MONASH University

FIT3175 - Usability

User Interfaces and Design Guidelines

Week 2 Lecture P2

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Learning objectives

Graphical User Interfaces

- Evolution of user interfaces
- WIMP systems
- Metaphors and skeuomorphism

Navigation Menus

- Navigation and menu types
- Menu design guidelines

Interface Design Guidelines

- Shneiderman's 8 Golden Rules
- Comparison with Norman's Principles

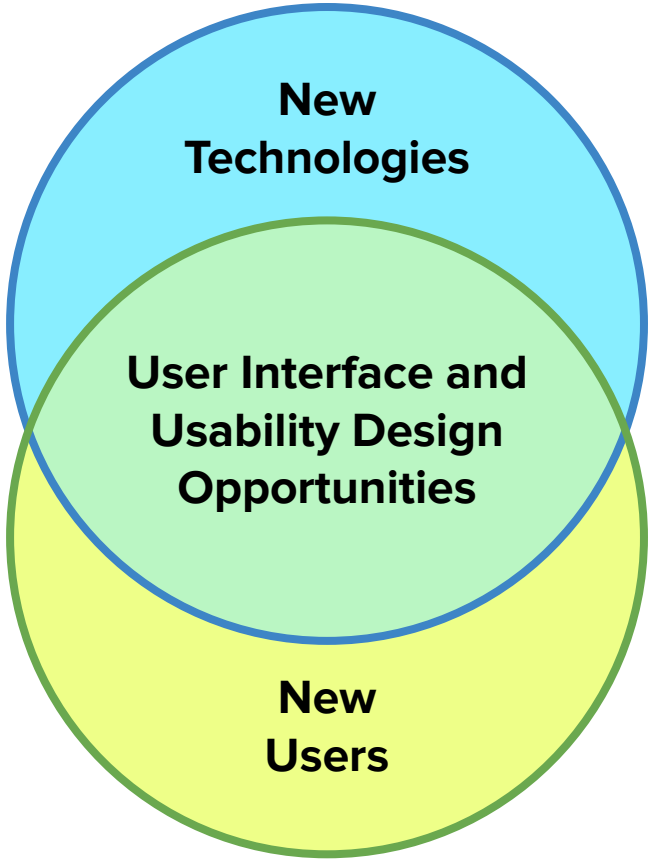
Graphical User Interfaces

Paradigm shifts in UI design

There have been paradigm shifts in computing that also shifted expectations of UI design:

- Business computing
- Home computing
- Educational computing
- The World Wide Web
- Mobile and responsive design
- Virtual and augmented reality

Changes in technology and users, necessitate design changes to maximise usability.



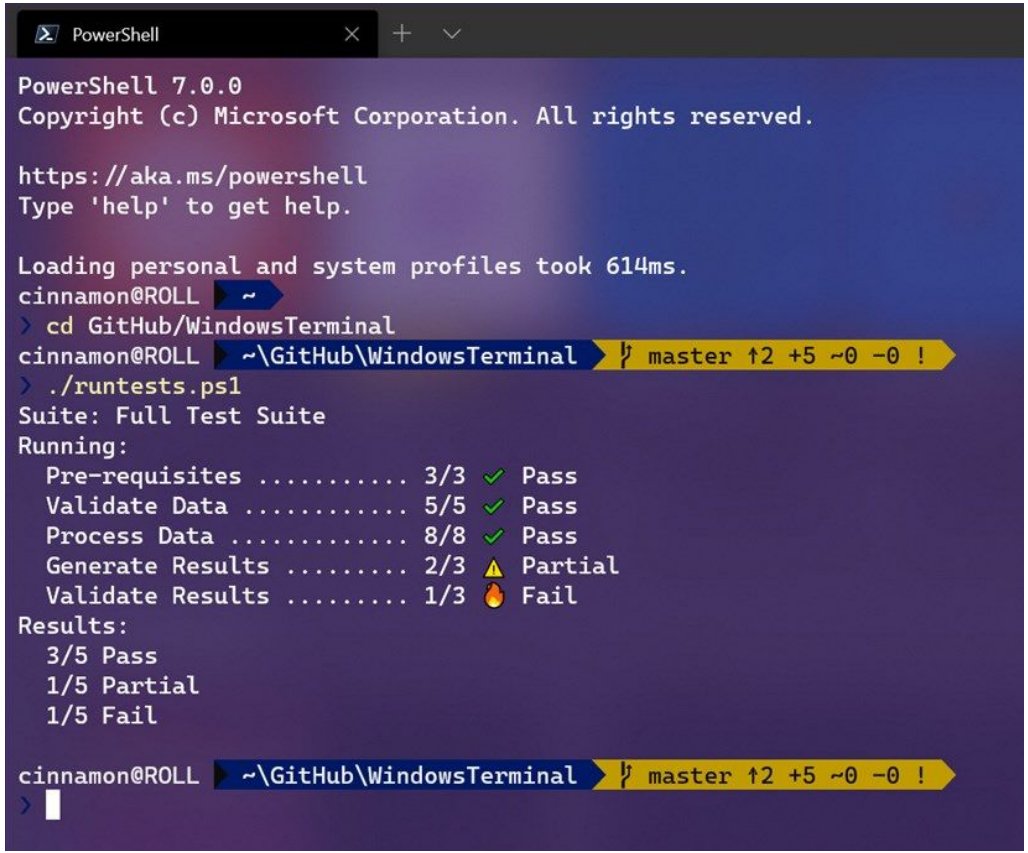
Command Line Interface (CLI)

Early computers (after those primarily controlled with manually switches) used text based interfaces.

Common interaction method:

- Typed commands, often with user-supplied parameters.
- Typed selection from an on-screen text menu of commands (a letter or number that for a single command).

Command Line Interface (CLI)



Still present in modern computer systems, **CLI has advantages:**

- Low system requirements
- Remote work
- Fast and precise

... and disadvantages:

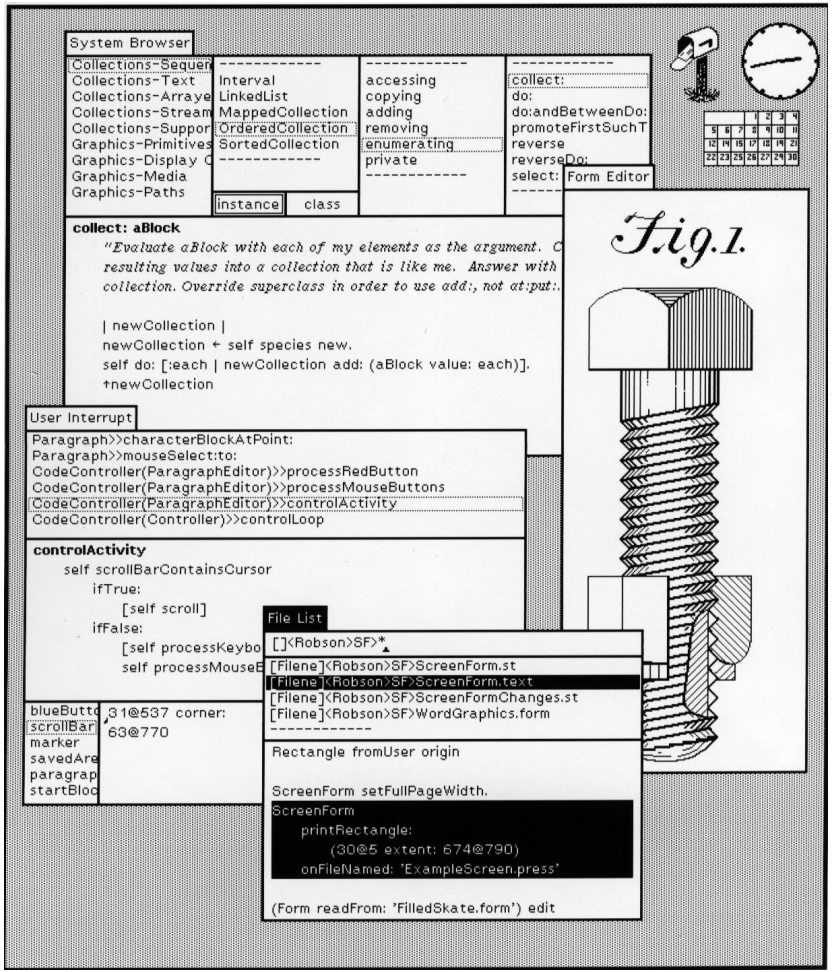
- Remembering commands
- Remember syntax
- Command entry errors
- Limited direct interactivity

Xerox Alto GUI (1973)

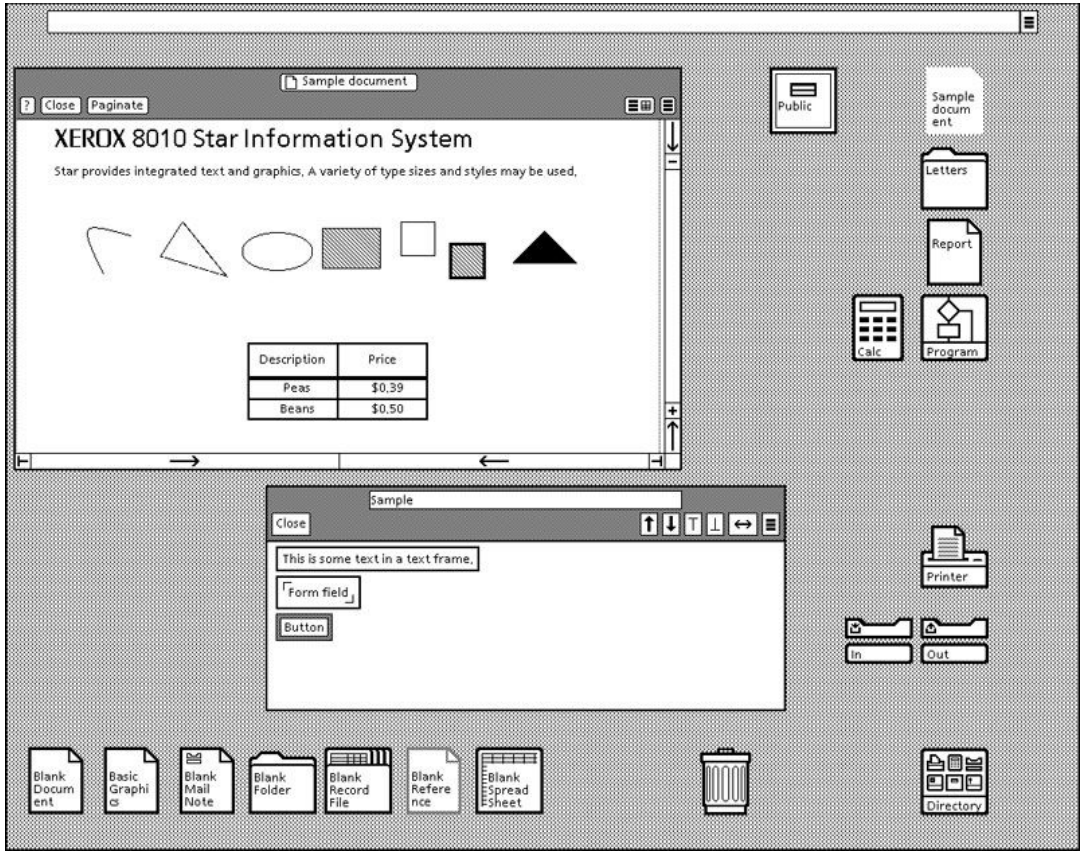
The first computer designed with the intent of having a graphical user interface.

