An Introduction to HCI and UX Design

ITS290F

User Interface

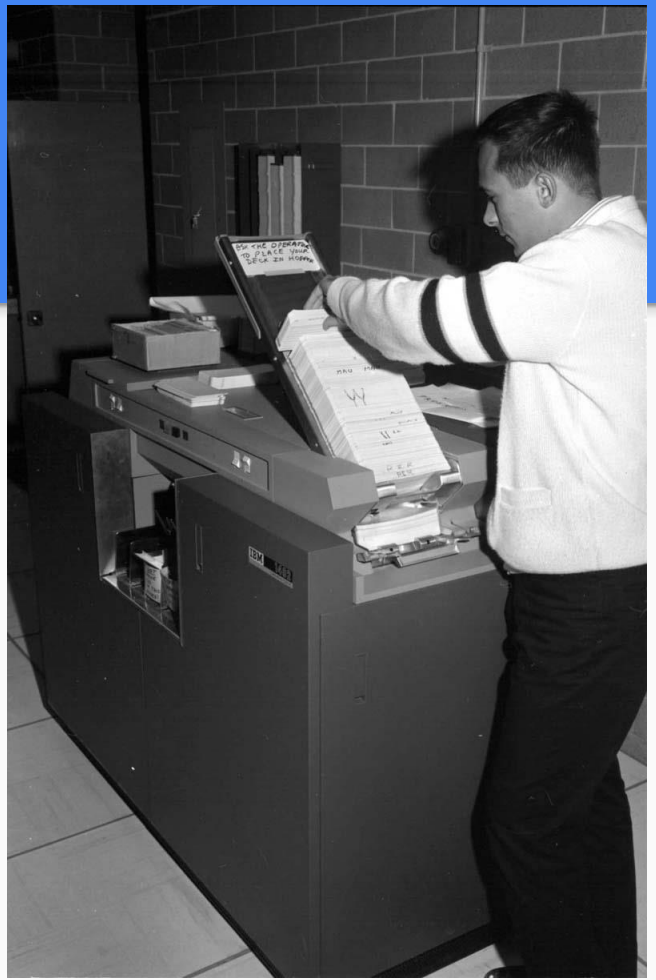
User Interface (UI)

- Batch interface
- Command-line interface
- Graphical user interface
- Touch user interface
- Conversational / voice user interface
- Motion tracking interface
- Tangible user interface

More UI: https://en.wikipedia.org/wiki/User_interface

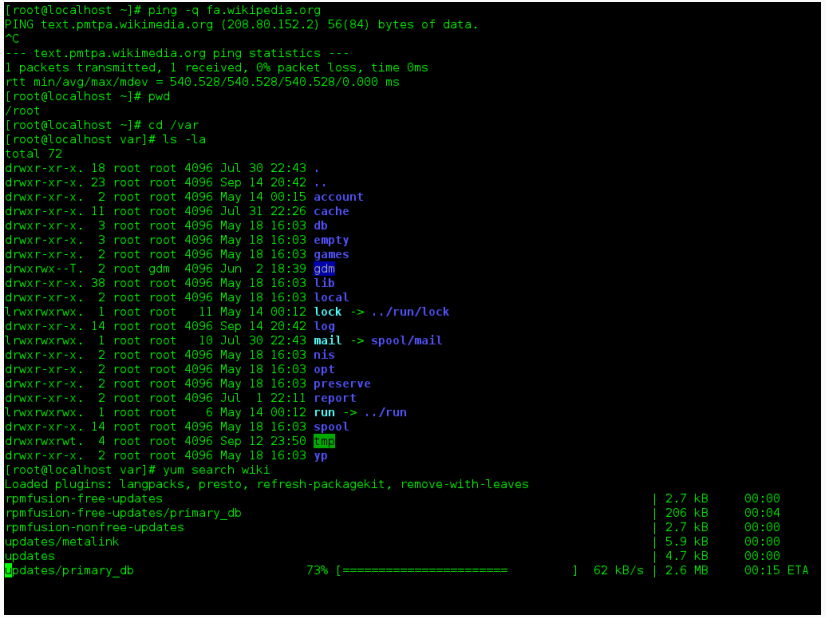
Batch Interface

Non-interactive user interfaces, where the user specifies all the details of the batch job in advance to batch processing and receives the output when all the processing is done. The computer does not prompt for further input after the processing has started.

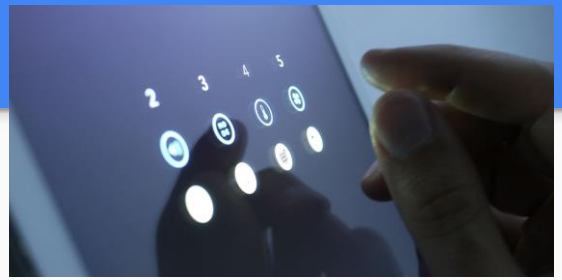


Command Line Interface vs. Graphical User Interface

A **command-line interface** (CLI) processes commands to a computer program in the form of lines of text. Today, many users rely upon **graphical user interfaces** (GUI) and menu-driven interactions. However, some programming and maintenance tasks may not have a graphical user interface and may still use a command line.



Touch User Interface

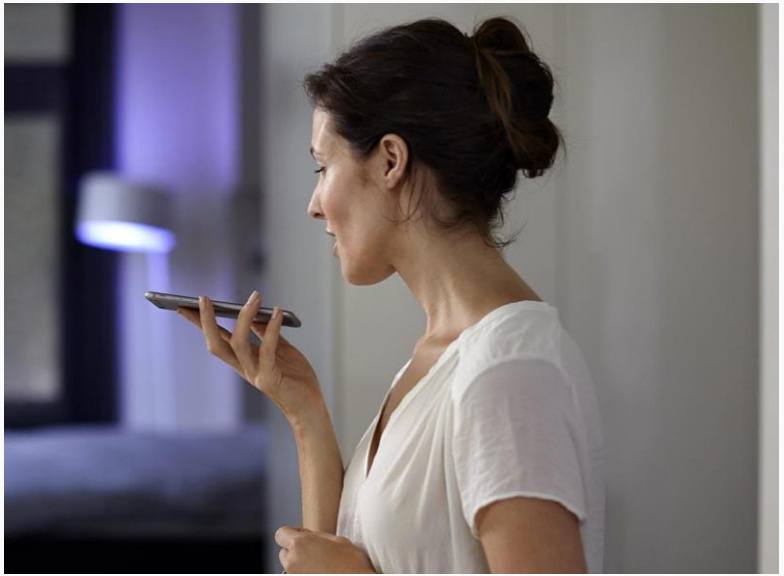


A touch user interface is a computer-pointing technology based upon the **sense of touch** (haptics).
A touch UI enables not only the sense of touch to innervate and activate computer-based functions, but it also allows the user, particularly those with visual impairments, an added level of interaction based upon ***tactile*** or ***Braille input***.

