Human-Computer Interaction

Dr. Mohammed Al-Ebady

Computer Science Department

University of Karbala

Lecture 2

2017

Headlines

- Activity 1.4
- More on usability: design and usability principles
- Design Principles
- Heuristics and usability principles
- The ten main usability principles

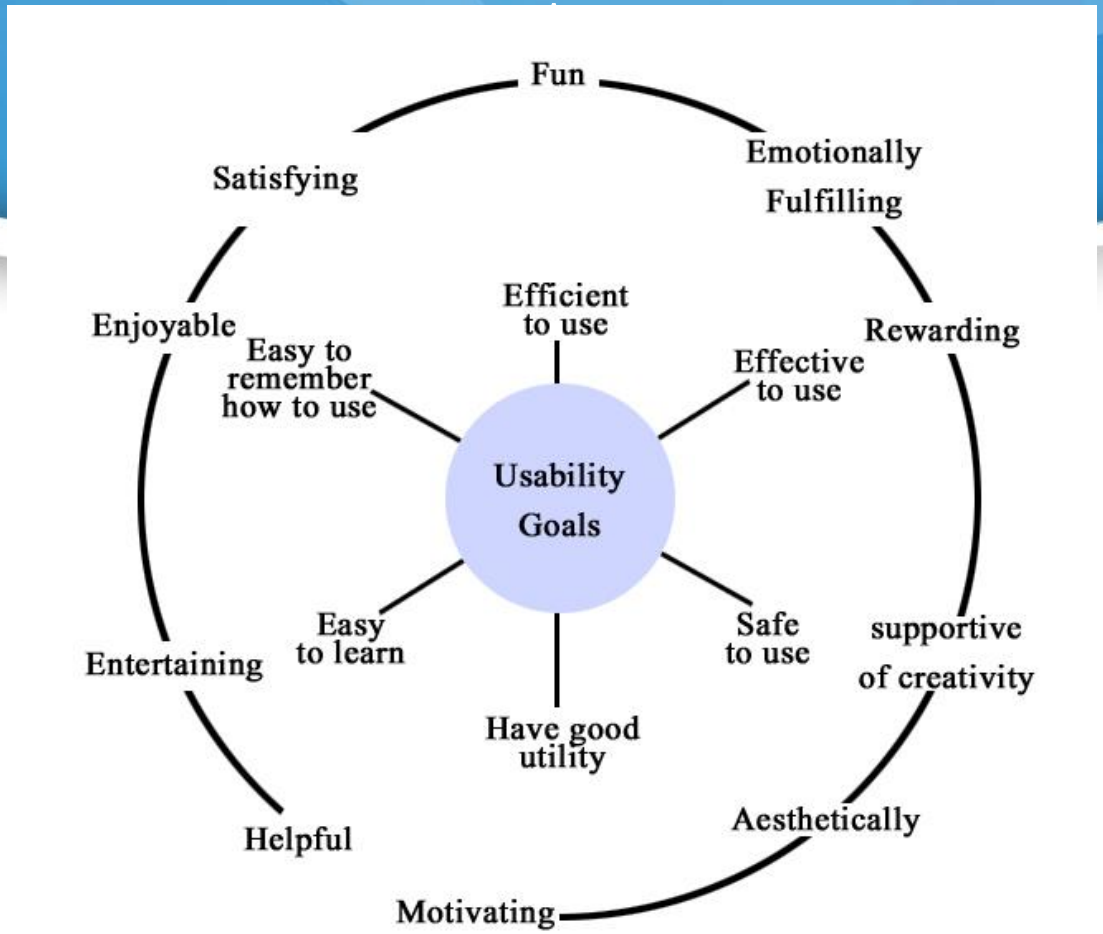


Figure 1.7: Usability and user experience goals. Usability goals are central to interaction sign and are operationalized through specific criteria. User experience goals are shown in the outer circle and are less clearly defined.

Activity 1.4

What do you think are the key goals and user experience goals for each of them?

(a) a mobile device that allows young children to communicate with each other and play collaborative games

Comment: Such a collaborative device should be easy to use, effective, efficient, easy to learn and use, fun and entertaining.

(b) a video and computer conferencing system that allows students to learn at home

Comment: Such a learning device should be easy to learn, easy to use, effective, motivating and rewarding.

(c) an Internet application that allows the general public to access their medical records via interactive TV

Comment: Such a personal system needs to be safe, easy to use and remember how to use, efficient and effective.

