IT3060 – Human Computer Interaction

Lecture 05 – Design Recommendations

Principles, Standards, Best Practices, Guidelines and Usability Process

Design Principles

Visibility

- Make core user functions highly visible (e.g., toolbars vs. Menus)

- Hide secondary user functions.

- Visible properties guide users as to what to do next

- Structure enhances visibility.

- Elements that are mission critical to the website or application should be designed to be more visible.

- Less important elements can be designed for less visibility.

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Design Principles
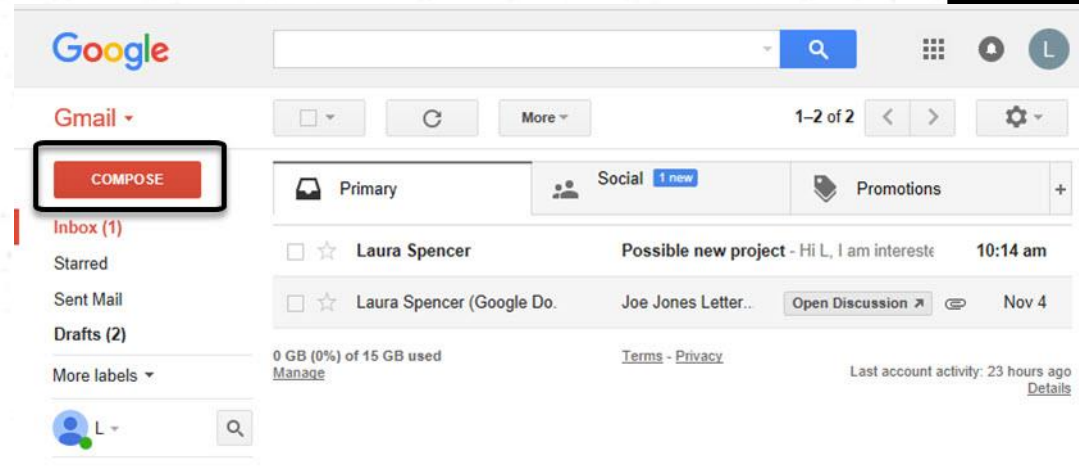
Visibility

E.g.:

Design Principles

Visibility

E.g.:

Gmail offers many features, but one main feature is ability to write and send emails. By making the compose new email button large, placing it in a prominent position and giving it a contrasting color, it stands out in the design. Users can quite effortlessly, and perhaps, instinctively, find the function. The designers at Gmail have recognized the importance of this single function – and the importance of making it easy to find.

Design Principles

Feedback

- Feedback is when a system provides users with information about what has been completed or accomplished allowing the person to continue with the activity.

- It continuously inform the user about what the system is doing.

- How the system is interpreting the user's input.

- User should always be aware of what is going on.

- Feedback is a critical way to help users avoid frustration and confusion. If I click a button for an action to happen, and there's no indication that it happened, the user will understandably question whether it has worked or not.

Design Principles

Feedback

- Feedback can come in many forms;

  ➢ a vibration on your phone

  ➢ a color change of an interface element

  ➢ a beeping sound, that alerts you , etc.

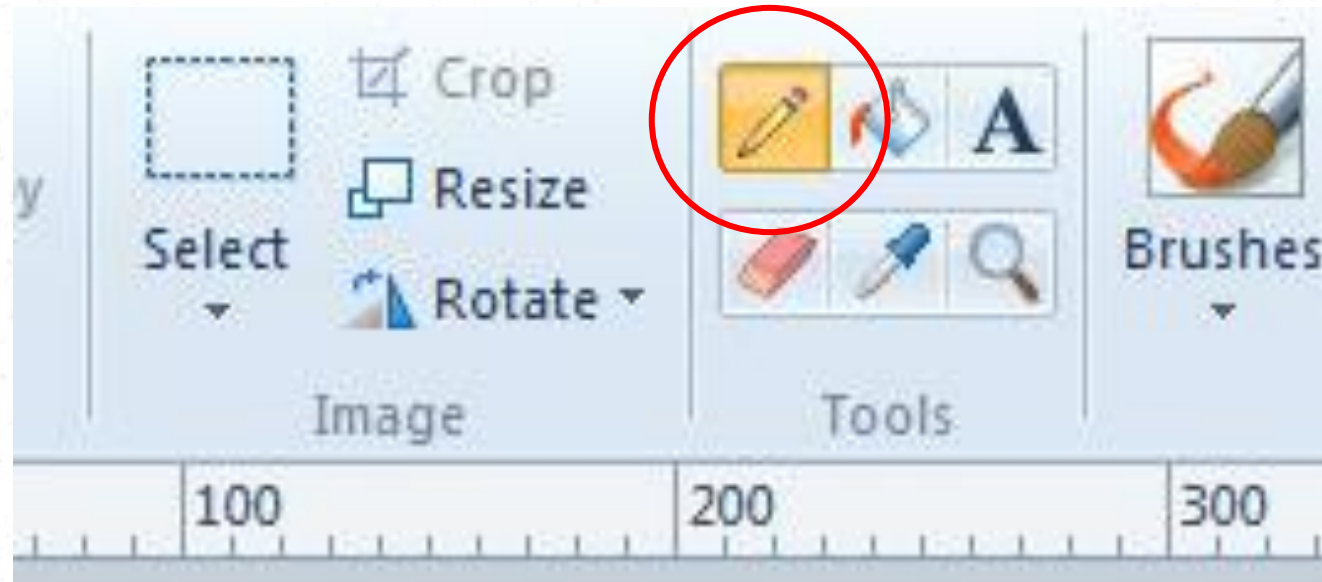 There are many ways to let users know the status of a system.

- Using feedback in the right way can also provide the necessary visibility for user interaction.

Design Principles

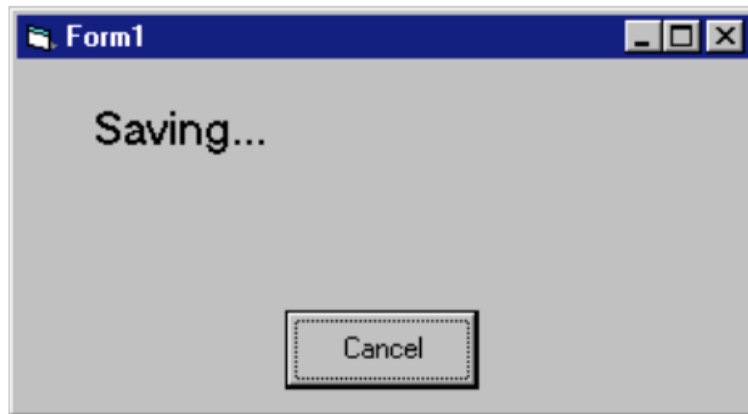## **Feedback**

What type of feedback is being provided here?

1. What item was selected

2. What mode the user is in now
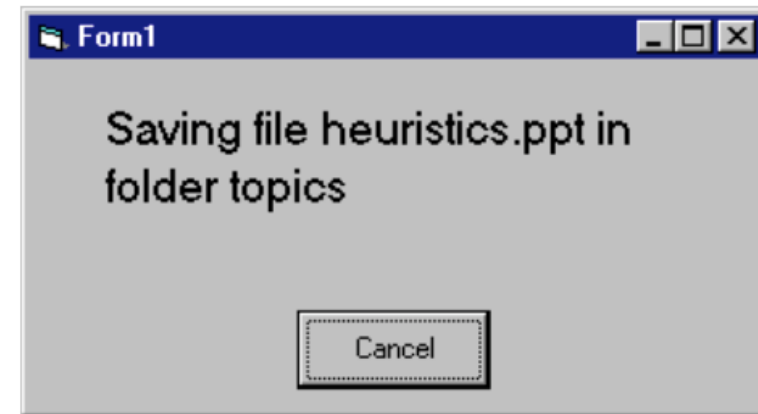
3. How the system is interpreting the users actions

Design Principles
<u>Feedback</u>

- Needs to be immediate and synchronized with user action.

- Feedback should be as specific as possible based on user input

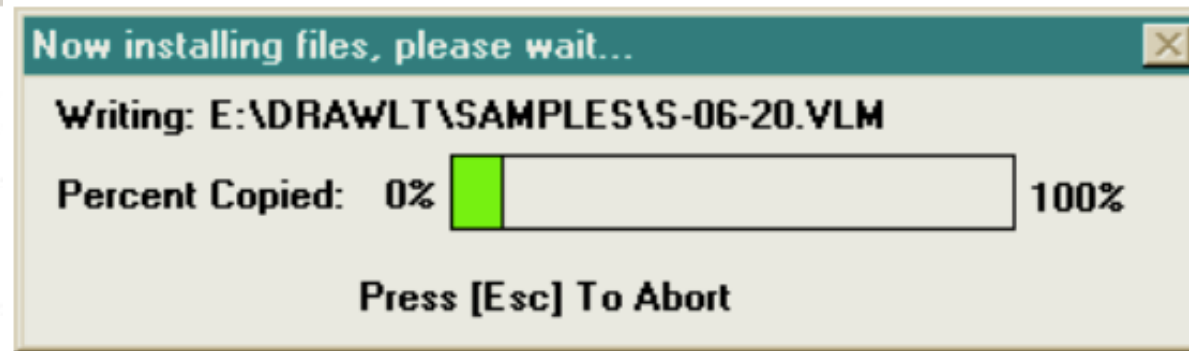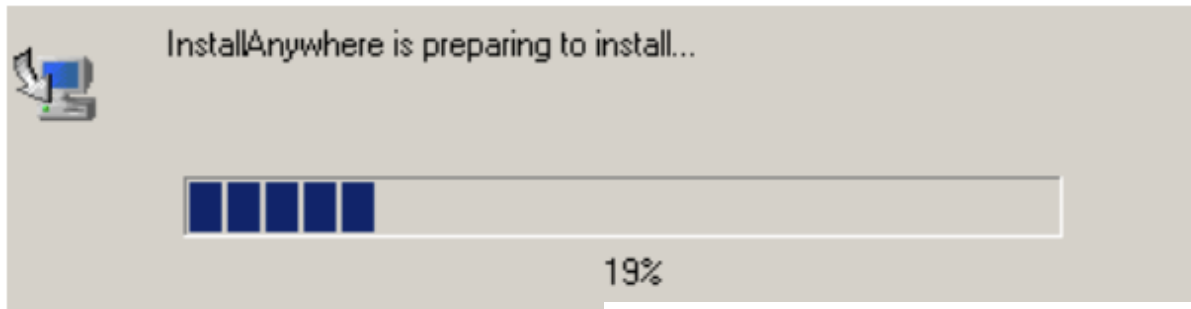- Ideally provided in the context of the user's action

Design Principles
Feedback

- With longer jobs, the more detail you can provide on the status, the better.

InstallAnywhere is preparing to install...

19%

Now installing files, please wait...

