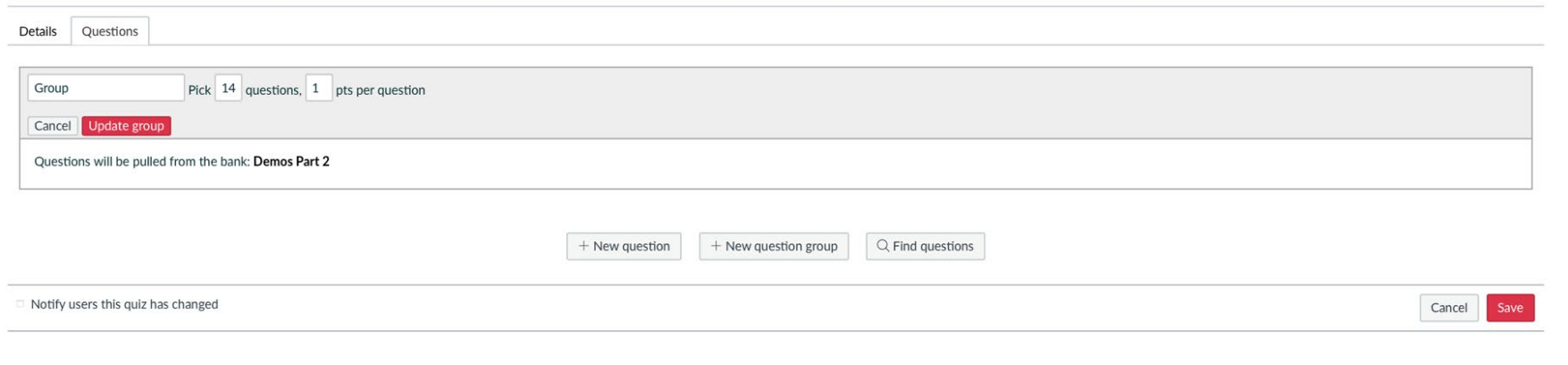
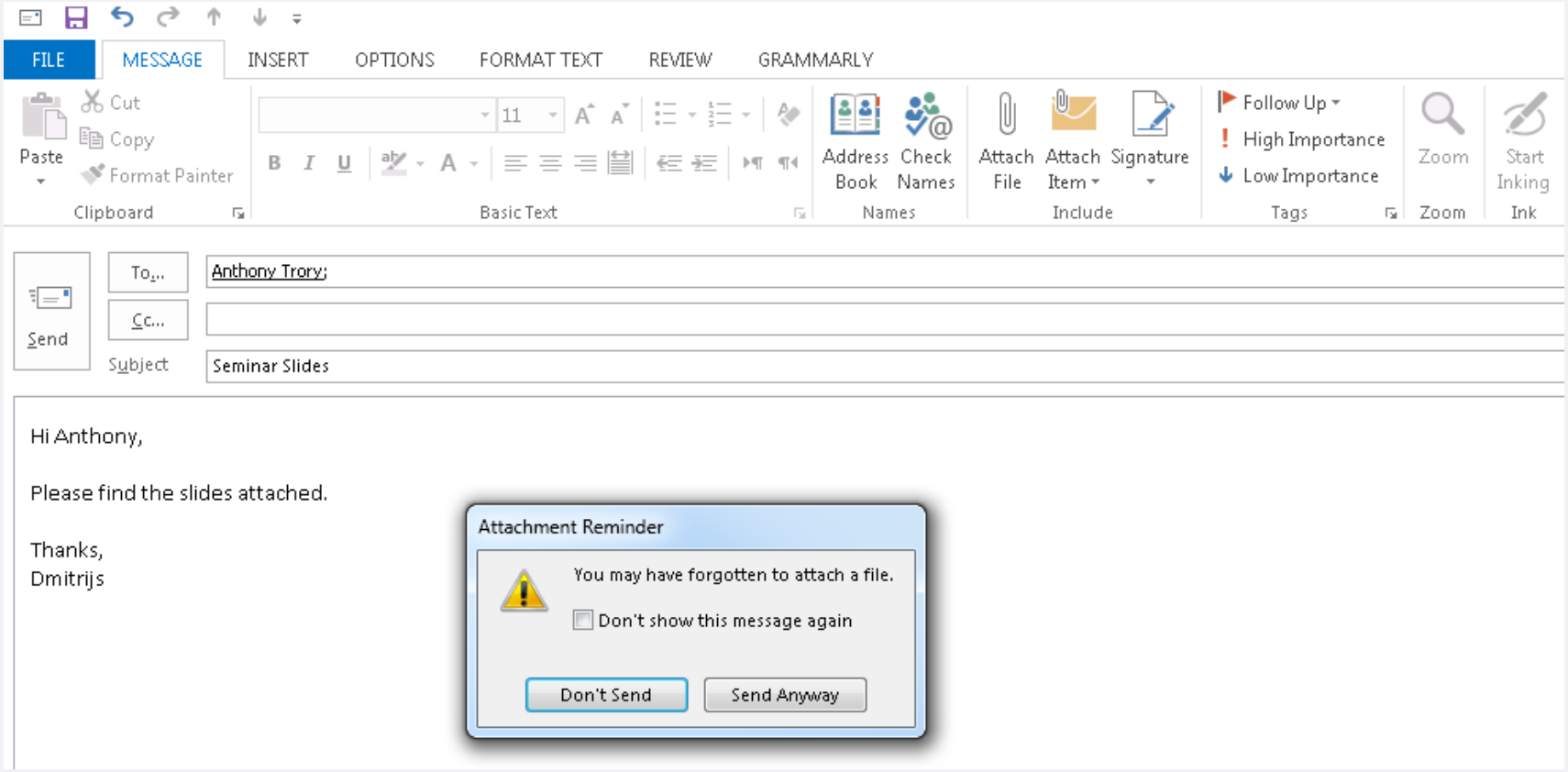


