UNIVERSITY OF PLYMOUTH

# COMP2000: Software engineering 2

## Session 6: Interaction design and usability

# Outline

- Interaction design
- Usability goals
- User experience
- Design principles
- Heuristics and usability principles

# Examples of good and bad design

- Menti.com

# Poor and good design

- A central concern of interaction design is to develop interactive products that are usable.
- This is generally mean easy to learn, effective to use, and provide an enjoyable user experience.
- A good place to start thinking about how to design usable interactive products is to compare examples of well and poorly designed ones.

# Any idea what usability means?

- Menti.com

# Usability Testing

- The usability of products has traditionally been tested in controlled laboratory settings. This approach emphasizes how usable a product is.
- It has been most commonly used to evaluate desktop applications, such as websites, word processors, and search tools.
- Doing usability testing in a laboratory, or a temporarily assigned controlled environment, enables evaluators to control what users do and to control environmental and social influences that might impact the users' performance.
- The goal is to test whether the product being developed is usable by the intended user population to achieve the tasks for which it was designed.

# What to design?

- Designing usable interactive products thus requires considering who is going to be using them and where they are going to be used.
- Another key concern is understanding the kind of activities people are doing when interacting with the products.

- A key question for interaction design is:
  - How do you optimize the users' interactions with a system, environment or product, so that they match the users' activities that are being supported and extended?

- One could use intuition and hope for the best.
- Alternatively, one can be more principled in deciding which choices to make by basing them on an understanding of the users.

- This involves:

- Taking into account what people are good and bad at
- Considering what might help people with the way they currently do things
- Thinking through what might provide quality user experiences
- Listening to what people want and getting them involved in the design
- Using "tried and tested" user-based techniques during the design process

# Activity

- How does making a phone call differ when using:
- a public phone box a cell phone?
- How have these devices been designed to take into account:
- (a) the kind of users,
- (b) type of activity being supported, and
- (c) context of use?

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# What is interaction design?

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# What is interaction design?

- *By interaction design, we mean I designing interactive products to support people in their everyday and working lives*.

- Put another way, it is about creating user experiences that enhance and augment the way people work, communicate, and interact.
- More generally, Winograd describes it as "*designing spaces for human communication and interaction*" (1997, p. 160).
- while Saffer emphasizes its artistic aspects: "*the art of facilitating interactions between humans through products and services*" (2010, p. 4).

# 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.
- To help identify the objectives it's been suggested 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.

# Usability goals

- To recap, usability is generally regarded as 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, school, and in their everyday life

More specifically, usability is broken down into the following goals:

- Effective to use (effectiveness)
- Efficient to use (efficiency)
- Safe to use (safety)
- Have good utility (utility)
- Easy to learn (learnability)
- Easy to remember how to use (memorability)

- For each goal, we describe it in more detail and provide a key question.
- Effectiveness is a very general goal and refers to how good a system is at doing what it is supposed to do.
- Question: Is the system capable of allowing people to learn well, carry out their work efficiently, access the information they need, buy the goods they want, and so on?

- Efficiency refers to the way a system supports users in carrying out their tasks.
- Question: Once users have learned how to use a system to carry out their tasks, can they sustain a high level of productivity?

- Safety involves protecting the user from dangerous conditions and undesirable situations.
- Question: Does the system prevent users from making serious errors and, if they do make an error, does it permit them to recover easily?

- Utility refers to the extent to which the system provides the right kind of functionality so that users can do what they need or want to do.
- Question: Does the system provide an appropriate set of functions that enable users to carry out all their tasks in the way they want to do them?


Are you sure you want to remove the items in the Trash permanently?
You cannot undo this action.
Cancel
OK

- 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.
- Question: How easy is it and how long does it take (i) to get started using a system to perform core tasks and (ii) to learn the range of operations to perform a wider set of tasks?

- Memorability refers to how easy a system is to remember how to use, once learned. This is especially important for interactive systems that are used infrequently.
- Question: What kinds of interface support have been provided to help users remember how to carry out tasks, especially for systems and operations that are used infrequently?