- Raster-based (pixel) display - compared to line-based text displays.
- Included a keyboard and three-button mouse for input.
- Pioneered **What You See Is What You Get (WYSIWYG)** word processing.

Xerox Alto was targeted at large corporations - not personal use.



Xerox Star desktop GUI (1981)



The **Xerox 8010 Information System** was the first commercial personal computer.

Introduced a new **"desktop"** metaphor to help familiarise new users to computing tasks.

What do you think the main purpose of this computer was?

Who is the target audience?

Metaphoric interfaces

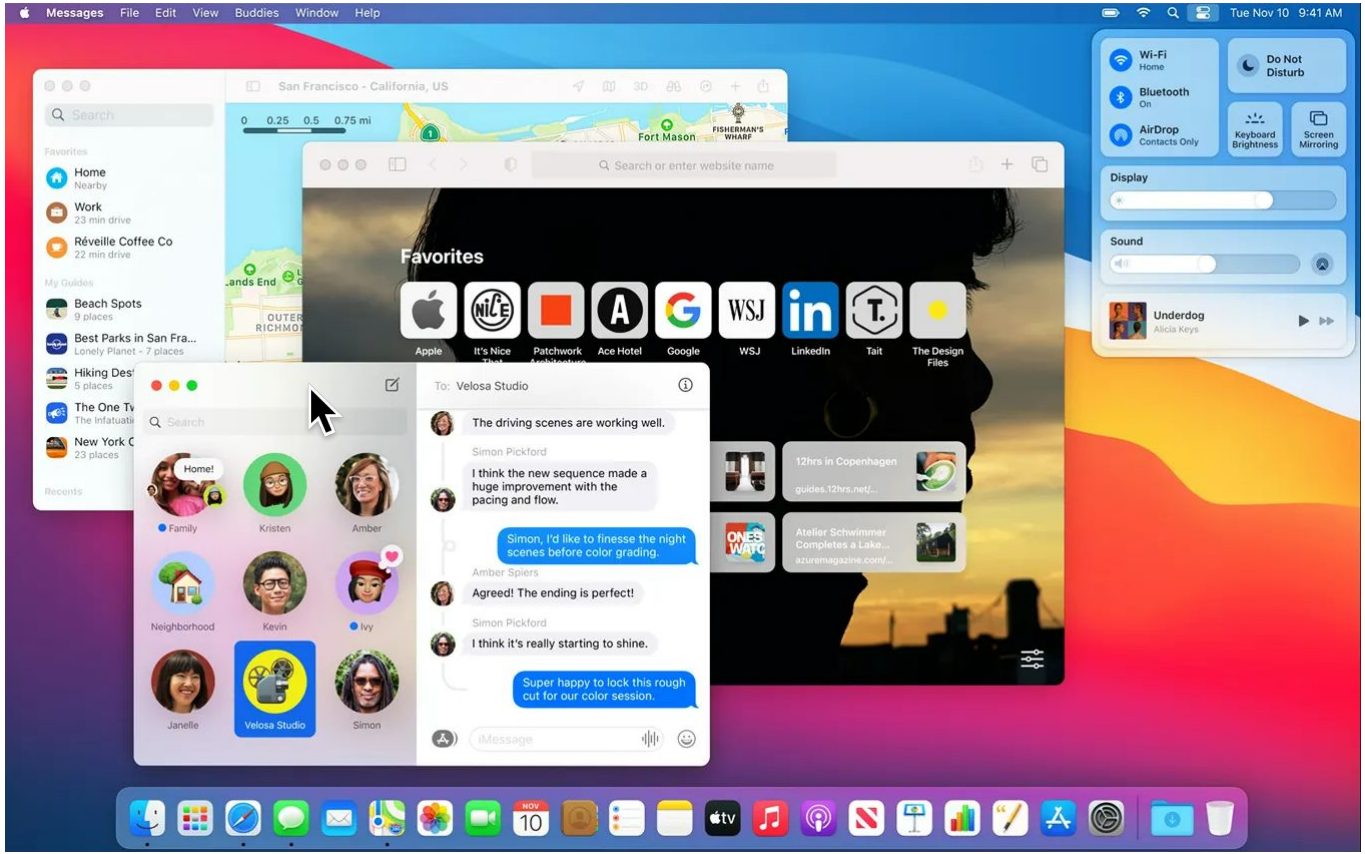
Microsoft Bob (1995) was released shortly ahead of Windows 95, at the boom of personal home computing.

The interface presents users with a room containing familiar objects that can be interacted with.

Who is the target audience?

Does this UI feel intuitive?

WIMP interface style



WIMP Interfaces

- **W**indows
- **I**cons
- **M**enus
- **P**ointers

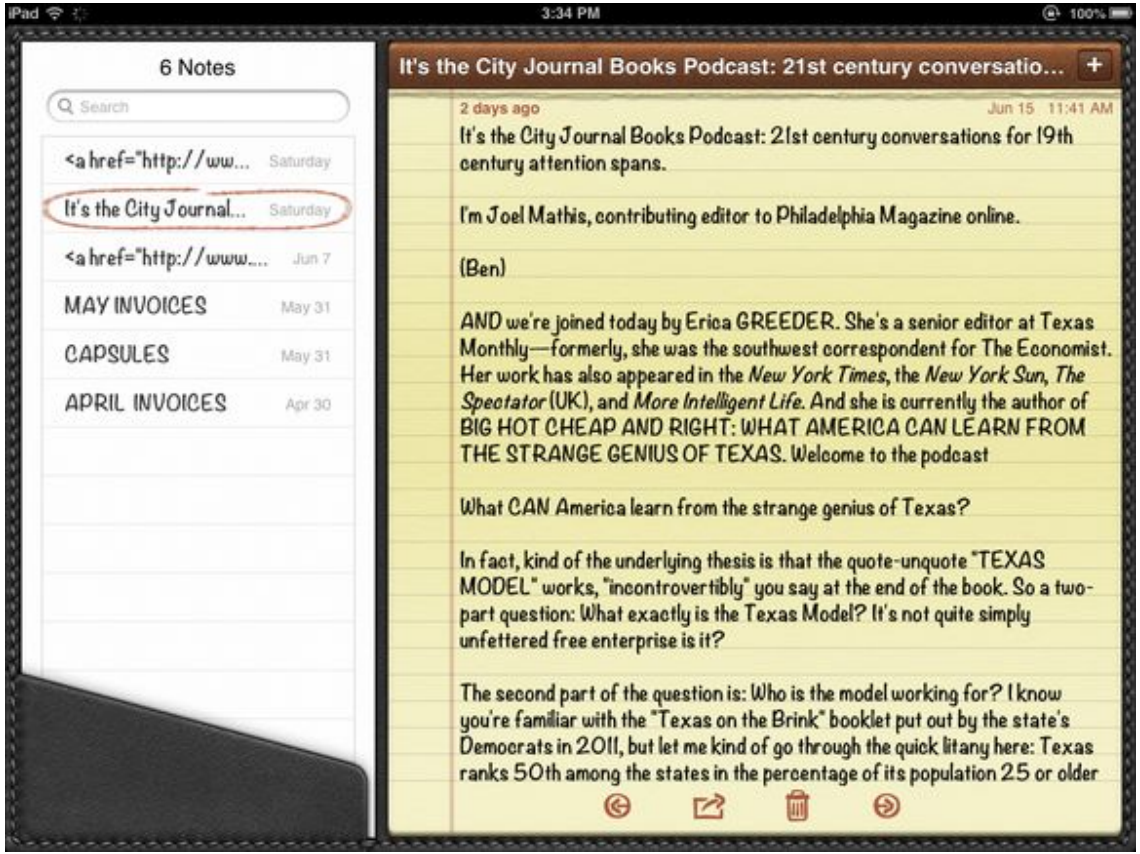
Well-suited for managing tasks requiring mostly 2-dimensional input.

Mobile interfaces

These interfaces retain many familiar concepts of desktop computing, but with differences.

- "Home screens" instead of desktops
- Windowless task-focussed application-based interfaces
- Icons and menus still present
- No visual representation of pointer (unless using a mouse)

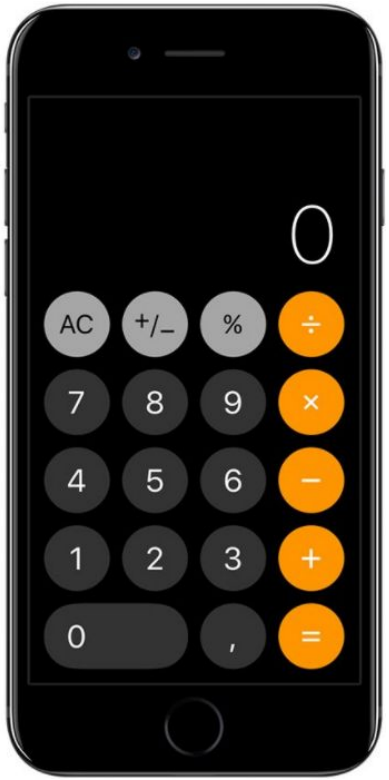
Skeuomorphic interfaces



Skeuomorphic vs metaphoric

Real Braun Calculator

Skeuomorphic Design



Metamorphic Concept

Navigation Menus

The purpose of navigation menus

Navigation is about finding information by navigating through the interface

Navigation is

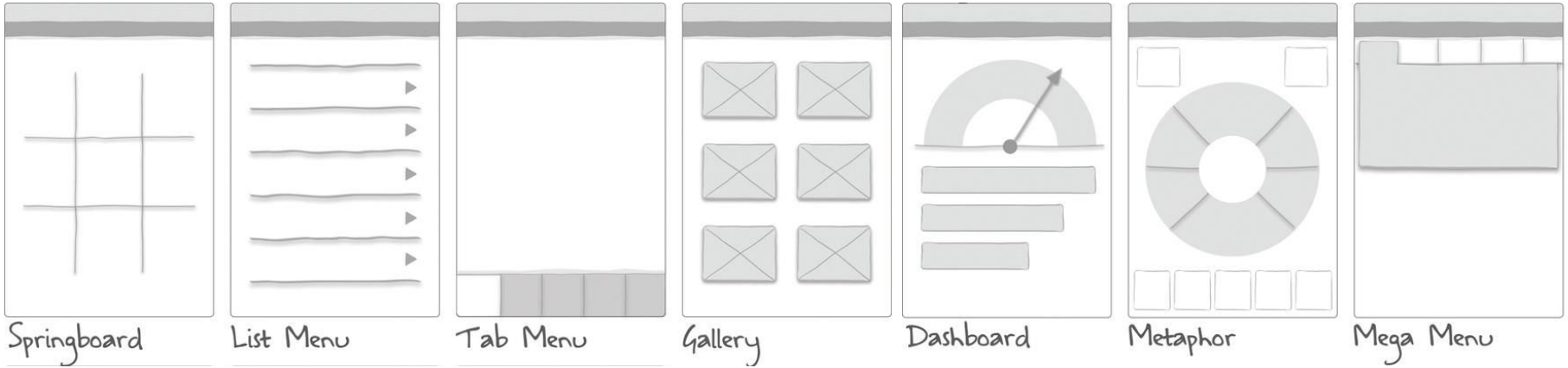
- Movement between different screens or pages of information
- Movement between UI elements within a single screen
- Direct movement between different systems, such as websites

Moving between options within any menu is "navigation" between UI elements.