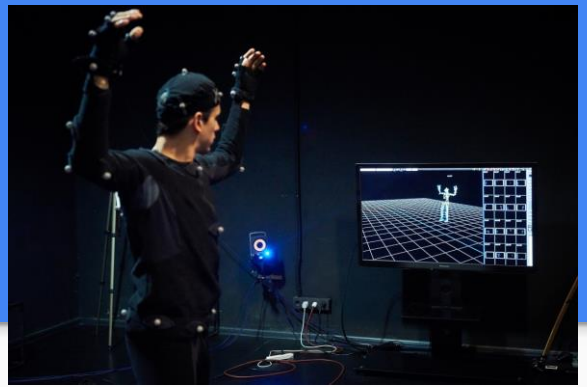
Conversational / Voice User Interface

A voice-user interface (VUI) makes spoken human interaction with computers possible, using speech recognition to understand spoken commands and answer questions, and typically text to speech to play a reply.

Alexa Google Assistant Siri



Motion Tracking Interface



Developments in virtual reality (VR) bring motion tracking interfaces into mainstream computing.
There are two different types of applications that support the tracking of movement:

- **Optical tracking** is where an imaging device is used to track body motion of an individual.
- **Non-optical tracking** makes use of sensors that are installed in hardware or attached to the body to measure and track movements. These are typically gyroscopes, magnetometers, and accelerometers.

Tangible User Interface

A tangible user interface (TUI) is a user interface in which a person interacts with digital information through the physical environment.

Human Computer Interaction (HCI)

Human Computer Interaction (HCI) - Definition

"Human-computer interaction is a discipline concerned with the **design**, **evaluation** and **implementation** of *interactive computing systems for human use* and with the study of major phenomena surrounding them."
(ACM SIGCHI, 1992)

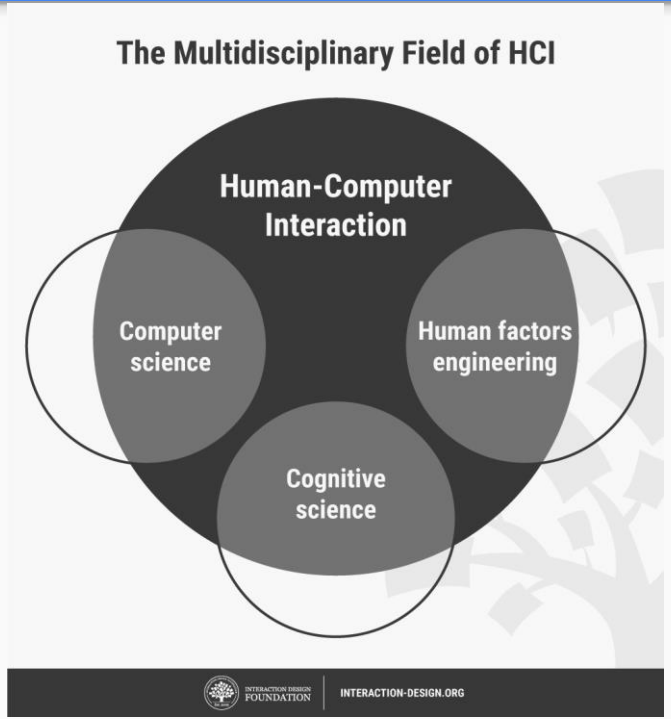
Some forms of ***user interface*** are required

Where HCI came from?

Until the late 1970s, the only humans who interacted with computers were information technology professionals and dedicated hobbyists. This changed disruptively with the emergence of personal computing in the later 1970s. Personal computing, including both personal software (productivity applications, such as text editors and spreadsheets, and interactive computer games) and personal computer platforms (operating systems, programming languages, and hardware), made everyone in the world a potential computer user, and vividly highlighted **the deficiencies of computers with respect to usability for those who wanted to use computers as tools**

The Multidisciplinary Field of HCI

1. Human-Computer Interaction (HCI) is a **multidisciplinary field of study** focusing on the design of computer technology and, in particular, the interaction between humans (the users) and computers.
2. Emphasis on **human performance**
3. Roots of HCI by Prof. Alan Dix (video) https://www.interaction-design.org/tv/topic-definition-what-is-hci.mp4



Cognitive Science

- An interdisciplinary science that draws on many fields (as psychology, artificial intelligence, linguistics, and philosophy) in developing ***theories about human perception, thinking, and learning***
- Cognitive science is the science of **cognition**, which includes:
  - perception, action, learning, memory, attention, reasoning, decision-making, language use,...
- Study of how human minds work...

Cognitive Science Example：
Stroop Test - How many ***Red***?

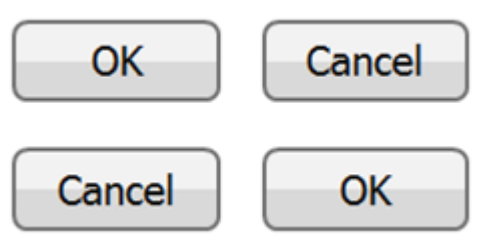
Red	Yellow	Blue	Green	Black
Pink	Orange	Brown	Gray	Purple
Green	Gray	Black	Blue	Yellow
Gray	Brown	Pink	Orange	Blue
Yellow	Red	Green	Black	Gray
Black	Brown	Purple	Orange	Pink
Purple	Black	Yellow	Red	Green
Orange	Pink	Brown	Gray	Purple

Cognitive Science Example：
Stroop Test - How many ***Red***?

Red	Yellow	Blue	Green	Black
Pink	Orange	Brown	Gray	Purple
Green	Gray	Black	Blue	Yellow
Gray	Brown	Pink	Orange	Blue
Yellow	Red	Green	Black	Gray
Black	Brown	Purple	Orange	Pink
Purple	Black	Yellow	Red	Green
Orange	Pink	Brown	Gray	Purple

- When you give your brain two conflicting problems to solve at once, things can get confusing very quickly.
- This phenomenon known as the Stroop effect was first described in 1935 by experimental psychologist John Ridley Stroop.

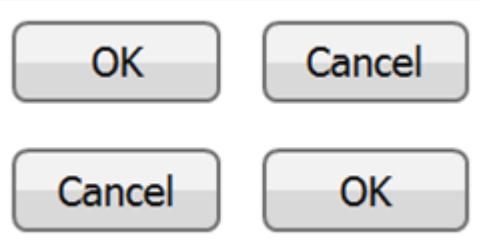
Implications in UI Design
OK – Cancel paradigm



Epic questions in UX design: should the OK buttons be to the left of the Cancel button or should it be the other way round?

- Microsoft/Windows
  - OK-Cancel
  - Support normal reading flow in the Western culture, where you say for example “Do you agree with me – Yes or No?”.
  - Given that in most cases OK is the primary action to complete a flow. It is faster to hit with the TAB key for keyboard users.
- Apple/Mac
  - Cancel-OK
  - Assuming a reading direction that goes from left to right. The dialogue “Ends” with its conclusion.
  - As with Previous/Next, OK is the option moving you forward towards the completion of your flow, while Cancel moves you back.