Writing: E:\DRAWLT\SAMPLES\S-06-20.VLM

Percent Copied: 0%   100%

Press [Esc] To Abort
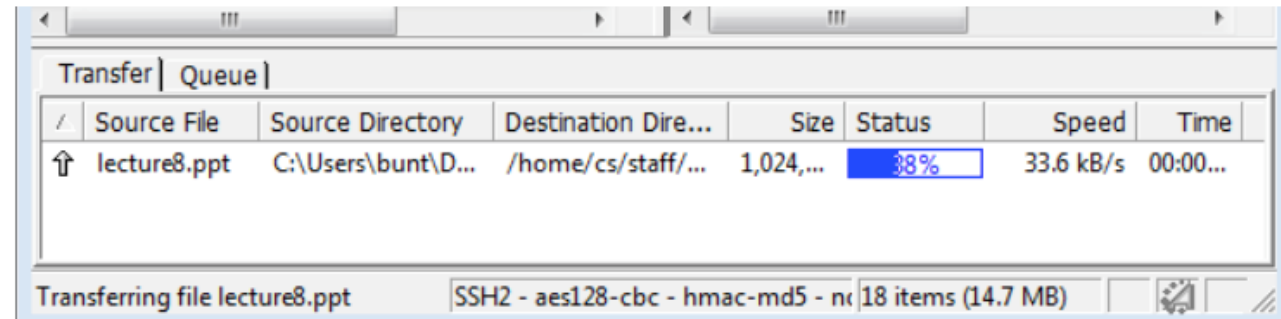
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Design Principles

Feedback

Feedback during long delays:

- Cursors - for short transactions

- Percent done dialogs - for longer transactions
  - Shows how much left
 - estimated time
  - what it is doing.

/	Source File	Source Directory	Destination Dire...	Size	Status	Speed	Time
⬆	lecture8.ppt	C:\Users\bunt\D...	/home/cs/staff/...	1,024,...	38%	33.6 kB/s	00:00...

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Design Principles

Feedback

In Google Chrome the little spinning circle starts as soon as you hit enter, so you know something's happening, and goes faster when the page is about to load, so you know you're about to do something again.

It's simple and effective feedback.
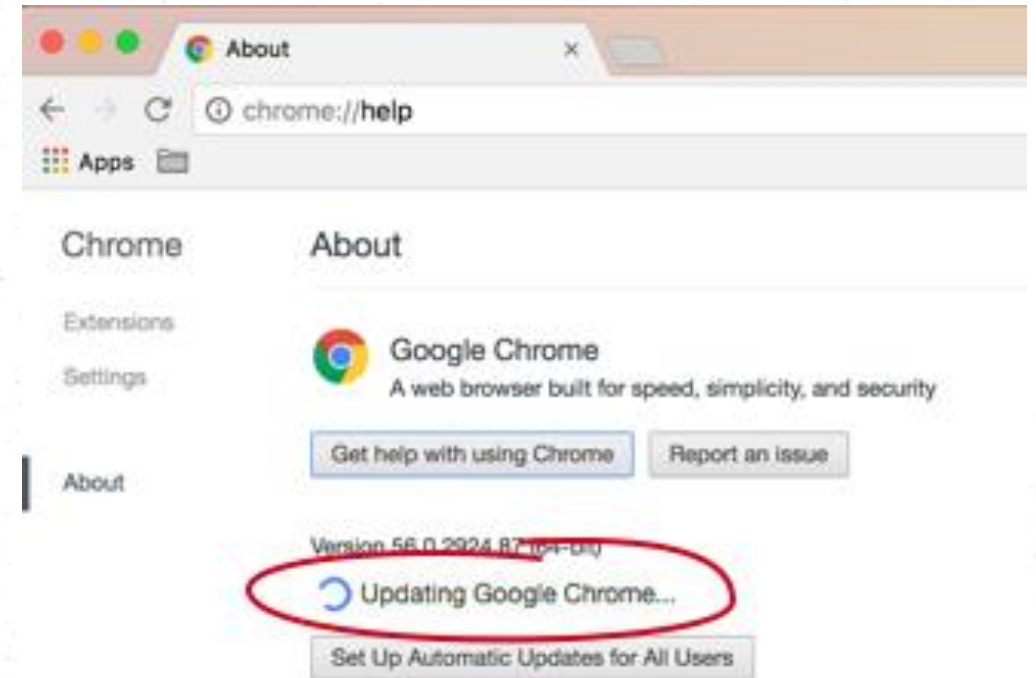
Design Principles

Feedback

- Feedback should **correspond to goals and intentions.**

- Feedback should **help evaluate goal accomplishment.**

- Feedback should **be sufficiently specific to control user activity.**

- Feedback should **help develop accurate mental models.**

- Feedback should **fit the task representation (verbal and visual).**

- Feedback should **fit the type of behavior (controlled, automatic).**

- Lack of feedback results in

  - User does not receive enough information from the system to construct a proper mental model

  - User has trouble interpreting system output in light of his/her goals

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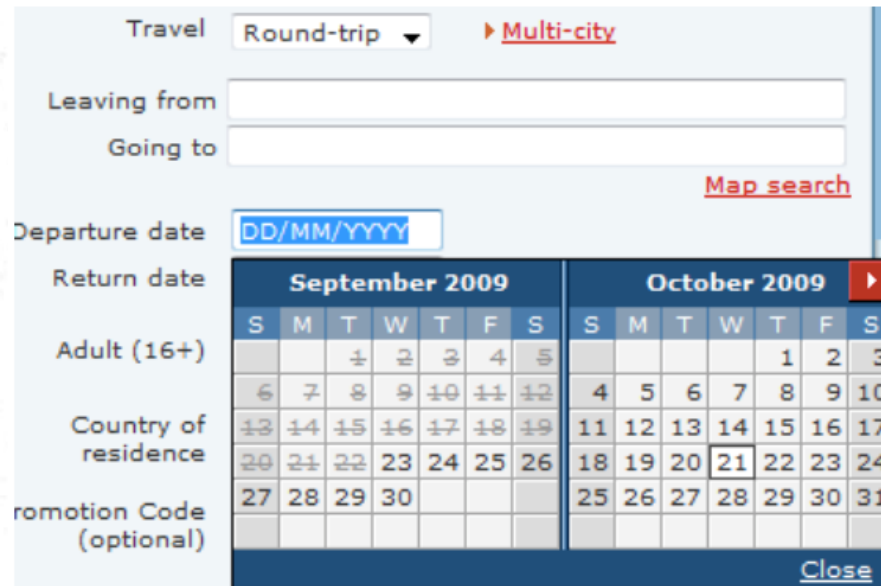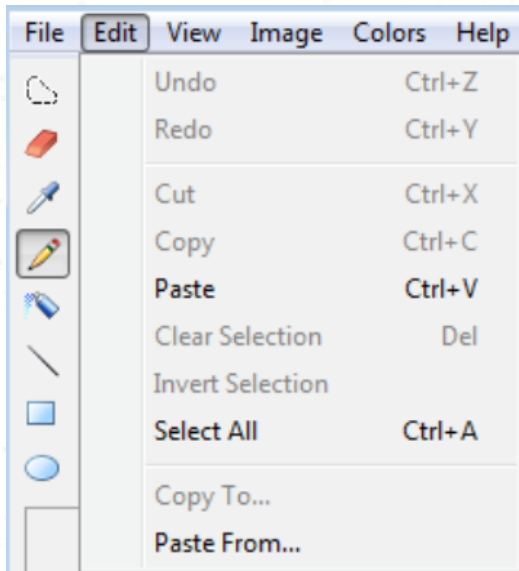FACULTY OF COMPUTING

Design Principles

Constraints

- Restrict the kinds of user actions that can take place at a given moment for any given mode of interaction.

- Provide people with a range of usage possibilities.

- Three categories of Constraints:

  - Physical Constraints

  - Logical Constraints

  - Cultural Constraints

Design Principles
Constraints

E.g.: Deactivate certain menu options by shading them gray, thereby restricting the user only to actions permissible at that stage of the activity.

Design Principles

Constraints

One of the advantages of this form of constraining is that it prevents the user from selecting incorrect options and thereby reduces the chance of making a mistake.

Physical objects can be designed to constrain things

e.g. only one way you can insert a key into a lock

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Design Principles

Constraints

User inputs can also be guided using input masks.
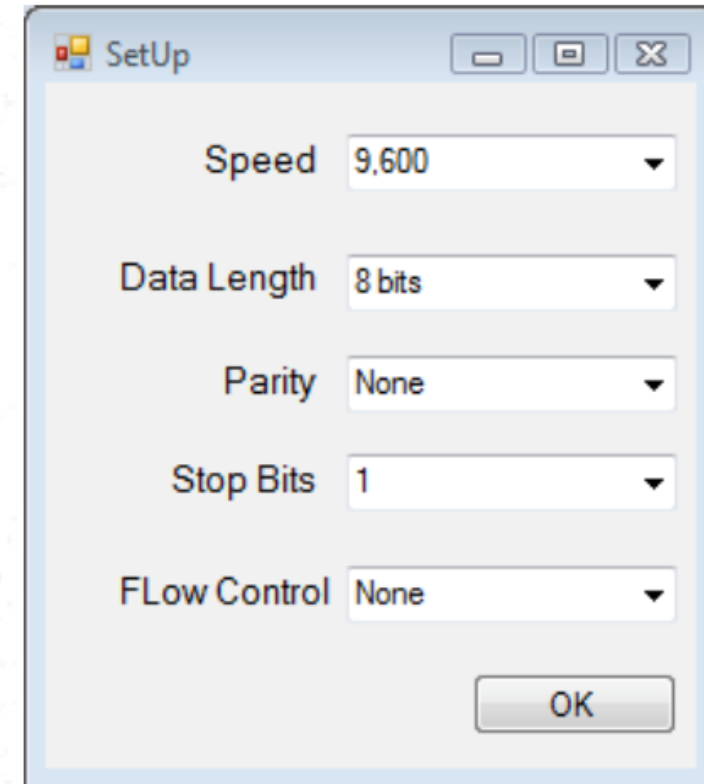
Design Principles

Consistency

Design interfaces to have similar operations and use similar elements for similar tasks.

Systems are usable and learnable when similar concepts are expresses in similar ways

It enables people to quickly transfer prior knowledge to new contexts and focus on relevant tasks.

The same action has to cause the same reaction, every time.

- For example:
    - always use ctrl key plus first initial of the command for an operation – ctrl+C, ctrl+S, ctrl+O

Main benefit is consistent interfaces are easier to learn and use

Design Principles

- **Consistency and standards:** Follow appropriate standards/conventions for the platform and the suite of products. Within an application (or a suite of applications), make sure that actions, terminology, and commands are used consistently.