# User experience

- The user experience (UX) is central to interaction design. By this it is meant how a product behaves and is used by people in the real world. Nielsen and Norman (2014) define it as encompassing “all aspects of the end-user’s interaction with the company, its services, and its products.”
- As stressed by Garrett (2010, p. 10), “every product that is used by someone has a user experience: newspapers, ketchup bottles, reclining armchairs, cardigan sweaters.”

# User experience goals

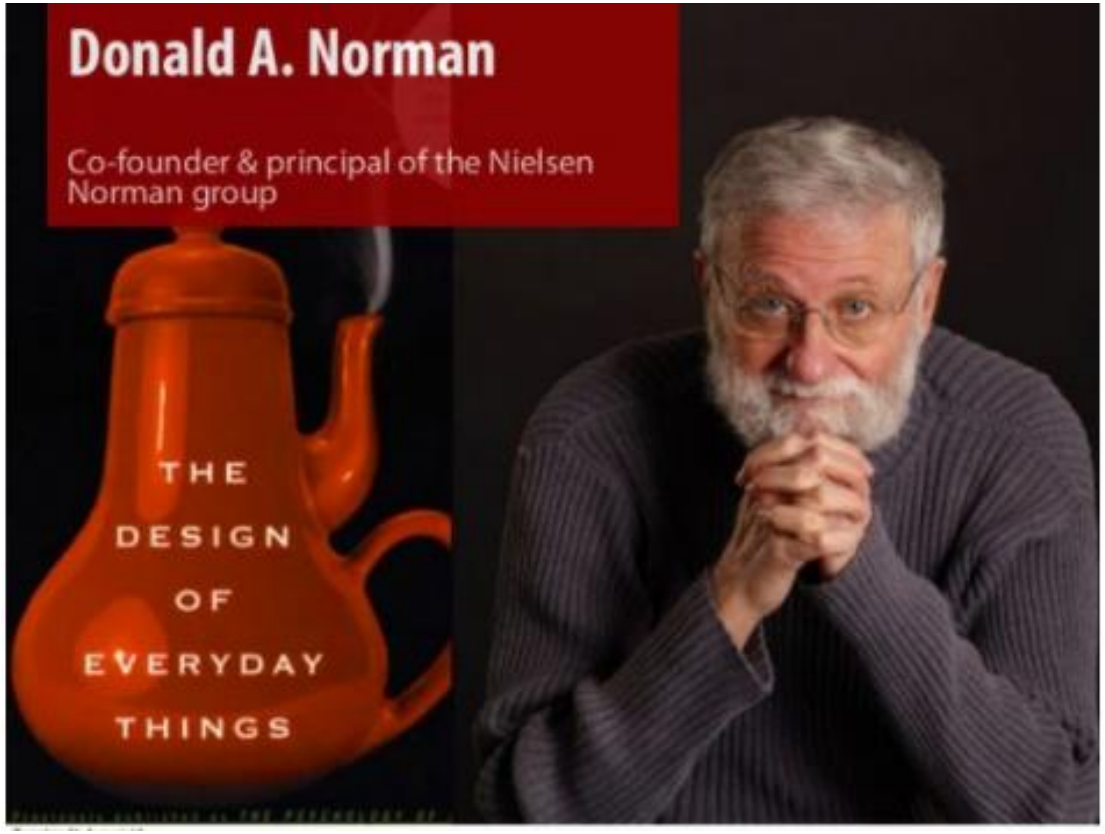
- A diversity of user experience goals has been articulated in interaction design, which cover a range of emotions and felt experiences.
- These include desirable and undesirable ones, as shown in Table 1.

Table – 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 | |

# Design principles

- Here we briefly describe the most common ones: visibility, feedback, constraints, mapping, consistency, and affordances.
- Each of these has been written about extensively by Don Norman (1988) in his bestseller The Design of Everyday Things.

