LECTURE 10
DESIGN PRINCIPLES #1

SOME GENERAL HOUSEKEEPING

- Short introduction
- Assignment 2

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LEARNING OBJECTIVES

- To be able to apply design principles in the context of user interface design tasks
- To be able to characterise key design principles for *effectiveness* and *efficiency*
- To be able to conceptualise design principles in terms of an interaction framework

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PRINCIPLES OF INTERACTION DESIGN

- *How do we create elegant solutions to complex interaction problems?*
  - Don't let the technical variables get in the way of coming up with something useful, usable and pleasing
- *How do interaction designers succeed at creating great designs that are powerful and aesthetically appealing?*

- 'Insanely great' – Steve Jobs' description of the Macintosh

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PRINCIPLES OF INTERACTION DESIGN
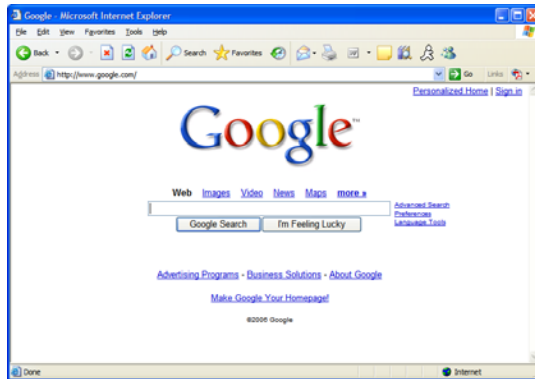
- Clear, minimal, to-the-point and insanely successful!

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PRINCIPLES OF INTERACTION DESIGN

MAXIM

Design principles can be used to guide design decisions

○ Design principles do not prescribe specific outcomes; they function within the context of a particular design project.

○ Design principles guide interaction designers and help them make decisions that are based on established criteria
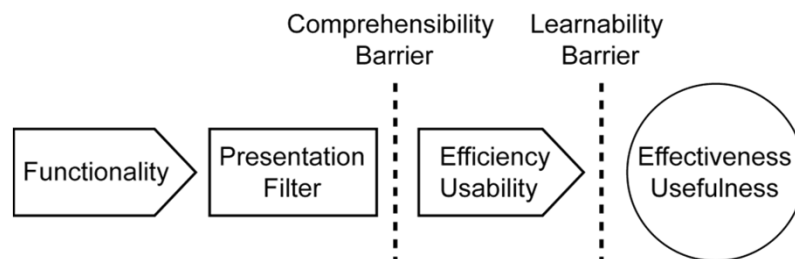
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GULFS AND PRINCIPLES

- Design principle can be used to determine if there are gulfs of execution or evaluation

- Gulfs of execution relate to the effectiveness principles

- Gulfs of evaluation relate to the efficiency principles

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FRAMEWORK FOR DESIGN PRINCIPLES

- Provides a framework for thinking about design principles in terms of interaction

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FRAMEWORK FOR DESIGN PRINCIPLES

The framework has the following components:

- **Usability Goals**
  - There are two main usability goals in the framework; comprehensibility and learnability.
- **Design Principle Categories**
  - The framework also divides the design principles into two main groups; efficiency principles and effectiveness principles.
- **Format to Describe Design Principles**
  - The framework uses the format "serves the principle of … which promotes …" to describe the different principles.
  - *Familiarity* serves the principle of *memorability*, which promotes *usability*.
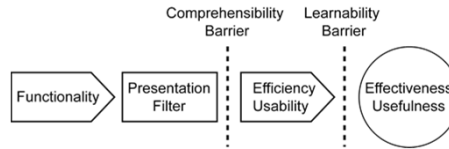
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FRAMEWORK FOR DESIGN PRINCIPLES
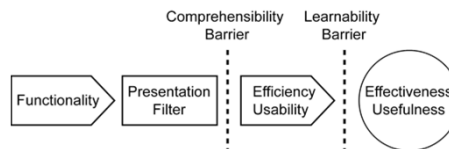
Functionality - The system must have adequate functionality for a particular task.

