HNDIT2052 : Principles of User Interface Design

Week 1 : Introduction to Human computer Interaction (HCI)

Course Details

- Course Code : HNDIT2052
- Course Title : Principles of User Interface Design
- Diploma Program : HNDIT
- Semester : 2 Course
- Status :Compulsory, GPA Number of Credits : 3 Mode of Delivery : Lectures, Discussion, Presentations, Assignment, Practical, LMS, independent learning

Course Details Cont.

- **Time Allocation :**
  - Lectures : 2 hours
  - Tutorials /practical : 2 hours
- **Course Aim :**
  - To develop an awareness of various approaches to the design of contemporary user interfaces To identify key principles by which effective contemporary user interfaces are designed
- **Learning Outcomes (LO)**
- After successful completion of this course the student should be able to:
  - LO1: Describe the key principles of user interface design
  - LO2: Describe a variety of approaches to user interface design
  - LO3: Identify a variety of methods for evaluating the design of user interfaces
  - LO4: Apply the knowledge learned in this module to create simple user interfaces

Subtopics

- What is HCI
- Importance of HCI
- Components of HCI model
- History of HCI

What is HCI ?

Human-Computer Interaction (HCI), Alternatively man–machine interaction (MMI) computer–human interaction (CHI) is the study of interaction between people (users) and computers.

• With today's technology and tools, and our motivation to create really effective and usable interfaces and screens, why do we continue to produce systems that are inefficient and confusing or, at worst, just plain unusable? Is it because:
1. We don't care?
2. We don't possess common sense?
3. We don't have the time?
4. We still don't know what really makes good design?

HCI (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

Goals of HCI

- **A basic goal of HCI is**
  - to improve the interactions between users and computers
  – by making computers more usable and receptive to the user's needs.

- **A long term goal of HCI is**
  – to design systems that minimize the barrier between the human's cognitive model of what they want
  – to accomplish and the computer's understanding of the user's task

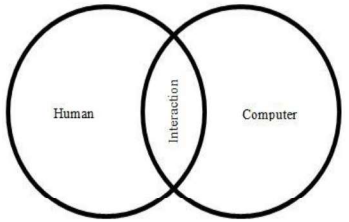
WHY IS HCI IMPORTANT ?

- User-centered design is getting a crucial role!
- It is getting more important today to increase competitiveness via HCI studies (Norman, 1990)
- High-cost e-transformation investments
- Users lose time with badly designed products and services
- Users even give up using bad interface

Ineffective allocation of resources

Components of HCI model

As its name implies, HCI consists of three parts: the Human, the computer itself, and the ways they work together



Human

By "Human", we may mean an individual user, a group of users working together. An appreciation of the way people's sensory systems (sight, hearing, touch) relay information is vital. Also, different users form different conceptions or mental models about their interactions and have different ways of learning and keeping knowledge and. In addition, cultural and national differences play a part.

Components of HCI model Cont.

Computer

When we talk about the computer, we're referring to any technology ranging from desktop computers, to large scale computer systems.

For example, if we were discussing the design of a Website, then the Website itself would be referred to as "the computer". Devices such as mobile phones or VCRs can also be considered to be “computers”.

Interaction

There are obvious differences between humans and machines. In spite of these, HCI attempts to ensure that they both get on with each other and interact successfully. In order to achieve a usable system, you need to apply what you know about humans and computers, and consult with likely users throughout the design process. In real systems, the schedule and the budget are important, and it is vital to find a balance between what would be ideal for the users and what is feasible in reality.

.

A Brief History Of HCI

- The need for people to communicate with each other has existed since we first walked upon this planet.
- The lowest and most common level of communication modes we share are movements and gestures.
- Movements and gestures are language independent, that is, they permit people who do
  not speak the same language to deal with one another.
- The next higher level, in terms of universality and complexity, is spoken language.
- Most people can speak one language, some two or more. A spoken language is a very efficient mode of communication if both parties to the communication understand it.
- At the third and highest level of complexity is written language. While most people speak, not all can write.
- But for those who can, writing is still nowhere near as efficient a means of communication as speaking.

A Brief History Of HCI Cont.

- In modem times, we have the typewriter, another step upward in communication complexity.
- Significantly fewer people type than write. (While a practiced typist can find typing faster and more efficient than handwriting, the unskilled may not find this the case.)
- Spoken language, however, is still more efficient than typing, regardless' of typing skill level.
- Through its first few decades, a computer's ability to deal with human communication was inversely related to what was easy for people to do.
  - The computer demanded rigid, typed input through a keyboard; people responded slowly using this device and with varying degrees of skill.
  - The human-computer dialog reflected the computer's preferences, consisting of one style or a combination of styles using keyboards, commonly referred to as Command Language, Question and Answer, Menu selection, Function Key Selection, and Form Fill-In.
- Throughout the computer's history, designers have been developing, with varying degrees of success, other human-computer interaction methods that utilize more general, widespread, and easier-to-learn capabilities: voice and handwriting.
  - Systems that recognize human speech and handwriting now exist, although they still lack the universality and richness of typed input.

