★ **What is Human Computer Interaction (HCI)?**

Human-computer interaction (HCI) is a Multidisciplinary field.focusing on the design of computer technology and the interaction between humans (the users) and computers.

HCI improves human-computer interaction, making computers user-friendly and enhancing productivity.

Example - IOT technology , cloud computing , VR/AR technology , Eye tracking technology

★ **What are Interactive systems?**

Interactive systems are computers that accept human input.

★ **Components of HCI Model**

1.Human User (The person interacting with the computer or device.)
2.Computer (The hardware and software enabling interaction.)
3.Interaction (The way the user communicates with the system.)

Or (this is google Answer)

1.User
2.the interface
3.the goal oriented task
4.the context

★ **What is Interaction?**

interaction is a communication between a user and computer be it direct and indirect

Two types of interaction design.

1. User-centered design
   Designing for users' needs, preferences, and feedback.(short answer)
   In order to optimize the system functionality and resources, human users are considered main stakeholders to satisfy.

2. Task-centered design
   Tasks are what the user is carrying out in a way he/she wants.

★ What is the interface?

An interface is a connection point enabling interaction and communication between systems or components.   (Interaction happens through the interface)

★ Interactive interfaces

The interface to an interactive system is all those parts of the system with which people come into contact.

★ Good interfaces

1.Suitable for the task
2.Easy to use (appropriate, adaptable to the user's knowledge and experience)
3.Feedback on performance
4.Display information to useful for the user

★ Human Memory Management

1.Sensory Memory

There are things that you can easily remember
There are things that you find hard to remember

2.Short Term Memory (STM)

Quickly and easily lost, unless processed continuously
Severely limited amount of info 5-9 'items'

3.Long Term Memory (LTM)

Memory of the past
Repository for all our knowledge

★ Bellow devices affect the interaction

1.Input devices
2.Output devices
3.Virtual reality memory
4.Processing

★ Sensors

Convert physical signals into electrical signals.(Interaction based on sensor data)

★ **Richer interaction examples**

    1.Open and navigate with apps with voice without touching the screen
    2.3D car racing video game

★ **Modeling Human Computer Interaction (HCI)**

    1.GOMS models (Goals, Operations, Methods and Selection rules)

        1. Goals – what user intends to do
        2. Operators – actions performed to reach the goal
        3. Methods – sequence of operators to accomplish/complete the goal (Many
        methods possible)
        4.Selection rule – how the user selects the method

    2.KLM methods (Keystroke Level Model)

        Model helps to investigate and discover more efficient data input methods to a
        system

        Can be used to estimate the time taken to complete simple data input tasks.
            Eg- using a computer and mouse
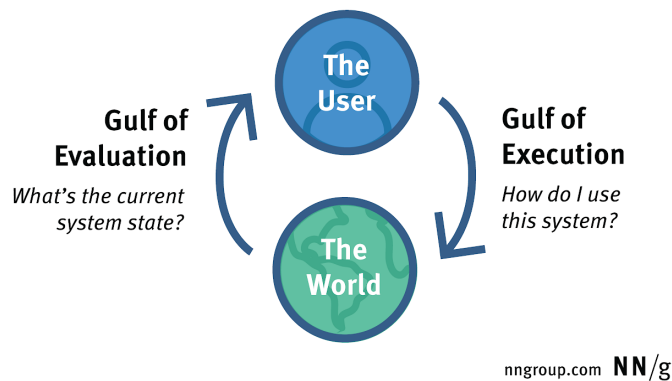
    3. Donald Norman's model (7 stages)

        Norman's model focuses on user's view of the interface

★ **Why do we need a model ?**

    Understand a complex system and complex behavior.

★ **Two Gulf in the Interactions**

    Gulf of Execution and Gulf of Evaluation

Gulf of Evaluation — What's the current system state?

The User

Gulf of Execution — How do I use this system?