Presentation Filter - The functionality must be made accessible through the presentation filter (interface).
- The user has to be able to access the functionality (that's what the 'user interface' is for!)

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FRAMEWORK FOR DESIGN PRINCIPLES

Comprehensibility Barrier - If the presentation is comprehensible, the comprehensibility barrier will be superseded. This depends on the degree of efficiency/usability in the interface design.
  - The user needs to understand how they access the functionality

Learnability Barrier – If the interface is comprehensible it will be learnable, there is a direct relationship.
  - Effective use generally requires that the way of working through the interface become natural to the user (that they 'learn' it)

Effectiveness/Usefulness - If the user can learn the interface s/he can take advantage of the functionality and the interface will, therefore, be useful.

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COMPREHENSIBILTY

MAXIM

An interface design that is easy to comprehend will be efficient and effective

- If a user does not understand the interface it will be useless

- A design's comprehensibility is highly dependent on the way in which the interface communicates its functionality to the user

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INTERFACE HALL OF SHAME

Tally printer dialog

VCR metaphor for a print dialog – what does rewind do?!

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INTERFACE HALL OF SHAME

Stoplight metaphor

Stoplight *can* be a good metaphor

In this dialog, however, it's indicating whether all, some or none of the required information has been entered

Problems:
- Could do with a single colour of flag (e.g. for 'incomplete')
- The 1-6 on the bottom row is an indirect reference to the labelled tabs, requiring the user to map

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LEARNABILTY

An interface with high usability will be easier to learn

- The learnability of a design is based on comprehensibility: if you can't understand it, you can't learn it

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COMPREHENSIBILITY LEARNABILTY

- Learnability and comprehensibility are recursive: we start with comprehensibility which affects learnability, which will in turn increase comprehensibility.

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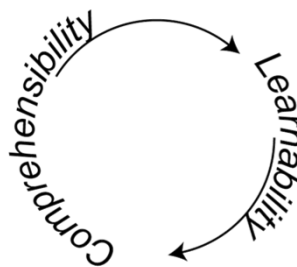
Comprehensibility/Learnability Feedback Loop

PRINCIPLES OF INTERACTION DESIGN

- Effectiveness/Usefulness
  - Utility
  - Safety
  - Flexibility
  - Stability
- Efficiency/Usability
  - Simplicity
  - Memorability
  - Predictability
  - Visibility

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HALF TIME ENTERTAINMENT

- https://www.youtube.com/watch?v=ouP9xNujkNo

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DESIGN PRINCIPLE CATEGORIES

○ **Effectiveness/Usefulness**

MAXIM

Effectiveness describes the usefulness of a design

○ The effectiveness goal stipulates that a design must fulfill the user's needs by affording the required functionality

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EFFECTIVENESS/USEFULNESS

○ **Utility** - The principle of utility relates to what the user can do with the system.
  • And how that relates to the user's goals in the real world

○ **Safety** - If a design has a high degree of safety, it will prove more useful than a design that involves a high degree of risk.
  • **Recovery -** can be implemented in interaction designs by incorporating appropriate <u>undo</u> functionality and robust error recovery routines.

A computer shall not harm your work or, through inaction, allow your work to come to harm.

(Raskin, 2000 [making fun of Asimov's laws of robotics])

Can be a real pain to implement, but immensely useful

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EFFECTIVENESS/USEFULNESS

- **Flexibility** - A tool that is flexible can be used in multiple environments and may address diverse needs (e.g. a spreadsheet app)
  - **Customization** - A tool will have greater flexibility if people are able to customize the interface according to their personal preferences

- **Stability** - A stable system is a robust system.
  - A system that functions consistently well will be more useful than a system that crashes frequently

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EFFICIENCY/USABILITY

MAXIM

Efficiency describes the usability of a design

- The efficiency goal stipulates that a design should enable a user to accomplish tasks in the easiest and quickest way possible without having to do overly complex or extraneous procedures.

  A computer shall not waste your time or require you to do more work than is strictly necessary. (Raskin, 2000)

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EFFICIENCY/USABILITY

○ **Simplicity** - If things are simple they will be easy to understand and, therefore, easy to learn and remember.

