Human-Computer Interaction (HCI)

Chapter One

1.6 Interaction Design and the User Experience

- Part of the process of understanding users is to be clear about the primary objective of developing an interactive product for them.

- Is it to design an efficient system that will allow them to be highly productive in their work, or

- Is it to design a learning tool that will be challenging and motivating, or

- is it something else?

- To help identify the objectives we suggest classifying them in terms of usability and user experience goals.

- Traditionally, usability goals have been viewed as being concerned with meeting specific usability criteria, e.g. efficiency, whereas, more recently, user experience goals have been concerned with explicating the nature of the user experience, e.g. to be aesthetically pleasing.

- It is important to note, however, that the distinction between the two types of goal is not clear-cut, since usability is fundamental to the quality of the user experience and, conversely, aspects of the user experience, such as how it feels and looks, are inextricably linked with how usable the product is.

- We distinguish between them here to help clarify their roles but stress the importance of considering them together when designing for a user experience. Also, historically, HCI was concerned primarily with usability (known as usability engineering) but has since become concerned with understanding, designing for, and evaluating a wider range of user experience aspects.

1.6.1 Usability Goals

- Usability refers to ensuring 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 to enable them to carry out their activities at work, at school, and in their everyday lives. More specifically, usability is broken down into the following goals:

- Effective to use (effectiveness)

- Efficient to use (efficiency)

- Safe to use (safety)

- Having good utility (utility)

- Easy to learn (learnability)

- Easy to remember how to use (memorability).

- Usability goals are typically operationalized as questions.
- The purpose is to provide the interaction designer with a concrete means of assessing various aspects of an interactive product and the user experience.
- Through answering the questions, designers can be alerted very early on in the design process to potential design problems and conflicts that they might not have considered.
- However, simply asking 'is the system easy to learn?' is not going to be very helpful.
- Asking about the usability of a product in a more detailed way, for example,
  - 'how long will it take a user to figure out how to use the most basic functions for a new smartwatch;
  - how much can they capitalize on from their prior experience;
  - and how long would it take a user to learn the whole set of functions?'
- will elicit far more information.

- Effectiveness is a very general goal and refers to how good a product is at doing what it is supposed to do.

- Question: Is the product capable of allowing people to learn, carry out their work efficiently, access the information they need, or buy the goods they want?

- Efficiency refers to the way a product supports users in carrying out their tasks.
- The marble answering machine described at the beginning of this chapter was considered efficient in that it let the user carry out common tasks e.g. listening to messages, through a minimal number of steps.
- In contrast, the voice mail system was considered inefficient because it required the user to carry out many steps and learn an arbitrary set of sequences for the same common task.
- This implies that an efficient way of supporting common tasks is to let the user use single button or key presses.
- An example of where this kind of efficiency mechanism has been employed effectively is in online shopping.
    - Once users have entered all the necessary personal details in an online form to make a purchase, they can let the website save all their personal details.
    - Then, if they want to make another purchase at that site, they don't have to re-enter all their personal details again.
    - A highly successful mechanism patented by Amazon.com is the one-click option, which requires users only to click a single button when they want to make another purchase.
- Question: Once users have learned how to use a product to carry out their tasks, can they sustain a high level of productivity?

- Safety involves protecting the user from dangerous conditions and undesirable situations.

- In relation to the first ergonomic aspect, it refers to the external conditions where people work. For example,

  - where there are hazardous conditions – such as X-ray machines or toxic chemicals – operators should be able to interact with and control computer-based systems remotely.

- The second aspect refers to helping any kind of user in any kind of situation avoid the dangers of carrying out unwanted actions accidentally.

- It also refers to the perceived fears users might have of the consequences of making errors and how this affects their behaviour.

- To make interactive products safer in this sense involves:

- (i) preventing the user from making serious errors by reducing the risk of wrong keys/buttons being mistakenly activated (an example is not placing the quit or delete-file command right next to the save command on a menu) and

- (ii) providing users with various means of recovery should they make errors. Safe interactive systems should engender confidence and allow the user the opportunity to explore the interface to try out new operations (see Figure 1.8a).