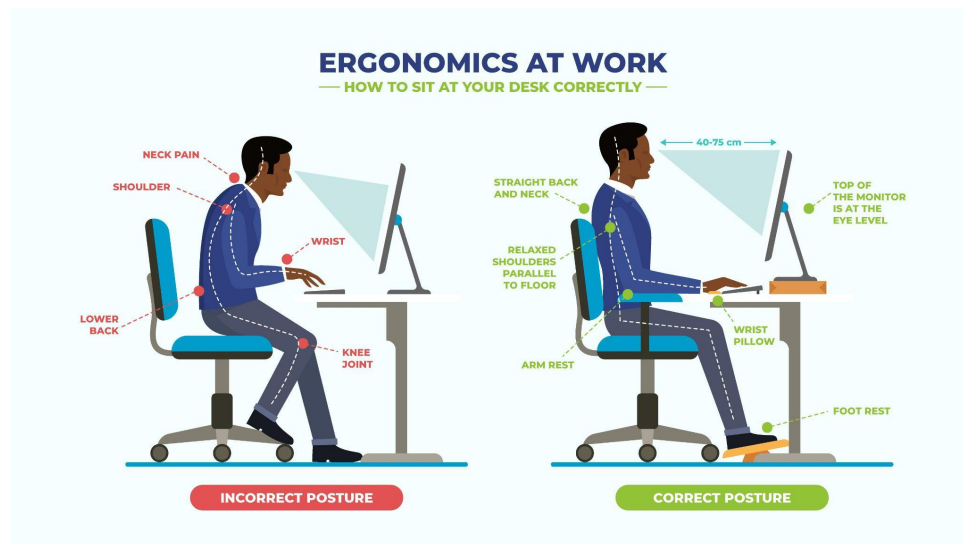The World

nngroup.com NN/g

★ **Some facts to reduce the gulfs in a software system**

1. Determine the function of the device
2. Tell what actions are possible
3. Tell what state the system is in
4. Determine mapping from intention to physical movement
5. Perform the action Tell if system is in desired state
6. Determine mapping from system state to interpretation

★ **Ergonomics**

Ergonomics can roughly be defined as the study of people in their working environment.

Ergonomics manages these issues by improving the product design and workspace arrangement

ERGONOMICS AT WORK
— HOW TO SIT AT YOUR DESK CORRECTLY —

INCORRECT POSTURE: NECK PAIN, SHOULDER, WRIST, LOWER BACK, KNEE JOINT

CORRECT POSTURE: STRAIGHT BACK AND NECK, RELAXED SHOULDERS PARALLEL TO FLOOR, ARM REST, WRIST PILLOW, TOP OF THE MONITOR IS AT THE EYE LEVEL, FOOT REST, 40-75 cm

★ Benefits of Ergonomics

1. Improves employee's health
2. Lower health care costs
3. Lowers operational costs of running a business
4. Prevents injuries in the workplace
5. Improves employee moral, productivity, and job satisfaction

★ Common Health Issues

1. Carpal Tunnel Syndrome (Painful condition of the hands and wrists)
2. Back, Neck, and Shoulder Problems (Sitting for long periods in a chair)
3. Eye and Vision Problems (Long hours, being close or too far from the screen)
4. Stress

★ Some Ways to address Ergonomics

1. Arrangement of controls and displays
2. Take small breaks
3. Use standard devices
4. Sit correct position
5. Do eye exercises

★ Interaction styles

1. Command line interface
2. Menus
3. WIMP (Windows Icon Menu Pointer)
4. Speech Interaction
5. Point and click
6. Natural language based interfaces
7. Question/answer and query dialogue
8. Form-fills and spreadsheets
9. Three–dimensional interfaces

★ What is Typography?

Typography is the art and technique of arranging and designing fonts to make written language visually appealing and easy to read.

★ **What are the different elements of typography?**

    1.Fonts and Typefaces (typeface are serif, sans-serif, and decorative)
    2.Consistency
    3.White space
    4.Alignment
    5.Color (three key components: value, hue, and saturation.)
    6.Hierarchy
    7.Contrast

★ **Three key steps to use as a guiding reference as you begin to incorporate typography into your interface.**

    1.choosing your fonts
    2.readability
    3.scalability (Scalable fonts)

When Choosing Fonts For Your UI interface

    1.start by using fonts from the same font family-a single typeface.
    2.Using serif fonts for print.
    3.Limit the total number of fonts.
    4.Avoid using too similar fonts.
    5.Using sans-serif fonts for digital interfaces.
    6.the brand's personality

Enhance reading experience

    1.Formatting
    2.White Space
    3.Hierarchy
    4.Line Height
    5.Letter Spacing
    6.Line Length

scalability (Scalable fonts)

    Scalable fonts, also known as outlier fonts or vector fonts, are fonts that can be enlarged or reduced without resulting in any distortion. The outline of each character is stored as a mathematical formula.