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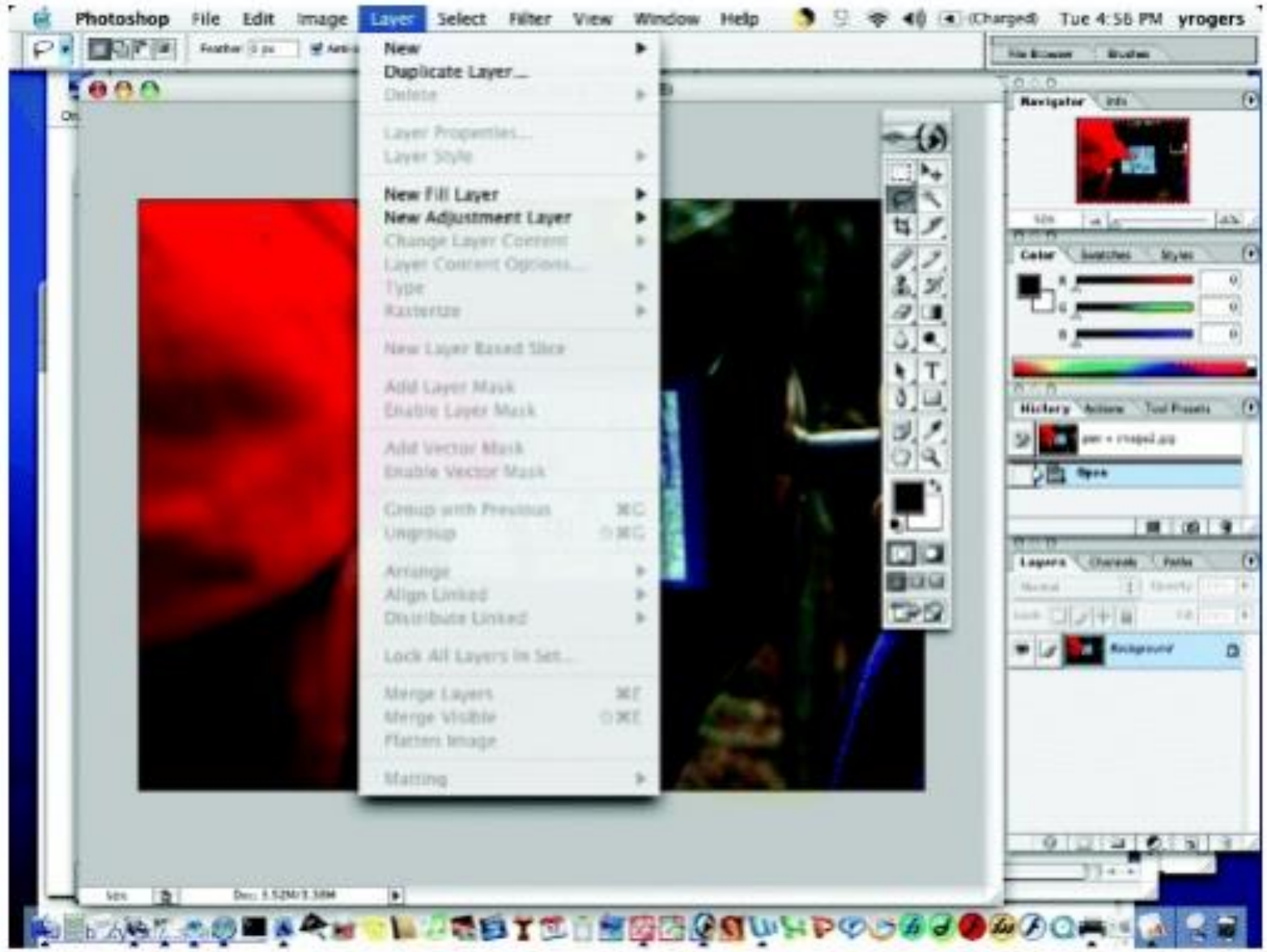
- Visibility: The more visible functions are, the more likely users will be able to know what to do next. In contrast, when functions are "out of sight," it makes them more difficult to find and know how to use.
- Feedback is about sending back information about what action has been done and what has been accomplished, allowing the person to continue with the activity.
- 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. A 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.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New Adjustment Layer