- Other safety mechanisms include undo facilities and confirmatory dialog boxes that give users another chance to consider their intentions (a well-known example is the appearance of a dialog box, after issuing the command to delete everything in the trashcan, saying: 'Are you sure you want to remove all the items in the Trash permanently?' – see Figure 1.8b).

(a)

Are you sure you want to remove the items in the Trash permanently?

You cannot undo this action.

Cancel   OK

(b)

Question: What is the range of errors that are possible using the product and what measures are there to permit users to recover easily from them?

- Utility refers to the extent to which the product provides the right kind of functionality so that users can do what they need or want to do.

- An example of a product with high utility is an accounting software package that provides a powerful computational tool that accountants can use to work out tax returns.

- An example of a product with low utility is a software drawing tool that does not allow users to draw freehand but forces them to use a mouse to create their drawings, using only polygon shapes.

- Question: Does the product provide an appropriate set of functions that will enable users to carry out all their tasks in the way they want to do them?

- Learnability refers to how easy a system is to learn to use. It is well known that people don't like spending a long time learning how to use a system.
- They want to get started straight away and become competent at carrying out tasks without too much effort.
- This is especially so for interactive products intended for everyday use (e.g. social media, email, GPS) and those used only infrequently (e.g. online tax forms).
- To a certain extent, people are prepared to spend longer learning more complex systems that provide a wider range of functionality, like web authoring tools.
- In these situations, pop-up tutorials can help by providing contextualized step-by-step material with hands-on exercises.
- A key concern is determining how much time users are prepared to spend learning a product.

- It seems a waste if a product provides a range of functionality that the majority of users are unable or not prepared to spend time learning how to use.

- Question: Is it possible for the user to work out how to use the product by exploring the interface and trying out certain actions? How hard will it be to learn the whole set of functions in this way?

- Memorability refers to how easy a product is to remember how to use, once learned.
- This is especially important for interactive products that are used infrequently.
- If users haven't used an operation for a few months or longer, they should be able to remember or at least rapidly be reminded how to use it.
- Users shouldn't have to keep relearning how to carry out tasks. Unfortunately, this tends to happen when the operations required to be learned are obscure, illogical, or poorly sequenced.
- Users need to be helped to remember how to do tasks.
- There are many ways of designing the interaction to support this.
- For example, users can be helped to remember the sequence of operations at different stages of a task through meaningful icons, command names, and menu options.
- Also, structuring options and icons so they are placed in relevant categories of options, e.g. placing all the drawing tools in the same place on the screen, can help the user remember where to look to find a particular tool at a given stage of a task.
- Question: What kinds of interface support have been provided to help users remember how to carry out tasks, especially for products and operations they use infrequently?

- As well as couching usability goals in terms of specific questions, they are turned into usability criteria.

- These are specific objectives that enable the usability of a product to be assessed in terms of how it can improve (or not) a user's performance.

- Examples of commonly used usability criteria are time to complete a task (efficiency), time to learn a task (learnability), and the number of errors made when carrying out a given task over time (memorability).

- These can provide quantitative indicators of the extent to which productivity has increased, or how work, training, or learning have been improved. They are also useful for measuring the extent to which personal, public, and home-based products support leisure and information gathering activities.

- However, they do not address the overall quality of the user experience, which is where user experience goals come into play.

1.6.2 User Experience Goals

- A diversity of user experience goals has been articulated in interaction design, which cover a range of emotions and felt experiences. These include desirable and undesirable ones, as shown in Table 1.1.

- Many of these are subjective qualities and are concerned with how a system feels to a user.

1.6.2 User Experience Goals

TABLE 1.1		
Desirable and undesirable aspects of the user experience		
Desirable aspects		
Satisfying	Helpful	Fun
Enjoyable	Motivating	Provocative
Engaging	Challenging	Surprising
Pleasurable	Enhancing sociability	Rewarding
Exciting	Supporting creativity	Emotionally fulfilling
Entertaining	Cognitively stimulating	
Undesirable aspects		
Boring	Unpleasant	
Frustrating	Patronizing	
Making one feel guilty	Making one feel stupid	
Annoying	Cutesy	
Childish	Gimmicky	

1.6.3 Design Principles

- Design principles are used by interaction designers to aid their thinking when designing for the user experience.