★ There are five main categories of typefaces in Typography

serif, sans-serif, script, monospaced, and display.

1. What are the Serif fonts ?

Serif fonts are generally more traditional and formal. They have small lines at the ends of the strokes, which can help guide the eye along the text.

Examples :- **Times New Roman** and **Georgia**.

2. What are the Sans-serif fonts ?

Sans-serif fonts are more modern and smooth. They do not have the small lines at the end of the strokes.

Examples :- **Arial** and **Helvetica**.

3. What are the Script fonts ?

Script fonts are designed to look like handwriting or calligraphy.
They are often used for invitations, greeting cards, and other formal documents.

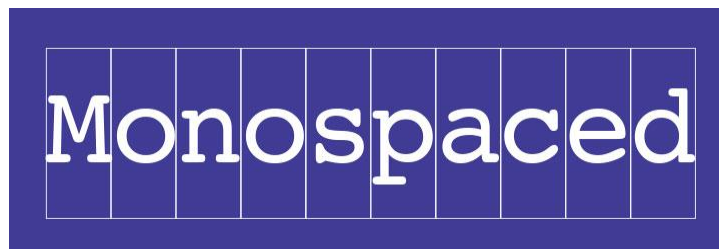Examples :- **Edwardian Script** and **Brush Script**.

4. What are the Monospaced fonts ?

Monospaced fonts are a type of typography where every character takes up the same amount of horizontal space.

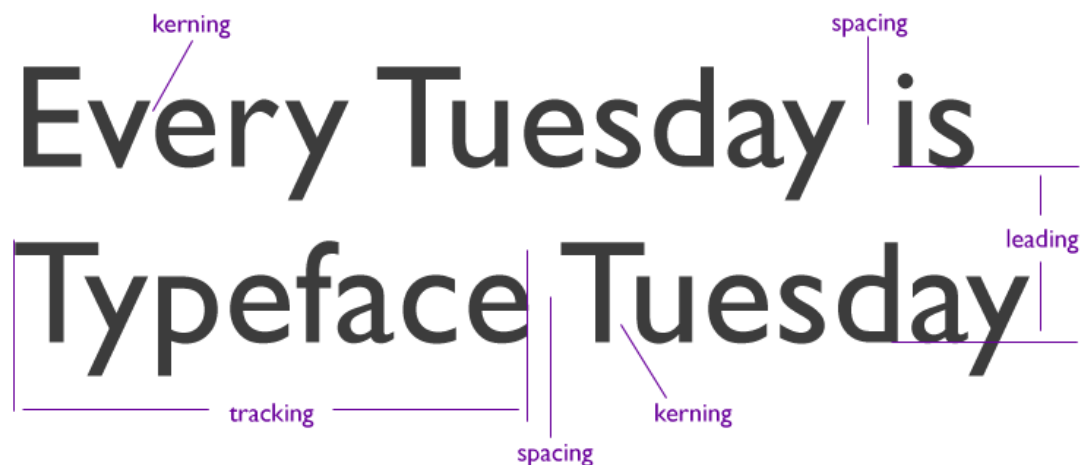This means that each letter, number, and symbol has the same width, regardless of its shape or size.

★ **What is Tracking and Kerning in Typography ?**

Tracking refers to the overall spacing between characters.

kerning refers to the adjustment of spacing between specific characters.

Leading is an amount of vertical space between lines of text.

★ **What is color theory?**

Color theory is the collection of rules and guidelines which designers use to communicate with users through appealing color schemes in visual interfaces.

The basic color wheel displays three categories of color:- primary colors, secondary colors and tertiary colors.