Confusing red buttons on Canvas

5. error prevention

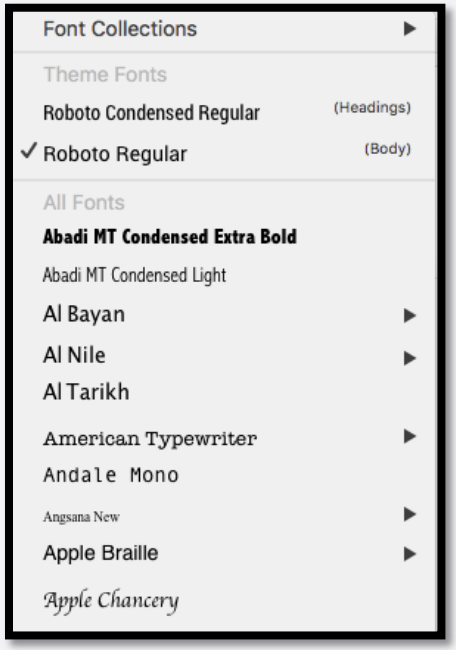


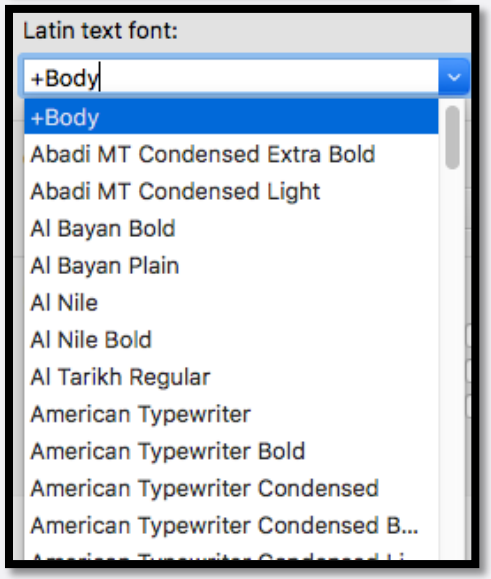
6. recognition rather than recall

what: minimise the user's memory load by making objects/actions/options visible

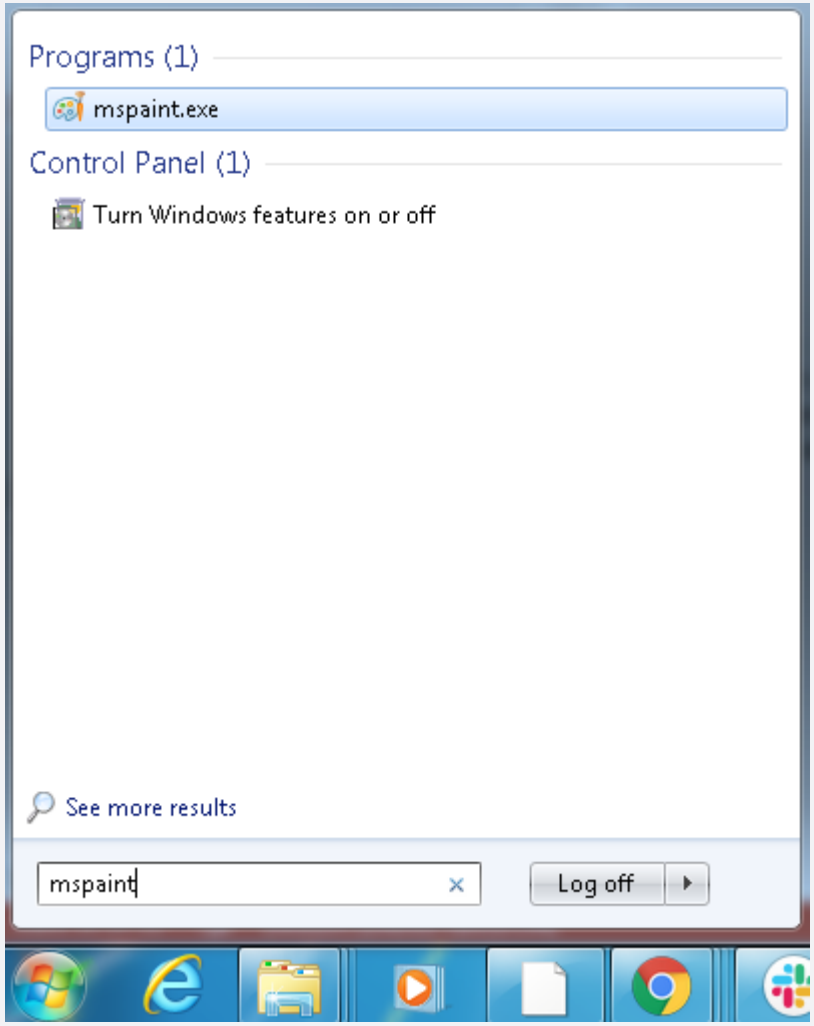
user should not have to remember information from one part of the system to another

how: instructions for use of the system should be visible or easily retrievable whenever appropriate (e.g. previewing fonts while choosing)



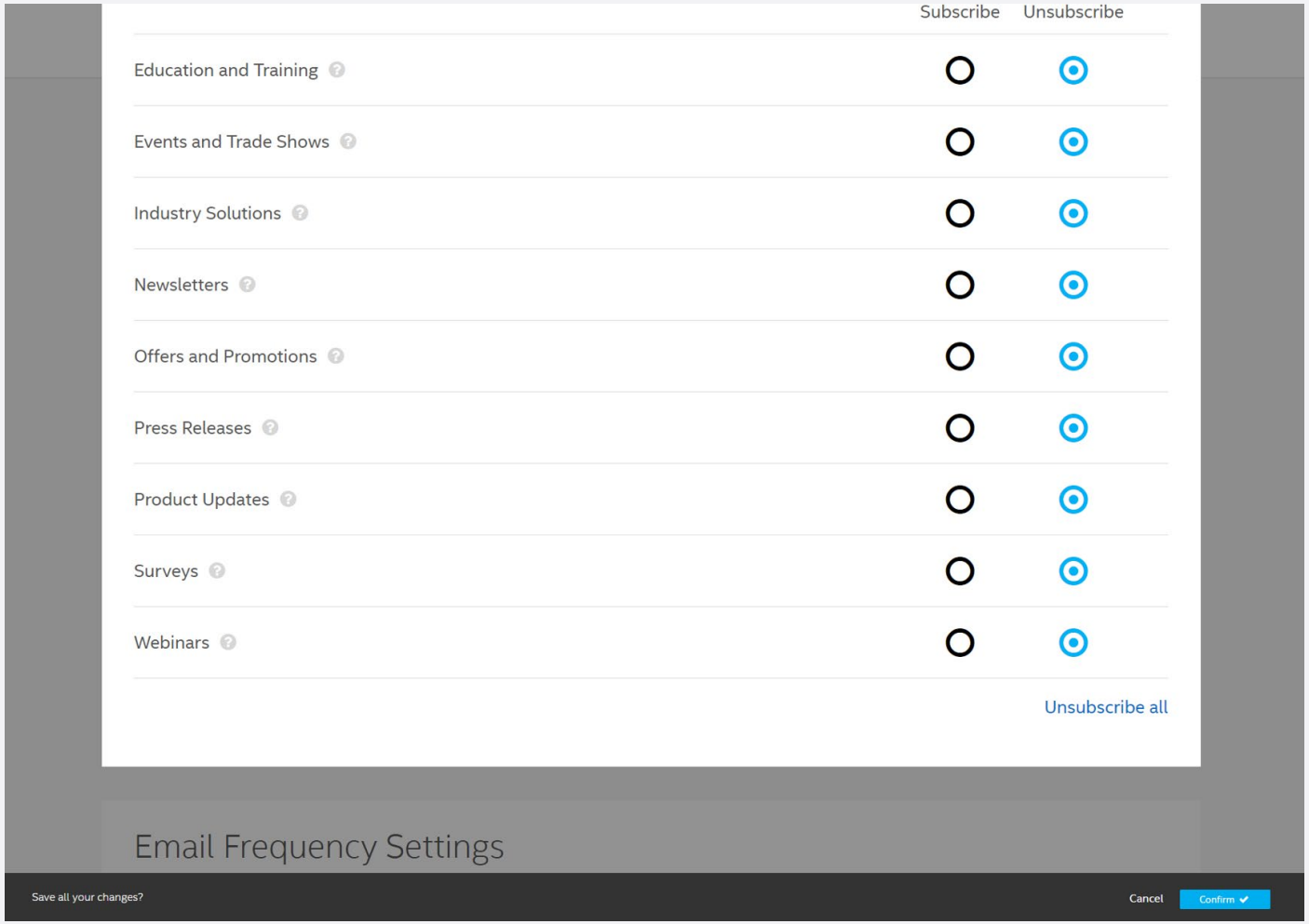


6. recognition rather than recall



6. recognition rather than recall

Think of Gestalt principles!