IT1211: User Interface Design

Learning Outcomes

After successful completion of this course the student should be able to:

LO1: Describe the key principles of user interface design

LO2: Describe a variety of approaches to user interface design

LO3: Be familiar with a variety of methods for evaluating the design of user interfaces

LO4: Apply the knowledge learned in this module to create simple user interfaces

Outline Syllabus

1. Introduction to Human computer Interaction (HCI)
2. Understanding the user
3. Evolving Technologies for Rich Interaction
4. Interaction modeling and design
5. Design Principles: Typography
6. Design Principles: Color
7. PACT Analysis
8. The process of human centered interactive systems design
9. Usability & Accessibility
10. Process of GUI design
11. Task Analysis
12. Developing Effective Prototype Interfaces
13. Tools for prototyping
14. Developing a working prototype
15. General issues in User interface designing and new trends in UID

Assessment Plan

- On-line Quizzes : 20%
- Group Assignment : 20%
- Final Examination : 60%
- Total : 100

Content

- Importance of HCI
- Components of HCI model
- History of HCI

Human Computer Interaction (HCI)

- Also known as man-machine interaction
- **User Definition:**
  A discipline that organizes interaction between man and computing devices to make it more successful
- **Developer 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

Human Computer Interaction (HCI)

- HCI is a subject which is directed to many disciplines of other study streams such as Cognitive Psychology, Social Psychology, Ergonomics, Linguistics, Artificial Intelligence, Philosophy, Sociology & Anthropology, Engineering & Design.
- HCI is a sub-field of **Computer Science**.

Human Computer Interaction (HCI)

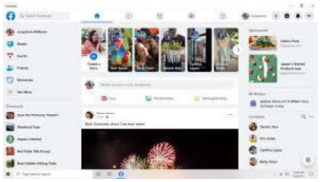
- HCI consultants should have good knowledge or understanding of
  - Psychology and cognitive science
    - to give someone knowledge of the user's perceptual, Cognitive and problem-solving skill
  - Ergonomics
    - for the user's physical capabilities
  - Sociology •
    - to help her understand wider context of the interaction
  - Computer Science and Engineering
    - to be able to build the necessary technology
  - Business/Management
    - to be able to market it
  - Arts
    - Graphic designer's to produce effective interaction
  - Writing
    - Technical writing to produce the manual

Is HCI a Science or a Craft?

- A beautifully designed graphic display may be unstable if it ignores dialog constraints or the psychological limitations of the user.
- Theoretically, HCI is a marriage of art and science.
- HCI is required to be both a craft and a science in order to be successful.
- Product success may depend on ease of use, not necessarily power of machine.

What are Interactive systems

- Systems that accept human input.
- What are current – very popular – interactive systems:
  - Second Life
  - Facebook



Components of HCI Model

- Human User
- Computer
- Interaction

The user is interacting with the computer in order to accomplish something

Human User

- An individual
- A group of users working together
- A sequence of users in an organization (each dealing with some parts of task

Human User

- Human users and their contexts are major components of the design problems that cannot be neglected since they are complex.
- Inadequate attention to users and task context not only lead to bad user interfaces, it puts entire system at risk.
- People will definitely refuse to use poor/difficult products

How to classify or understand human users?

- Physical abilities
- Personality differences
- Skill differences
- Cultural diversity
- Motivation
- Special needs

Different types of computers

- PC
  - Desktop, laptop(*), PDA, ...
- A large scale computer system
  - ERP, Accounting packages
- A process control system (computing devices)
- An embedded system
  - Car, electrical equipment and etc.
- Mobile computing devices
- if we were discussing the design of a Website, then the Website itself would be referred to as "the computer". Devices such as mobile phones or VCRs can also be considered to be “computers”.

What is Interaction?

- A communication between a user and computer.
- Two types of interaction:
  - **Direct:** a dialog with feedback and control throughout the performance of the task
  - **Indirect:** Batch processing or intelligent sensors controlling the environment

Goals of Interaction Design

- Produce usable, safe and functional systems.
- Allow users to carry out tasks;
  - Safely
  - Effectively
  - Efficiently
  - Enjoyably

Two types of interaction design

- User-Centered Design:
  - In order to optimize the system functionality and resources, human user is considered main stakeholders to satisfy
- Task-Centered Design:
  - Tasks are what the user is carrying out in a way he/she wants.

What is interface?

- Interaction happens through the interface
- Interface facilitates the communication between the user and system
- The interface needs to provide some mechanisms for
  - people to provide instructions and enter data into the system: '**input**'.
  - the system to tell people what is happening: '**feedback**'
  - the system to display the content (i.e. information, pictures, movies, animations) : '**output**'.