- These are generalizable abstractions intended to orient designers towards thinking about different aspects of their designs.

- A well-known example is feedback: products should be designed to provide adequate feedback to the users to ensure they know what to do next in their tasks.

- Another one that has become increasingly important is findability (Morville, 2005). This refers to the degree to which a particular object is easy to discover or locate – be it navigating a website, moving through a building, or finding the delete image option on a digital camera.

- More specifically, they are intended to help designers explain and improve their designs (Thimbleby, 1990).

- However, they are not intended to specify how to design an actual interface, e.g. telling the designer how to design a particular icon or how to structure a web portal, but act more like triggers to designers, ensuring that they have provided certain features at an interface.

- **Visibility.**
- The voice mail system made the presence and number of waiting messages invisible, while the answer machine made both aspects highly visible.
- The more visible functions are, the more likely it is that users will be able to know what to do next.
- Norman (1988) describes the controls of a car to emphasize this point. The controls for different operations are clearly visible, e.g. 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 find the appropriate control for the task at hand.
- In contrast, when functions are out of sight, it makes them more difficult to find and know how to use.

- **Feedback.**

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, cut, or stroke.

- Feedback involves 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.

- **Constraints.**
- The design concept of constraining refers to determining ways of restricting the kinds of user interaction that can take place at a given moment.
- There are various ways this can be achieved.
- A common design practice in graphical user interfaces is to deactivate certain menu options by shading them grey, thereby restricting the user only to actions permissible at that stage of the activity (see Figure 1.11).
- 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.
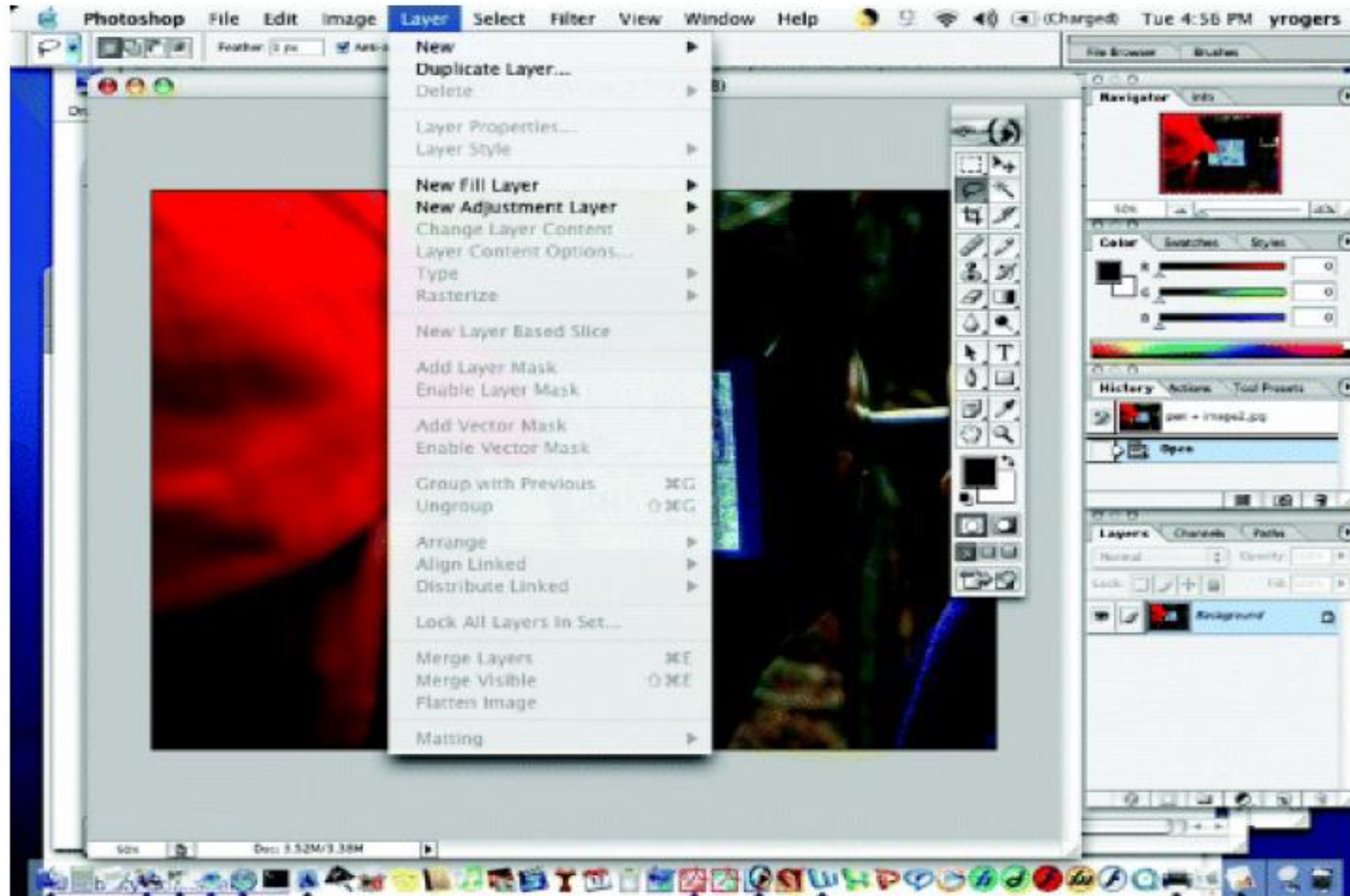
Figure 1.11 A menu showing restricted availability of options as an example of logical constraining. Shaded areas indicate deactivated options