6. recognition rather than recall

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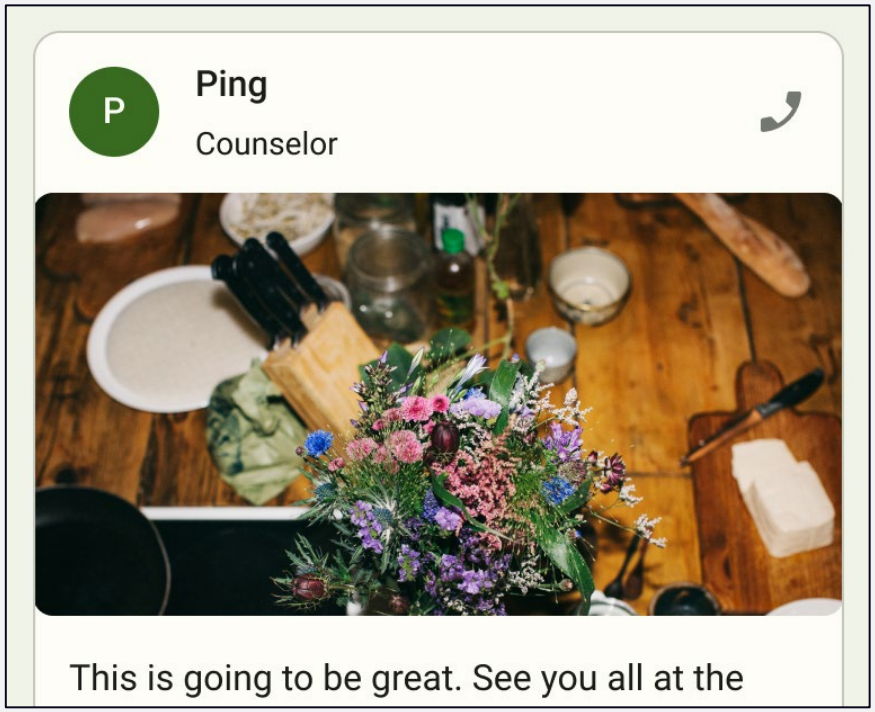


Explicit grouping

Implicit grouping

See Google Material Design Guidelines for more detail.

6. recognition rather than recall:
F-pattern reading

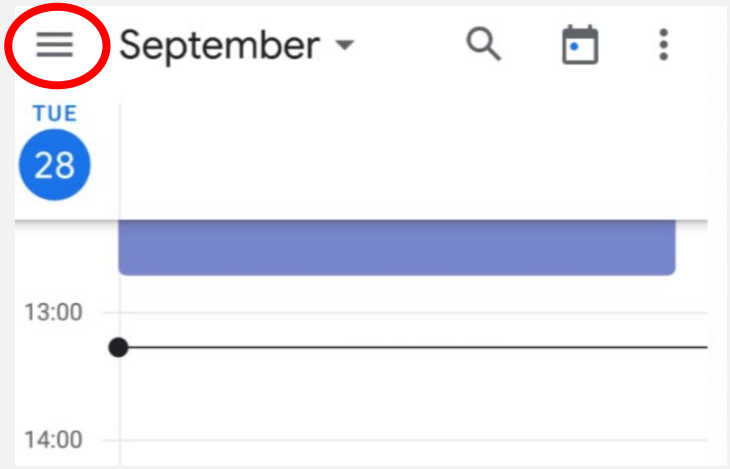
about us

product page

search results

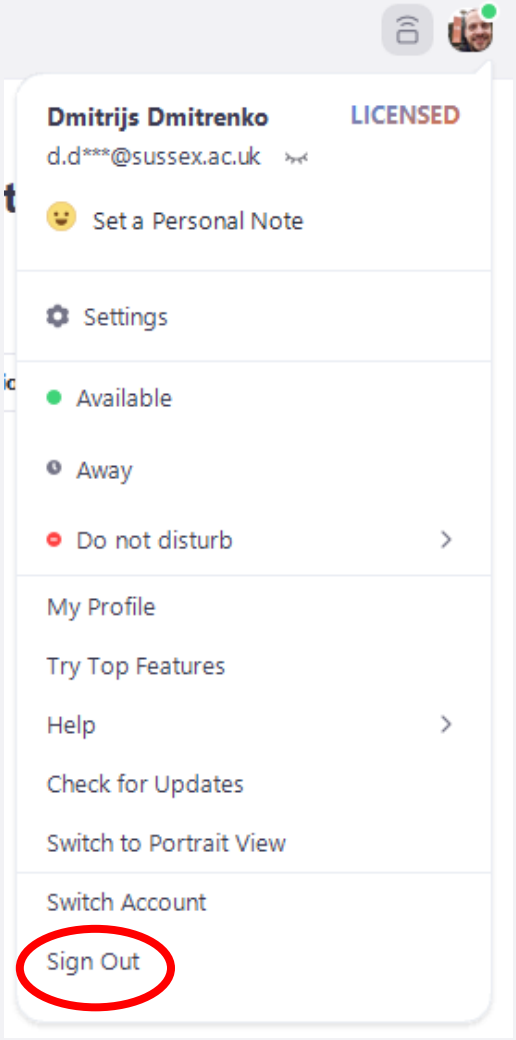
6. recognition rather than recall:
F-pattern reading