Cont.

(d) a CAD system for architects and engineers

Comment: Such a tool needs to be easy to learn, easy to remember, have good utility, be safe, efficient, effective, support creativity and be aesthetically pleasing.

(e) an online community that provides support for people who have recently been bereaved

Comment: Such a system needs to be easy to learn, easy to use, motivating, emotionally satisfying and rewarding.

More on usability: design and usability principles

In Another way of conceptualizing usability is in terms of design principles. These are generalizable abstractions intended to orient designers towards thinking about different aspects of their designs. A well-known example is feedback: systems should

be designed to provide adequate feedback to the users to ensure they know what to do next in their tasks.

Cont.

Design principles are derived from a **mix of theory-based knowledge**, **experience**, and **common sense**. They tend to be written in a prescriptive manner, *suggesting to designers what to provide and what to avoid at the interface if you like, the do's and don'ts of interaction design*. **More specifically, they are intended to help designers explain and improve the design** (Thimbleby, 1990)

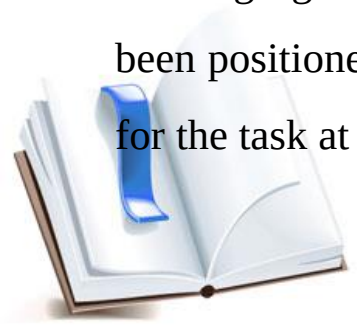
Design Principles

A number of design principles have been promoted. *The best known are concerned with how to determine what users should see and do when carrying out their tasks using an interactive product*. Here we briefly describe the most common, Don Norman (1988):

Visibility

The more visible functions are, the more likely users will be able to know what to do next. In contrast, when functions are out of sight, it makes them more difficult to find and know how to use. Norman (1988) describes the controls of a car to emphasize this point.

The controls for different operations are clearly visible indicators, headlights, horn, hazard warning lights), indicating what can be done. The relationship between the way the controls have been positioned in the car and what they do makes it easy for the driver to the appropriate control for the task at hand.



Feedback

In Related to the concept of visibility is feedback. This is best illustrated by an analogy to what everyday life would be like without it. Imagine trying to play a guitar, slice bread using a knife, or write using a pen if none of the actions produced any effect for several seconds. There would be an unbearable delay before the music was produced, the bread was cut, or the words appeared on the paper, making it almost impossible for the person to continue with the next strum, saw, or stroke.

Cont.

Feedback **is about sending back information about what action has been done and what has been accomplished, allowing the person to continue with the activity**. Various kinds of feedback are available for interaction design audio, tactile, verbal, visual, and combinations of these. Deciding which combinations are appropriate for different kinds of activities and interactivities is central. Using feedback in the right way can also provide the necessary visibility for user interaction.

Tactile Feedback

Constraints

Constraints The design concept of constraining refers to determining ways of restricting the kind of user interaction that can take place at a given moment. There are various ways this can be achieved. common design practice in graphical user

interfaces is to deactivate certain menu options by shading them, thereby restricting the user to only actions permissible at that stage of the activity (see Figure 1.8)