1. Primary colors

Primary colors are colors you can't create by combining two or more other colors.
The primary colors are **red, blue, and yellow.**

2. Secondary colors

colors that can be created by combining any two of the three primary colors.
The secondary colors are **orange, purple, and green**

3. Tertiary colors

Tertiary colors are created by mixing a primary color with a secondary color.
The tertiary colors are **magenta, vermillion, violet, teal, amber, and chartreuse.**

★ **Dimension of color (HSL/HSV/HSB)**

HSL stands for **hue, saturation, and lightness**
HSV stands for **hue, saturation, and value**
HSB stands for **hue, saturation, and brightness**

★ **Main integral parts of color (Hue / Saturation / Value)**

1.Hue (Any one of the six primary and secondary colors is a hue)
2.Saturation (also called "chroma") (A more unsaturated color is darker)

Shade
Shade refers to how much black is added into the hue.

Tint

Tint refers to how much white is added to a color.

Tone

Tone is the result of a color that has had both white and black added to it.

3.Value (Value is the dimension of lightness / darkness)

★ **What is the Color depth ?** (Color depth, also known as bit depth)

Color depth is the number of bits per pixel representing colors.

1 bit - Black and White
8 bits - for each R,G and B
24 bits - for full color (16.7 million colors)

★ **What is the Color temperature?**

Color temperature is the warmth or coolness of light, measured in Kelvin (K).

Warm color - red , orange , yellow
Coolness color - blue , green , violet

★ **color models**

1. additive color model (RGB)

Additive color synthesis is the creation of color by mixing colors of light. (red, green, and blue)

2. subtractive color model (CMYK)

CMYK is known as the subtractive color model, which obtains colors by the subtraction of light. (cyan, magenta, yellow, and black)

★ **color palette**

A color palette is a combination of colors used by UI designers when designing an interface.

What are the different types of color palettes?

1.monochromatic
   Monochromatic color refers to a color scheme that is comprised of
   variations of one color
2.analogous
3.complementary
4.split complementary
5.triadic
6.rectangle (or tetradic)

★ **The best tools for choosing a color palette**

1.Adobe Color
2.Coolors
3.Adobe Illustrator color guide

★ **What is the PACT analysis ?**

A PACT analysis is a useful framework for thinking about human centered design.

A PACT analysis means that identification of the different activities that people conduct in different contexts using different technologies is made.

Main Components of PACT analysis

1.People
2.Activities
3.Contexts
4.Technologies

1. People

Physical differences

• Physical characteristics: height, weight
• Senses: sight, hearing, touch, smell, taste
• Color blindness

Psychological differences

• Different spatial abilities
   – Good ability help easier navigate in websites
   – Designers should design for people with poor ability
• Provide good signs and clear directions
   –Language differences

–Cultural differences

Mental model

The understanding and knowledge of using IT
  –Incomplete
    •people understand some parts better that others
  –unstable
    • people can forget details

Social differences

Some people do not have to use a system, but who the designer would like to use the system. These people (sometimes called 'discretionary users') are often quickly put off if things are difficult to do.

2. Activities

  Acceptable response time
  Time pressure
  Cooperation (One or more users)
  Complexity (can be accomplished by step by step design)
  Safety-critical aspects
    designers must pay attention to ensuring that mistakes do not have a serious effect

3. Contexts

  The physical context (Environment in which activity happens)
  Social contexts (private issues, individual or group activity)
  Organizational contexts
    Changes in technologies alter communication and power structures

4. Technologies

  Input devices (touch screens , pointing devices, trackball , gestures , QR codes)
  Output devices (printers , Lcd/Led display)
  Communication

    Between people and between devices
      Bandwidth and speed are critical
      Wired with fiber-optic cables
    Wireless, Wi-Fi
    Bluetooth, NFC