Unlike other types of menus (selection menus, tool menus, context menus, etc.) a navigation menus purpose is to **facilitate navigation as a user goal**.

Types of menus

Navigation should feel natural - different menu styles suit different users and tasks.



These are common design patterns for navigation - they are not just based on layout.

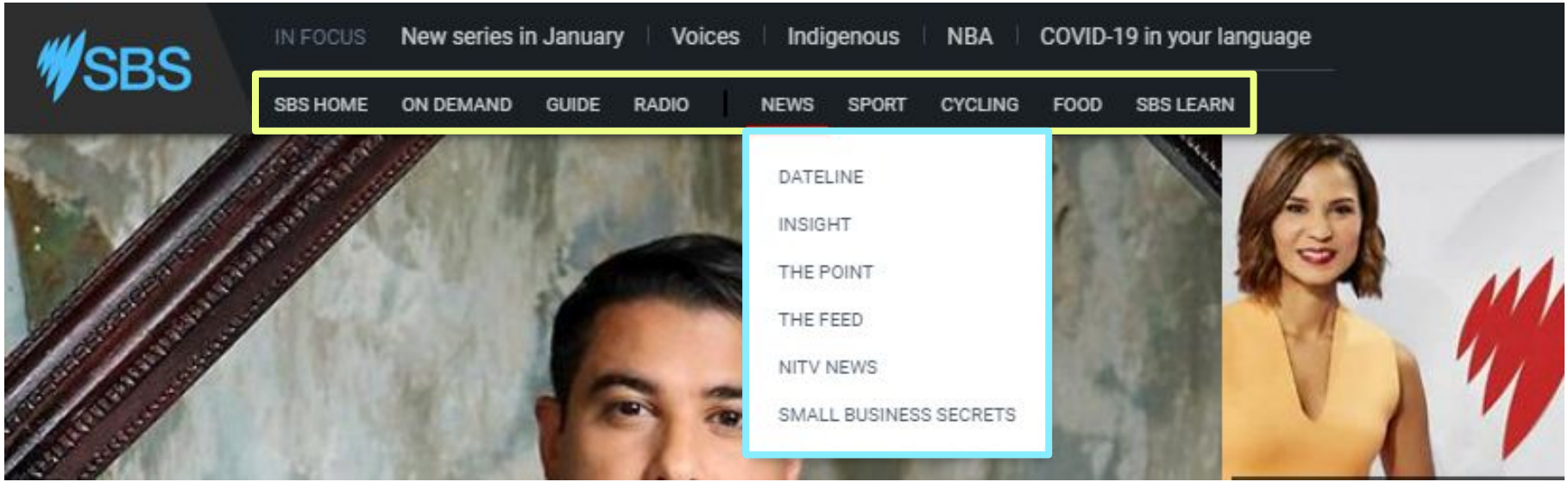
- **Dashboard menus** focus on providing overviews of data
- **Metaphor menus** base their visual appearance on the conceptual model.

https://www.oreilly.com/library/view/mobile-design-pattern/9781449336455/ch01.html

Structural navigation

This menu structure involves navigation between pages according to a hierarchy:

- **Primary/main navigation** between pages at the top-level of the hierarchy.
- **Secondary/local navigation** between options located deeper in the hierarchy.



Associative navigation

Associative navigation connects pages with similar topics and content.

- Hierarchical relationships are not represented in the groupings.
- Pages may have the same of different hierarchical importance.

Common types include: Footer navigation, quick links and contextual navigation.

Contextual navigation

Navigation occurs in-context, within the content

Common types of contextual navigation include:

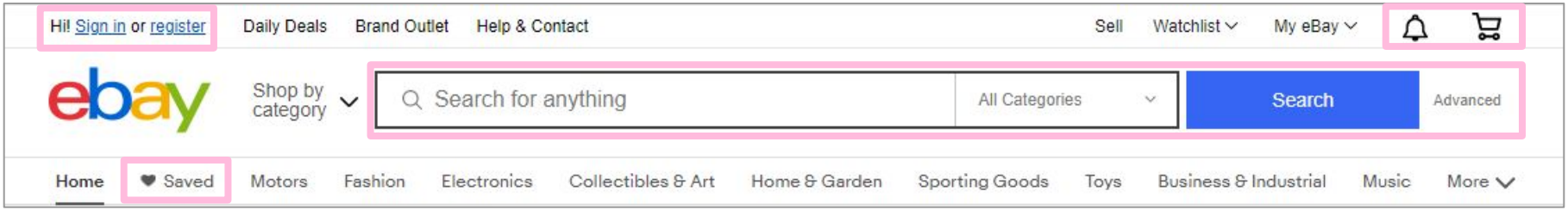
- **Embedded navigation**
  - Links within the context, such as linked text within a sentence.
- **Related links**
  - Usually beside/below the main content.
- **Adaptive navigation**
  - Links that change destination based on the selected context.

The object of use can be a software application, website, book, tool, machine, process, vehicle, or anything a human interacts with. A usability study may be conducted as a primary job function by a *usability analyst* or as a secondary job function by designers, technical writers, marketing personnel, and others. It is

Utility navigation

Navigation menus often provide access to tools that help with using the interface.

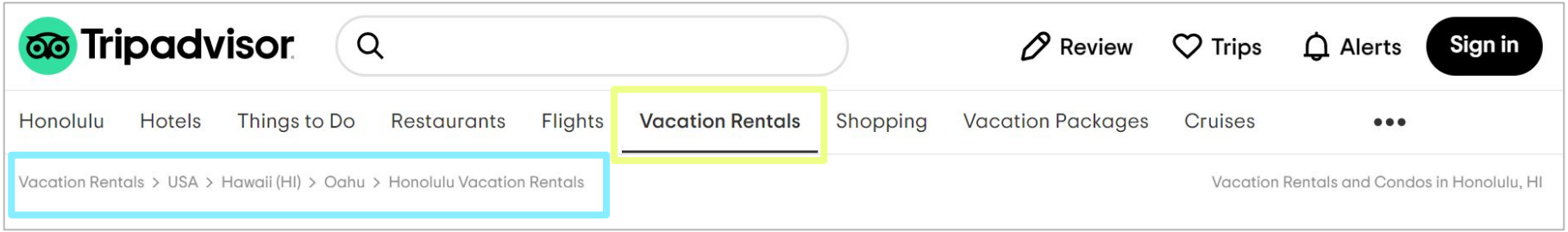
- Newsletter subscription
- Font size and dark mode
- Share and follow
- Website search
- Shopping cart
- Log-in and Sign-up



Notice that some special cases exist where a link that navigates to a page can be grouped with utility navigation. **These pages typically have a task-based role.**

Where am I?

Navigation can also help users identify where they are currently within the hierarchy of a system.



In the above example, 2 techniques are implemented:

- A signifier **highlighting the current page** (location relative to top level)
- A **breadcrumb trail** (location in hierarchical/categorical context)

Transient menus

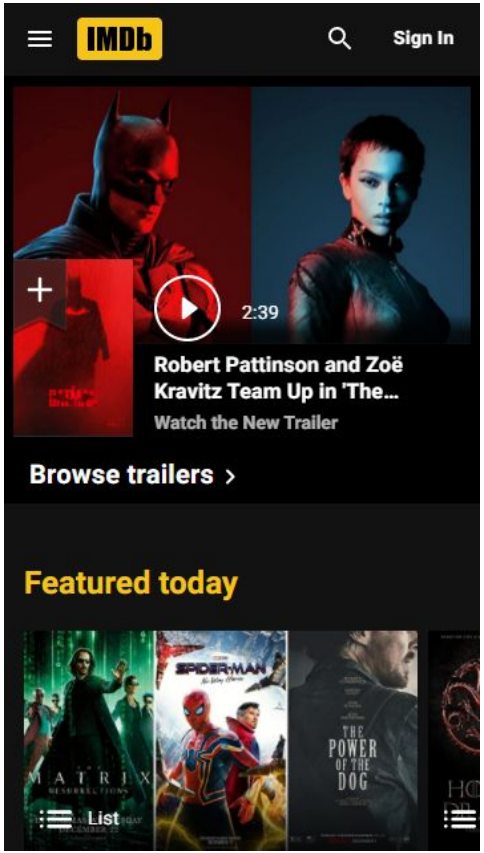
These menus require interaction to reveal their options. Context menus are transient by nature.

These patterns arise from the constraints of smartphone screen sizes. The most common menus include:

- A menu button - typically a "hamburger button"
- An off-canvas menu drawer, located off-screen

Right: *IMDB uses a typical hamburger button with the an off-canvas menu drawer located outside the left edge of the screen*

What are some problems with transient menus?



Visual flow considerations

Eye-tracking studies support an **"F-shaped pattern"** for visual scanning of web content.

This can be used to guide placement of primary and secondary navigation options.

https://www.nngroup.com/articles/f-shaped-pattern-reading-web-content-discovered/

Interface Design Guidelines

Ben Shneiderman's 8 Golden Rules

Ben Shneiderman is an American Professor and co-author of **"Designing the User Interface"**

1. **Strive for consistency**
2. **Seek universal usability**
3. **Offer informative feedback**
4. **Design dialogs to yield closure**
5. **Prevent errors**
6. **Permit easy reversal of actions**
7. **Keep users in control**
8. **Reduce short-term memory load**

https://www.cs.umd.edu/users/ben/goldenrules.html

Preface: What Shneiderman says...

"These principles, derived from experience and refined over three decades, require validation and tuning for specific design domains. No list such as this can be complete, but even the original list from 1985, has been well received as a useful guide to students and designers."

"These underlying principles must be interpreted, refined, and extended for each environment. They have their limitations, but they provide a good starting point for mobile, desktop, and web designers."

\- Ben Shneiderman

Refer to the full list of rules: https://www.cs.umd.edu/users/ben/goldenrules.html

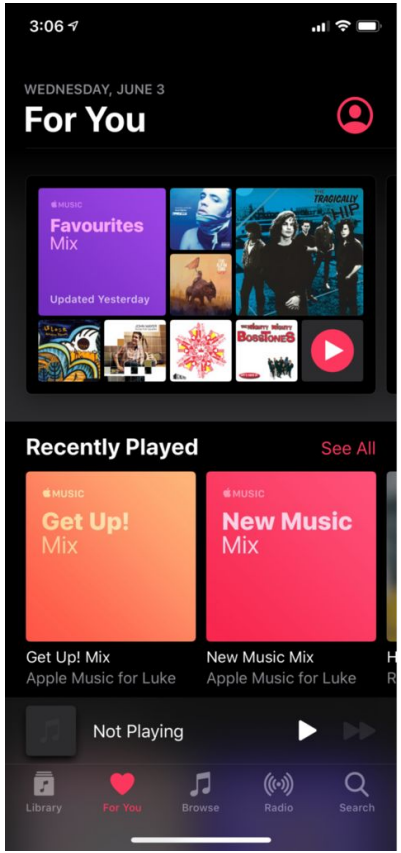
1. Strive for Consistency

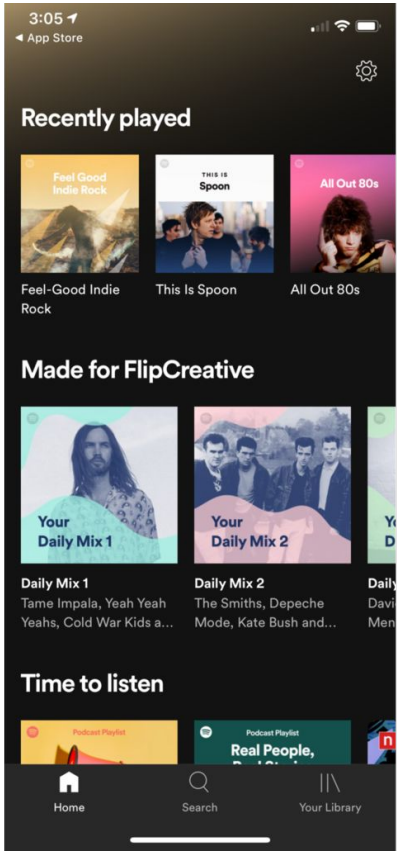
Beyond general psychological concepts of consistency, this Golden Rule provides guidance specific to the design of computer interfaces.