OK – Cancel paradigm



Which way is better?

- Like with many UX design topics, there's no right or wrong answer.
- It's helpful though to know what speaks for each option.
- Any other reasons than those stated above?.

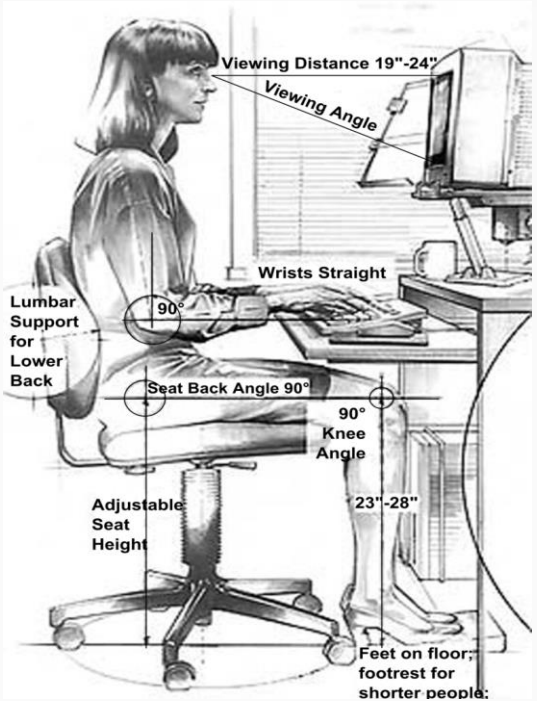
https://www.infragistics.com/community/blogs/b/ux/posts/ok-cancel-or-cancel-ok

Human Factors Engineering

- Also known as ***ergonomics*** or ***human engineering***
- ***Science*** dealing with the application of information on physical and psychological characteristics to the design of devices and systems for human use
- A term to designate equally a body of knowledge, a process, and a profession

Ergonomics: Physical and Cognitive

Physical ergonomics is concerned with human anatomy (解剖學), and some of the anthropometric (人體測量學), physiological (生理) and biomechanical (生物力學) characteristics as they relate to physical activity.



Cognitive Ergonomics

- Just like computers, human brains have a limited amount of processing power.
- When the amount of information coming in exceeds our ability to handle it, our performance suffers. We may take longer to understand information, miss important details, or even get overwhelmed and abandon the task.
- In the field of user experience, we use the following definition:
  - the **cognitive load** imposed by a user interface is the amount of mental resources that is required to operate the system. Informally, you can think of mental resources as "brain power"
  - **Good UI minimizes cognitive load**

High vs. Low Cognitive Load

Cognitive ergonomics is concerned with ***mental processes***, such as perception, memory, reasoning, and motor response, as they affect interactions among humans and other elements of a system.

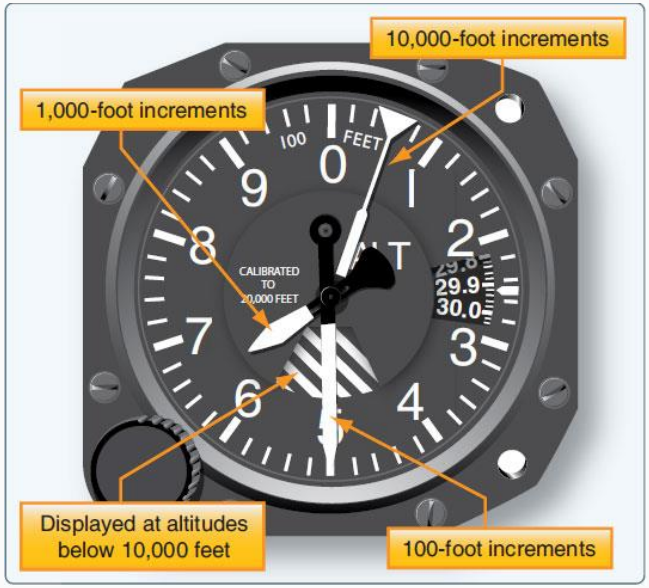
High

Low

High vs. Low Cognitive Load

Cognitive load refers to the effort being used in the working memory

Altimeter



High

Low

Human Performance - UI for capturing DOB

Which user interface (UI) is better?

- Frequency of use: casual vs. expert?
- Environment / context of use: desktop (keyboard & mouse) vs. mobile (touch & virtual keyboard)?

Bad Design vs Good Design - Presenting Information (1)

Let's image that you are a *driver* along this road on a Tuesday morning at 9am.

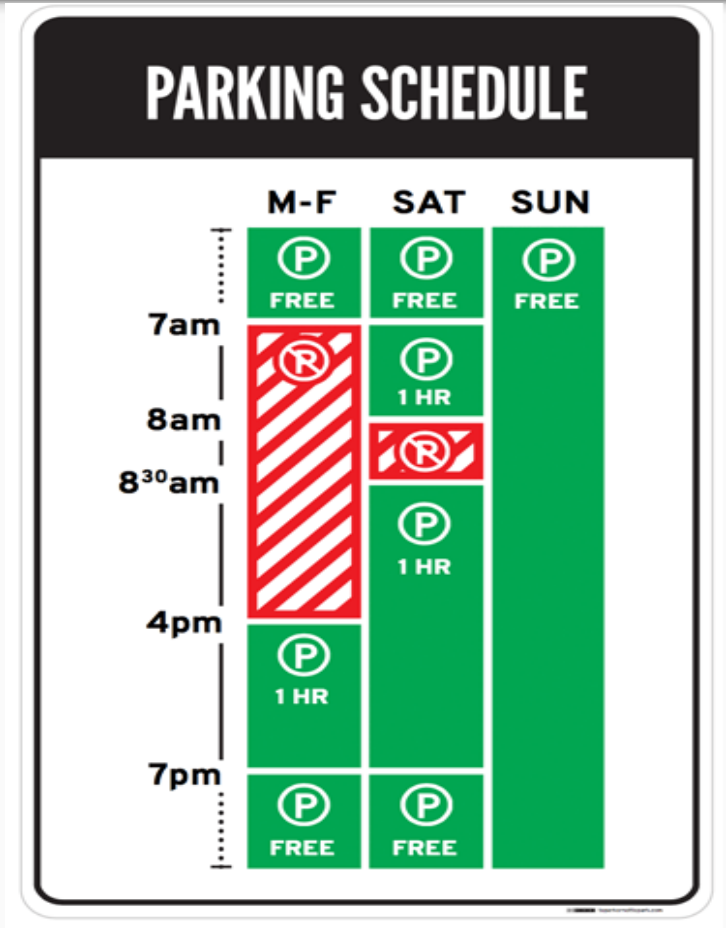
Can you park at this spot?

Were you able to answer this question *quickly* and *correctly*?

What seems to be the problem here?