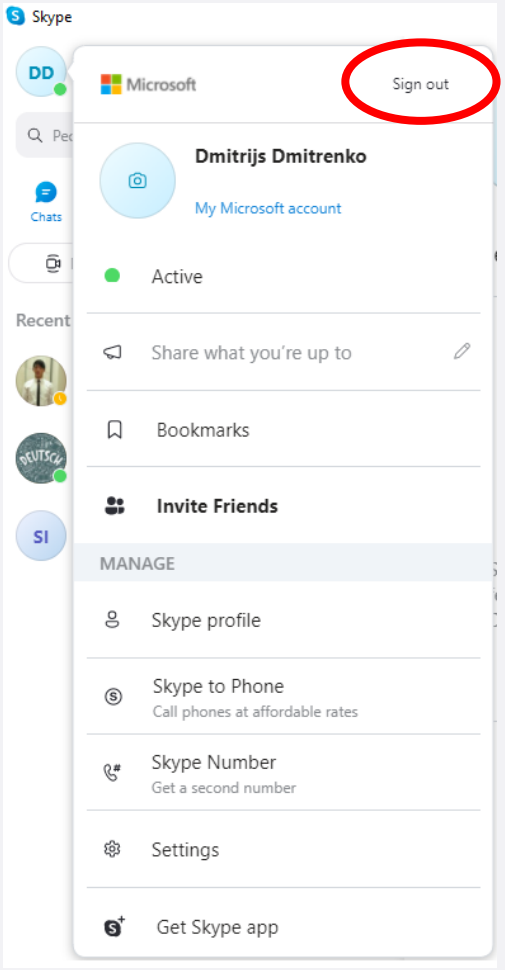
Burger menu in the top-left corner



Source: Google Calendar

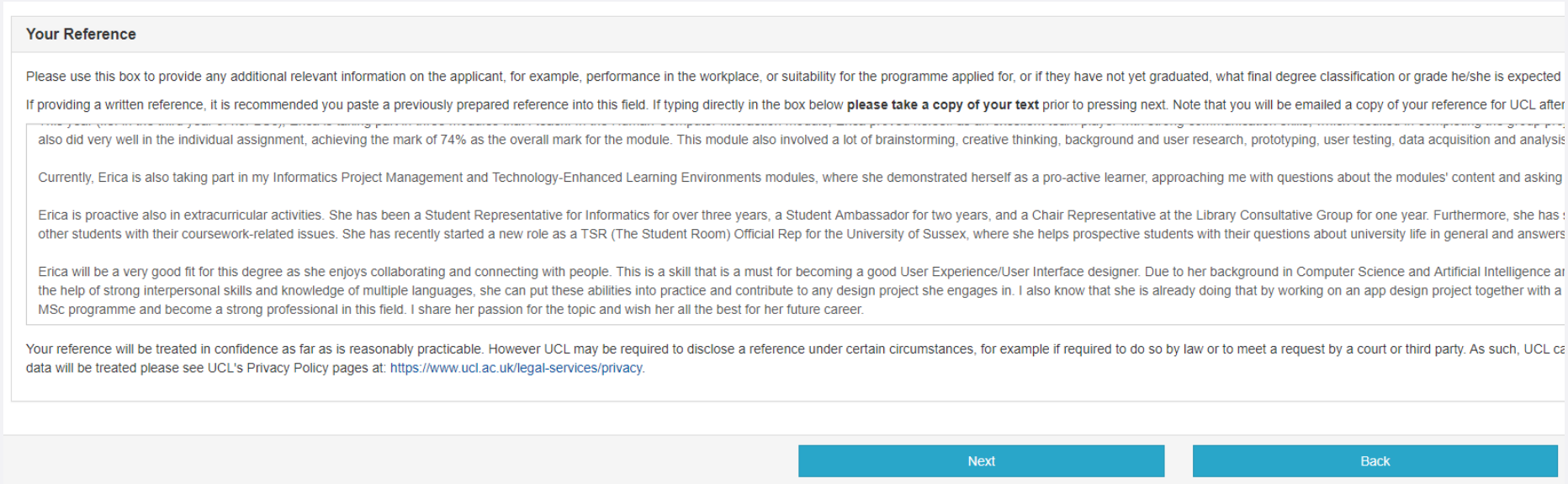
6. recognition rather than recall:
F-pattern reading





Quiz time!

Which heuristic is violated here?



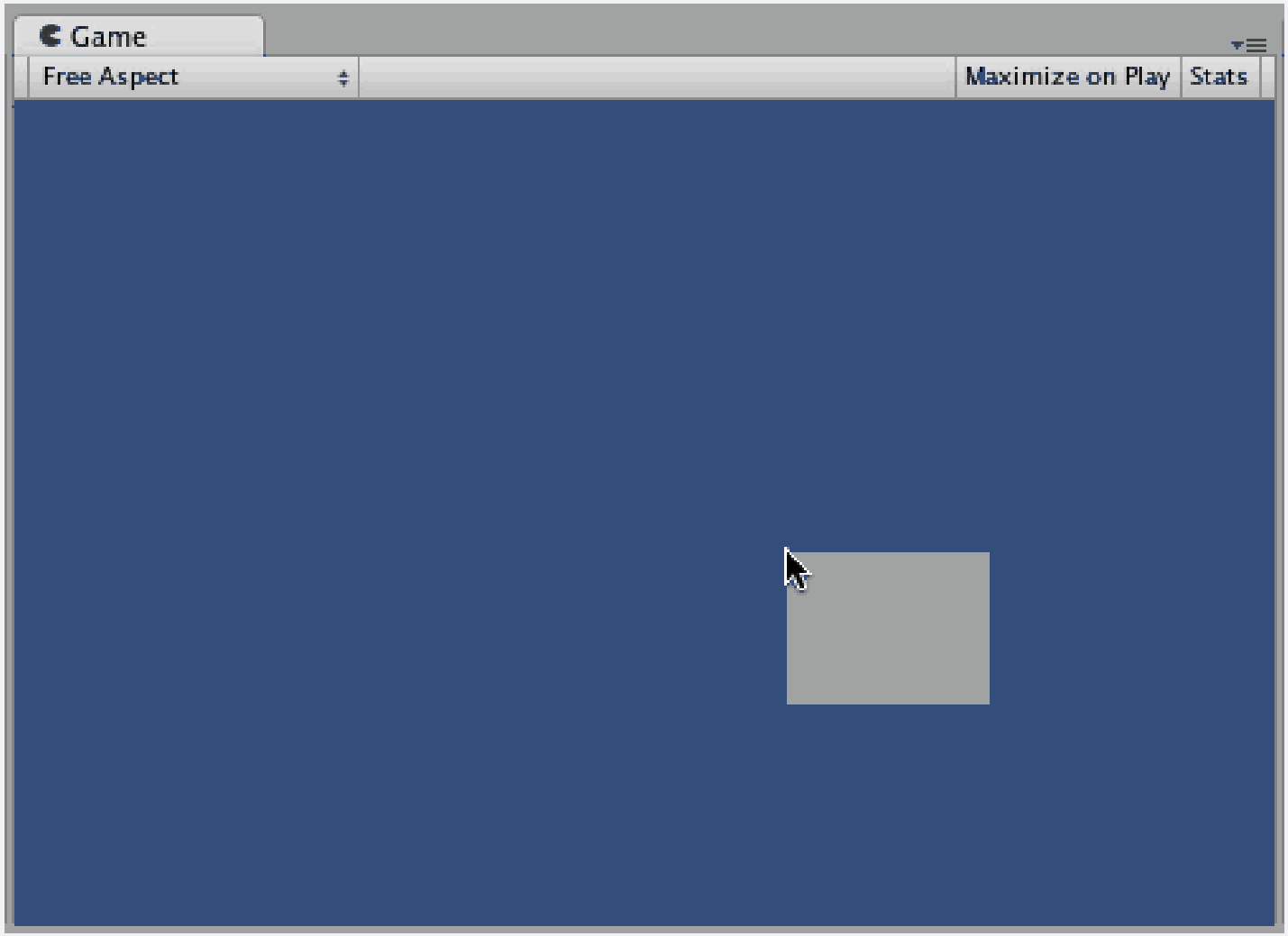
4. consistency & standards
5. error prevention
6. recognition rather than recall

7. flexibility and efficiency of use

what: accelerators - unseen by the novice user - may often speed up the interaction for the expert user such that the system can cater to inexperienced and experienced users