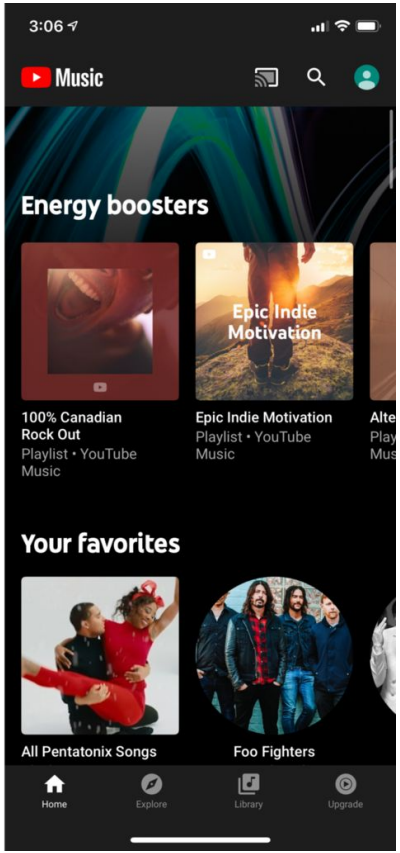
- Consistent sequences of actions should be required in similar situations
- Identical terminology should be used in prompts, menus, and help screens
- Consistent color, layout, capitalization, fonts, and so on, should be employed throughout.

Exceptions, such as required confirmation of the delete command or no echoing of passwords, should be comprehensible and limited in number.

1. Strive for Consistency







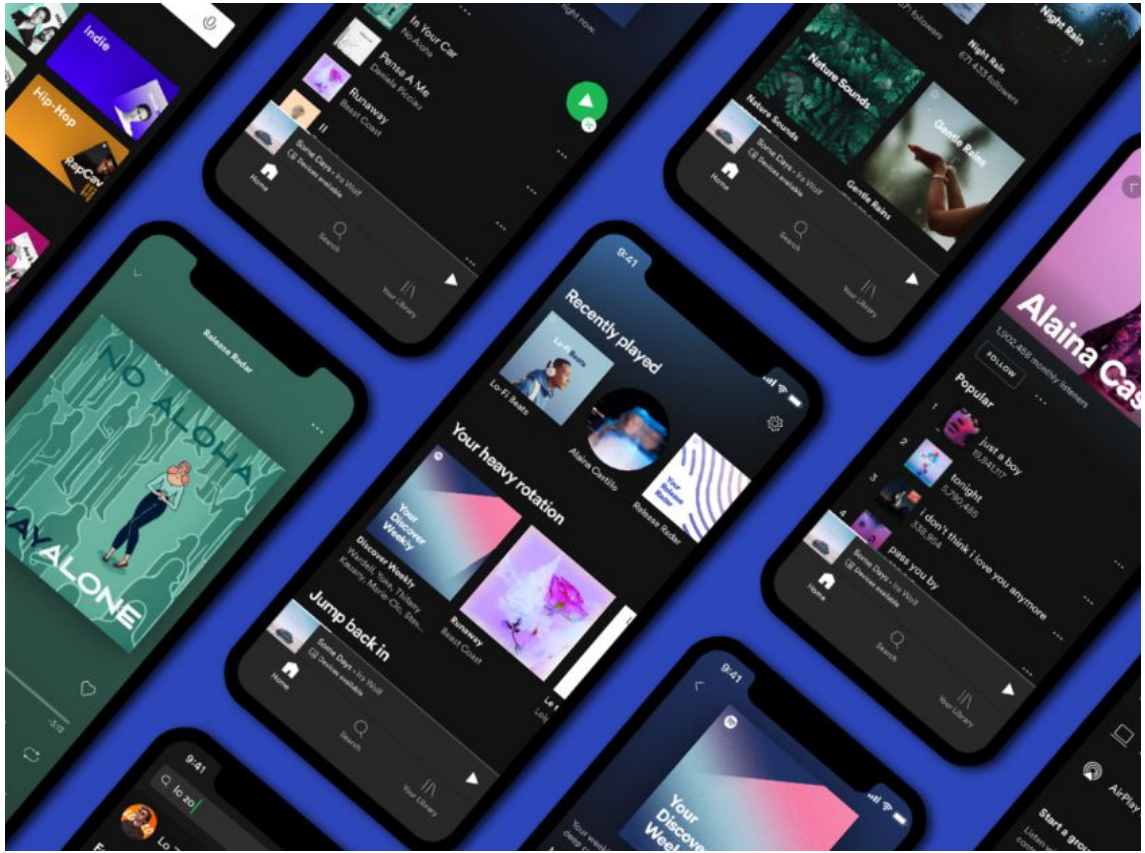
Right: *Apple Music, Spotify and YouTube Music are designed with consistent conceptual models.*

What do you think about this approach to design?

- *Benefits?*
- *Disadvantages?*

https://www.imore.com/i-tried-apple-music-youtube-music-and-spotify-and-heres-what-i-found-out

1. Strive for Consistency



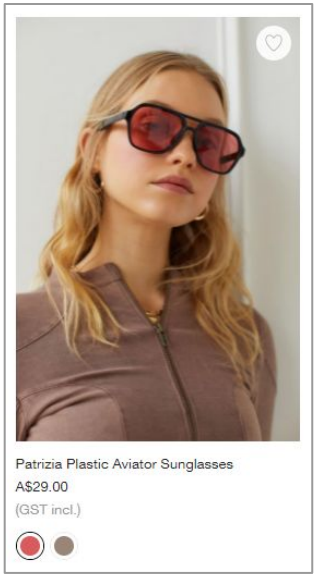
Left: *Spotify implements* ***internal consistency*** *in the design of various screen elements seen across the mobile app.*

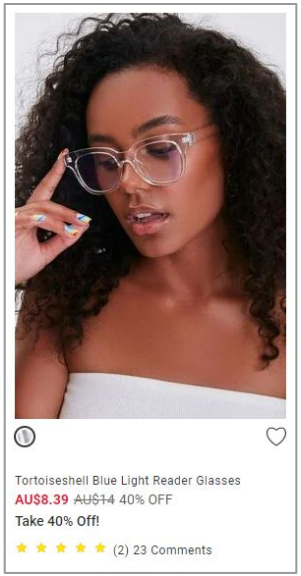
Internal consistency creates familiarity within the system and even between apps for different platforms.

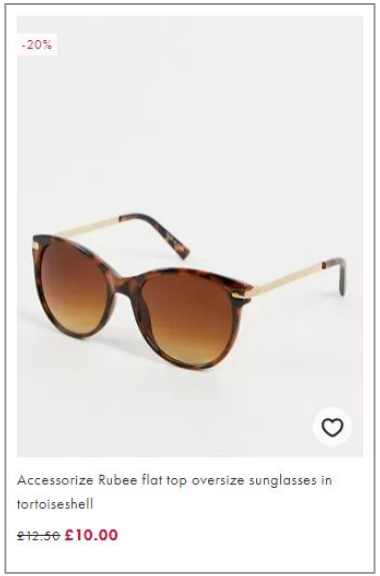
- *Users spend less time searching for features.*
- *Users can make assumptions about functionality.*
- *Consistent branding results in a feeling of quality in the product.*

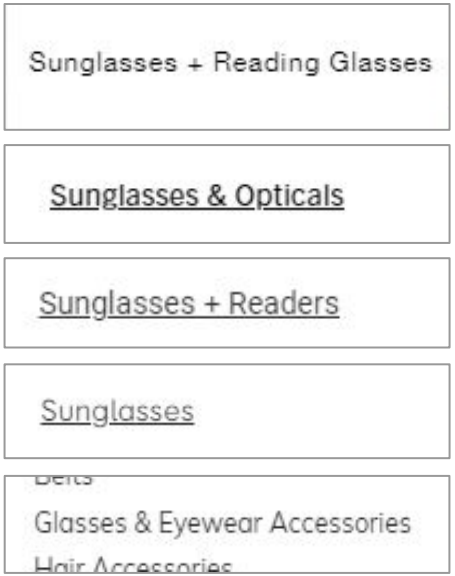
https://9to5mac.com/2021/09/12/comment-spotify/

1. Strive for Consistency









Above Left: *Observe the* ***external consistency*** *between product tiles from 4 major fashion retailers. Consistent conceptual models helps reinforce users' mental models.*

Above Right: *Inconsistencies in terminology used reduce navigation efficiency as users search through menus to locate a desired option among many navigation choices.*

2. Seek Universal Usability

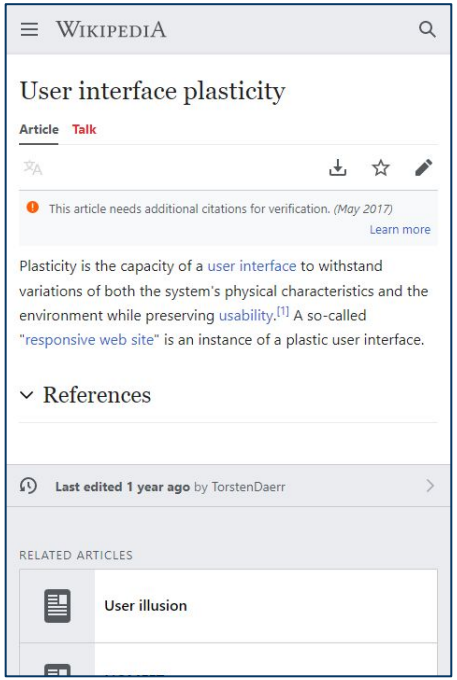
When originally published, this rule was **"Enable frequent users to use shortcuts"**.

Since then, views about the types of user that interact with technology has changed.

Novice to expert differences, age ranges, disabilities, international variations, and technological diversity each enrich the spectrum of requirements that guides design.