- Too much information to be displayed in a small space?
- It takes a lot of mental processing to answer?
- **Poor cognitive ergonomic ?**
  - **Requirements of mental processes / resources ?**

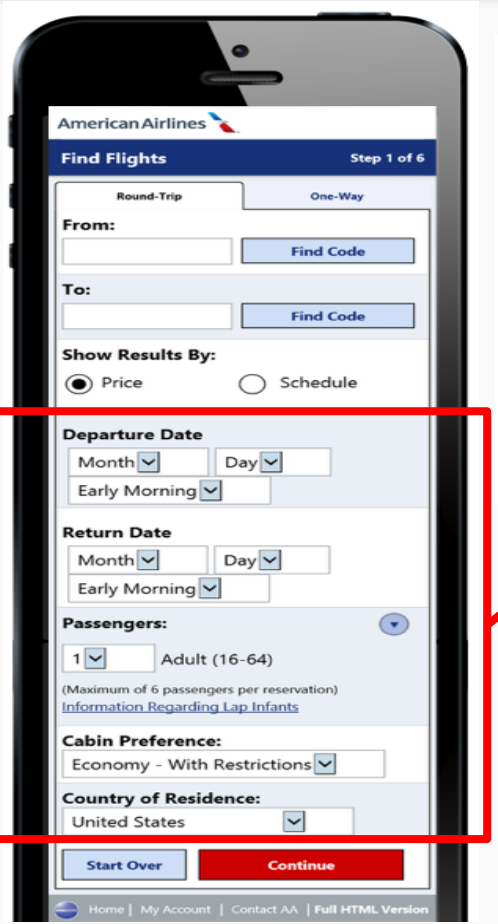
Bad Design vs Good Design - Presenting Information (2)



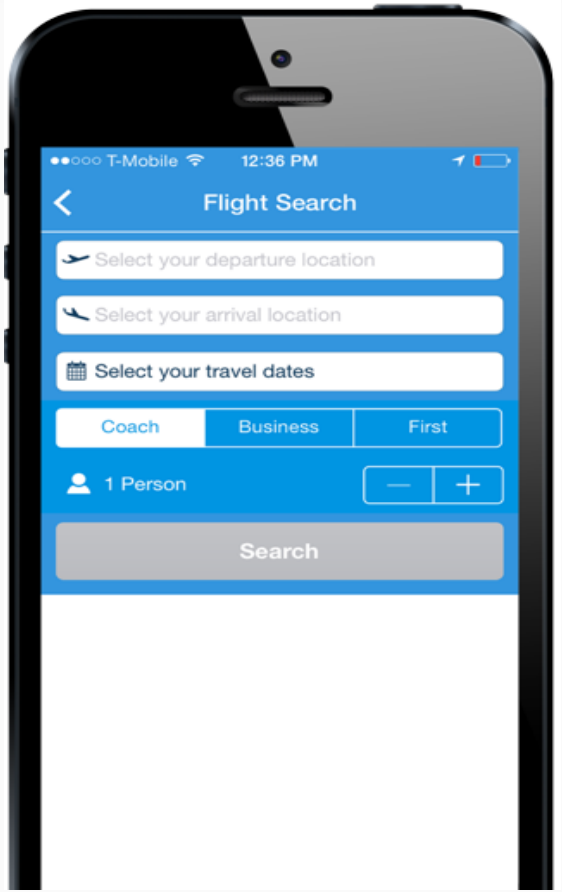
User-Centered Design - Understand what your users need, then design based on that.

- The designer realised drivers simply want to know whether they can park at a spot.
- Yes or no - that's all drivers needed, and that's all the parking sign shows.
- Use visuals, rather than text, to convey information.
- Intuitive: **green** for Ok, **red** for no parking.
- Designed for color blind, with stripes for no parking

Bad Design vs Good Design - Using Dropdown Menus

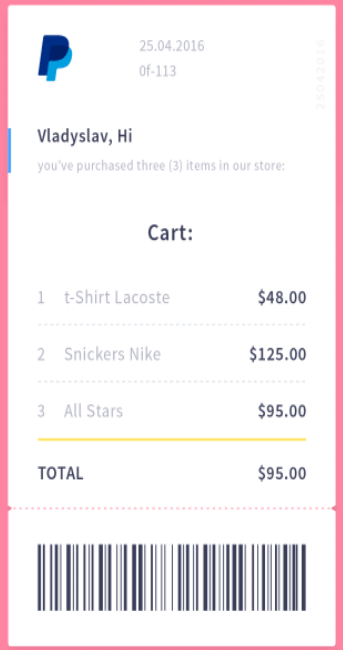


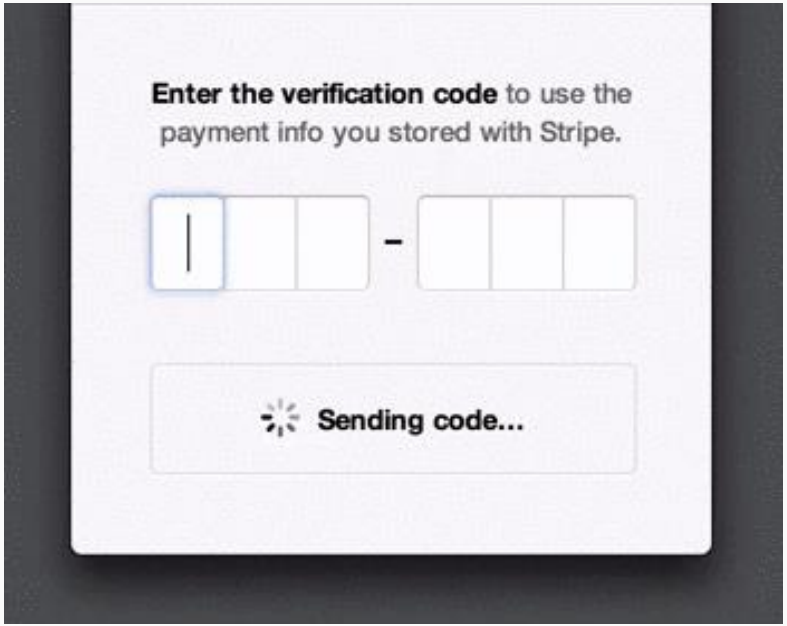
Lots of tap...