★ **Example: access to university laboratories**

- People
    - –students, lecturers, technicians
- Activities
    - –enter some form of security clearance and open the door
- Contexts
    - –indoor activity, people may carry books, in a crowd,
- Technologies
    - –small amount of data has to be entered quickly
    - –the output must be clear
    - –accessible for people in wheelchairs
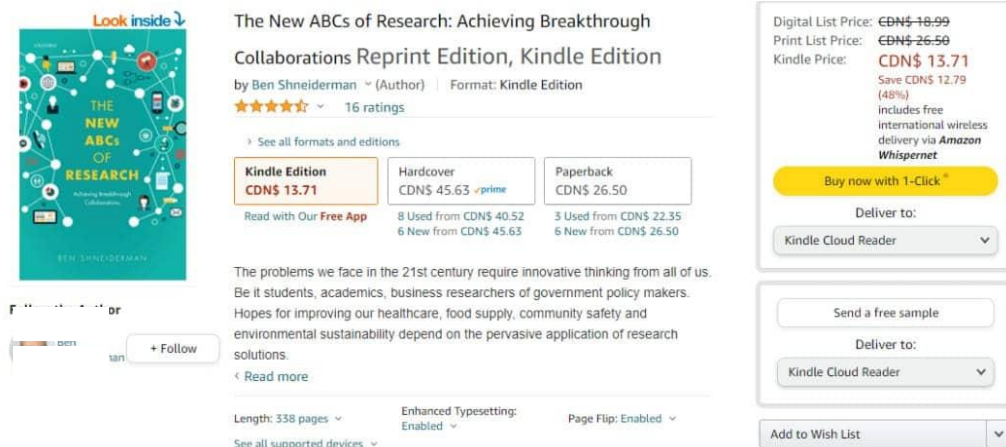
★ **What is human centered design (HCD) ?**

Human-centered design is an approach to interactive system development that focuses specifically on making systems usable. It is a multi-disciplinary activity.

★ **Golden Rules of Design**

1. Strive for Consistency

Whether it is the layout, the size of the button, the color code or the tone used when writing the page, it is important to be consistent throughout the site. Example - amazon website

2. Enable Frequent Users to Use Shortcuts

Allow your users to access all parts of the website with a minimum of clicks.

for example, with keyboard shortcuts or macro facilities, as for example with Canva which allows its users to use shortcuts to copy and paste.


Copying and pasting in Canva

These actions are unavailable using the right click menu, but you can use:

ctrl C — to copy
ctrl V — to paste
ctrl X — to cut

3. Offer Informative Feedback

If your users have performed or are performing actions on your website, it is best to display feedback immediately so that they have an idea of where their processes are

Example - if you are uploading files in google drive,if it is upload successful .user showing a pop up message.

Importation terminée ∨ ✕

Cours Nielsen.PNG ✓
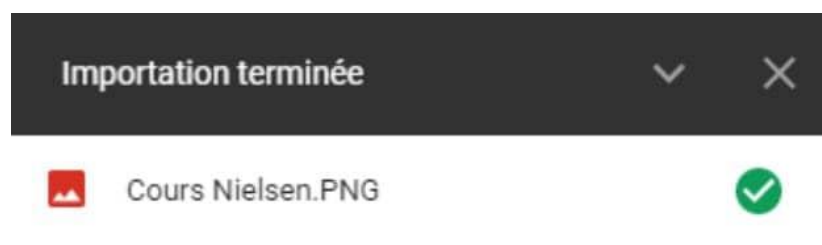
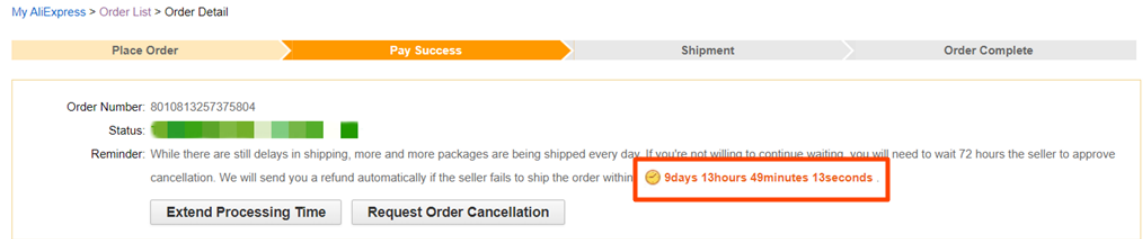## 4. Design Dialog to Yield Closure

Remember to close any interaction made with a user based on the cause of the interaction so that the user knows when they have completed a task.
Example -
    Thank you message.
    Validation message.
    Summary message during a purchase.