2. Seek Universal Usability

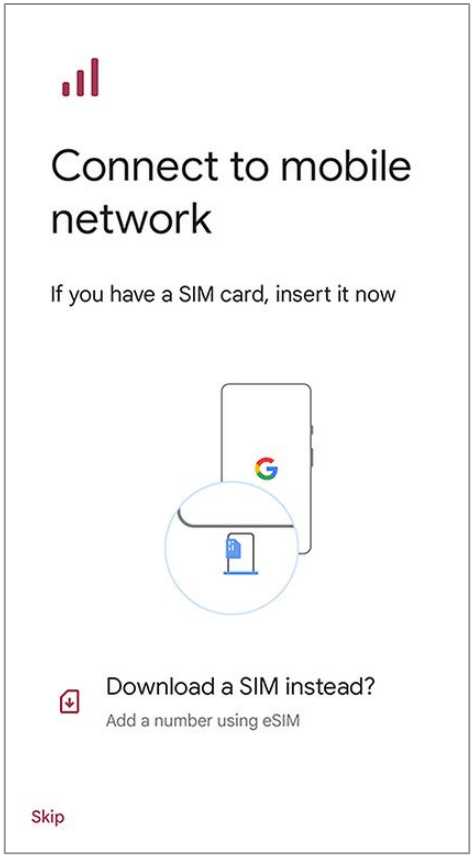
People use interfaces in different contexts and different ways. Recognize the needs of diverse users and **design for plasticity**, facilitating **transformation of content**.



2. Seek Universal Usability

An interface should cater to different levels of experience and knowledge. **Often the only difference between novices and experts is prior experience and frequency of use.**

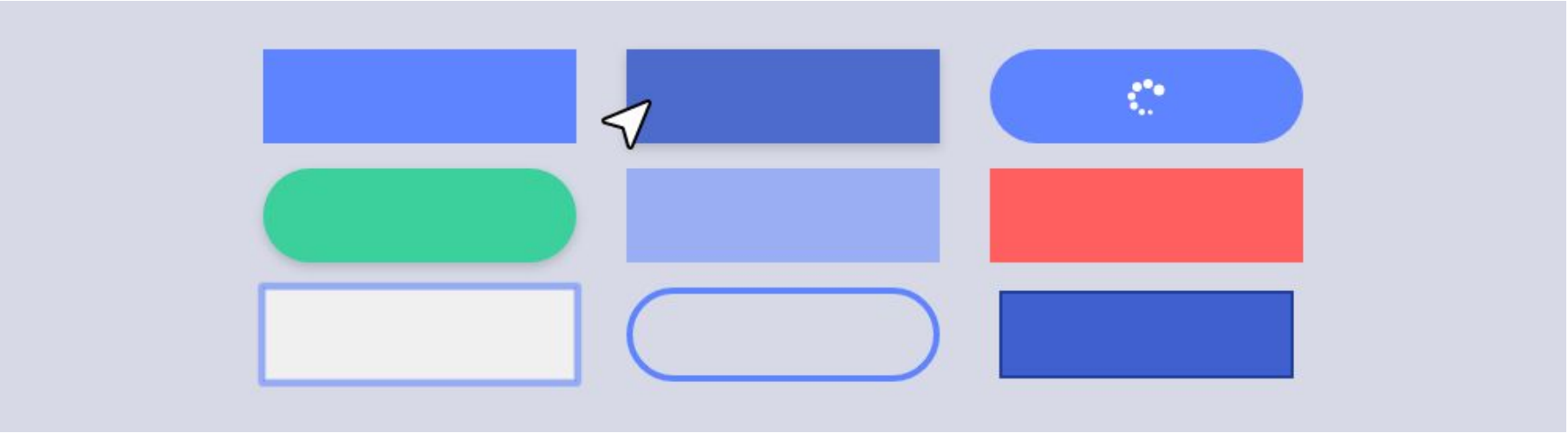
- Add features for novices, such as explanations.
- Adding features for experts, such as shortcuts and faster pacing.



Right: *Setup of a new android device provides clear written steps for novices, but also allows experts start using the device immediately and configure settings manually at a later time.*

3. Offer Informative Feedback

As explained by Norman's Principles and 7 Stages of Action, humans continuously assess feedback to validate their interactions.



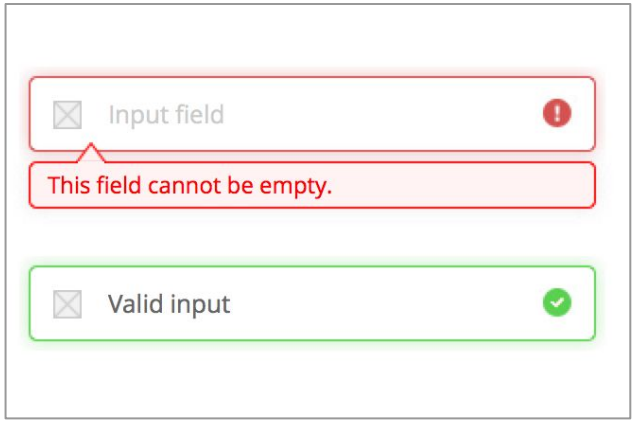
For every user action, there should be an interface feedback. Feedback should be comprehensible well-mapped to the action.

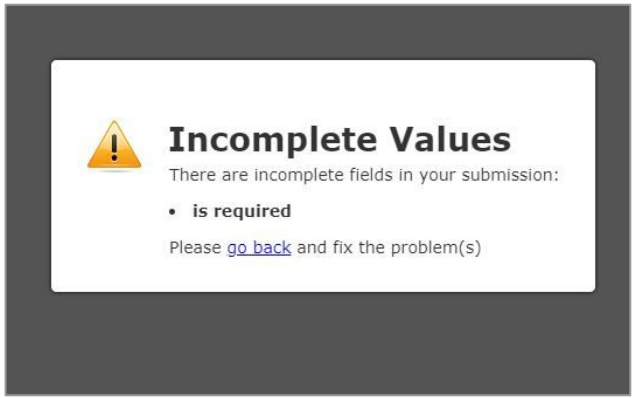
https://xd.adobe.com/ideas/process/ui-design/designing-interactive-buttons-states/

3. Offer Informative Feedback

Prominence of feedback should be proportional to the magnitude of the action and severity of outcome.

- For frequent and minor actions, the response can be modest.
- For infrequent and major actions, the response should be more substantial.





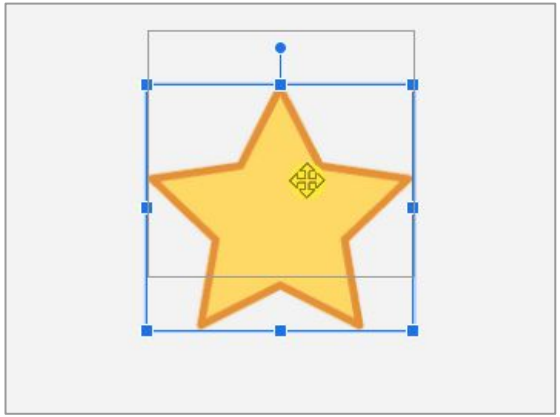
Right top: *The error message has more prominent feedback compared to the valid input to represent a more severe outcome.*

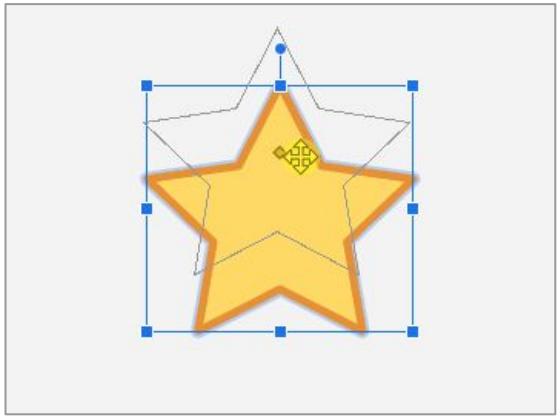
Right bottom: *This form error is a larger change of state and requires more effort to process and respond to.*

3. Offer Informative Feedback

Visual presentation of the objects of interest provides a convenient environment for showing changes explicitly.

We should make use of the capabilities of the system to provide rich and accurate feedback for a pleasant experience.





Right top: *Lower-fidelity feedback is more* ***implicit*** *- good spatial and temporal mapping inform that the action is producing a result.*

Right bottom: *Higher-fidelity feedback is more* ***explicit****. It shows the a more accurate representation of the user's action, allowing for more reliable prediction of the result.*

4. Design Dialogues to Yield Closure

Users engage in **dialogue (conversations)** with computers via interactions. Avoid creating conversations that feel too open-ended.

- Sequences of actions should be grouped with a **beginning, middle, and end**.
- Informative **feedback at the completion** of a group of actions gives users the satisfaction of accomplishment

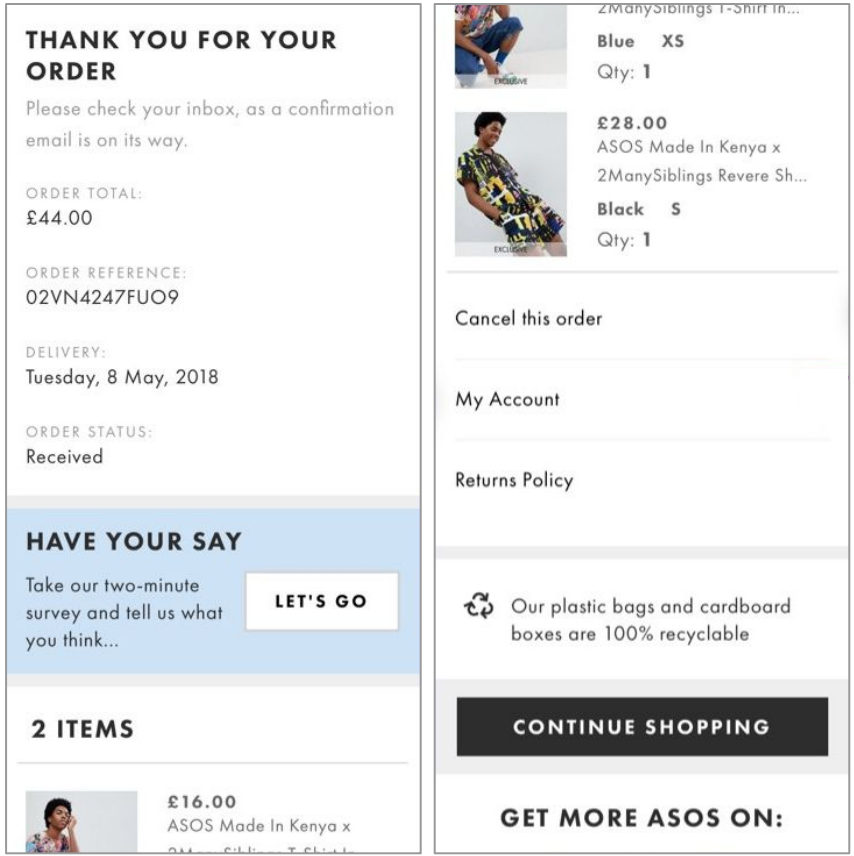
Closure provides a sense of relief, allow users to prepare for the next group of actions.

4. Design Dialogues to Yield Closure

For example, as a user moves through an e-commerce checkout, the **completion of the dialogue** should be clearly signalled.