- **Consistency.**
- This refers to designing interfaces to have similar operations and use similar elements for achieving similar tasks.
- 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 is where certain graphical objects (e.g. email 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.
- A 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.
- One of the benefits of consistent interfaces, therefore, is that they are easier to learn and use.

- **Affordance**.

This 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 simple level, to afford means 'to give a clue' (Norman, 1988). When the affordances of a physical object are perceptually obvious, it is easy to know how to interact with it. For example, a door handle affords pulling, a cup handle affords grasping, and a mouse button affords pushing.

- The term has since been much popularized in interaction design, being used to describe how interfaces should make it obvious as to what can be done at them.

- For example, graphical elements like buttons, icons, links, and scrollbars are talked about with respect to how to make it appear obvious how they should be used: icons should be designed to afford clicking, scrollbars to afford moving up and down, buttons to afford pushing.

- Norman (1999) suggests that there are two kinds of affordance: perceived and real.

- Physical objects are said to have real affordances, like grasping, that are perceptually obvious and do not have to be learned.

- In contrast, user interfaces that are screen-based are virtual and do not have these kinds of real affordances.

- A well-known resource is Tog's First Principles of Interaction Design (asktog.com).

Assignment

This assignment is intended for you to put into practice what you have read about in this chapter. Specifically, the objective is to enable you to define usability and user experience goals and to transform these and other design principles into specific questions to help evaluate an interactive product.

Find an everyday handheld device, e.g. remote control, digital camera, smartphone, and examine how it has been designed, paying particular attention to how the user is meant to interact with it.

a. From your first impressions, write down what first comes to mind as to what is good and bad about the way the device works.

b. Give a description of the user experience resulting from interacting with it.

c. Based on your reading of this chapter and any other material you have come across, compile a set of usability and user experience goals that you think will be most relevant in evaluating the device. Decide which are the most important ones and explain why.

d. Translate each of your sets of usability and user experience goals into two or three specific questions. Then use them to assess how well your device fares.

e. Repeat (c) and (d) but this time using the design principles outlined in the chapter.

f. Finally, discuss possible improvements to the interface based on the answers obtained for (d) and (e).

- Thank you