E.g.: **Platform consistency**

    In-house consistency

    Consistency across a suite of products, e. g., Microsoft Office

- **Real-world conventions:** Use commonly understood concepts, terms and metaphors, follow real-world conventions (when appropriate), and present information in a natural and logical order.
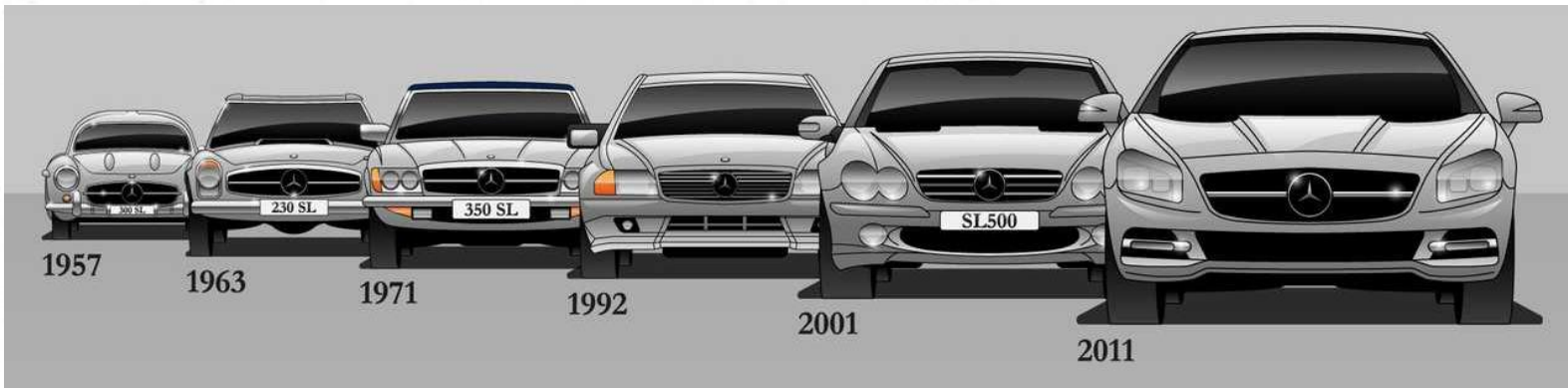
Design Principles

Four types of consistency:

- *Aesthetic*

- *Functional*

- *Internal*

- *External*

Design Principles

Aesthetic Consistency

- Style and appearance is repeated to enhance recognition, communicates membership and sets emotional tone - E.g.: Mercedes Benz vehicles are instantly recognizable because the company consistently feature its logo on all its vehicles

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Design Principles

<u>Functional</u> <u>Consistency</u>

- Meaning and action are consistent to improve learnability and understanding

- Consistent use of symbols to represent similar concepts, leverages prior knowledge and makes new things easier to use
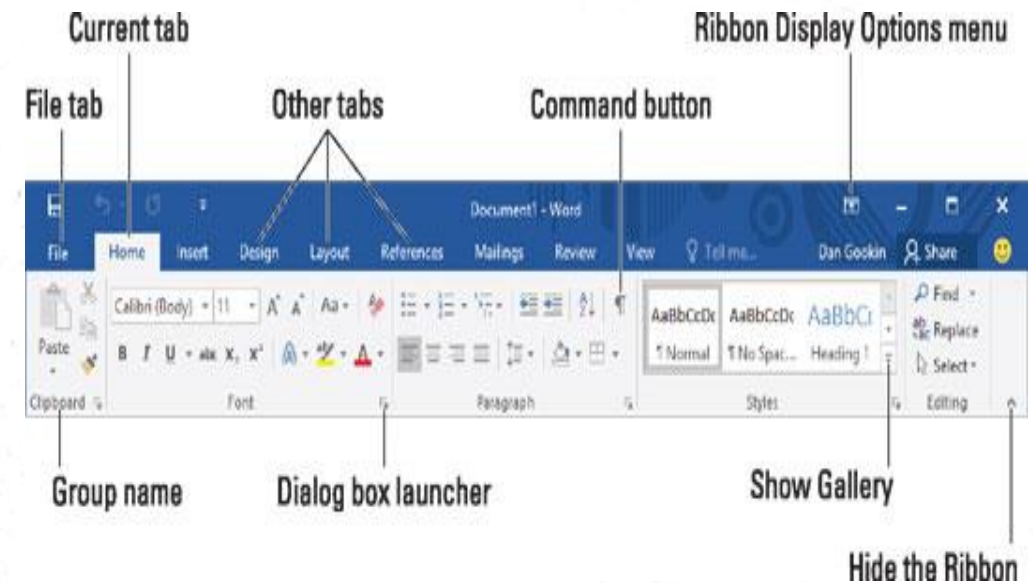
    E.g.: traffic always turns yellow before red

Design Principles

Internal Consistency

- Consistency with other elements in the system.

- Design operations to behave the same within an application

- Cultivates a sense of orientation and trust.

- Indicates system is well thought out and planned.

- Difficult to achieve with complex interfaces.

Design Principles

External Consistency

- External consistency refers to designing operations, interfaces, etc., to be the same across applications and devices

- Consistent with other elements in the environment.

- Extends the benefit of internal consistencies across multiple, independent systems.

- More difficult to achieve because different systems rarely observe the same design standards.

| **Finder** | File | Edit | View | Go | Window | Help |

| **Safari** | File | Edit | View | History | Bookmarks | Window | Help |

| **Photoshop** | File | Edit | Image | Layer | Select | Filter | View | Window | Help |

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Design Principles

We need to consider both appearance and interaction Consistency

Consistent appearance :

❖ Consistent language/terminology

❖ Consistent graphics

- Same information/controls in same location on all screens dialog boxes

- Forms, pages, boilerplate

Especially important for websites: helps user know they are still on the same site

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Design Principles

Consistent interaction

❖Consistent results

  • Same commands, actions will always have the same effect in equivalent situations

  • Consistent results lead to predictability

❖Consistent input

  • Consistent syntax across complete system "Ctrl+C"/"Ctrl+V" for Copy/Paste in Windows

Design Principles

When consistency breaks down

- What happens if there is more than one command starting with the same letter?

  e.g. save, spelling, select, style

- Have to find other initials or combinations of keys, thereby breaking the consistency rule

  e.g. ctrl+S, ctrl+Sp, ctrl+shift+L

- Increases learning burden on user, making them more prone to errors.

Design Principles

A case of external inconsistency

E.g.: Keypad numbers layout

(a) phones, remote controls

1	2	3
4	5	6
7	8	9
	0	

(b) calculators, computer keypads

7	8	9
4	5	6
1	2	3
0		

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Design Principles

Inconsistency can lead to:

- User frustration

- Increased learning time Errors

- Disorientation (Web)

Design Principles

Affordance

- This is a term used to refer to an attribute of an object that allows people to know how to use it.

- It is the relationship between what something looks like and how it's used. Appearance indicates how the object should be used.

- As soon as someone sees something, they have to know how to use it.

- Complex things may need explaining, but simple things should not.

E.g.: a door handle affords pulling

     a door panel affords pushing

     a cup handle affords grasping

     a mouse button affords pushing.

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Design Principles

Affordance

- Real affordances apply to physical objects (i.e. grasping), but interfaces exhibit perceived affordances as they are virtual.

- Affordance is more important for web designers as users need to be able to tell how to access information they want from a website, or else they'll just leave.

- Affordance is being used to describe how interfaces should make it obvious as to what can be done at them.

E.g.: icons should be designed to afford clicking

scrollbars to afford moving up and down

buttons to afford pushing.

slots for inserting things into

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Design Principles

Mapping

Refers to the relationship between controls and their effects in the world.

E.g.:

1. A good mapping between control and effect is the up and down arrows used to represent the up and down movement of the cursor, respectively, on a computer keyboard.

2. The vertical scroll bar. It tells you where you are in a page, and as you drag it down, the page moves down at the same rate; control and effect are closely mapped.

Design Principles

Mapping

- The mapping of the relative position of controls and their effects is also important.

    E.g.: Consider the various musical playing devices such as MP3, CD player, tape recorder.

How are the controls of playing, rewinding, and fast forward mapped onto the desired effects?

- play button in the middle

- the rewind button on the left

- the fast-forward on the right.

This configuration maps directly onto the directionality of the actions.

Design Standards

What are Standards?

- Standards are limited tools for encouraging certain changes in practice.

- They are part of a large and systematic usability engineering approach to design.

- Set by national or international bodies to ensure compliance by a large community of designers.

Design Standards

Purpose of using Standards?

• Standardize the look and feel of a user interface

• Incorporate human factors, research and best practices in HCI.

• Smooth the HCI design process.

• Achieve mandated compliance.

Standards do not guarantee good design, they provide a means of specifying interface quality in design.

Design Standards and Bodies.

International Standards

- Developed by organizations to reflect agreements among national member organizations.

E.g.:

International Organization for Standardization (ISO)

ISO 9241, *Ergonomic Requirements for Office Work with Visual Display Terminals.*

- Issues covered in ISO 9241: workstation layout, postural requirements, human-computer dialogue, software aspects of display design, keyboard requirements and user guidance

[http://www.iso.ch/cate/cat.html—search on ISO number 9241]

Design Standards and Bodies.

National Standards

Standards developed by national bodies to reflect agreements among companies and other entities within a country. E.g.:

- **American National Standards Institute** (ANSI)

- **HFES-200, Ergonomics of Software User Interfaces** (in process), developed by the Human Factors and Ergonomics Society

- **British Standards Institution** (BSI)

- **Deutsches Institut für Normung** (DIN)

  - more than 20 years ago published standards which addressed ergonomics problems of VDUs and their workplace.

Design Standards and Bodies.

Commercial Standards

E.g.:

- **Macintosh Human Interface Guidelines** (Apple Computer)

- **Common User Access** (CUA) (IBM)

    IBM HCI Guidelines

- **OSF/Motif Style Guide** (Open Software Foundation)

- **The Windows Interface Guidelines** for Software Design (Microsoft)

Design Best Practices

1. Creating effective color palettes

2. Acknowledging different color visions

3. Effective Typefaces

4. Paring fonts

5. Use images to breakup texts

6. Source images responsibly

7. Use Coherent Layout

8. Use a grid

9. Enforce visual hierarchy

10. Use white space

1. Creating effective color palettes

- Color is a powerful visual tool
- Build a color palette
- Have a brand color
- Use neutral colors

Creating effective color palettes

- **What are the colors of?**
  - Facebook
  - Netflix
  - YouTube
  - SLIIT
- **Color brings identity**

2. Awareness for different color visions

- 5% of all web users are colorblind
- Avoid confusing colors combinations

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3. Effective Typefaces

- Consider types of fonts that will match the purpose.
- Use font styling (Bold, Italic, Etc.) effectively.

Modern Typography

Modern typography was a reaction against the perceived decadence of typography and design of the late 19th century. It is mostly associated with the works of Jan Tschichold and Bauhaus typographers Herbert Bayer, László Moholy-Nagy, and El Lissitzky. It reflected a modern, universal method of communication.

History of Ancient Egypt

The history of ancient Egypt spans the period from the early prehistoric settlements of the northern Nile valley to the Roman conquest, in 30 BC. The Pharaonic Period is dated from the 32nd century BC, when Upper and Lower Egypt were unified, until the country fell under Macedonian rule, in 332 BC.

4.   Paring fonts

- Experiment with multiple fonts.
- Maximum of two fonts should be enough.
- Use one font for body and another for headings.