My AliExpress > Order List > Order Detail

| Place Order | Pay Success | Shipment | Order Complete |

Order Number: 8010813257375804

Status:

Reminder: While there are still delays in shipping, more and more packages are being shipped every day. If you're not willing to continue waiting, you will need to wait 72 hours the seller to approve cancellation. We will send you a refund automatically if the seller fails to ship the order within **9days 13hours 49minutes 13seconds** .

Extend Processing Time   Request Order Cancellation

5. Offer error prevention and simple error handling

Users are prevented from making mistakes and, if they do, they are offered clear and informative instructions to enable them to recover.

6. Permit easy reversal of actions

Immediately discovering that it is easy to choose "Cancel" after making an error is a very good thing for the user.

For example, here we are in the Outlook mobile application, when archiving an email, a small window automatically appears at the bottom of the screen offering to cancel the archiving.
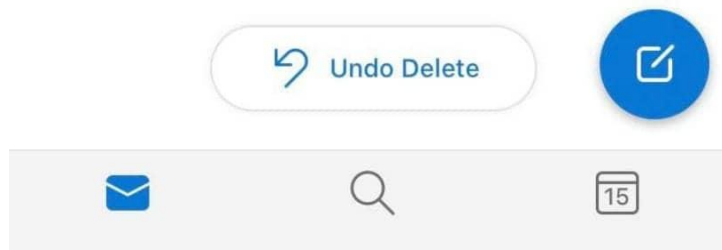
7. Support internal locus of control

> We need to give control and freedom to the users, so that they can feel that they are in control of the system themselves.

> For example, in the screenshot below we are on Capian's YouTube page, and we can choose to turn on notifications or not.
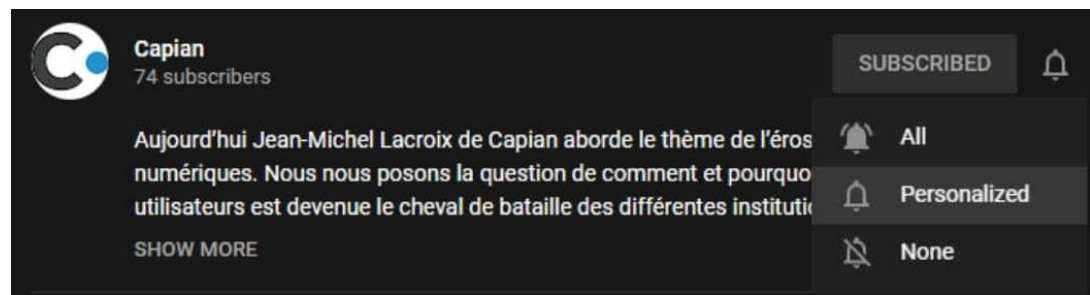
8. Reduce short-term memory load

> Avoid overloading your site or application with information of the same level. You have to deduce which ones should be placed first or you will lose the user's attention.