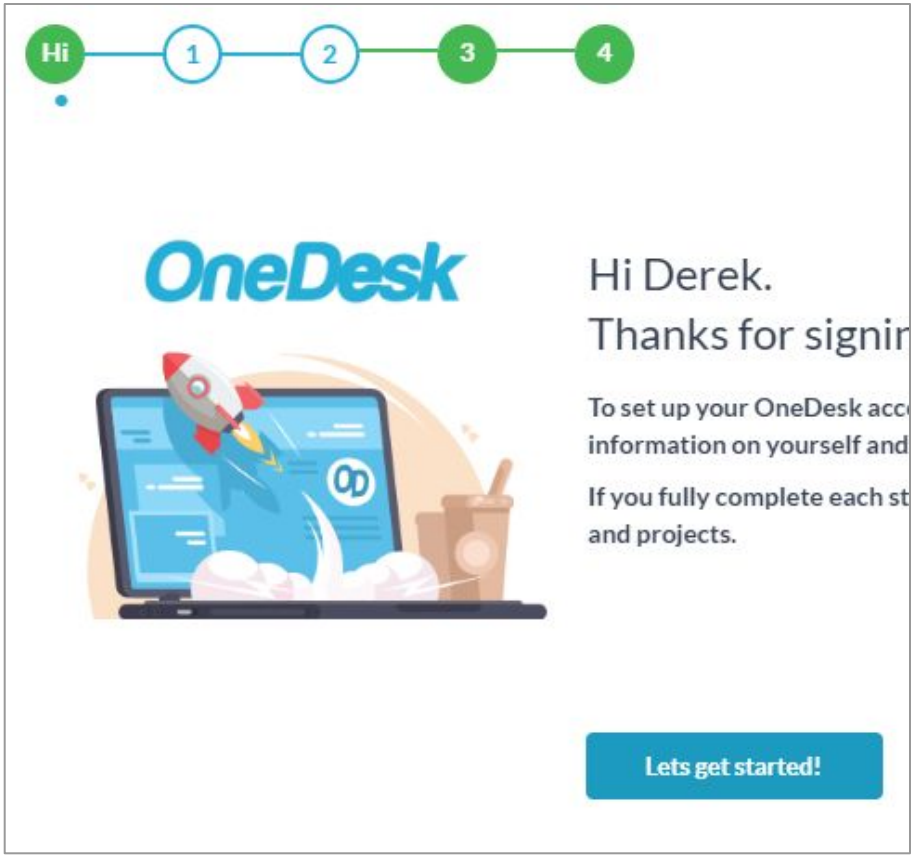
Right: *The checkout process in the ASOS app provides a clear message for closure and useful information to details to be confirmed with minimal cognitive load.*

Additionally, further options for action are provided to maintain the action cycle.



https://medium.com/the-versatile-designer/learn-from-the-best-asos-com-mobile-e-commerce-checkout-c8c35324525b

4. Design Dialogues to Yield Closure



https://www.onedesk.com/quick-setup-wizard/

Users will be less anxious if are given a general understanding of where they are currently relative to the dialogue's closure.

Left: *The setup wizard for OneDesk provides a timeline of steps that is always visible throughout the setup process.*

Assuming that interactions grouped into each step require a similar amount of effort, the user gains a sense of how much work they have done compared to how much work remains.

5. Prevent Errors

This rule refers to the possible errors a user could make - not system errors where an interface enters an invalid state due to an unforeseen technical issue.

- Design the interface so that users cannot make serious errors
- If users make an error, the interface should offer simple, constructive, and specific instructions for recovery.
- Erroneous actions should leave the interface state unchanged, or the interface should give instructions about restoring the state.

Can you recall how Norman's Principles can be used to prevent users from performing invalid or undesirable actions?

5. Prevent Errors

In *"The Design of Everyday Things"*, Don Norman describes 2 general classifications for human error.

- **Slips** occur when goal is planned correctly but the execution is flawed.

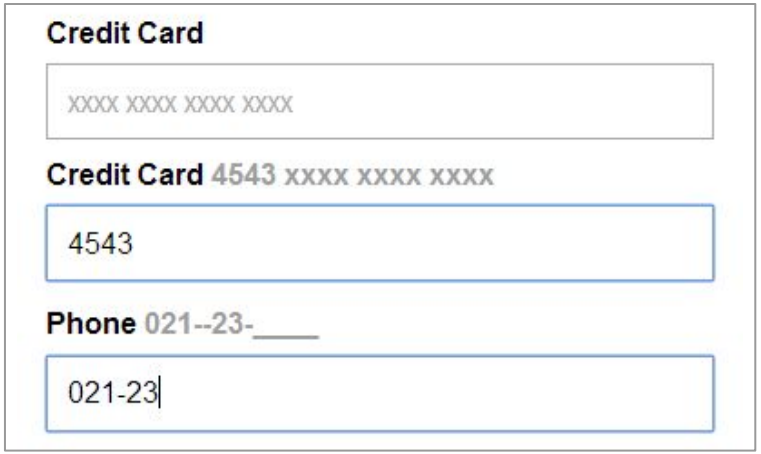
- **Mistakes** occur with a goal or plan is wrong.

Both types of mistakes can be caused by lapses in memory. Conscious decisions resulting in error are mistakes. Subconscious errors are slips.

5. Prevent Errors

Slip and mistakes can be minimised or prevented by correctly designing interactions.

- **Affordances** that encourage valid interactions.
- **Signifiers** that provide clear guidance.
- **Constraints** that limit or remove options for incorrect input.
- **Feedback** that highlights errors.
- **Conceptual models** and **natural mappings** that reduce confusion.



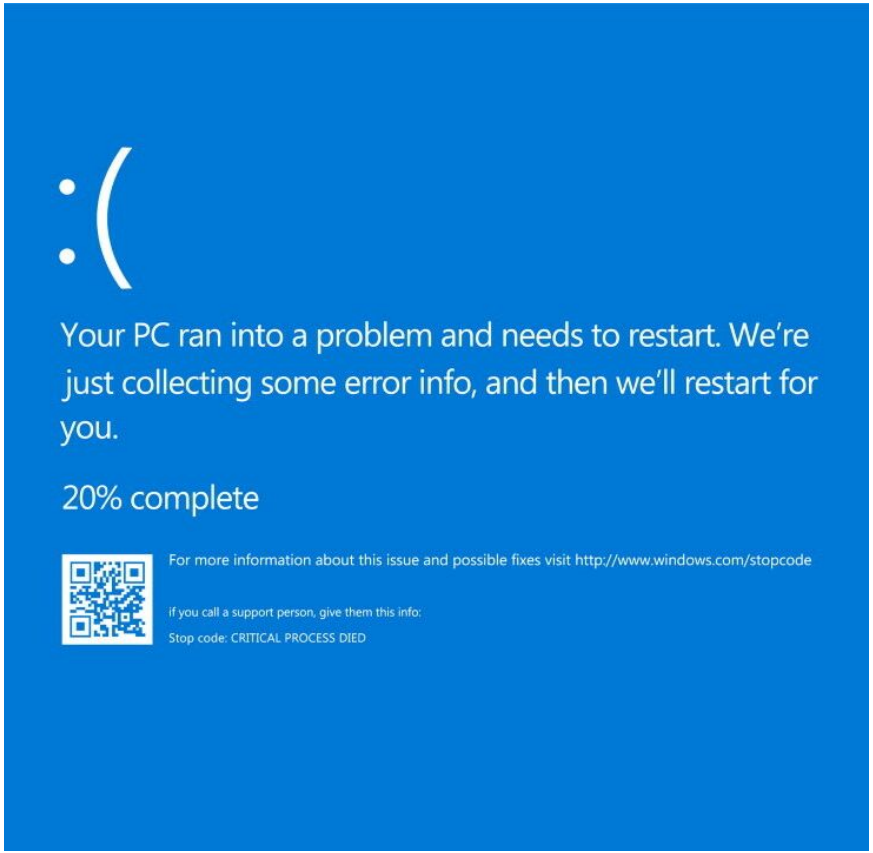
Top: *Input placeholders, examples and masks guide provide guidance.*

Left: *Date pickers will only allow valid dates.*

5. Prevent Errors

Random system errors are sometimes unpreventable. Ensuring that these crashes do not occur is not in the domain of a UX designer.

However, we can still strive to provide clear messages and useful recovery options to improve the user experience.

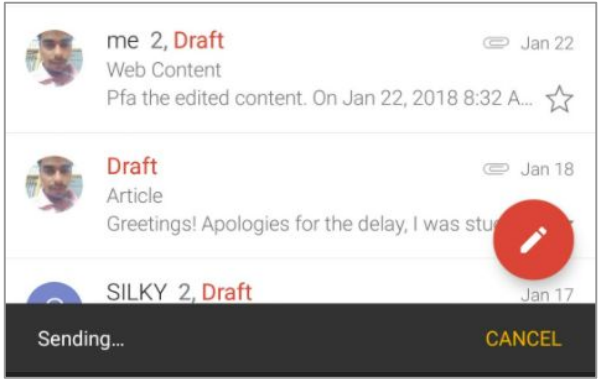


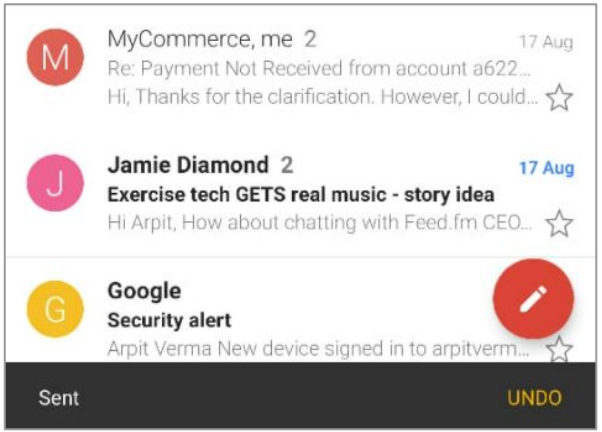
6. Permit Easy Reversal of Actions

A user should feel safe in knowing that any changes made to a system do not have a permanent effect.

- As much as possible, actions should be reversible.
- The units of reversibility may be a single action, a data-entry task, or a complete group of actions, such as entry of a name-address block.

Reversing the action should require minimal effort from the user. If a change cannot be reversed, strive to prevent users from making mistakes.





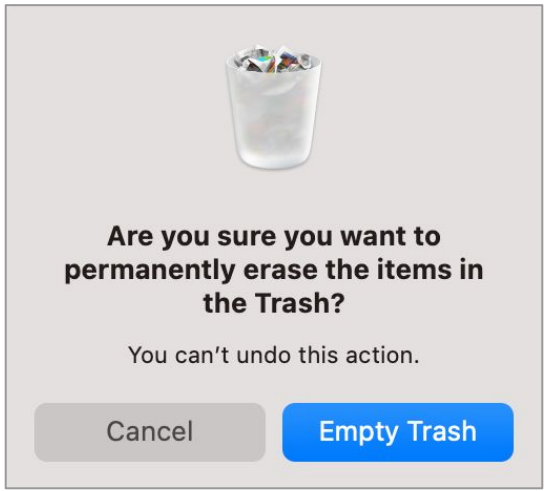
6. Permit Easy Reversal of Actions

Not only for error recovery, reversible actions have psychological benefits.

When users have knowledge that actions can be undone with minimal inconvenience:

- Reversible actions relieve anxiety
- Encourages exploration of unfamiliar options
- Reduces instances of critical user error

Where actions are not easily reversible, consider the severity of outcomes and implement constraints if necessary.