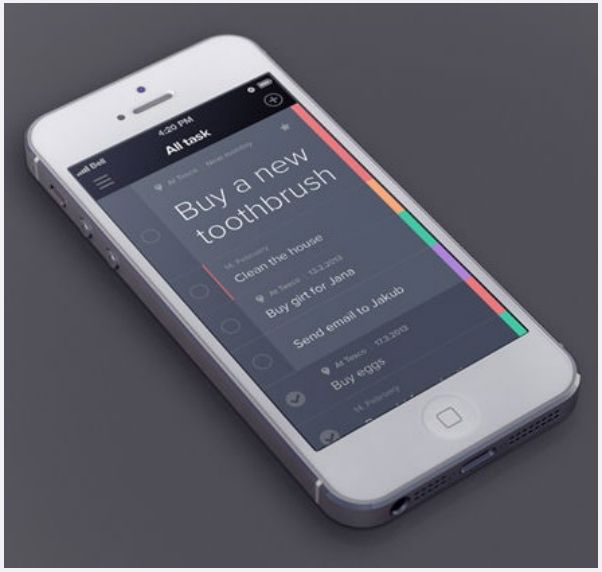
how: allow users to tailor frequent actions (e.g. customisable shortcuts and macros)

7. flexibility and efficiency of use



Source: https://docs.unity3d.com/Manual/CustomizingYourWorkspace.html

8. aesthetic and minimalist design

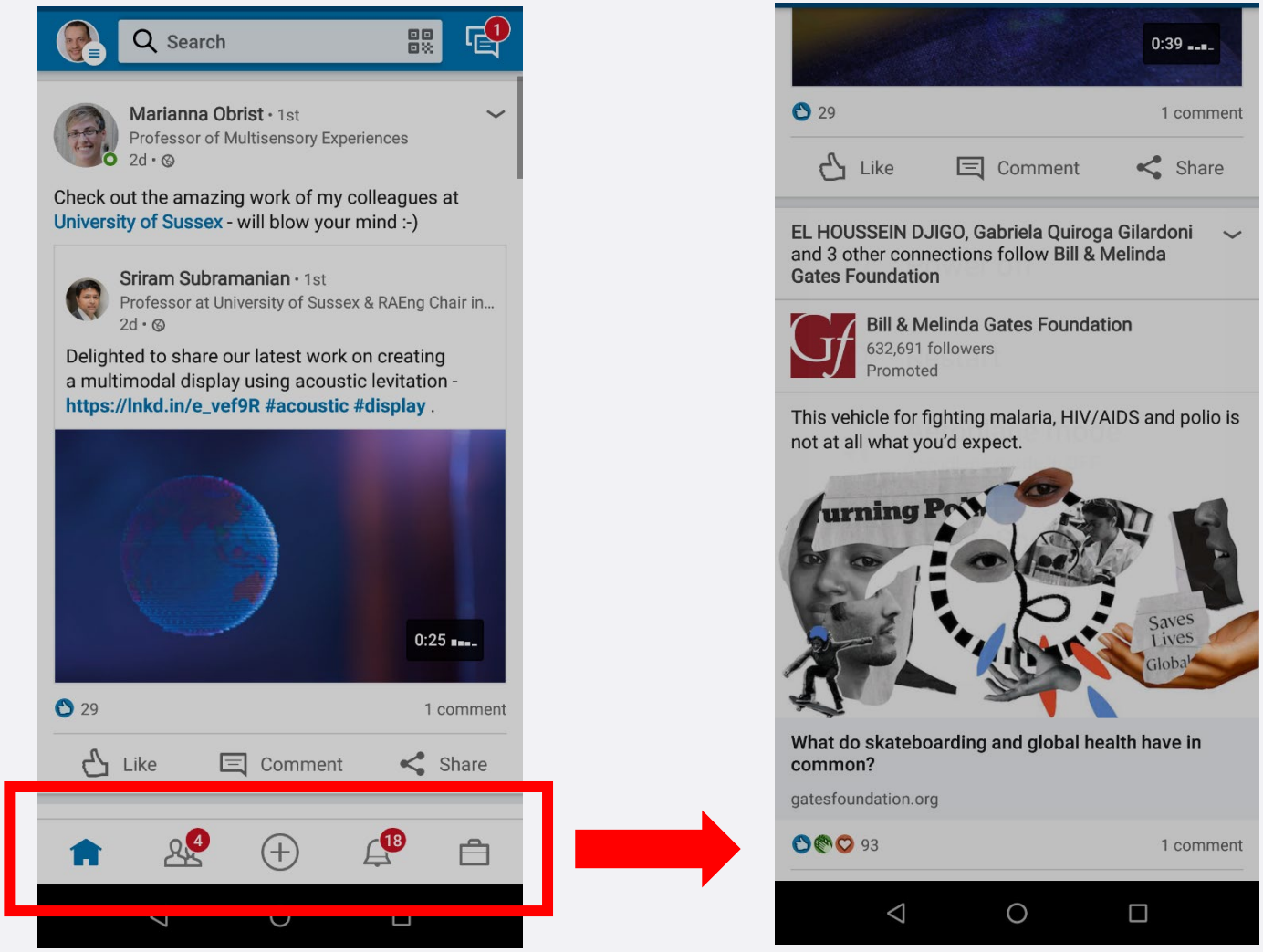


what: screens and dialogs should not contain information which is irrelevant or rarely needed

every extra unit of information in a dialogue competes with the relevant units of information and diminishes their relative visibility

how: visual layout should respect the principles of contrast, repetition, alignment, and proximity

8. aesthetic and minimalist design

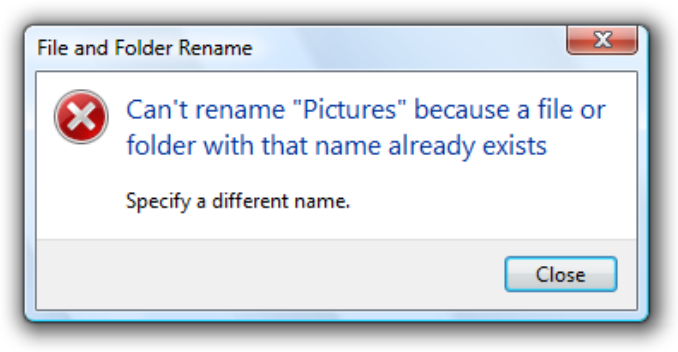


The bottom menu bar disappears as you scroll down in the LinkedIn app.