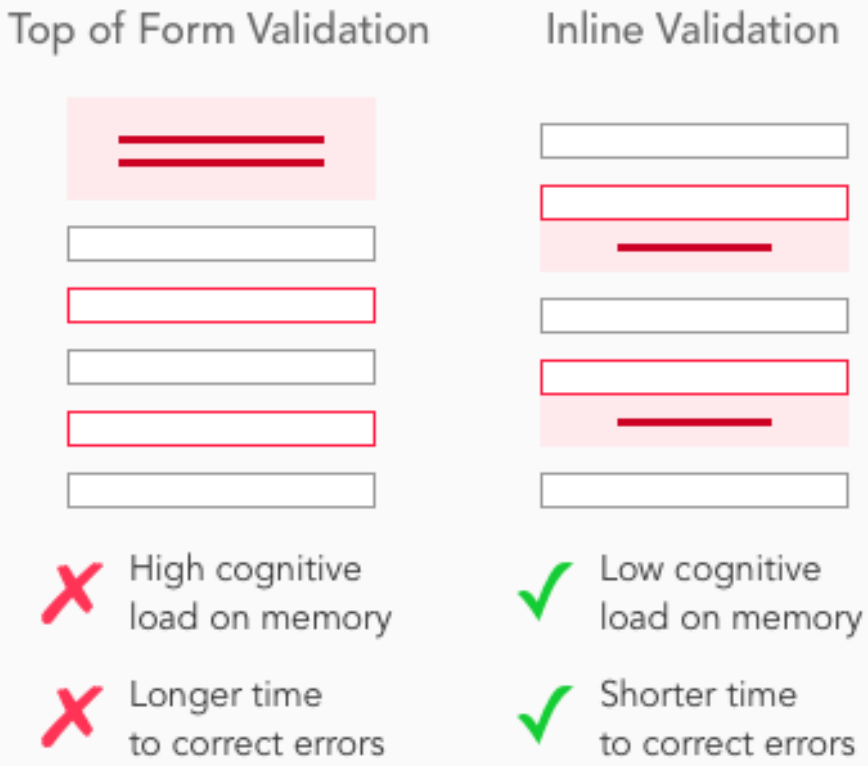
Source: https://www.lukew.com/ff/entry.asp?1950

Bad Design vs Good Design: Using Animation





Bad Design vs Good Design: Placement of Error Messages on Forms



Source: https://uxmovement.com/forms/the-best-place-for-error-messages-on-forms/

Usability

- The official ISO 9241-11 definition of usability is: “the extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency and satisfaction in a specified context of use.”
- The level of usability is determined by the product’s features, together with the context of the user (what the user wants to do with it and the user’s environment).

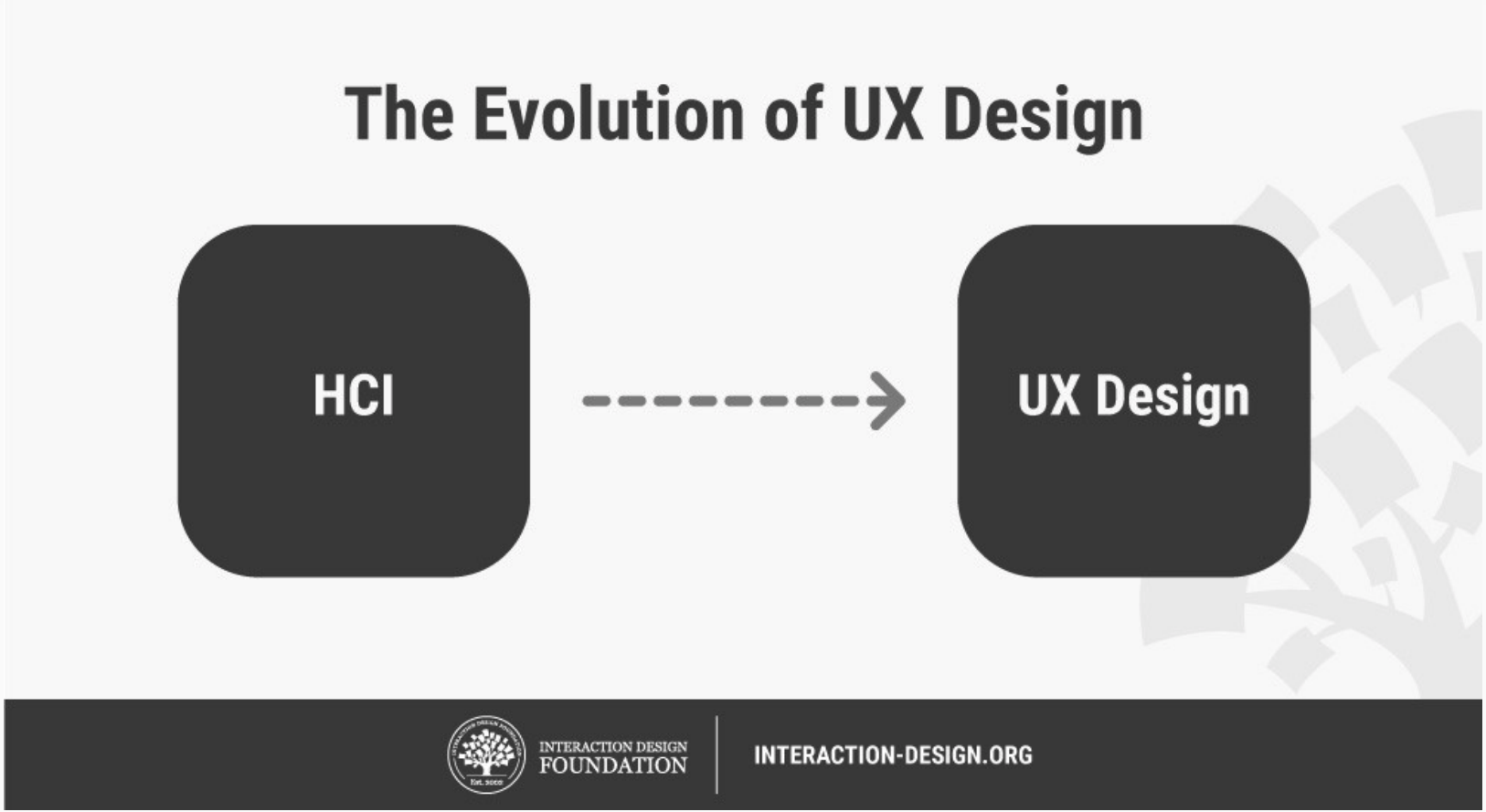
Usability in Plain English

- Usability refers to the quality of a **user's experience** when interacting with products or systems, including websites, software, devices, or applications. Usability is about **effectiveness**, **efficiency** and the **overall satisfaction** of the user.
- A concept very similar to user experience (UX)
  - More about UX later...

Characteristics of a ***usable*** website

1. It should be **easy for the user to become familiar with and competent** in using the user interface during the ***first*** contact with the website.
    - For example, if a travel agent's website is a well-designed one, the user should be able to move through the sequence of actions to book a ticket quickly.
2. It should be **easy for users to achieve their objective** through using the website.
    - If a user has the goal of booking a flight, a good design will guide him/her through the ***easiest*** process to purchase that ticket.
3. It should be **easy to recall the user interface and how to use it on subsequent visits**.
    - So, a good design on the travel agent's site means the user should learn from the first time and book a second ticket just as easily.

User Experience (UX) Design


The Evolution of UX Design
HCI
UX Design
INTERACTION DESIGN FOUNDATION
INTERACTION-DESIGN.ORG

What is UX Design?

- In simple terms, UX design is the ***process*** of creating a product that is as **usable**, **accessible**, and as **enjoyable** for your users as possible.
- UX builds on the design principles of traditional HCI, but extends them by also considering every other aspect of a product or service that the users will interact with.