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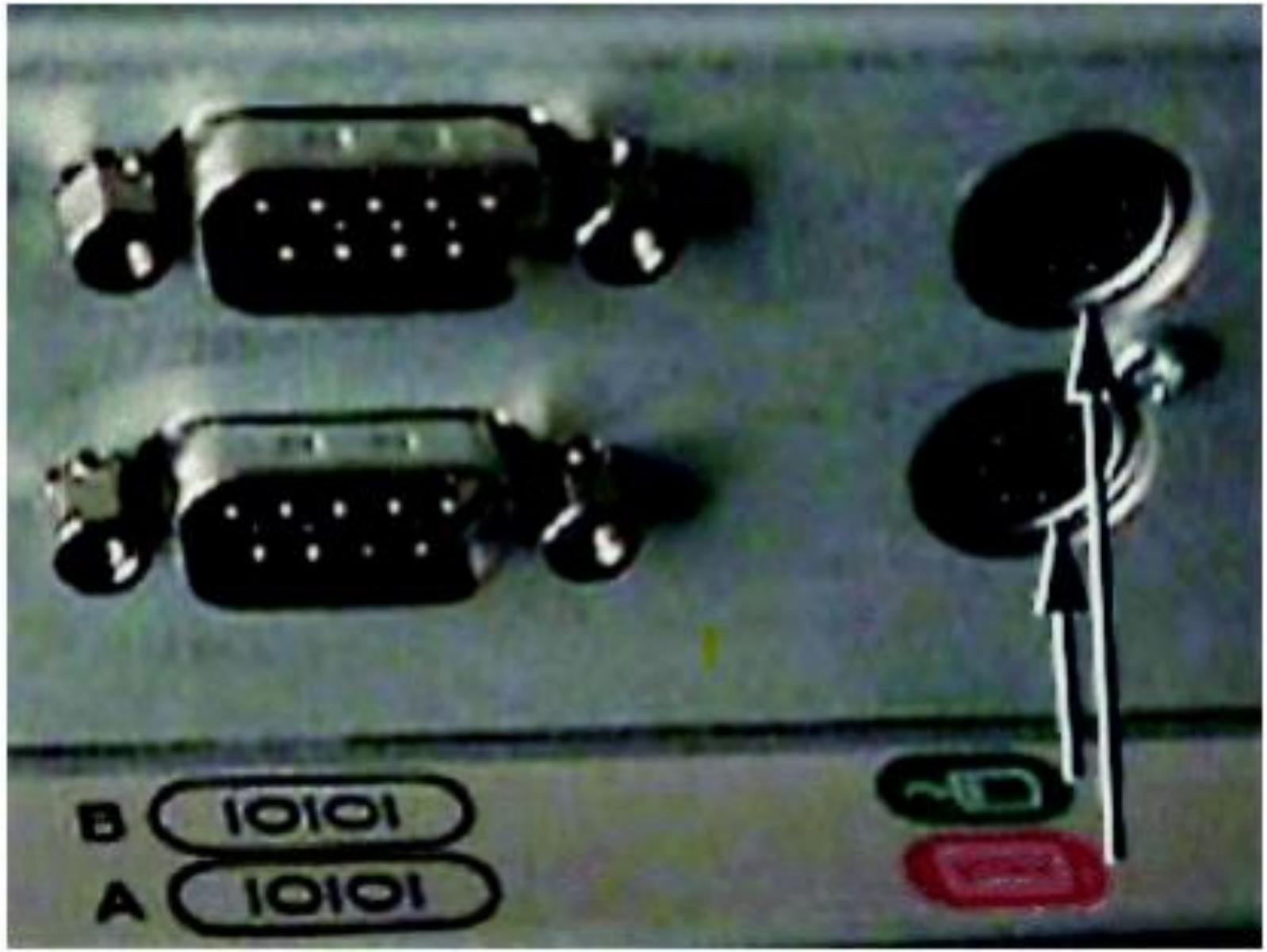
New Layer Based Slice
Add Layer Mask
Enable Layer Mask
Add Vector Mask
Enable Vector Mask
Group with Previous
Ungroup
Arrange
Align Linked
Distribute Linked
Lock All Layers in Set...
Merge Layers
Merge Visible
Flatten Image
Matting
Navigator
Color
Swatches
Styles
History
Actions
Tool Presets
Layers
Channels
Paths
Background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10101
A
10101