The Story of Typography

Contemporary typographers view typography as a craft with a very long history tracing its origins back to the first punches and dies used to make seals and currency in ancient times. The basic elements of typography are at least as old as civilization and the earliest writing systems.

5. Use images to breakup texts

- Images can be used to enhance user experience

- Make sure each visual elements adds value to context

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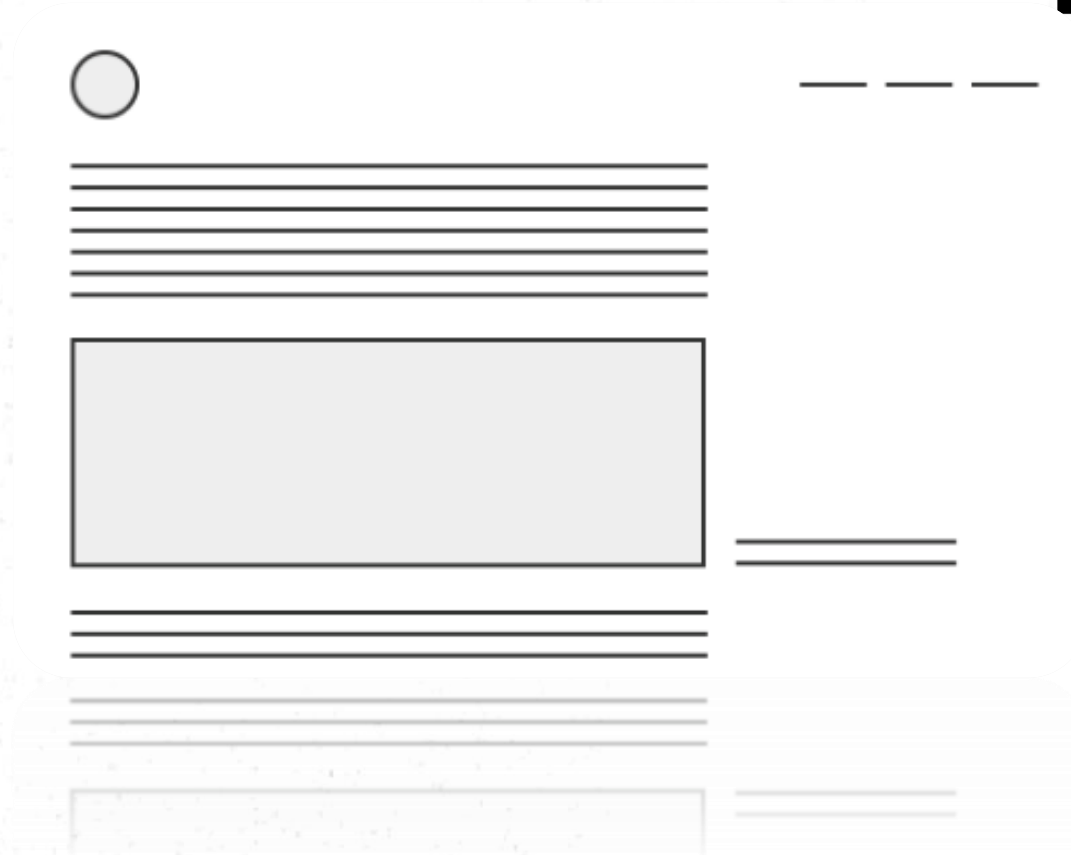
6. Source images responsibly

- Don't use images that are copyright.
- Use free stock photo sites.
- Create your own photos.

Google

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7. Use Coherent Layout

- Know how to use texts and visual elements.

- Make your design look elegant and professional.

- Use the design to bring attention to the right place.
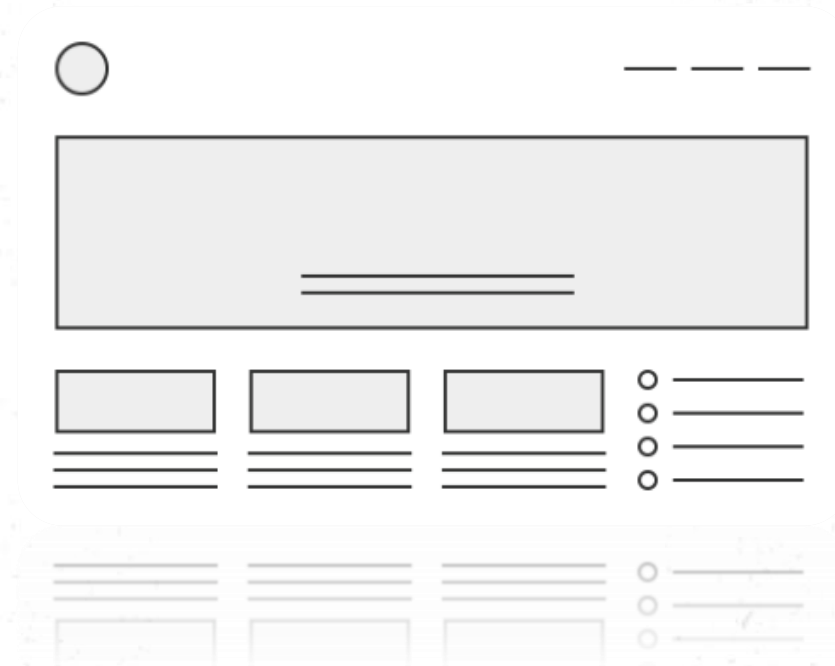
8. Use a grid

- To organizing content.

- To help the design look professional, uniform and well-aligned

- Add consistency and structure to your layout

- Make it easier for the user to understand and navigate.

The New York Times
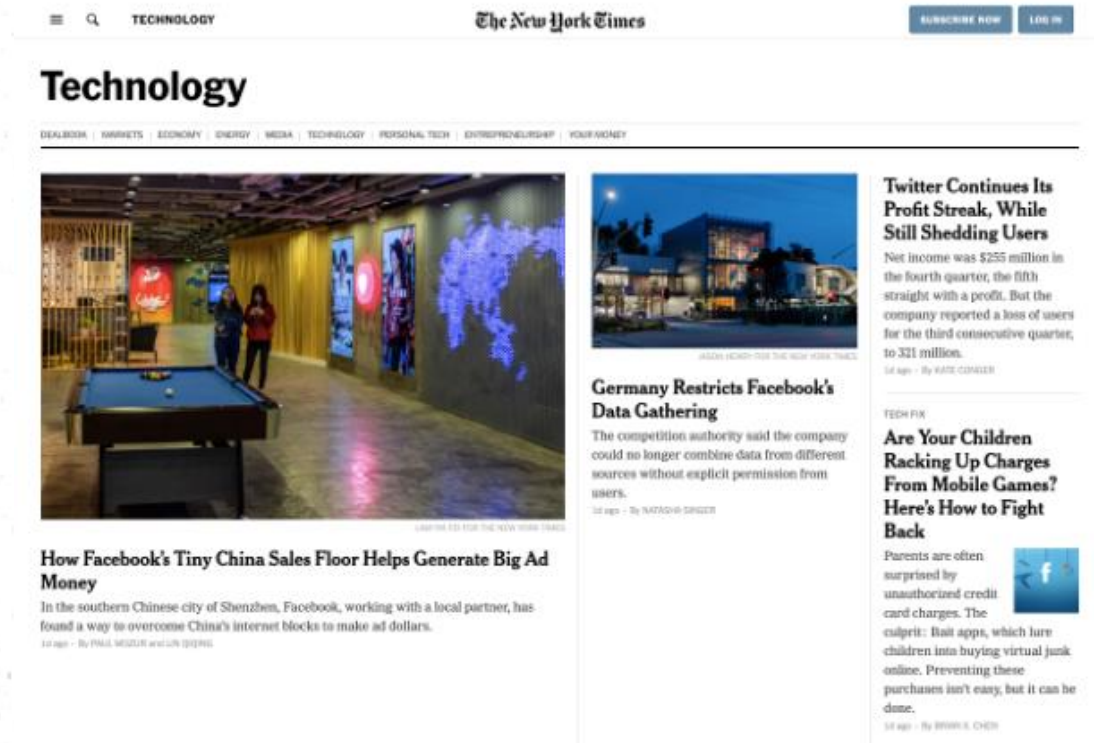
9. Enforce visual hierarchy

- Important information should be easily noticeable (Bigger font, Bold, etc.)

- Help users understand waymarkers in the texts (Headings)

- Use combinations of color, size and spacing to control hierarchy

10. Use white space

- Giving elements such as images and text blocks plenty of surrounding will help the user identify groupings of information, and therefore help them more easily understand the content.

- Makes your designs look cleaner and more elegant.
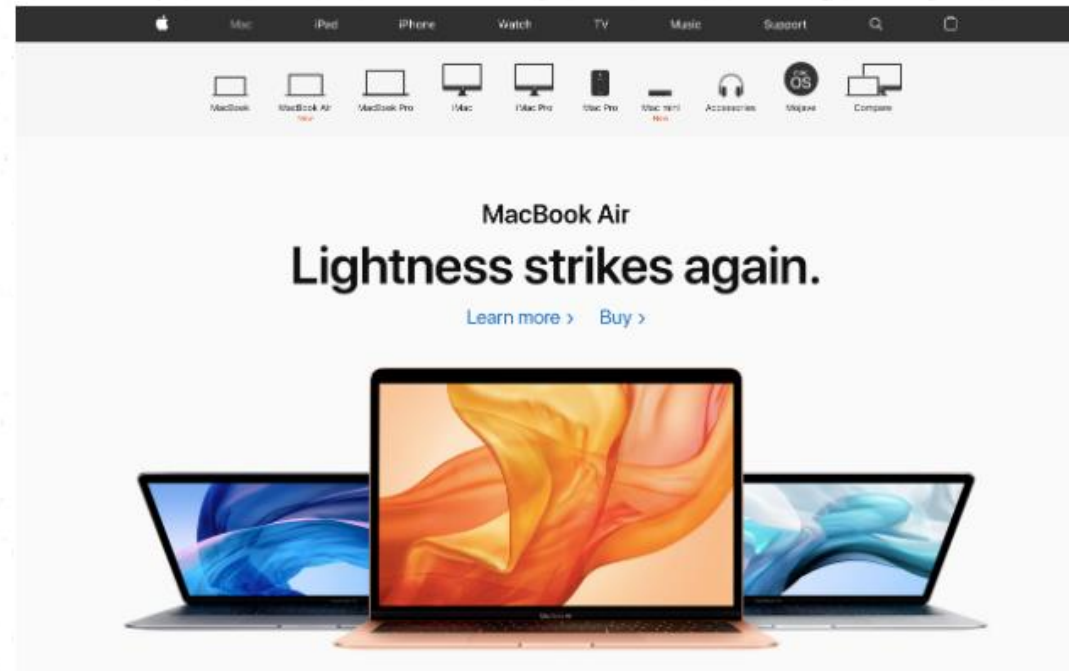
Usability ?

- Ensures that interactive products are easy to learn, effective to use, and enjoyable from the user's perspective.