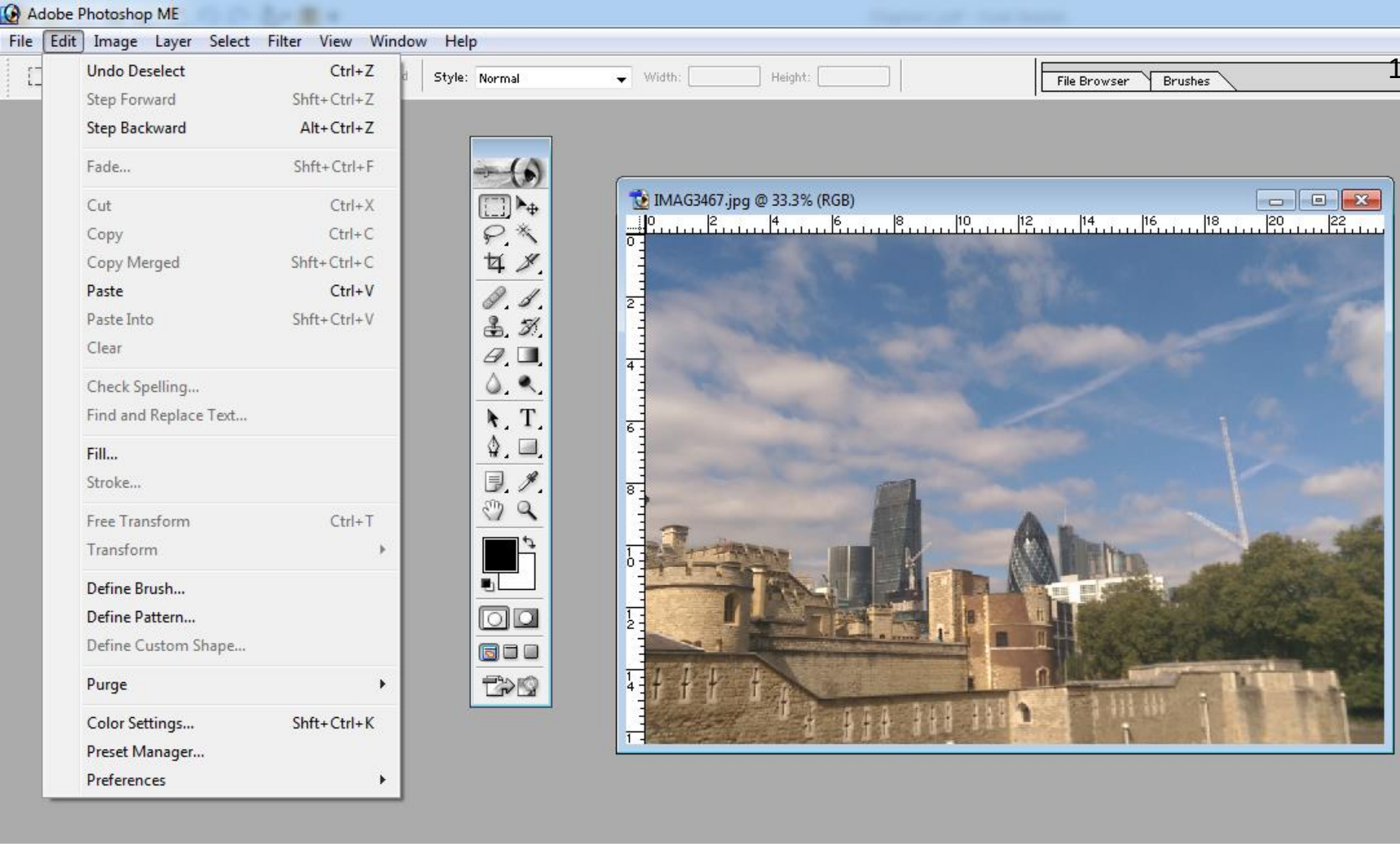


Figure 1.8: A menu illustrating restricted availability of options as an example of logical constraining Shaded areas indicate deactivated options.

Cont.

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

The use of different kinds of graphical representations can also constrain a person's interpretation of a problem or information space. For example, flow chart diagrams

show which objects are related to which, thereby constraining the way the information can be perceived.

Physical Constraints

Norman (1999) classifies constraints into three categories: physical, logical, and cultural. Physical constraints refer to the way physical objects restrict the movement of things. For example, the way an external disk can be placed into a disk drive is physically constrained by its shape and size, so that it can be inserted in only one way. Likewise, keys on a pad can usually be pressed in only one way.

Logical Constraints

In Logical constraints rely on people's understanding of the way the world works (cf. the marbles answering machine design). They rely on people's common-sense reasoning about actions and their consequences. Picking up a physical marble and placing it in another location on the phone would be expected by most people to trigger something else to happen. Making actions and their effects obvious enables people to logically deduce what further actions are required. Disabling menu options when not appropriate for the task in hand provides logical constraining. allows users to reason why (or why not) they have been designed this way and what options are available.

Cultural Constrains

In Cultural constraints rely on learned conventions, like the use of *red for warning*, the use of certain kinds of **audio** signals for danger, and the use of the *smiley face* to represent happy emotions. Most cultural constraints are arbitrary in the sense that their relationship with what is being represented is abstract, and could have equally evolved to be represented in another form the use of yellow instead of red for warning). Accordingly, they have to be learned. Once learned and accepted by a cultural group, they become universally accepted conventions.

Mapping

This refers to the relationship between controls and their effects in the world. Nearly all artifacts need some kind of mapping between controls and effects, whether it is a flashlight, car, power plant, or cockpit. An example of a good map ping 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.