- **Ockham's Razor** - Pluralitas non est ponenda sine necessitate - pluralities should not be posited without necessity ('simplest is best')
- **80/20 Rule** - The 80/20 rule implies that 80% of an application's usage involves 20% of its functionality
- **Satisficing -** Combines the conflicting needs of finding the optimal solution that satisfies all the requirements and the need to settle on a solution that will be sufficient to proceed with the design
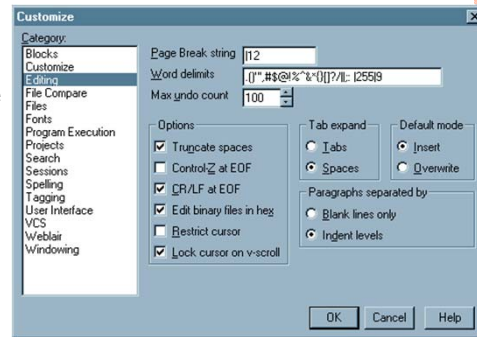
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INTERFACE HALL OF SHAME
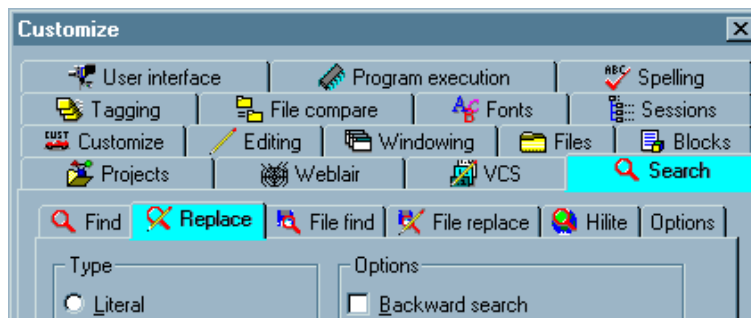
- Avoid multiple rows of tabs
  - And the icons aren't helping here
  - And the tabs are interacting in some complex way to allow search and replace to both be highlighted
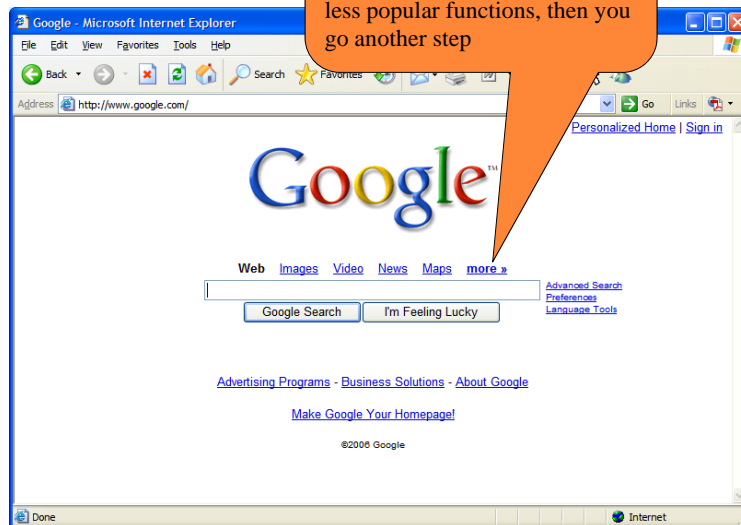
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IMPROVED

- Did it really need so much functionality in the one dialog?
- If so, here we use the list metaphor (and thus natural alphabetical order)

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SIMPLICITY!