- It involves optimizing the interactions people have with interactive products.
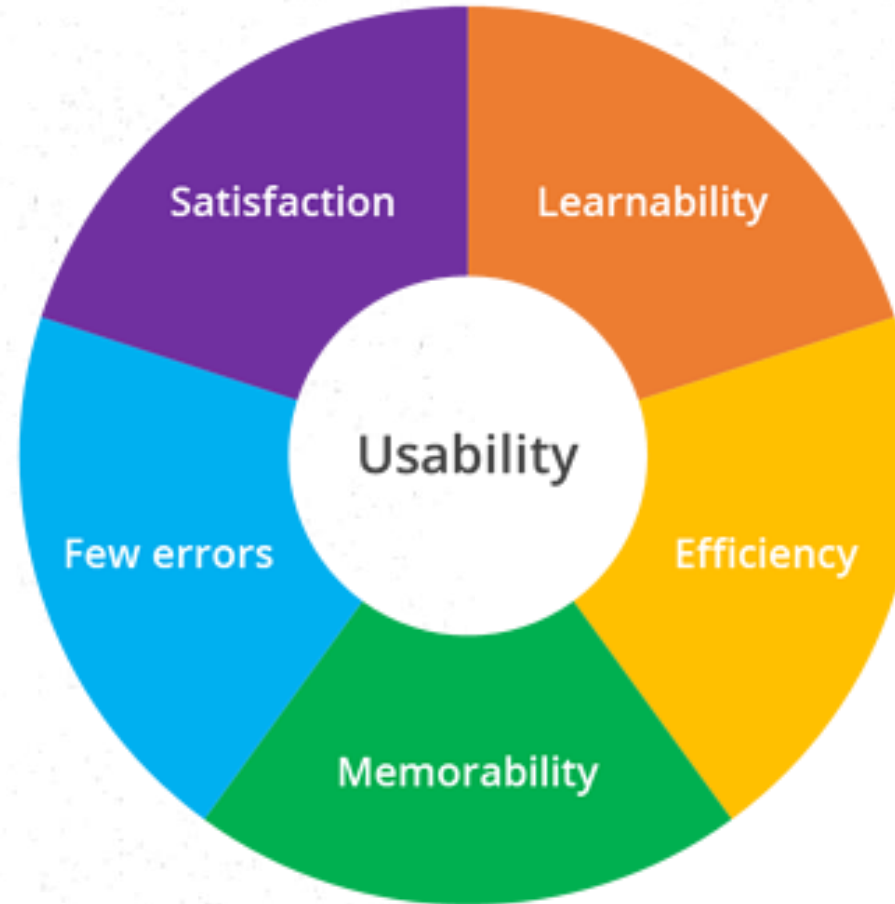
Usability Process

1. Study the users and their tasks.

2. Competitive Analysis

3. Set usability goals.

4. Participatory Design.

5. Coordinating the Total Interface for Consistency.

   • Include documentation, help, etc.

6. Guidelines and Heuristic Evaluation.

   • Evaluate your interface according to the guidelines.

7. Make prototypes of the system early and quickly.

8. Empirical testing.

9. Iterative design with usability analysis.

10. Collect feedback from field use.

Homework

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1. Study the users and their tasks.

- Study the intended users and the use of the product.
- Study the user characteristics
  - Work experience, education level, age, previous computer experience
  - Time for learning, training
  - Available hardware (monitor size, acceptance of plugins, cell-phones vs. desktop)
  - Social context of use.
- Early focus on users and tasks through contextual inquiry

1. Study the users and their tasks.

- Create personas

  - To represent your most common target group.

- User centered task analysis

  - What tasks the users will do?

  - E.g.: Hierarchical Task Analysis

        Cognitive task analysis

- Functional analysis

  - What really needs to be done

  - Not just the way users are doing it now

  - May be a more efficient or more appropriate way to achieve same task

2. Competitive Analysis

- Know the competition.

- Study the competition.

- Read trade-press reviews of products or web sites.

- Visit competitor's web sites

    Also, web sites for related products

- Study the importance of various features, issues.

    Pictures, navigation, search, prices, shipping, metaphors

- A competitive analysis does not imply stealing other people's copyrighted user interface designs.

2. Competitive Analysis

- Comparative analysis

  - If several competing products are

    available for analysis

  - This will provide ideas for the new design

- Competitive analysis

  - will involve the study of non-computer

    interfaces.

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3. Set Usability Goals

- effectiveness

- efficiency

- safety

- utility

- learnability

- memorability

3A. Much better Goals:

- Can be learned in less than 2 minutes

- User will perform 2 error-free purchases per session

- The error rate will be lower than 2 per 10 operations

- Tasks will be performed in 30% of the time it takes using the competitor's system

- Users will have a high satisfaction with the system as measured by a survey.

- *Explicit, specific, measurable metrics.*

- *Allows objective decision making.*

4. Participatory Design

- **Participatory Design** is a design approach where all stakeholders are actively involved in the processes and procedures of design.

- It actively involves users in the design process to help ensure that the product design meet their needs and is usable in the process.

5. Coordinating for Consistency

- One of the most important usability characteristics.

- May require overall design document, vocabulary guide, style guide, templates, etc.

6. Use Guidelines and Heuristic Analysis

- Designers evaluating the Interface based on their experience

- Guidelines list well-known principles for user interface design which should be followed in the development project.

7. Prototypes

- Simulation of interface
- Quick and cheap to create (no "back end")
- Start with low fidelity
- Progress to higher-fidelity
- Early usability evaluation can be based on prototypes of the final systems that can be developed
    - much faster
    - much more cheaply
    - which can be changed many times until a better understanding of the user interface design

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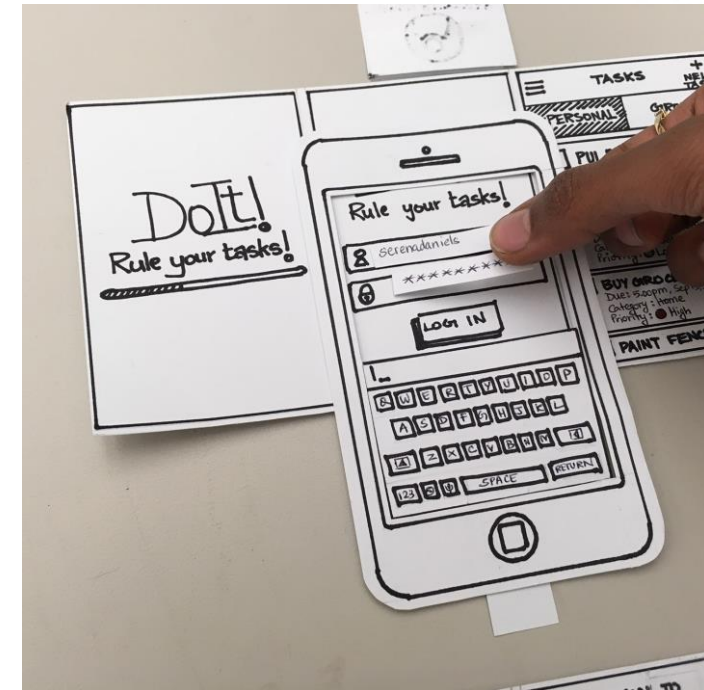
8. Empirical Testing

- Based on observation or experience rather than theory.

- Critical to usable products

- Designers must watch users

- Web logs are not sufficient

- Not necessarily difficult or expensive.

- Test low-fidelity prototypes, high-fidelity prototypes, final system.

9. Iterative design

- Redesign interface based on evaluation

- Keep track of reasons for design decisions

  - Called "Design Rationale"

  - Need to keep revisiting the same decisions

  - When future conditions suggest changing a decision will remember why made that way and what implications for change are.

- Empirical testing with intention to fix the problems.
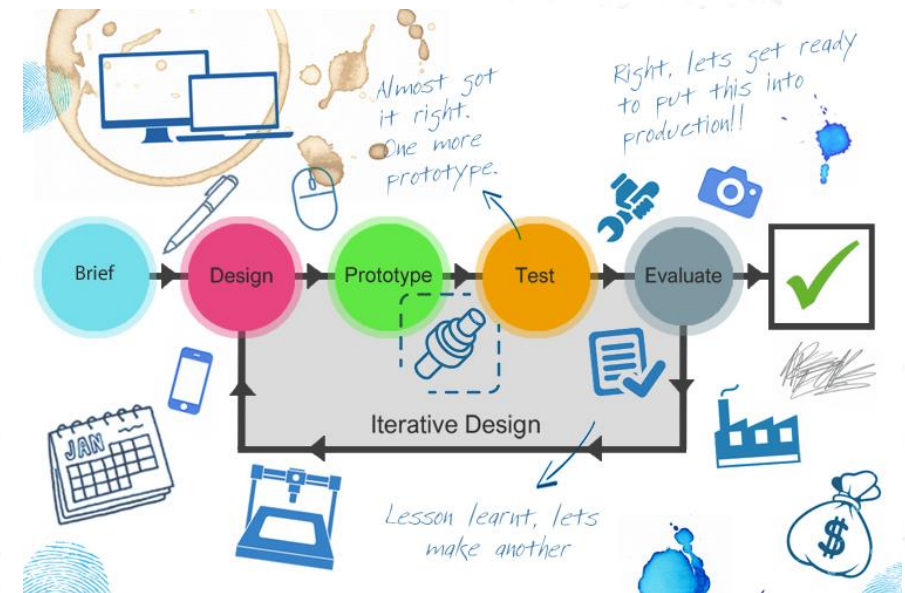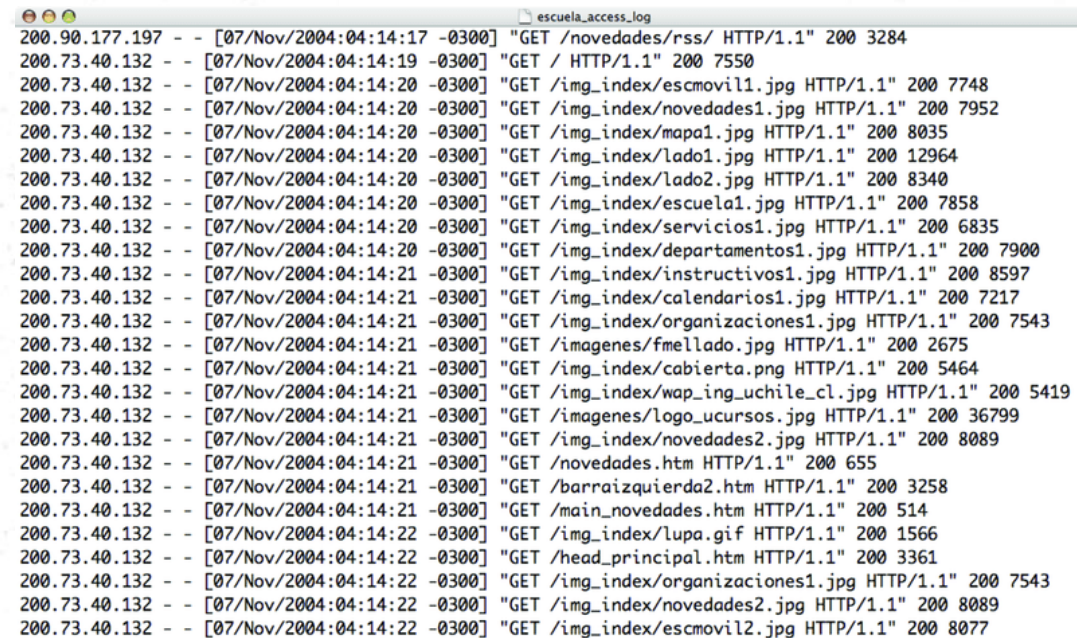
9. Iterative Design