Cont.

The mapping of the relative position of controls and their effects is also important. Consider the various musical playing devices MP3, CD player, tape recorder). How are the controls of playing, rewinding, and fast forward mapped onto the desired effects? They usually follow a common convention of providing a sequence of buttons, with the play button in the middle, the rewind button on the left and the fast forward on the right.

This configuration maps directly onto the directionality of the actions (see Figure Imagine how difficult it would be if the mappings in Figure were used. Look at Figure 1.10 and determine from the various map pings which is good and which would cause problems to the person using it.

Figure 1.9 (a) Natural mapping between rewind, play, and fast forward on a tape recorder device. (b) An alternative arbitrary mapping.

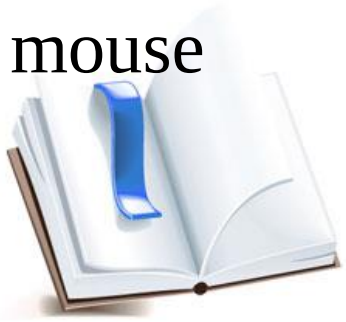
Consistency

This refers to designing interfaces to have similar operations and use similar elements for achieving similar tasks. In particular, a consistent interface is one that follows rules, such as using the same operation to select all objects. For example, a consistent operation is using the same input action to highlight any graphical object at the interface, such as always clicking the left mouse button.

Inconsistent interfaces, on the other hand, allow exceptions to a rule. An example of this is where certain graphical objects messages presented in a table) can be highlighted only by using the right mouse button, while all other operations are highlighted using the left button. problem with this kind of inconsistency is that it is quite arbitrary, making it difficult for users to remember and making the users more prone to mistakes.

Affordance

It is a term used to refer to an attribute of an object that allows people to know how to use it. For example, a mouse button invites pushing (in so doing activating clicking) by the way it is physically constrained in its plastic shell. At a very simple level, to afford means to give a clue (Norman, 1988). For example, a door handle affords pulling, a cup handle affords grasping, and a mouse button affords pushing.



Norman introduced this concept in the late '80s in his discussion of the design of everyday objects. Since then, it has been much popularized, being used to describe how interface objects should be designed so that they make obvious what can be done to them. For example, graphical elements like buttons, icons, links, and scroll bars are talked about with respect to how to make it appear obvious how they should be used: icons should be designed to afford clicking, scroll bars to afford moving up and down, buttons to afford pushing.

Heuristics and usability principles

When design principles are used in practice they are commonly referred to as heuristics. This term emphasizes that something has to be done with them when they are applied to a given problem. In particular, they need to be interpreted in the design context, drawing on past experience of, for example, how to design feedback and what it means for something to be consistent.

Another form of guidance is usability principles. An example is "speak the user's language." These are quite similar to design principles, except that they tend to be more prescriptive. In addition, whereas design principles tend to be used mainly for informing a design, usability principles are used mostly as the basis for evaluating prototypes and existing systems.

The ten main usability principles

Below are the ten main usability principles, developed by Nielsen

(2001) and his colleagues. Note how some of them overlap with the design principles:

1. Visibility of system status-always keep users informed about what is going on, through providing appropriate feedback within reasonable time

2. Match between system and the real world-speak the users' language, using words, phrases and concepts familiar to the user, rather than

system oriented terms

Cont.

3. User control and freedom-provide ways of allowing users to easily escape from places they unexpectedly find themselves, by using clearly marked 'emergency exits'

4. Consistency and standards-avoid making users wonder whether different words, situations, or actions mean the same thing

5. Help users recognize, diagnose, and recover from errors-use plain language to describe the nature of the problem and suggest a way of solving it

6. error prevention-where possible prevent errors occurring in the first place

7. Recognition rather than recall-make objects, actions, and options visible

8. Flexibility and efficiency of use-provide accelerators that are invisible to novice users, but allow more experienced users to carry out tasks more quickly.

9. Aesthetic and minimalist design-avoid using information that is irrelevant or rarely needed

10. Help and documentation-provide information that can be easily searched and provides help in a set of concrete steps that can easily be followed

Assignment 1:

1- What is the difference between effective and efficient in HCI?

(Note: Your answer need to be less than 200 words)**(2 Marks)**

2- What is DIKW pyramid? **(2 Marks)**

Thank You