Well, it's changed since this screen capture, but they continue to play the 80/20 rule – if you want one of their many less popular functions, then you go another step
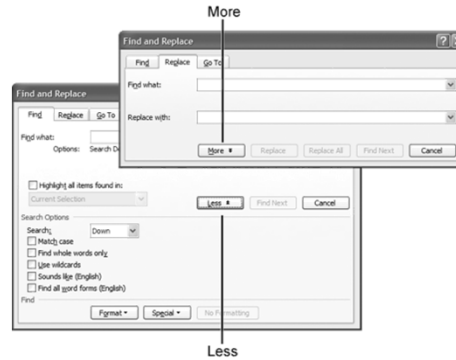

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EFFICIENCY/USABILITY

○ **Simplicity**

- **Progressive Disclosure -** Show the user only what is necessary


More

Less

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EFFICIENCY/USABILITY

○ **Simplicity**

- **Constraints -** Involves limiting the actions that can be performed in a particular design
  ○ Controls the design's simplicity
  Physical
    ○ **Paths** - constrain movement to a designated location and direction (e.g. scrollbar)
    ○ **Axes** - constrain the user's movement to rotation around an axis
    ○ **Barriers** -provide spatial constraints that can confine the user's movement to the appropriate areas of the interface
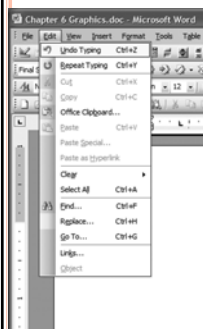
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EFFICIENCY/USABILITY

○ **Simplicity**

- **Constraints**
    - ○ Psychological – limit the way the user perceives the components
        - ○ **Conventions** - exploit learned behavior to influence a user's actions
        - ○ **Mapping** - can influence the way in which people perceive relationships between controls and effects
        - ○ **Symbols** - can influence the way in which we interact with an interface by defining meaning and constraining our possible interpretations of interface elements

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EFFICIENCY/USABILITY

○ **Memorability** - Interfaces that have high memorability will be easier to learn and use

- Many different parameters affect memorability:
    - ○ Location
    - ○ Logical Grouping
    - ○ Conventions
    - ○ Redundancy

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EFFICIENCY/USABILITY

o **Predictability** - Predictability involves a person's expectations and his ability to determine the results of his actions ahead of time.

- **Consistency (when appropriate)**
  - o Consistency reinforces our associations and, therefore, increases our ability to remember and predict outcomes and processes.
  - o Consistency is great, but only offer options that fit the task at hand
    - o Greyed out menu items are a compromise to keep the menu consistent, while also having the options minimized to those that are appropriate in context

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EFFICIENCY/USABILITY

o **Predictability**
- **Generalizabilty:** can help us use the knowledge we gathered from previous experience and apply it to similar situations
- **Conventions:** allows us to use our intuition
- **Familiarity:** familiar menu names and options help users locate objects and functions more easily
- **Location, Location, Location:** Not all areas on the screen are created equal
  - o **Top-left is the most prime real estate; bottom and right for closure; many location conventions exist**

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EFFICIENCY/USABILITY

○ **Predictability**

  • **Modes:** Modes create instability in mental models because they change the way objects function

Simplest example of a mode: Caps Lock – causes input to be interpreted differently. With few exceptions, modes are considered bad for usability (and, alas, are traditionally easy to program)

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EFFICIENCY/USABILITY

○ **Visibility** - The principle of visibility involves making the user aware of the system's components and processes, including all possible functionality and feedback from user actions.

Show everything at once, and the result is chaos.

Don't show everything, and then stuff gets lost.

(Norman, 1998, 74)

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EFFICIENCY/USABILITY

The principles of progressive disclosure and simplicity should be used in conjunction with the principle of visibility to avoid overload

- **Visibility**
  - **Overload:** Following the principle of visibility without also applying progressive disclosure can lead to visual overload
  - **Feedback:** Direct Manipulation interfaces provide immediate visual feedback about user actions. It is the task of the interaction designer to decide what form that feedback takes

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EFFICIENCY/USABILITY

- **Visibility**
  - **Recognition/Recall:** The principle of visibility is based on the fact that we are better at recognition than we are at recall
    - We'll explore cognitive reasons later in the semester, but basically it's easy to work with what's before your eyes as compared to dredging your memory
  - **Orientation:** People need to be able to orient themselves, especially in complex information spaces
    - With web sites – consistent and hierarchical page titles and menu structure, as well as footprints (changing colour to indicate traversed area)

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TO BE CONTINUED

- Next lecture we'll talk about human perception – particularly visual perception.
- We will come back and look at more design principles, with a focus on proportion and screen complexity

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