- Not just goals ("be easy to use"), but a process to achieve the goals

- Successively higher-fidelity designs

- Spiral model from (Boehm, 1988)
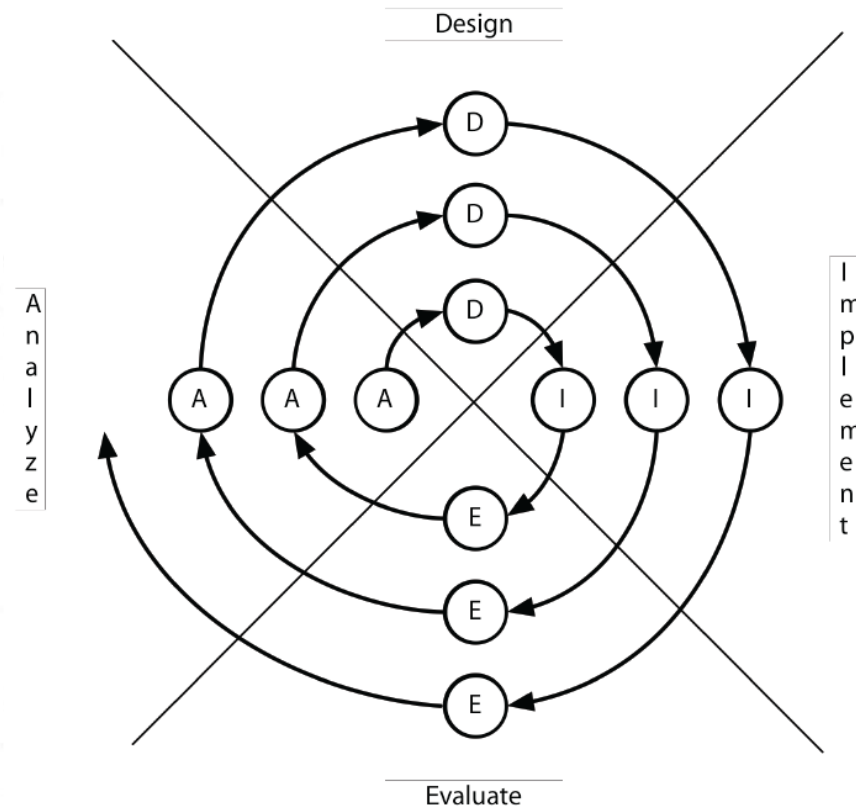
10. Measure Real Use

- Follow-up after release for the next

  version

- From bug reports, trainers, initial

  experiences (for conventional

  applications)

- From web logs, reports, customer

  support

Design Guidelines

- Design guidelines are sets of recommendations towards good practice in design.

- A design guideline sits between a principle in design and a standard or rule for implementing it.

- Provide clear instructions to designers and developers on how to adopt specific principles.

- Help designers understand how to implement a principle, without restricting their creativity in design.

- Design guidelines are not as generalizable as design principles.

Design Guidelines

<u>Nielsen and Molich's 10 User Interface Design Guidelines</u>

1. Visibility of system status

2. Match between system and the real world.

3. User control and freedom.

4. Consistency and standards.

5. Error prevention.

6. Recognition rather than recall.

7. Flexibility and efficiency of use.

8. Aesthetic and minimalist design.

9. Help users recognize, diagnose and recover from errors.

10. Help and documentation

Design Guidelines

1. **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.

   - Inform the users with what's happening with the program by visually showing the user what their actions have led to whenever possible.

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Design Guidelines

1. **Visibility of system status**.

   E.g.: In Photoshop, when users move layers around in the Layers palette, they can visually see the layer being represented as physically dragged within the space.

Design Guidelines

2. **Match between system and the real world**.

- Use the language and concepts users would find in the real world.

- Photoshop design the information structure and terminology to mirror the same wording we would use in the world of photography or print media.

E.g.: RGB, Hue/Saturation/Brightness and CMYK are used to represent color

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Design Guidelines

2. **Match between system and the real world**.

E.g.: Photoshop's dodge tool and the burn tool mimics a traditional darkroom technique for photographs.
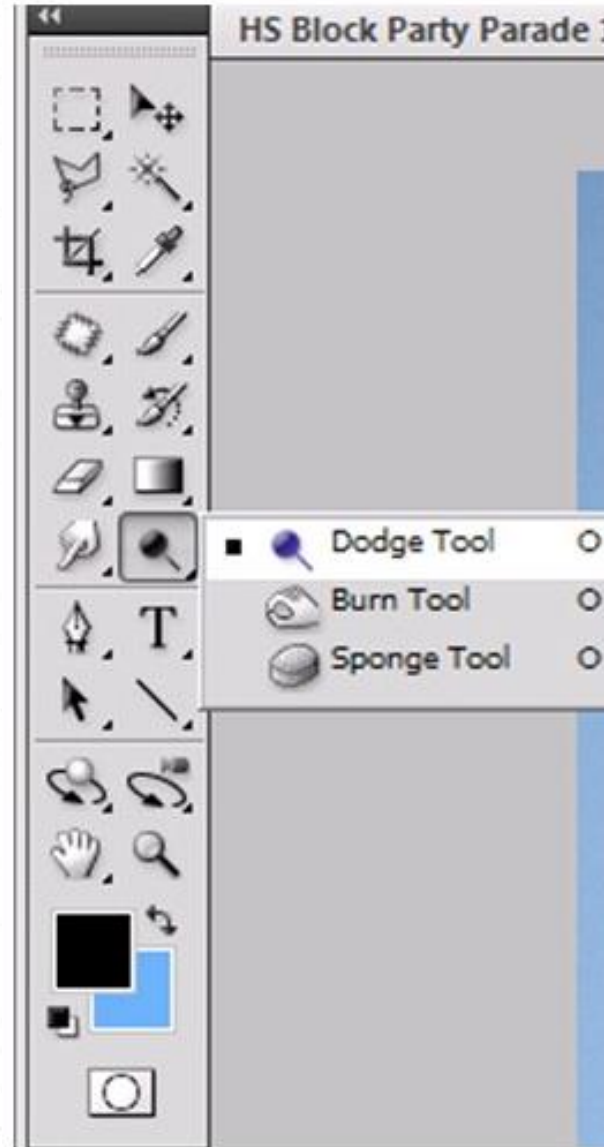
Design Guidelines

2. **Match between system and the real world**.

E.g.: Photoshop utilizes the term, "Exposure", as commonly used in the world of photography.
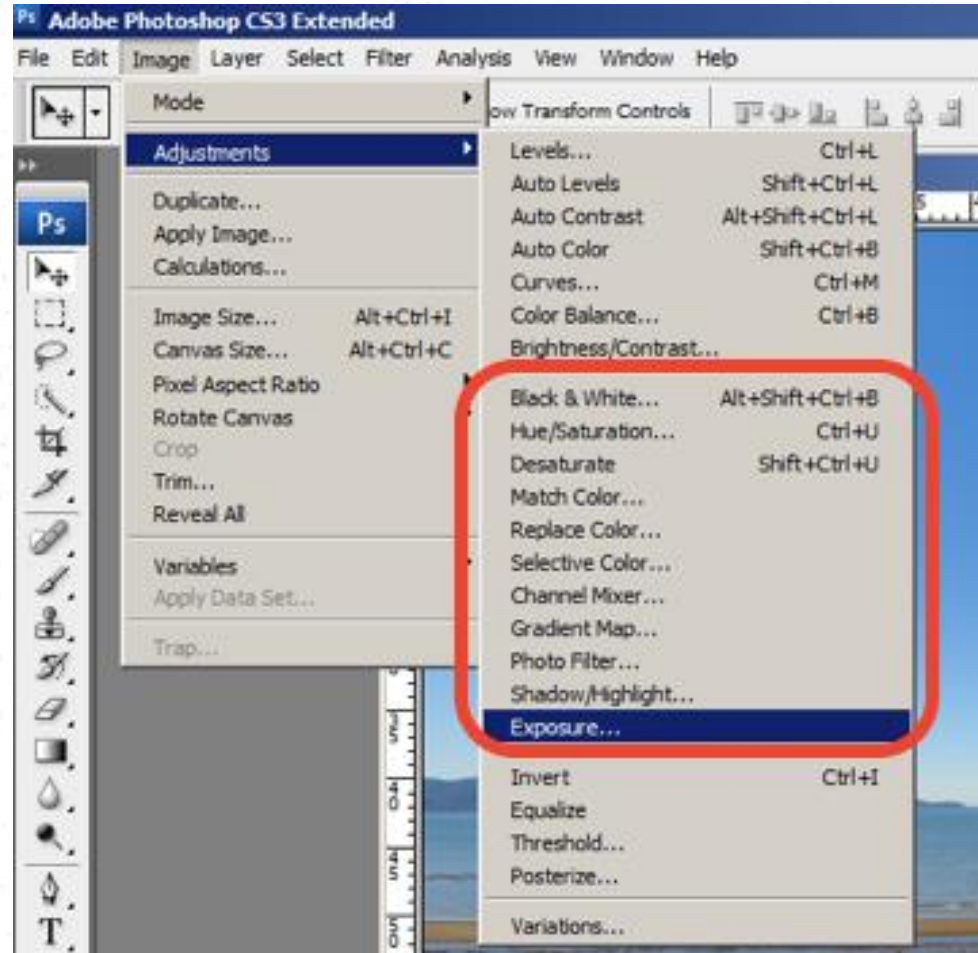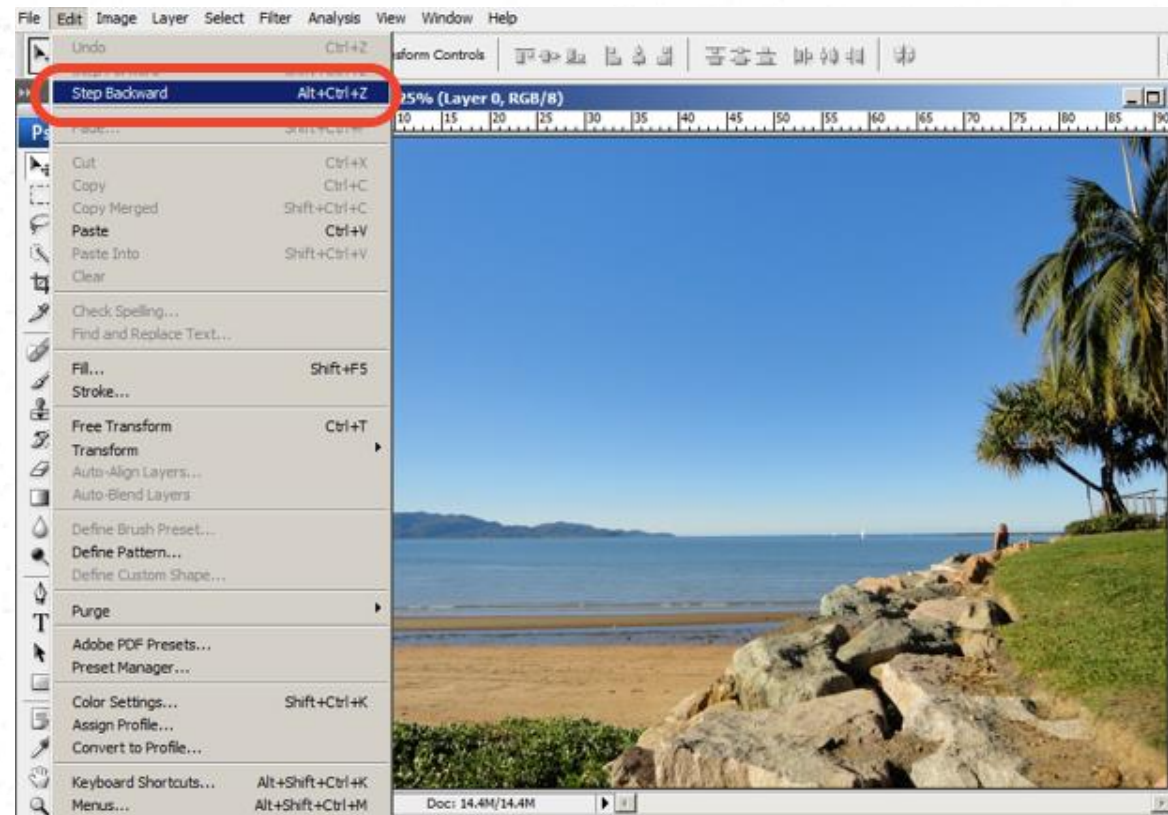
Design Guidelines