8. aesthetic and minimalist design

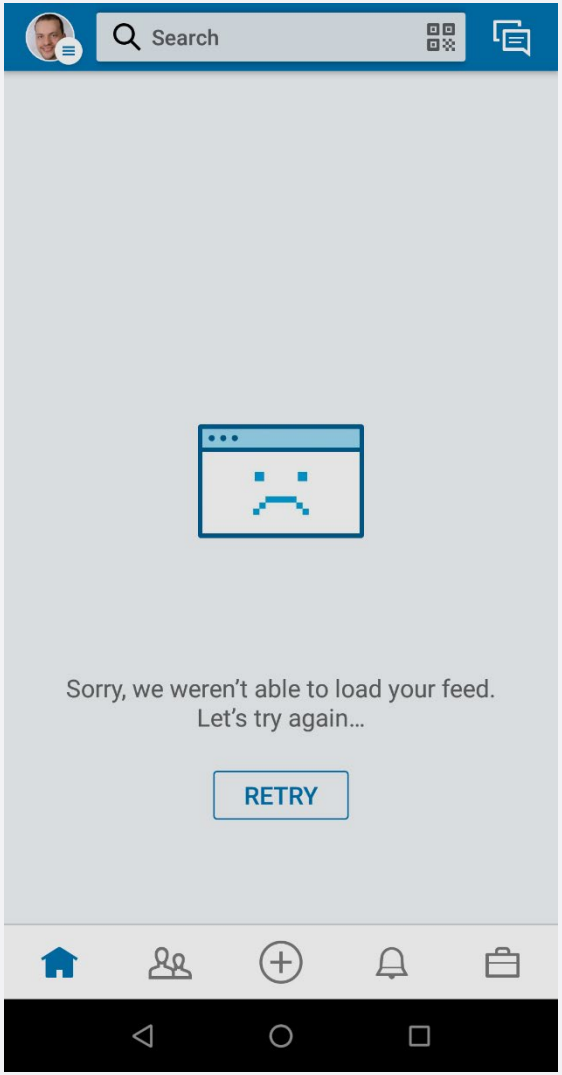
Check this page for more detail: https://articles.uie.com/death_of_relaunch/

9. help users recognise, diagnose and recover from errors



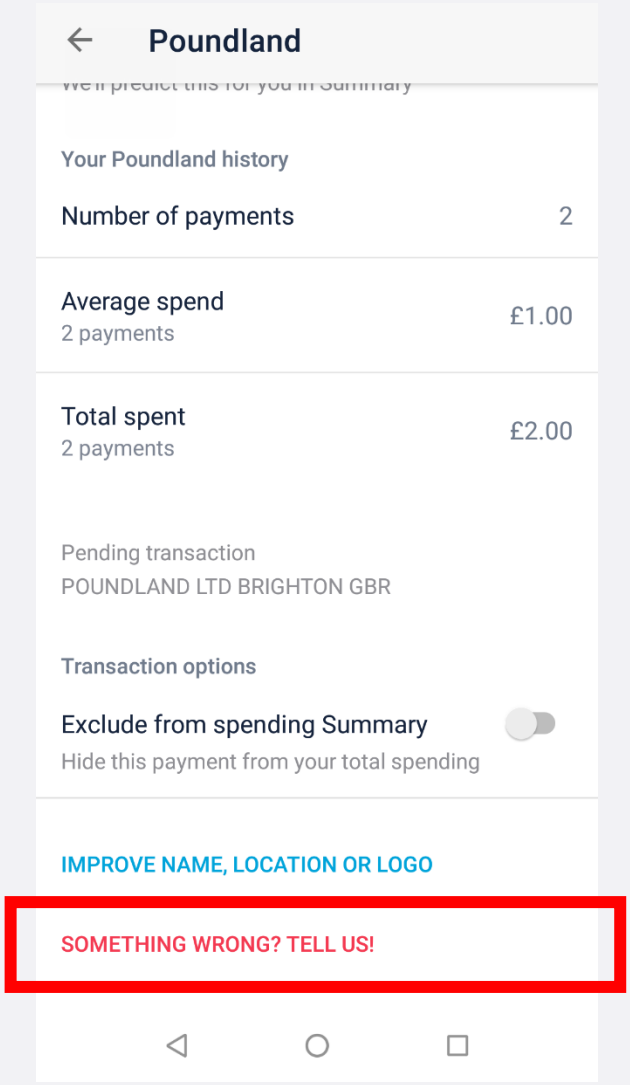
what/how: error messages should be expressed in plain language (no codes), precisely indicate the problem, and constructively suggest a solution

9. help users recognise, diagnose and recover from errors



Source: LinkedIn app

9. help users recognise, diagnose and recover from errors



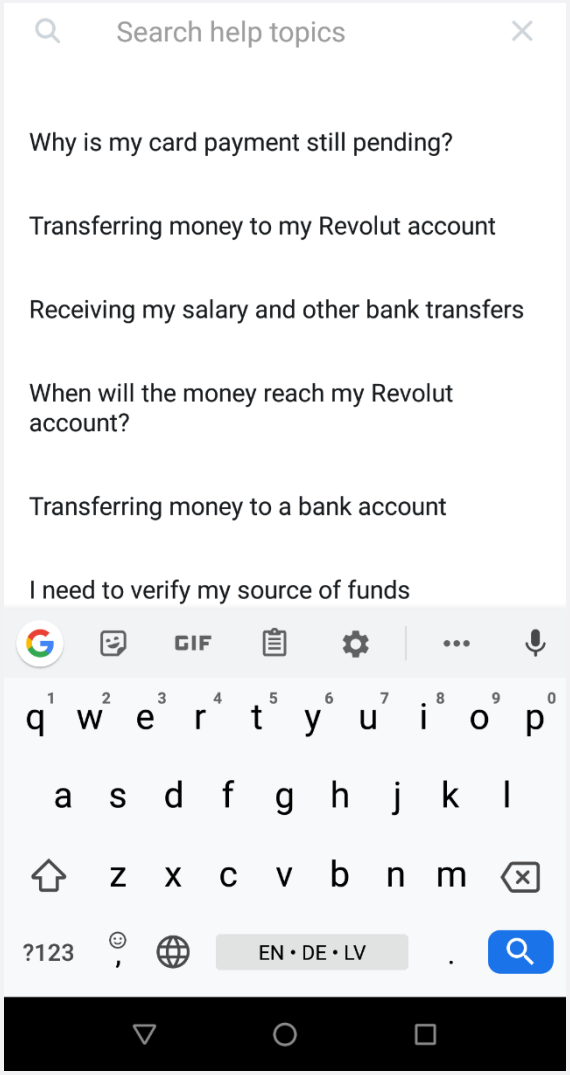
Source: Monzo app

10. help & documentation

what: even though it is better if the system can be used without documentation, it may be necessary to provide help and documentation

how: any such information should be easy to search, focused on the user's current task, list concrete steps to be carried out, and not be too large (e.g. contextual help, tooltips, short walkthroughs)

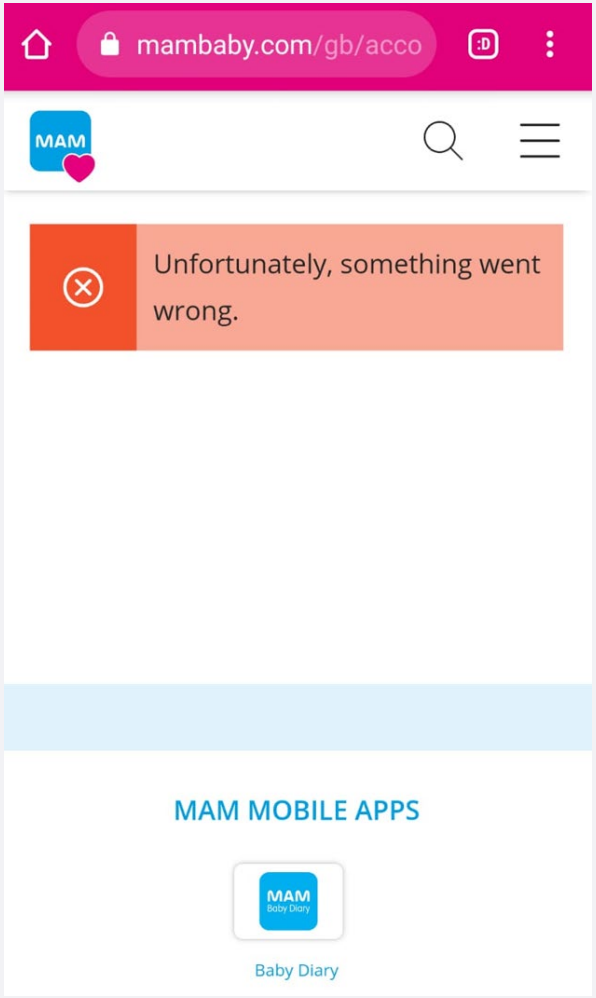
10. help & documentation



Source: Revolut app

Quiz time!