User Experience & Design

User Experience:

Experiences created and shaped through technology

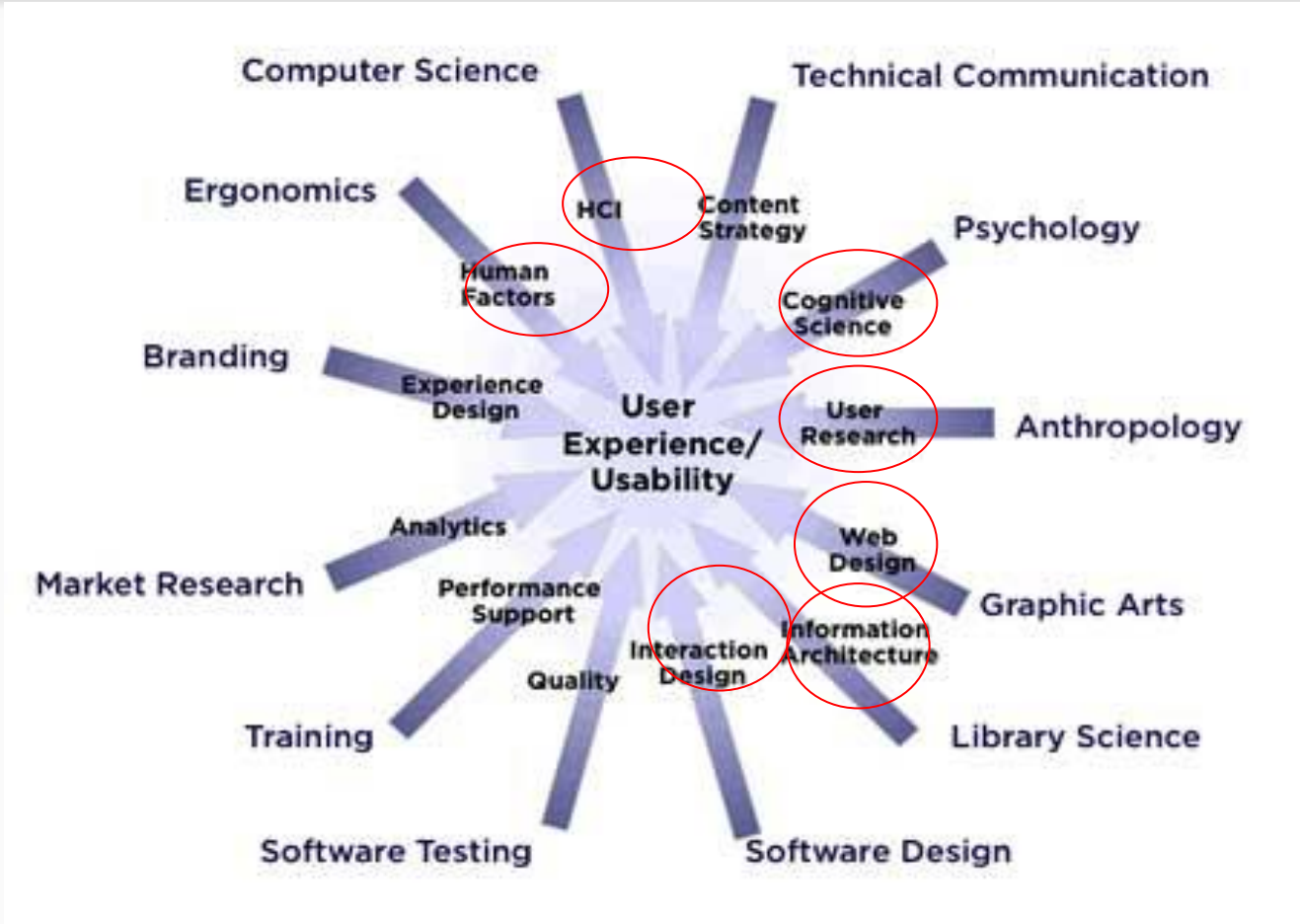
User Experience Design:

How to deliberately design these experiences

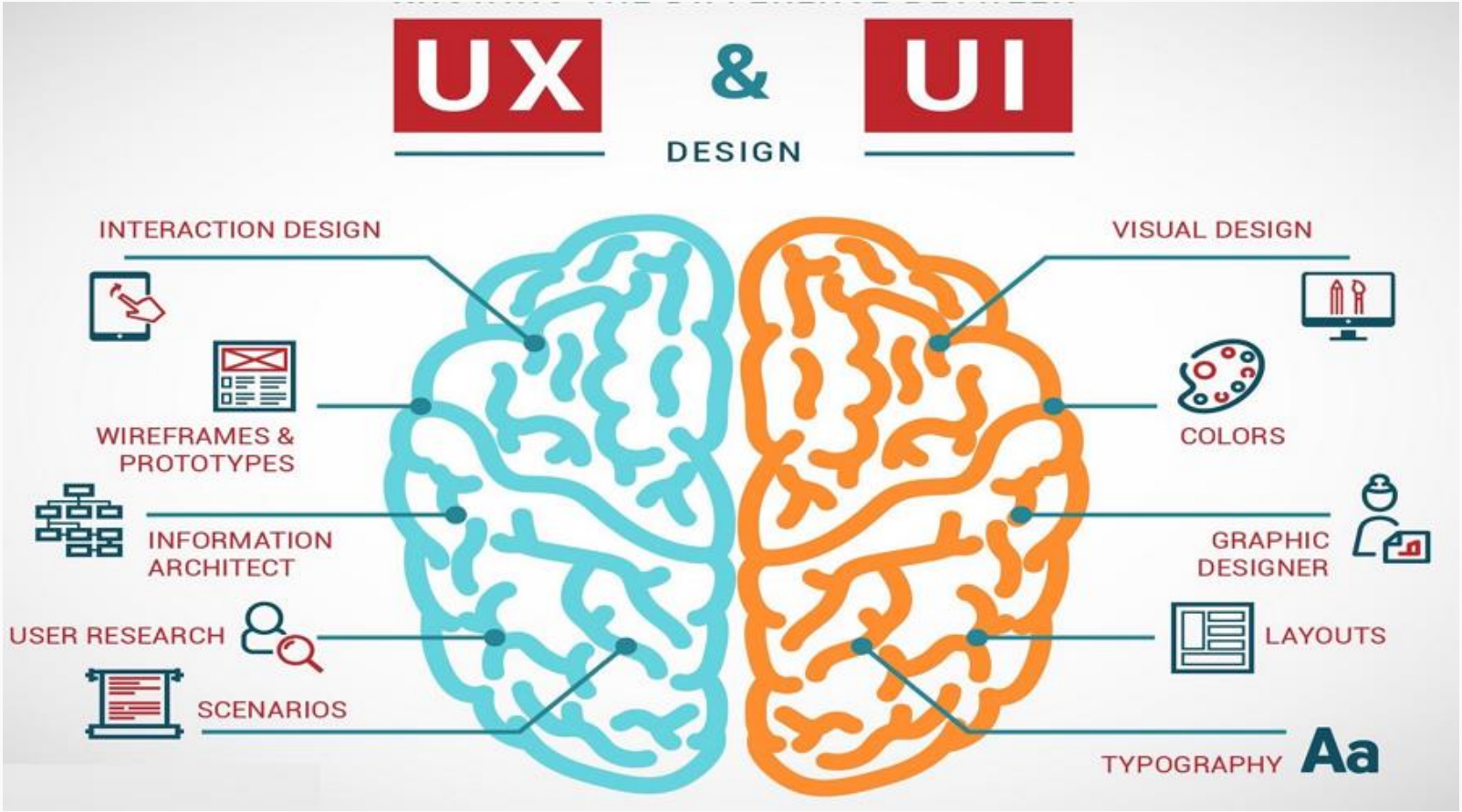
About UX design...