3. **User control and freedom**.

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

> E.g.: As the user makes changes to an image, they can quickly and easily take a step backwards if they make an error.
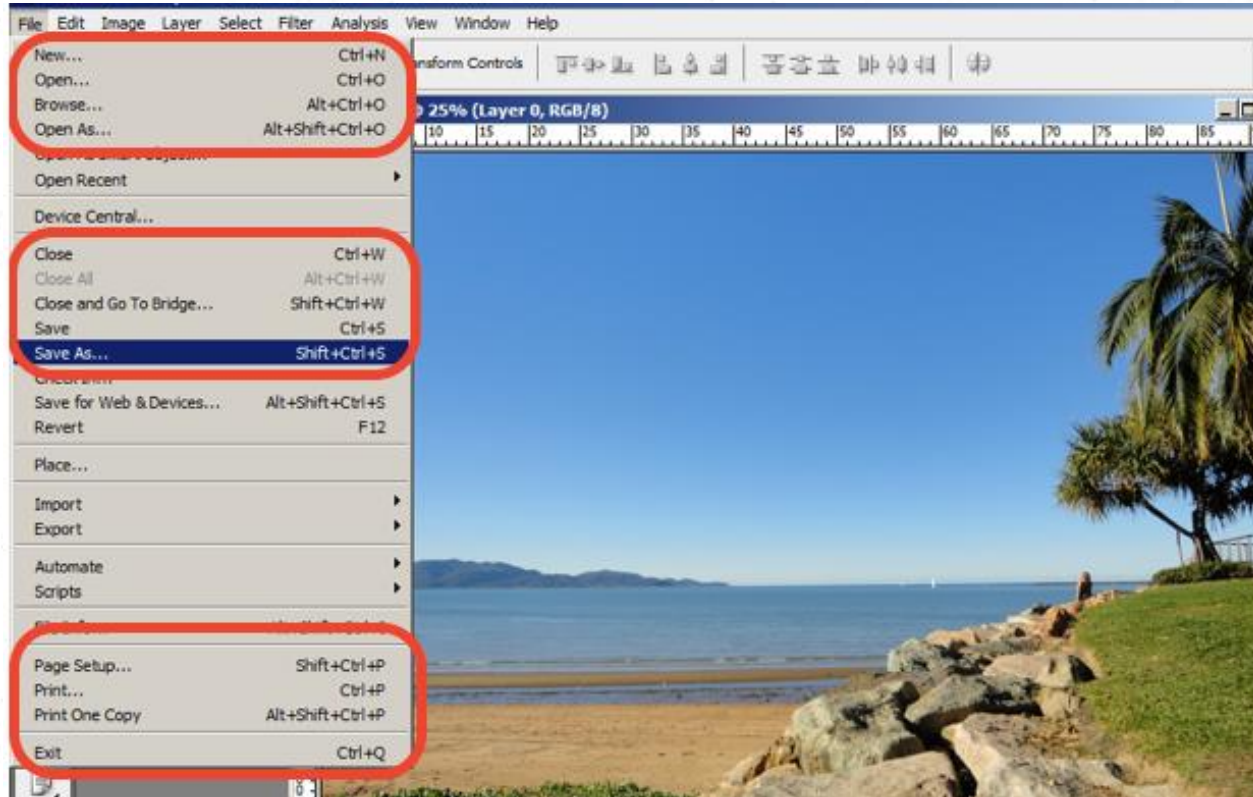
Design Guidelines

4. Consistency and standards.

Ensure that both the graphic elements and terminology are maintained across similar platforms.

E.g.: an icon that represents one category or concept should not represent a different concept when used on a different screen.

Design Guidelines

4. **Consistency and standards**.

E.g.: The File menu in Photoshop displays a variety of highly familiar options.

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Design Guidelines

5. **Error prevention**.

- Design systems so that potential errors are kept to a minimum.

- Eliminating or flagging actions that may result in errors are two possible

  means of achieving error prevention.

E.g.: Google Search trying to correct spelling.

Design Guidelines

6. Recognition rather than recall.

- It's always better to suggest the user a set of options than to let him remember and type the whole thing.

- The goal is to minimize the application of user memory.
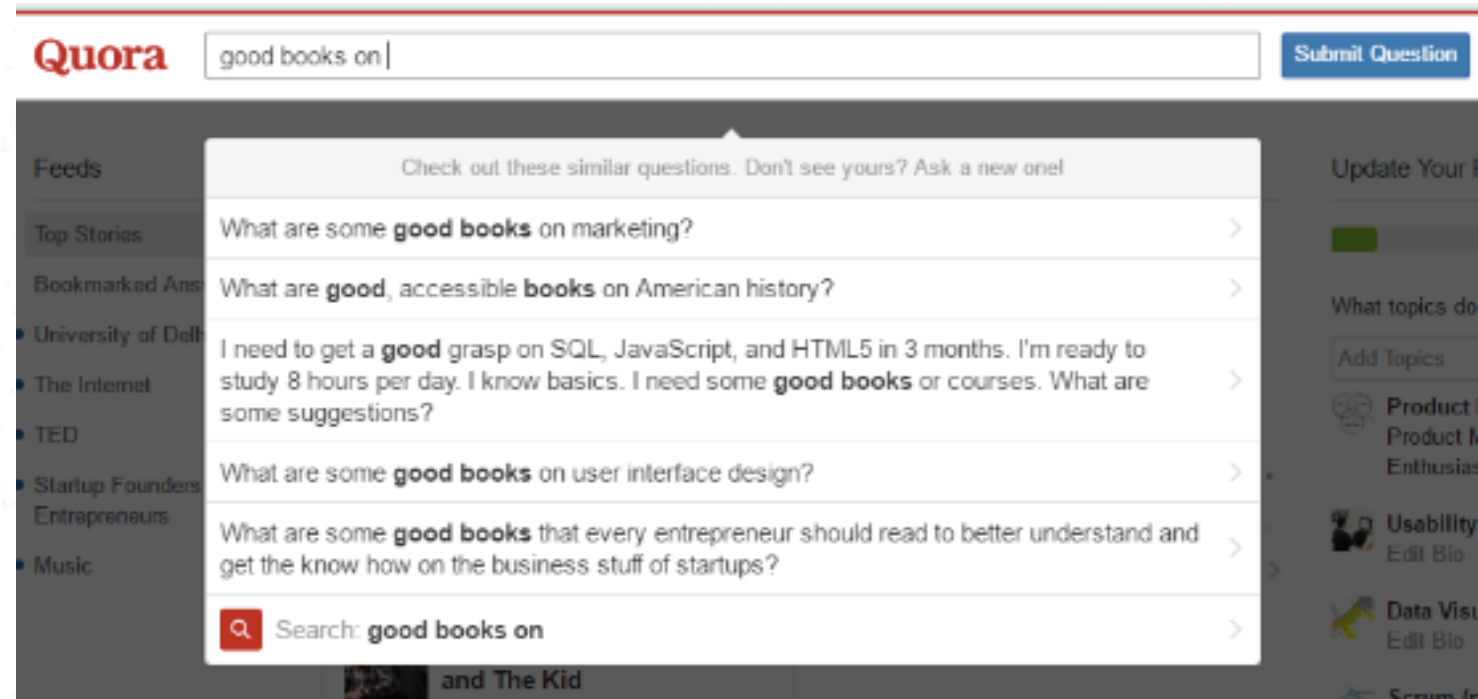
Design Guidelines

7. **Flexibility and efficiency of use**.

- The Interface should be flexible transforming itself between a novice user and an advanced user.

- This 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.

  E.g.: When installing a new software that asks if the user wants to go ahead with default installation or custom installation. An advanced user chooses a custom installation to cut out the unnecessary services.

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7. **Flexibility and efficiency of use**.