- 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.

- 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.

- Affordance 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).

# Login page

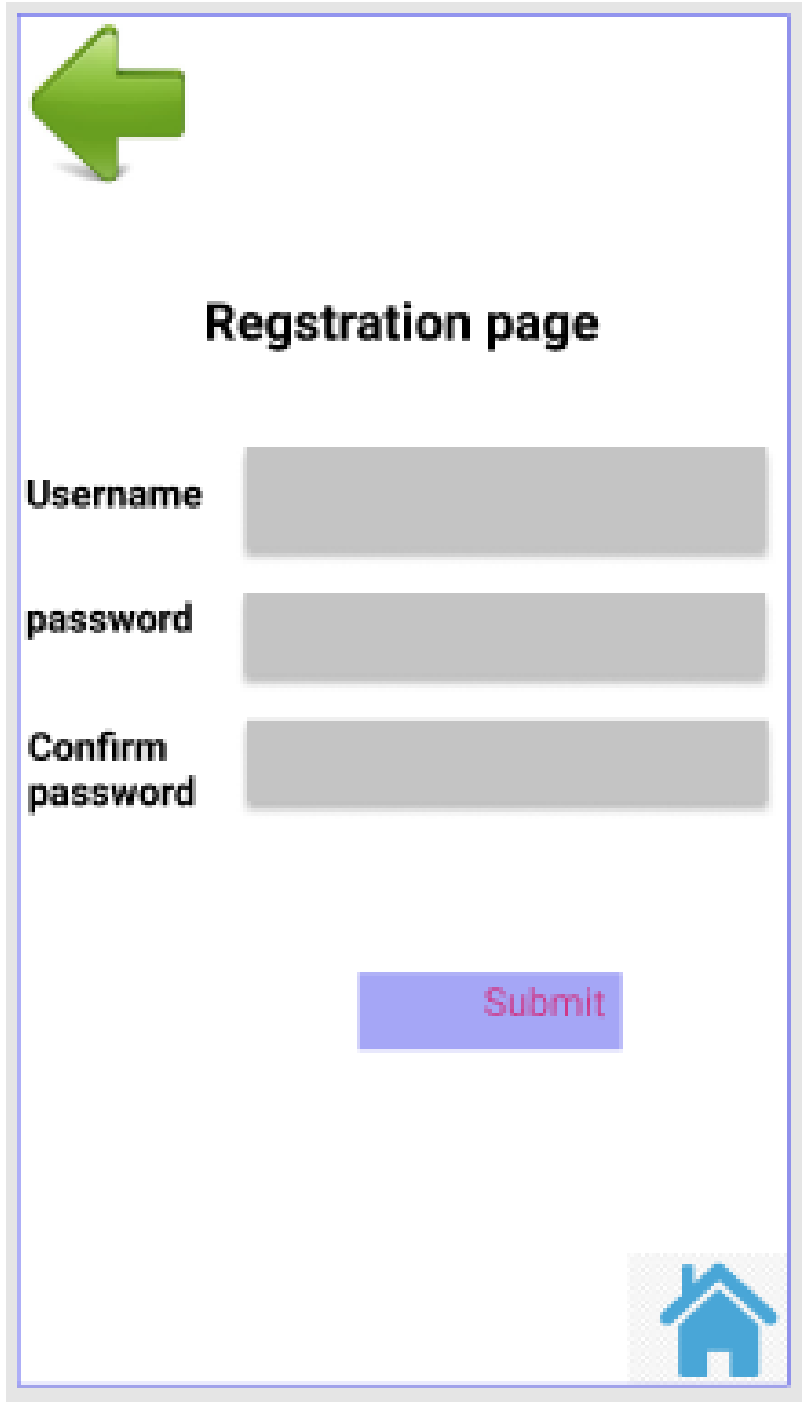
Username

Password

Sign up

Login in

Forgot password


Regstration page
Username
password
Confirm password
Submit

Back

WELCOME BACK Alaa

Dashboard

## Login page

Username

Password

Sign up

Login in

Forgot password

## Regstration page

Username

password

Confirm password

Submit

Back

WELCOME BACK Alaa

Dashboard

# Heuristics and usability principles

- 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.
- 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.
- In particular, they provide the framework for heuristic evaluation.

Next slide are the ten main usability principles, developed by Nielsen (2001) and his colleagues.

Note how some of them overlap with the design principles.


https://youtu.be/6Bw0n6Jvwxk

Nielsen Norman Group:
World Leaders in Research-Based User Experience
https://www.nngroup.com/

# 10 Usability Heuristics for User Interface Design

- 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
- 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

Nielsen Norman Group

# Jakob's Ten Usability Heuristics

## 1 Visibility *of* System Status

**Designs should *keep users informed* about what is going on, through appropriate, timely feedback.**

Interactive mall maps have to show people where they currently are, to help them understand where to go next.

## 2 Match between System and the Real World

**The design should speak the users' language. Use words, phrases, and concepts *familiar to the user*, rather than internal jargon.**

Users can quickly understand which stovetop control maps to each heating element.

## 3 User Control *and* Freedom

**Users often perform actions by mistake. They *need a clearly marked "emergency exit"* to leave the unwanted action.**

Just like physical spaces, digital spaces need quick "emergency" exits too.

## 4 Consistency *and* Standards

**Users should not have to wonder whether different words, situations, or actions mean the same thing. *Follow platform conventions.***

Check-in counters are usually located at the front of hotels, which meets expectations.