> For example, Capian's home page below is very minimalist and allows the user's attention to be focused on the "call to action",
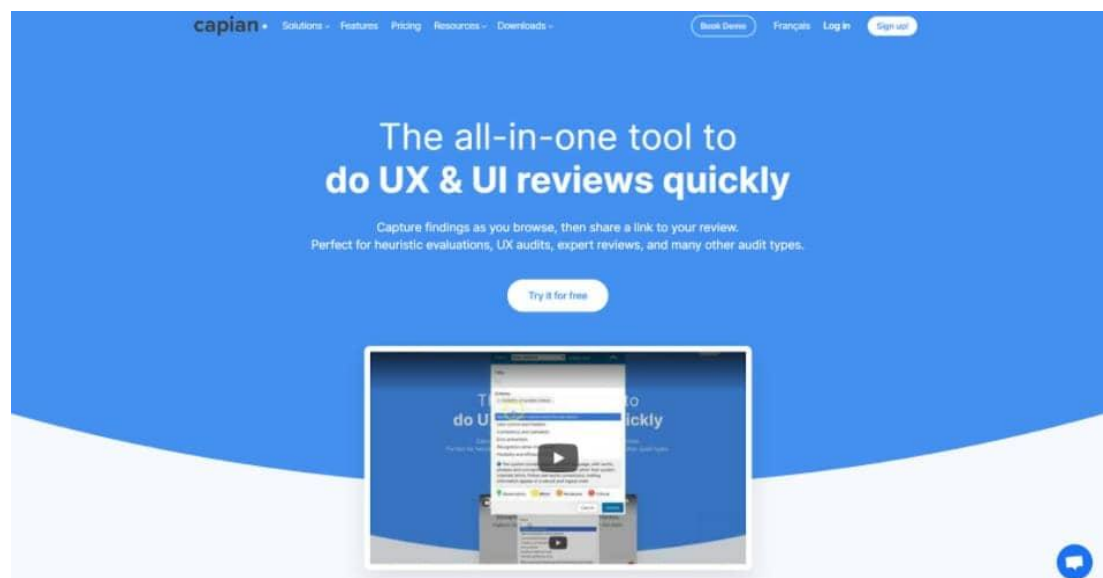
★ **Psychological principles and interface designing**

  1. Hick's Law
  2. Cognitive Load
  3. Von Restorff Effect
  4. Serial Position Effect

★ **What is User centered Design (UCD) ?**

  User-centered design (UCD) is a collection of processes which focus on putting users at the center of product design and development.

★ **The following are the general phases of the UCD process**

  1.Understand the context of use
      Identify the people who will use the product, what they will use it for, and under what conditions they will use it.

  2.Specify user requirements
      Identify any business requirements or user goals that must be met for the product to be successful.

  3.Design solutions
      This part of the process may be done in stages, building from a rough concept to a complete design.

  4.Evaluate designs
      Evaluation ideally through usability testing with actual users - is as integral as quality testing is to good software development.

★ **What is Usability ?**

  Usability is a quality attribute that assesses how easy user interfaces are to use.

★ **what is the include good user interface design**

  1. Usability
      Usability is a quality attribute that assesses how easy user interfaces are to use.

  2. Accessibility
      Accessibility concerns removing the barriers that would otherwise exclude some people from using the system at all.

3. Acceptability

Acceptability is about fitting technologies into people's lives

For example,
Some railway trains have 'quiet' carriages where it is unacceptable to use mobile phones, and cinemas remind people to turn their phones off before the film starts.

★ **What things/principles promote the usability of UI design?**

Efficiency- The system will enable users to perform tasks quickly and with minimal effort.

Learnability- Creating a UI design that is easy to learn through clear instructions and cues helps users grasp the interface quickly.

Simplicity- Keeping the interface simple and intuitive reduces cognitive load and allows users to navigate effortlessly.

Visibility and Feedback- Providing clear and timely feedback to user actions helps users

★ **What is Prototyping ?**

Prototyping is a means of exploring ideas before the real implementation to verify proposed solutions.

Example -
• Architects create models out of paper or cardboard, or with virtual reality tools

• Bridgebuilders create stress models

• Software and Web designers create mockups of how users will interact with their designs

The best reason to prototype is to save time and resources

★ **Why prototyping ?**

1.Get feedback on our design faster
2.Experiment with alternative designs
3.Fix problems before code is written
4.Keep the design centered on the customer

★ There are two major types of prototyping

   1.Throwaway Prototyping

      Main objective is to show the user how it may work in the real system

   2. Evolutionary Prototyping

      The initial prototype is presented to the user. Users provide feedback and
      suggestions for improvements.

      The developer who then presents a more refined version of the prototype. The
      user once more provides feedback. The process is repeated.

★ Example of the prototyping / wireframe tools.

   Wireframe applications/tools:

      1. Adobe XD
      2. Sketch
      3. Figma
      4. Balsamiq
      5. Axure RP
      6. Moqups

   Prototyping applications/tools:

      1. InVision
      2. Marvel
      3. Proto.io
      4. Principle
      5. Flinto
      6. Origami Studio

★ What is a wireframe ?

   wireframe is a visual representation of a product's layout. It is used for early-stage
   design and planning.