Which heuristic is violated here?



7. flexibility & efficiency of use
8. aesthetic & minimalist design
9. help users recognise, diagnose & recover from errors
10. help & documentation

how to do
heuristic evaluation

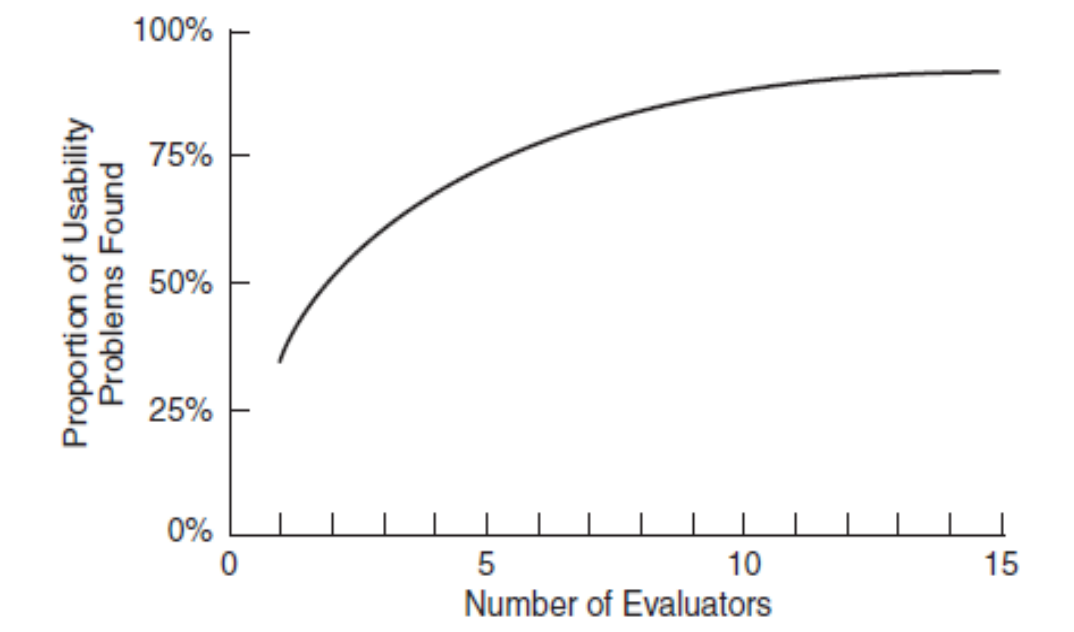
- briefing session to **tell experts what to do** (prepared script can be useful)
- **evaluation** period of **1-2 hours** in which:
  - each expert works separately
  - make **one pass** to get a **feel for the product**
  - make a **second pass** to **focus on specific features** and **identify potential usability problems**
- debriefing session in which experts work together to **prioritise problems**

levels of **severity**

- 0 - don’t agree that this is a usability problem
- 1 - cosmetic problem
- 2 - minor usability problem
- 3 - major usability problem; important to fix
- 4 - usability catastrophe; imperative to fix

number of evaluators

- Nielsen suggests that on average **5 evaluators identify 75-80% of usability problems**.
- Cockton and Woolrych (2001) point out that the number of users needed to find 75-80% of usability problems **depends on the context and nature of the problems**.



cognitive walkthroughs

"Cognitive walkthroughs involve **simulating a user's problem-solving process** at each step… checking to see if the user's goals and memory for actions can... lead to the next correct action." (Nielsen & Mack, 1994, p. 6).

- aims to **evaluate first use experiences**
- focus is on **ease of learning**

cognitive walkthroughs:
process

- **designer** presents an aspect of the **design & usage scenarios**
- **expert** told **assumptions about user populations**, context of use, task details
- **one or more experts walk through the design prototype** with the scenario
- experts guided by **three questions:**

the three questions

1. will the **correct action** be sufficiently **evident to the user**?
2. will the user **notice** that the **correct action is available**?
3. will the user **associate and interpret the response** from the action correctly?

as the experts work through the scenario, they note problems

pluralistic walkthrough

- variation on the cognitive walkthrough theme
- **users, developers and usability experts work together**, stepping through a task scenario
- the **panel of experts begins by working separately**
- then there is managed **discussion that leads to agreed decisions**
- the approach lends itself well to participatory design

advantages & problems of expert inspections

- **few ethical & practical issues** to consider because users not involved
- **best experts have knowledge of application domain & users**
- **can be quicker and less resource intensive** than user studies
- BUT…
- can be **difficult & expensive to find experts**
- important **problems may get missed**
- many trivial problems are often identified
- **experts have biases**

evaluation using
predictive models

use formulas to derive various measures of user performance:

- Fitts' Law
  - **predicts time taken to reach a target** using a pointing device
  - can help designers decide **size and placement of** physical/digital **buttons**, etc.
- GOMS
  - used to improve interaction efficiency by **eliminating useless or unnecessary interactions.**
  - could be a strong **analysis benchmark** of user's behaviours

Fitts' Law

- Fitts' Law describes the time taken to hit a screen target with a mouse cursor:

$$Mt = a + b \log_2(D/S + 1)$$

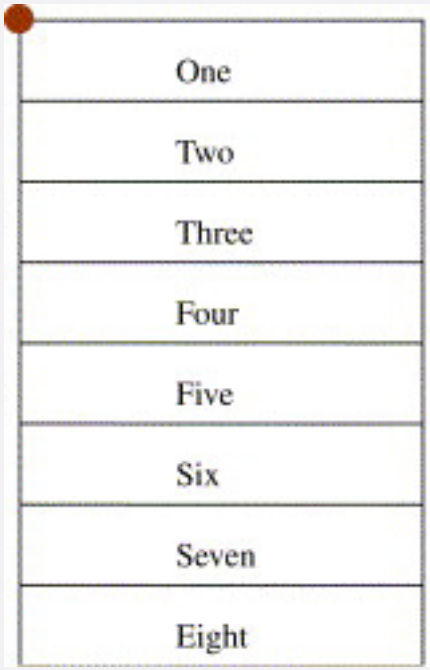
where: a and b are empirically determined constants (intercept & slope)
Mt is Movement time
D is Distance
S is Size of target