## 5 Error Prevention

**Good error messages are important, but the best designs carefully *prevent problems* from occurring in the first place.**

Guard rails on curvy mountain roads prevent drivers from falling off cliffs.

## 6 Recognition Rather Than Recall

***Minimize the user's memory load*** **by making elements, actions, and options visible. Avoid making users remember information.**

People are likely to correctly answer "Is Lisbon the capital of Portugal?".

## 7 Flexibility *and* Efficiency of Use

**Shortcuts — hidden from novice users — *may speed up the interaction* for the expert user.**

Regular routes are listed on maps, but locals with more knowledge of the area can take shortcuts.

## 8 Aesthetic *and* Minimalist Design

**Interfaces should not contain information which is irrelevant. Every extra unit of information in an interface competes with the relevant units of information.**

A minimalist three-legged stool is still a place to sit.

## 9 Recognize, Diagnose, *and* Recover from Errors

**Error messages should be expressed in plain language (no error codes), precisely indicate the problem, and constructively suggest a solution.**

Wrong-way signs on the road remind drivers that they are heading in the wrong direction.

## 10 Help *and* Documentation

**It's best if the design *doesn't need* any additional explanation. However, it may be necessary to provide documentation to help users complete their tasks.**

Information kiosks at airports are easily recognizable and solve customers' problems in context and immediately.

NN/g

https://www.nngroup.com/articles/ten-usability-heuristics/#poster

# Examples

- **10 Usability Heuristics Applied to Complex Applications** — Examples of the heuristics applied to complex and domain-specific software applications.

- **10 Usability Heuristics Applied to Virtual Reality** — See the heuristics applied to 3D virtual environments.

- **10 Usability Heuristics Applied to Video Games** — Great examples of the 10 heuristics in highly interactive and highly visual user interfaces that have an entertainment purpose.

- **10 Usability Heuristics Applied to Everyday Life** (Just for fun)

Thank you