E.g.: Photoshop gives frequent users the ability to save their preferred workspace-setup.
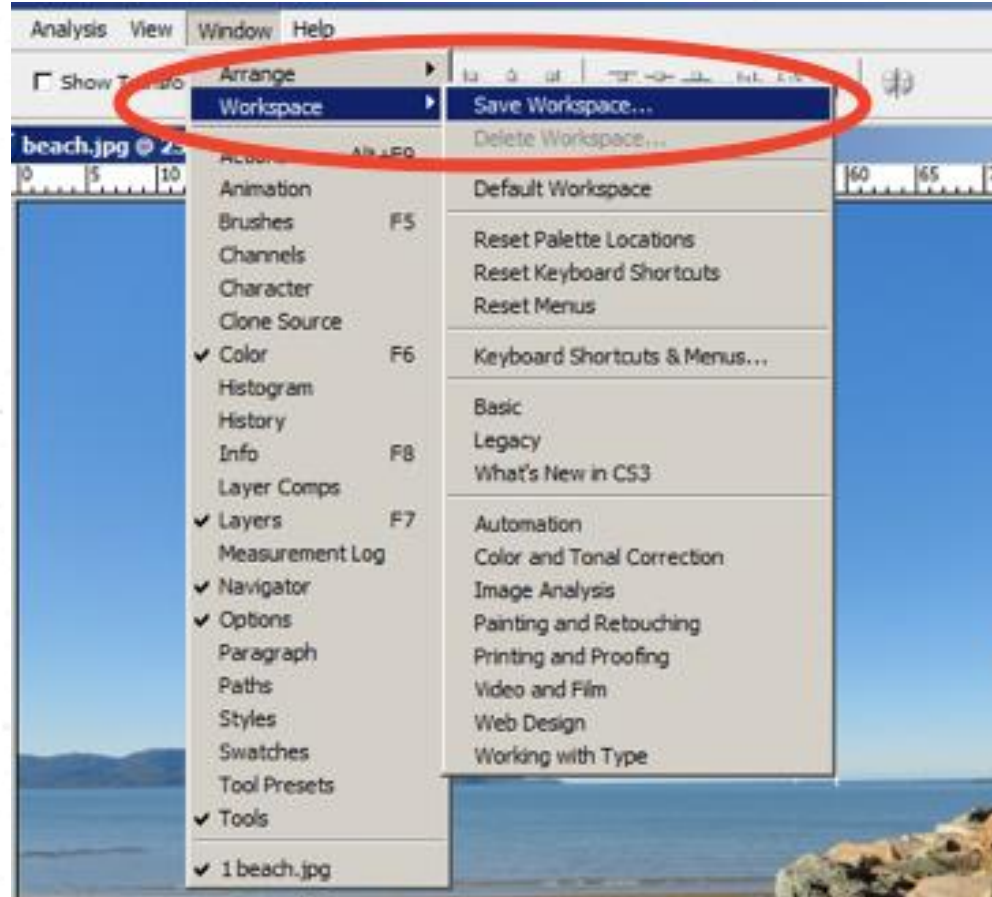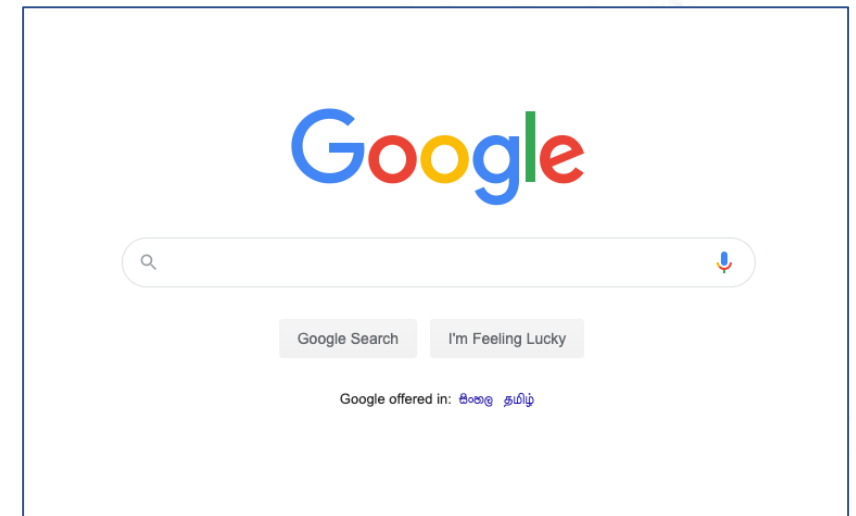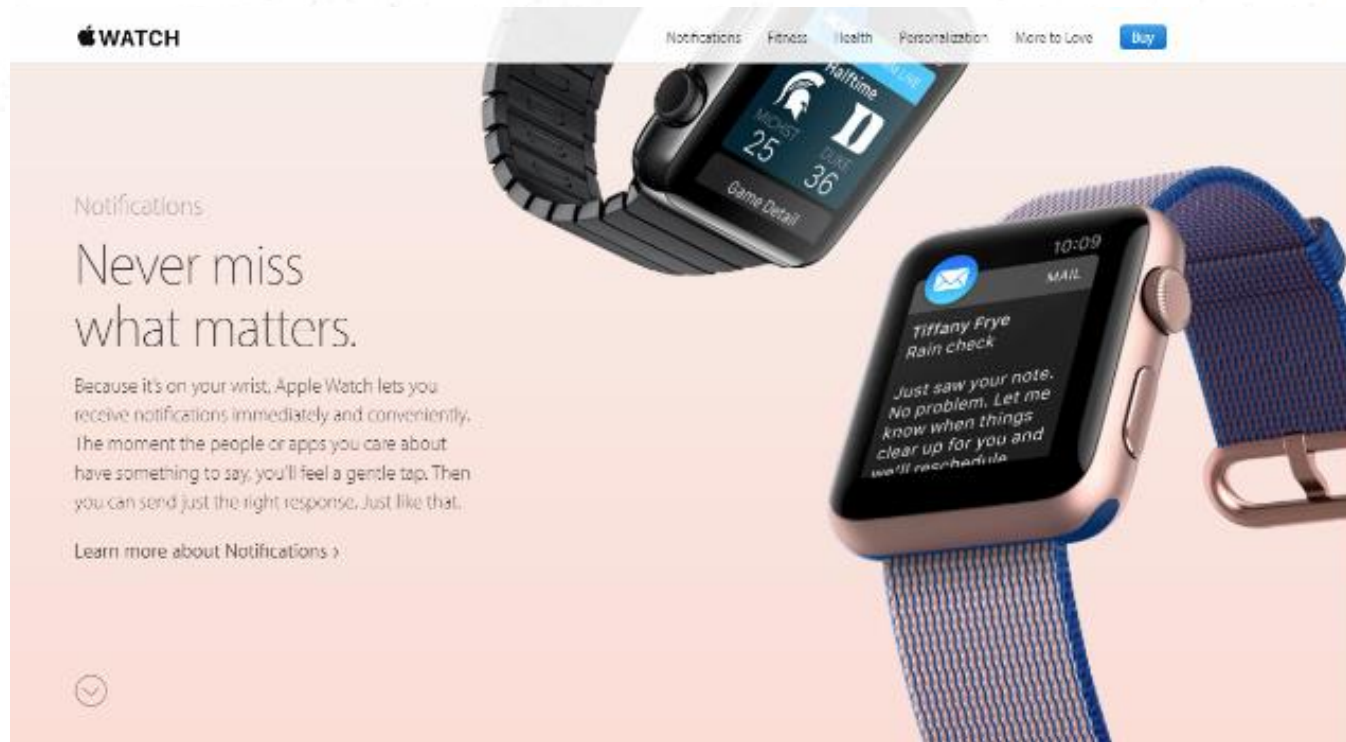
Design Guidelines

8.   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.

- Interfaces need to be cleared of the unnecessary elements and content that does not support the user's goals and tasks.

- Only the essential and absolute minimum of information needed for the user to complete a task should be presented.

- Designers should prioritize information screen-to-screen in the user flow.

Design Guidelines

8. **Aesthetic and minimalist design**.

E.g.:

Design Guidelines

9.   Help users recognize, 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.

Design Guidelines

9. **Help users recognize, diagnose and recover from errors**.

Design Guidelines

10. Help and documentation.

- When users require help, ensure it is easily located, specific to the task at hand and worded in a way that will guide them through the necessary steps towards a solution to the issue they are facing.

The window displays information on how to create rollovers in the context of web graphics. The user is also able to see a list of topics on the side menu.
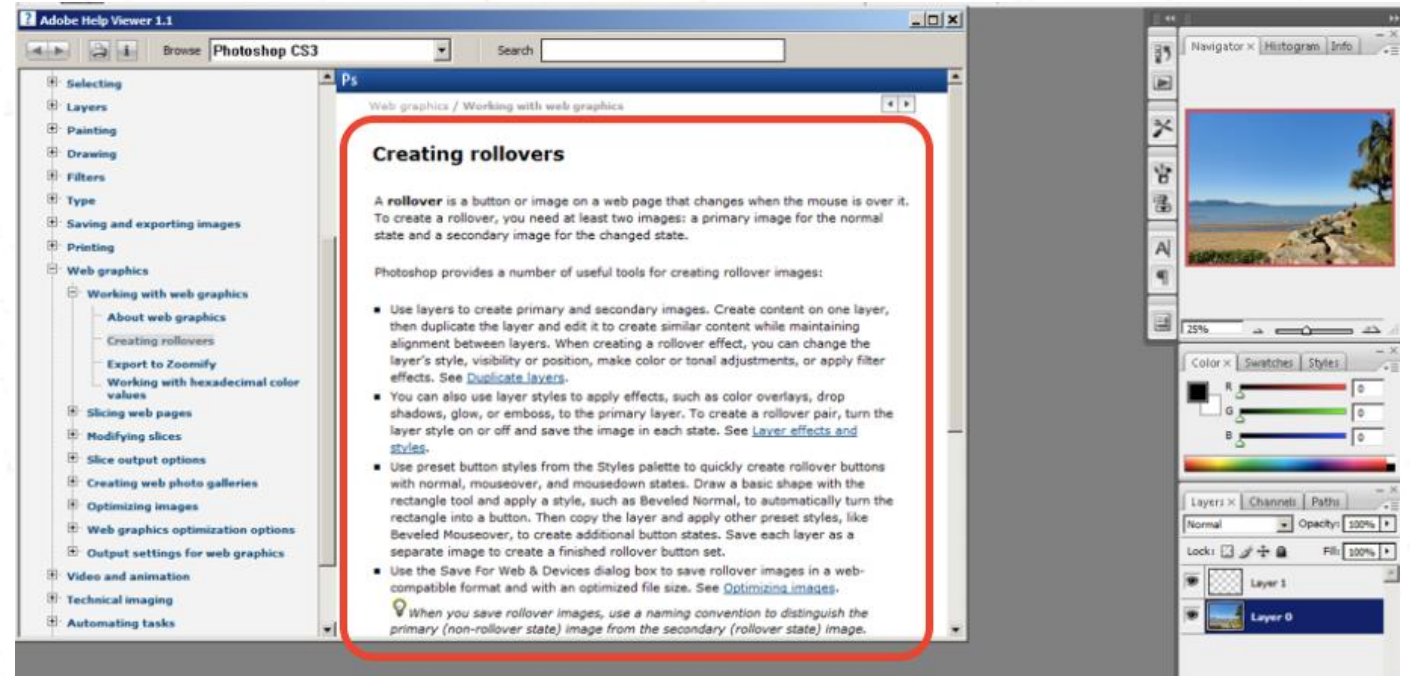
References

- Jenny Preece, Helen Sharp, Yvonne Rogers-Interaction Design_ Beyond Human-Computer Interaction-Wiley (2015)

- https://www.interaction-design.org/literature/topics/design-guidelines

- http://www.cs.umanitoba.ca/~umdubo26/COMP3020/lecture15_DesignPrinciples.pdf

- https://interactions.acm.org/archive/view/march-april-1999/hci-standards1

- https://www.southampton.ac.uk/~km2/teaching/hci/lec19.htm

- https://trydesignlab.com/blog/essential-visual-design-best-practices-beginners/

- https://blog.prototypr.io/10-usability-heuristics-with-examples-4a81ada920c