- The best user experience is the one the user doesn't notice.
- It appears smooth and simple on the surface, but hundreds of crucial design decisions have been made to guide, entertain and prevent trouble.
- The less users have to think about the interface or design, the more they can focus on accomplishing their goal on the system or website.
- Your job as a designer is to give them a straight path to their goal by clearing out the obstacles beforehand.

Elements of UX

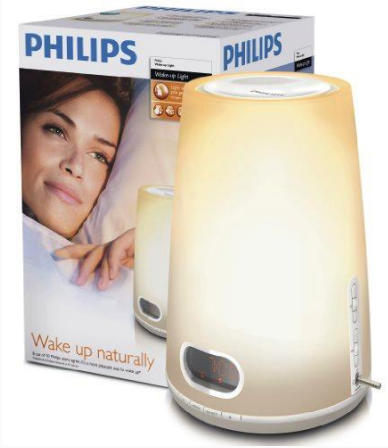


UX vs UI


UX
&
UI
DESIGN
INTERACTION DESIGN
WIREFRAMES &
PROTOTYPES
INFORMATION
ARCHITECT
USER RESEARCH
SCENARIOS
VISUAL DESIGN
COLORS
GRAPHIC
DESIGNER
LAYOUTS
TYPOGRAPHY
Aa

User experience - alarm clocks

Created & shaped through technology



Elements that wake you up,

Crucial features of sunrise and singing birds

What's UX? An Example

What do customers need to do?

Install an app

Pair up

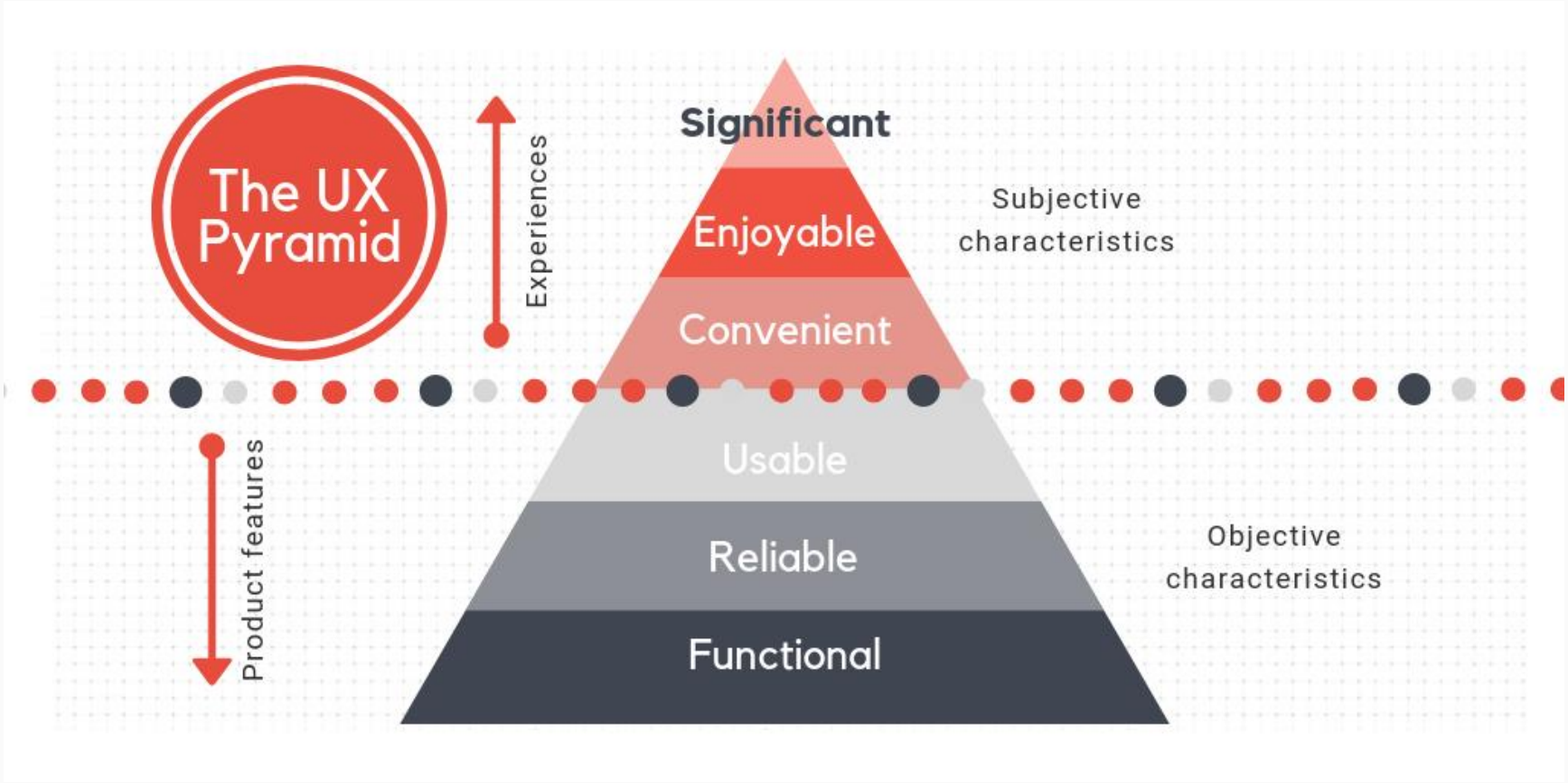
UX covers ***all aspects*** of the product, such as:

Installation, Initial Setup/Configuration, Warranty registration, Troubleshooting & etc.