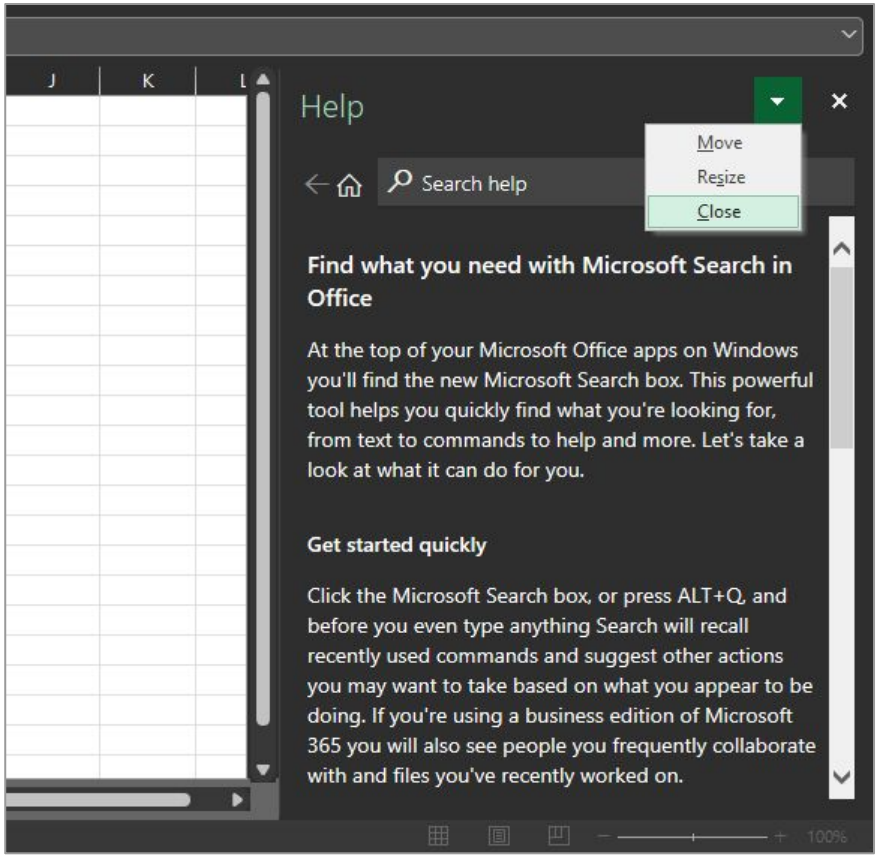


6. Permit Easy Reversal of Actions

When an action needs to be reversed, the action should be intuitive and convenient.

Consider the example shown here:

- Excel's help pane can activated by pressing **F1** on the keyboard.
- Closing the panel requires an interaction within the panel.
- ***How could we make this more convenient for users?***



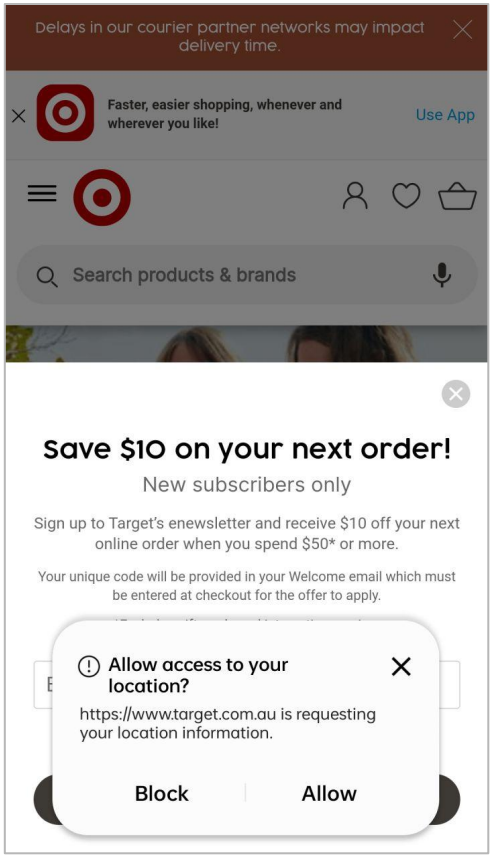
7. Keep users in control

Do users feel like they control the interface? Or does the does the interface feel like it controls the user?

- Users should feel that the interface responds to their actions.
- They don't want surprises or changes in familiar behavior.

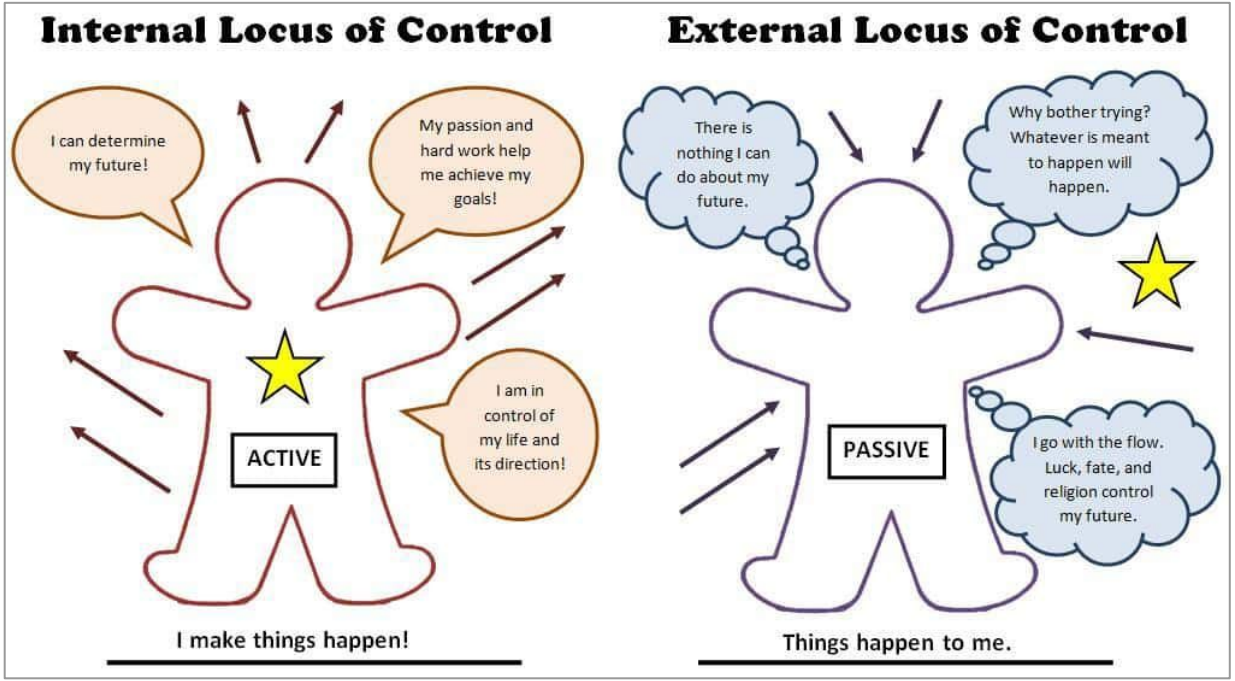
Avoid situations that make the user feel trapped - the where system feels like it forces users into a pause or an action.

Right: *Visiting Target Australia for the first time - how does this make you feel?*



7. Keep users in control

Locus of control describes how individuals perceive that they have control over their own actions, or if the actions are dictated by an external force.



https://www.simplypsychology.org/locus-of-control.html

Consider this scenario:

You walk up to a pedestrian crosswalk. You can see that another person has already pressed the crosswalk button.

What do you do next?

- ***Press the button.***
- ***Do nothing.***

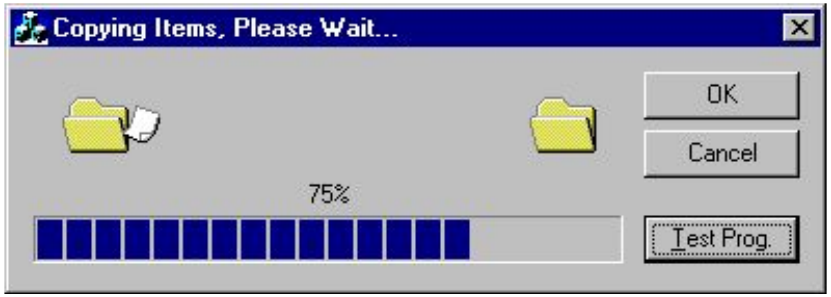
7. Keep users in control

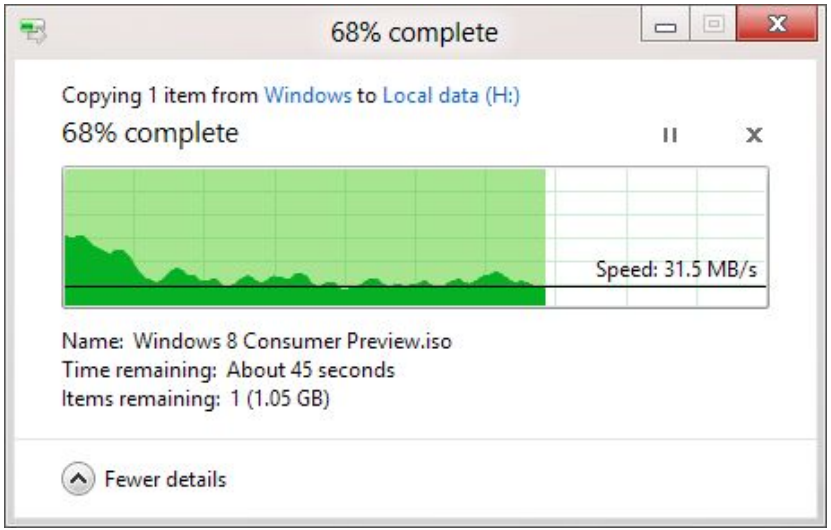
Users feel trapped and annoyed by:

- Tedious sequences of actions
- Difficulty in obtaining information
- Inability to produce their desired result
- TIme wasted in idle states

When major actions take time to complete:

- Chunk the action into manageable pieces
- Provide minor feedback that is informative or entertaining.

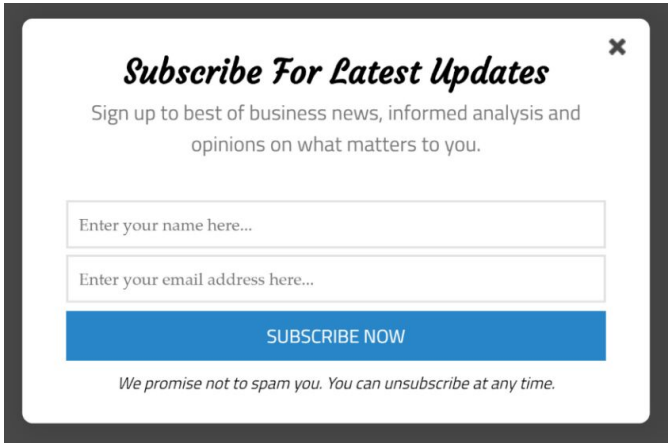




7. Keep users in control

Users need to feel like they are in command of the interface. There are ways to design interfaces that provide users with a feeling of control.

- Set clear expectations before the interaction
- Make actions easy to execute
- Minimise cognitive load
- Provide immediate feedback
- Provide accurate feedback
- Complete the action as quickly as possible



Above: *Newsletter subscription pop-ups interrupt the user's workflow, removing their sense of control.*

A well-designed popup should offer an immediate benefit and not interrupt important actions that are in progress.

8. Reduce Short-Term Memory load

This concept has been previously covered in our discussion of psychology and external cognition.

- Humans have limited capacity for information processing in short-term memory
- Generally, people can remember **"7 plus or minus 2 chunks"** of information
- Avoid interfaces in which users must remember information from one display and then use that information on another display.

Recall last week's discussion of external cognition and cognitive aids.