⇒ **targets** as **large** as possible

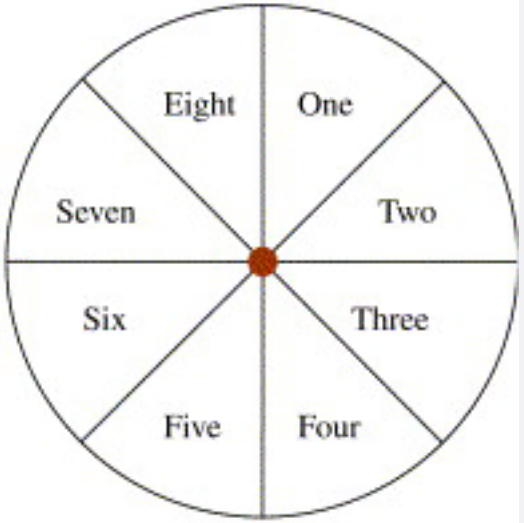
⇒ **distances** as **small** as possible

Fitts' Law example

Pop-up Linear Menu



Pop-up Pie Menu



- Which will be faster on average from red starting point?
  - pie menu (bigger targets & smaller distances)

GOMS

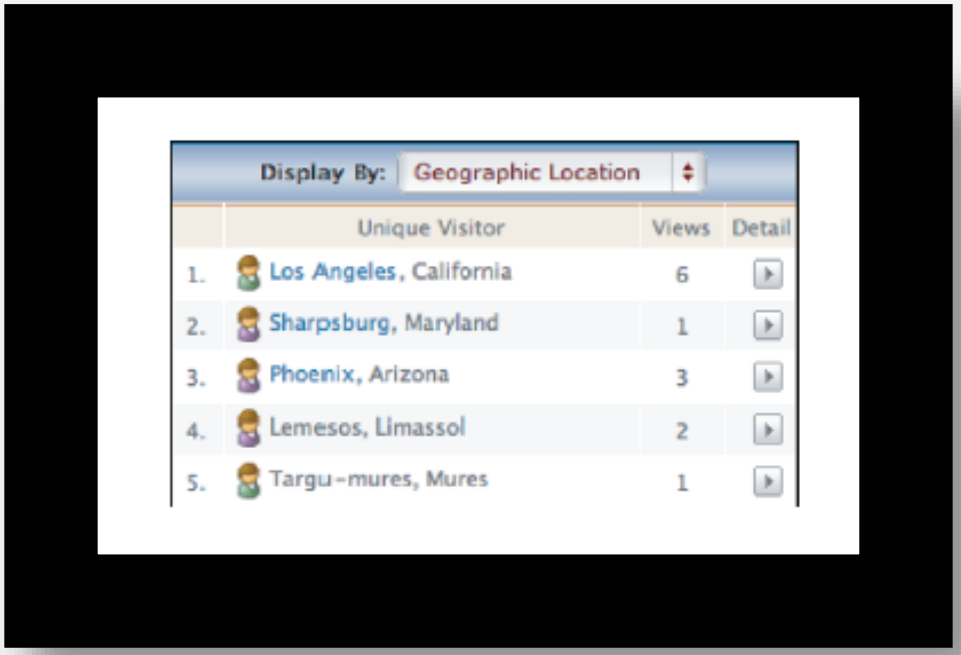
- **GOMS** is an abbreviation from:
  - **G** → Goals
  - **O** → Operators
  - **M** → Methods
  - **S** → Selection

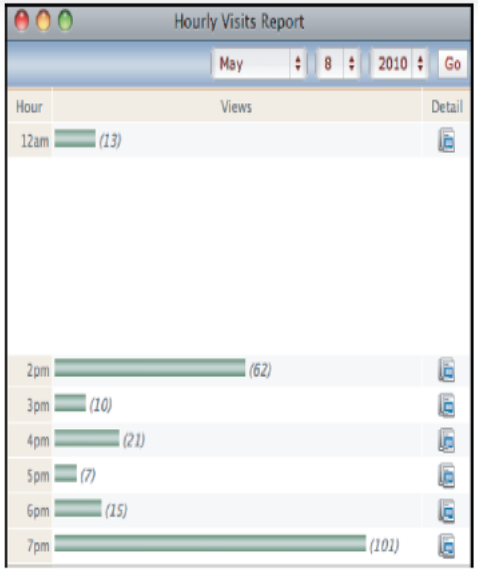
- For the detailed description, we define:
  - **Goals (G)** as a **task to do** e.g. “Send e-mail”
  - **Operators (O)** as all **actions** needed **to achieve the goal** e.g. “amount of mouse clicks to send e-mail”
  - **Methods (M)** as a **group of operators** e.g. “move mouse to send button, click on the button”
  - **Selection (S)** as a **user decision approach** e.g. “move mouse to send button, click on the button” or “move mouse to send button, click ENTER”

Source: UX Planet/GOMS

evaluation using **analytics**

- a method for evaluating user traffic through a system or part of a system
- many examples: Google Analytics, VisiStat, Learning Analytics
- **e.g. analyse times of day & visitor IP addresses**





what about
user experience?

- these methods may work for evaluating whether a tool is easy to learn to use, is effective, or has good utility, but what about evaluating against user experience goals?
- can these methods be used to tell us whether a game is **fun**, whether a piece of software **supports creativity**, whether a phone is **fulfilling**?

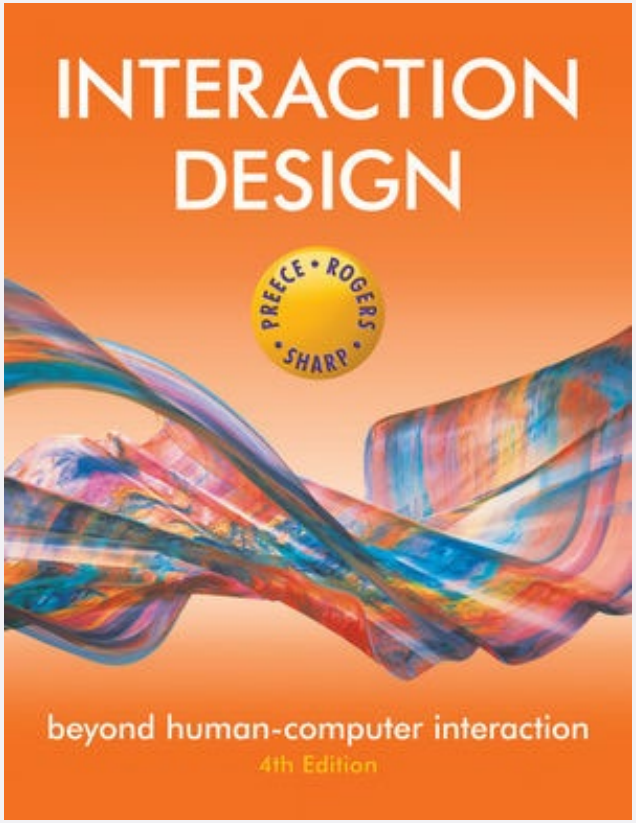
key points

- inspections can be used to evaluate requirements, mockups, functional prototypes, or systems
- design guidelines can be used to develop heuristics
- **user testing and heuristic evaluation may reveal different usability problems (but not user experience issue)**

Reminders

- Drop-in Sessions
- Office Hour

Please check the “Module Contacts” page on Canvas for details!

reading

- Read the **“Evaluation: Inspections, Analytics, and Models”** chapter of the Interaction Design book