What the #$%@ is UX Design? (Video)

https://youtu.be/Ovj4hFxko7c

The UX Design Pyramid



Source: https://syndicode.com/2018/12/26/the-ux-design-pyramid-with-the-user-needs/

Product Features - Levels 1 to 3

1. Functional Level
   - Meeting the requirements for the proper work of the product.
   - The design has some purpose and include the key features, works in all modern browsers and passes basic accessibility.
2. Reliable Level
   - Works correctly, available most of the time & accurate
3. Usability Level
   - Users don't get lost or confused and easily find what they want (content or products they need)

Experiences: Levels 4 to 6

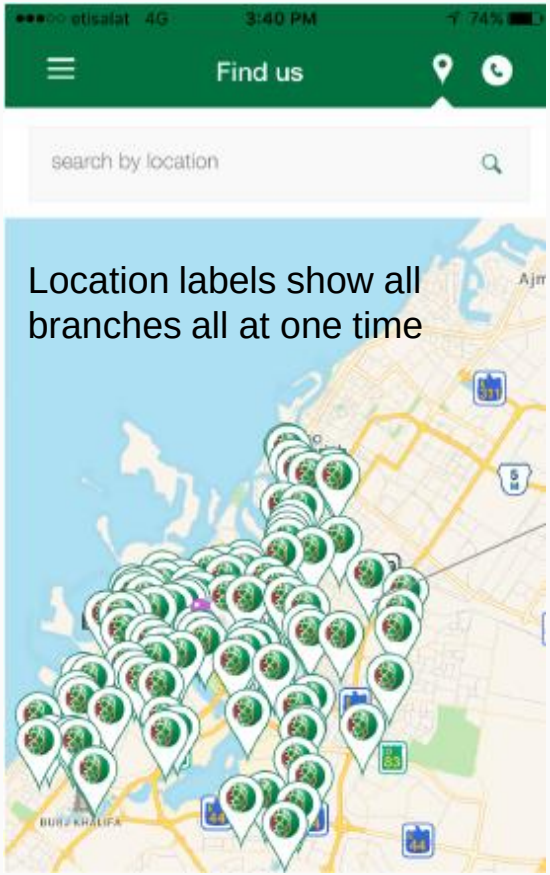
4. Convenient Level
   - Users want to use the product and can find situations when they can use it frequently.
5. Enjoyable Level
   - Users invest themselves into the product and promote it, share it with their friends and make it a part of everyday life.
6. Significant Level
   - Users love the product!

The UX Designer

- UX designers do all the thinking up front so that when a user comes to use the finished product, they don't need to think about anything - it just makes complete sense to them.
- Of course, everyone thinks differently, so everyone has the potential to encounter different obstacles when using a product. The UX designer's main job is to **identify all these potential problems** and **find a way to solve them,** preferably **in advance**!
- To align the user's goals with the goals of the business who's commissioned them to design the product.

Understanding the User

- For a UX designer, the first part of finding solutions is **empathising with the user**. This means that you've got to understand their point of view, instead of looking at the situation with your own viewpoint and understandings.
- The best way to get an insight into someone's behaviour is through **observation**. This is known as an 'Ethnographic Study'; a study of culture. Colloquially, this is often called a '**Field Study**', because it requires the UX designer to **go out into the field and gather data**.



Find the nearest ATM?

1. User context?

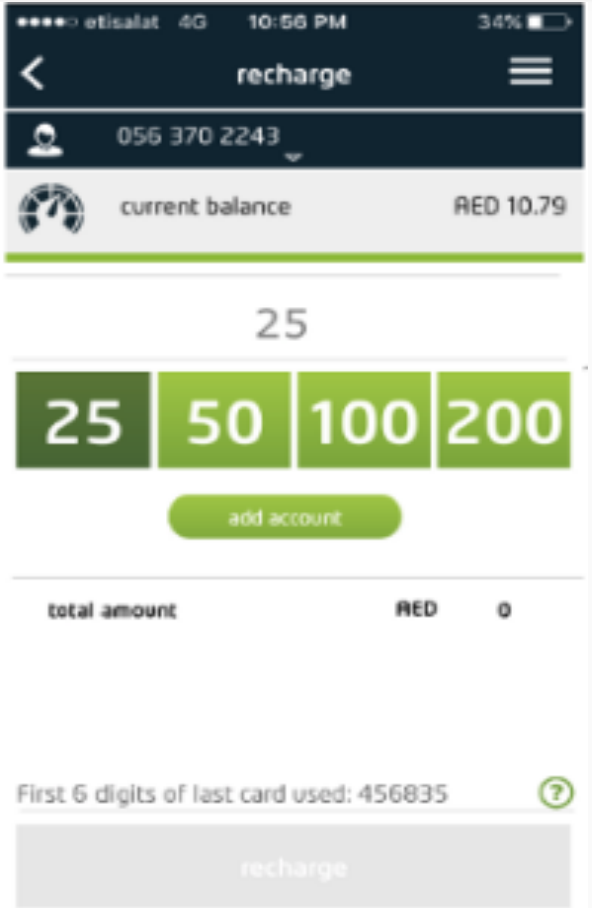
- I'm at location X, where're the nearest ATMs?

1. User needs?

- How do I select a particular ATM and get its address?

Source: https://uxdesign.cc/good-design-vs-bad-design-examples-from-everyday-experiences-18a7d1ba002c

Design from the user's perspective?



Top up prepaid sim card...

1. User context?

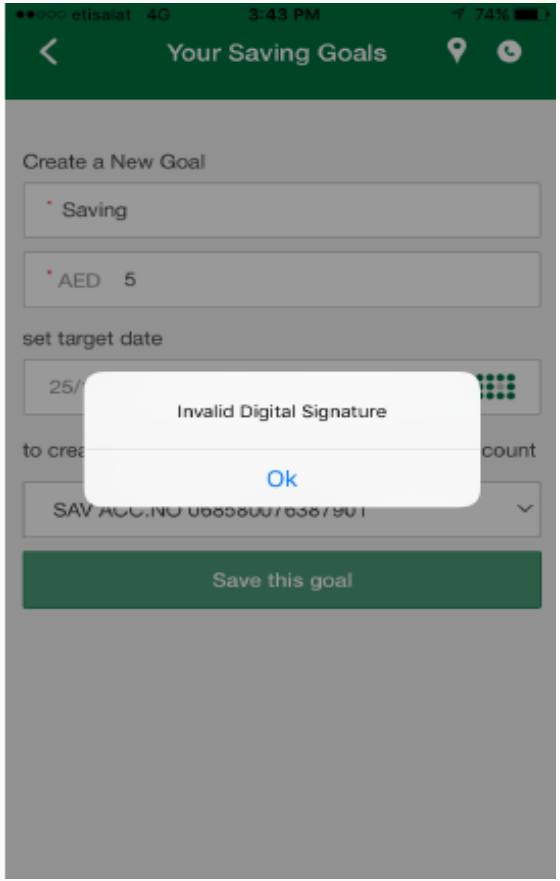
- I want to top up $125

1. UI Design satisfying user needs?

- Tap on **25** and **100** = **125**?

Source: https://uxdesign.cc/good-design-vs-bad-design-examples-from-everyday-experiences-18a7d1ba002c

Design from the user's perspective?



Empathetic UX?

1. User context?

- A *digital signature* is required in all high-risk transactions

1. (First-time / Novice) User needs?

- What's digital signature?
- How do I get one?
- Where can I go to get help?

Source: https://uxdesign.cc/good-design-vs-bad-design-examples-from-everyday-experiences-18a7d1ba002c

References

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- https://www.interaction-design.org/literature/topics/human-computer-interaction
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