- Externalising
- Computational offloading
- Annotation and cognitive tracing

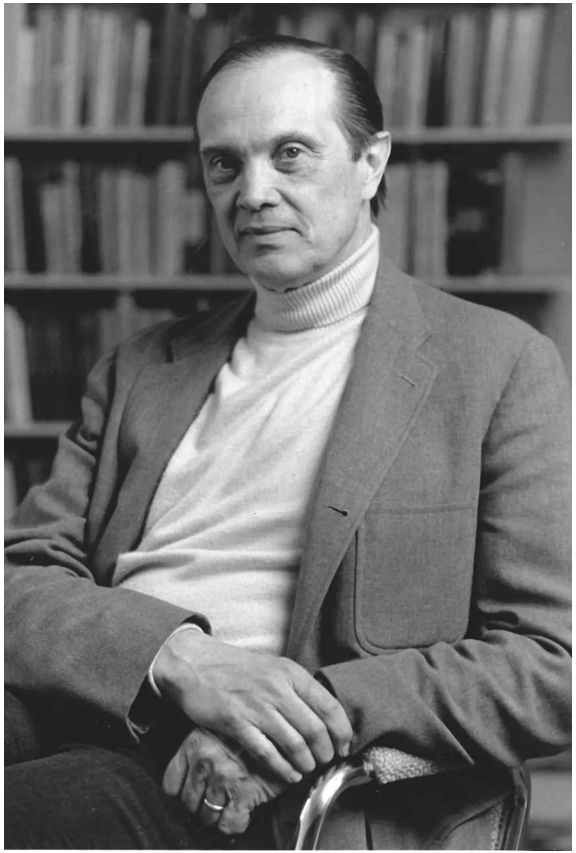
8. Reduce Short-Term Memory load

From George A. Miller's much cited research paper, **"The Magical Number Seven, Plus or Minus Two"**:

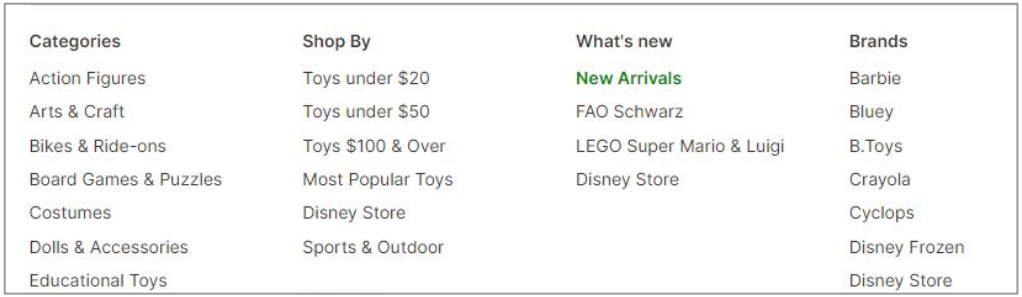
- Performance is nearly perfect up to 5-6 stimuli.
- Performance declines as the number of different stimuli is increased.

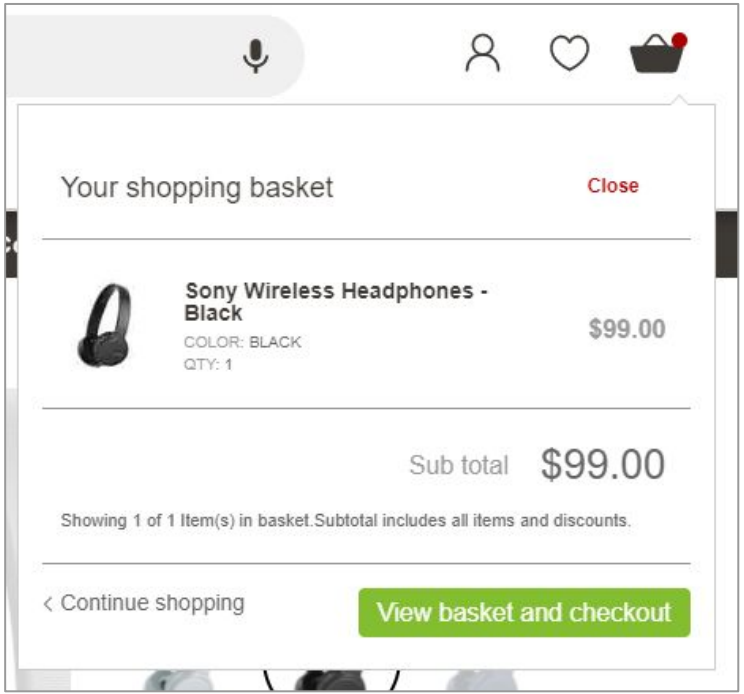
Can you memorise new random values easily?

- Can you remember a new phone number?
- Are 2-factor authentication codes easy to use?
- **What cognitive techniques/aids do you use?**



8. Reduce Short-Term Memory load





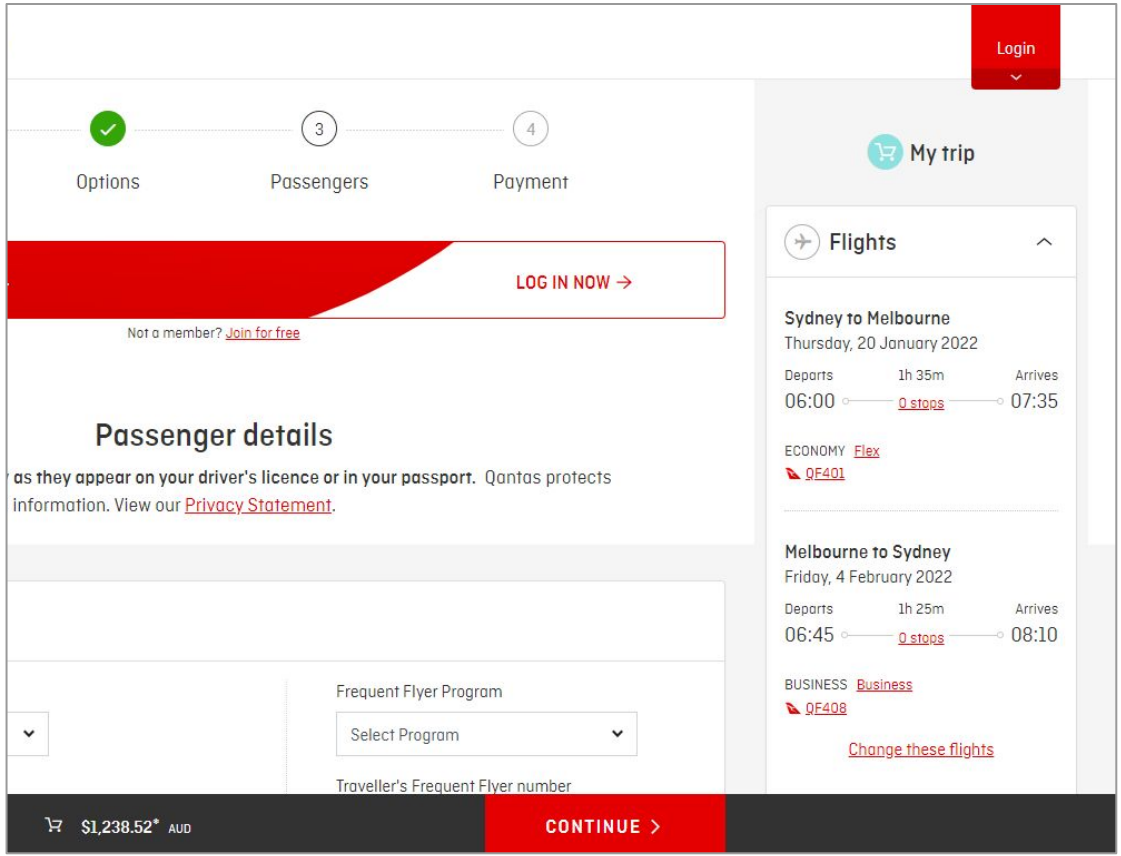
Observe how each interface component externalises information that a user would otherwise maintain in short term memory.

Clockwise from top-left: *Breadcrumb trails, highlighted current link, menu categories and shopping cart preview.*

8. Reduce Short-Term Memory load

A travel booking process is quite linear, but as an infrequent process with many steps, can feel very complex.

What cognitive aids are used here to reduce short-term memory requirements for users?



Discussion Forum 1

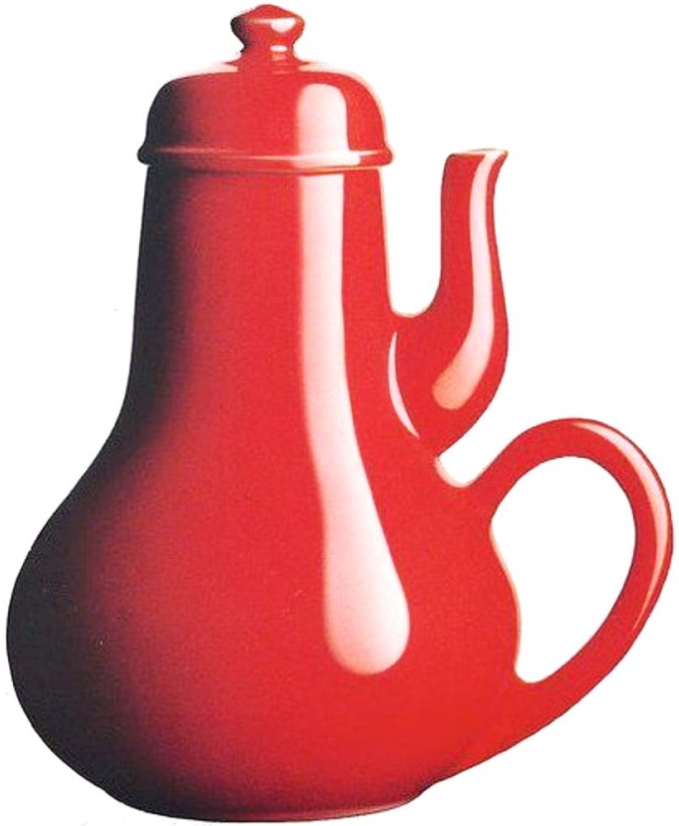
Discussion Forum 1

This individual assessment task is now available.

Contribute an example of **everyday physical object** that you own that is difficult to use because of poor consideration of usability in its design.

Task:

- Upload an original photograph of an object that you own that has a major or minor usability issue.
- Explain the usability issue by applying one of Norman's 7 principles (choose one only).
- Describe how the issue affects effectiveness, efficiency or satisfaction (choose one only).



Discussion Forum 1

Posting rules:

- Create a new discussion post with the name of the object as the title.
- Embed your photo using the  **Insert Image** option.
- The word count must be **between 150-300 words** inclusive.
- The **photo must be original** - not sourced from the Internet.
- The object and issue **must not be software-based or a GUI**.

Marking Criteria (5 marks, weighted at 2.5%)

- Clear photo and description, posting rules have been followed (2 marks)
- Identification and correct application of one Norman Principle (2 marks)
- Description of usability impact (1 mark)

Next session

- Navigation and Information Architecture
- Menu and Icon Design

Reminders

- **Stage A submission this week (Due Fri 14 January)**
  - Upload to be completed by 1 group member.
- **Stage B submission next week (Due Tue 18 January)**
  - Individual task - each group member uploads a submission
- **Discussion Forum 1 is now available (Due Fri 21 January)**
  - Demonstrate your understanding of Norman's Principles