History of HCI - Key People

Vannevar Bush:

- Vannevar Bush established the U.S. military / university research partnership that later developed the **ARPANET** (The First Internet), and wrote the first visionary description of the potential use for information technology, inspiring many of the Internet's creators.
- Postulated **Memex** device
- https://en.wikipedia.org/wiki/Vannevar_Bush

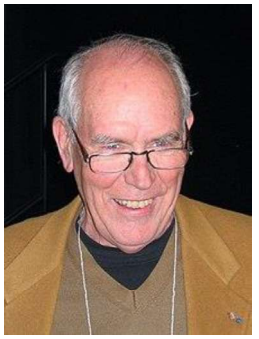
History of HCI - Key People

J.R. Licklider:

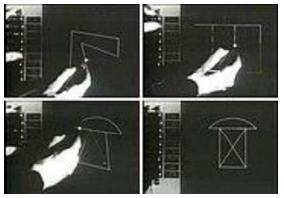
- Postulated "man-computer symbiosis" (1960)
- https://en.wikipedia.org/wiki/J._C._R._Licklider

History of HCI - Key People

Ivan Sutherland:

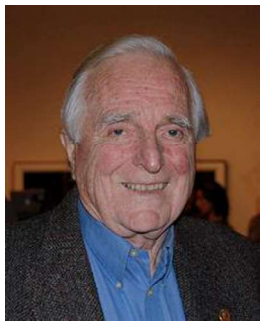


- an American computer scientist and Internet pioneer, widely regarded as a pioneer of computer graphics.
- Invention of the **Sketchpad**
- https://en.wikipedia.org/wiki/Ivan_Sutherland



History of HCI - Key People

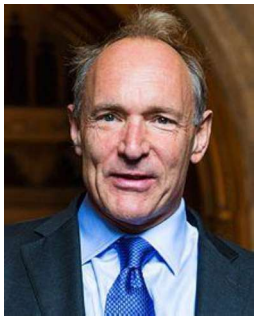
Douglas Engelbart:



- Inventor of **mouse device,** development of hypertext, networked computers, and precursors to graphical user interfaces.
- https://en.wikipedia.org/wiki/Douglas_Engelbart

History of HCI - Key People

Tim Berners-Lee:



- inventor of the **World Wide Web**.
- a system of globally unique identifiers for resources (URL/URI)
- the publishing language HyperText Markup Language (HTML);
- the Hypertext Transfer Protocol (HTTP).
- https://en.wikipedia.org/wiki/Tim_Berners-Lee

History of HCI

Main characteristics of HCI – Past

- Function/process centered
- Not much use of graphics
- Early PC and mouse
- High learning curve

History of HCI

2000- present

- XBOX 360 – Video Game Console- 2005
- Nintendo Wii – 7th generation Console
- Android – Linux based phone OS -2007
- iPhone – Apple's smartphone- 2007
- Windows 8 – Popular Microsoft's OS - 2012
- HMZ-T1- Sony HD and 3D viewer 2012

Main characteristics of HCI – Present

- User centered
- OS development
- New technologies aimed at
- Natural feel
- motion capture
- Touch screen
- Multi-touch

Past Vs Present of HCI

Past	Future
Function/process centered Not much use of graphics Early PC and mouse High learning curve	User centered OS development New technologies aimed at Natural feel motion capture Touch screen Multi-touch

Principles of User Interface Design

DIFFERENT CHANNELS AND HOW HUMAN PROCESS DATA

- The Human user
  - Humans are limited in their capacity to process information. This has important implications for design.

Understanding the user

- A Human can be viewed as an information processing system.
- Information received and responses given via input-output Channels
  - visual, auditory, movement
- Information stored in memory
  - sensory, short- term, long –term
- Information processed and applied in various ways
  - reasoning, problem solving, skill, error

Different Channels and how human process data

- INPUT:
  - visual (sight), auditory (hearing), haptic (touch)
  - Taste and Smell
- OUTPUT:
  - Auditory (speaking)
  - Body (movement, appearance)

Active Channels and communicate the status

- There are five major senses: sight, hearing, touch, taste and smell
- The first three are the most important to HCI.
- Taste and smell do not currently play a significant role in interface design.
- Speaking, Body movement, Facial expressions, etc. are used to output the status of human process

Different Channels in computers and human users

- Entering data/information into computers
  - Keyboard – Character processing - Text data
  - Microphone - Voice Recognition – Audio data
  - Camera - Image Recognition (Computer Vision) – Image data
  - Mouse – Spatial processing - point of location
- Entering data/information into human user
  - Eyes
  - Ears
  - Body

Different Channels in computers and human users

- The most common method is by viewing information expressed as text, an image or video displayed on a screen.
- Auditory data may take the form of music, recorded of speech, text-to-speech or alert sounds.

Human Eye

- Capabilities of humans in receiving information may vary from one to another although all humans have same eye structure (individual differences)
- "What you see" Vs "What you understand".

Interpreting the visual signal

- Size and depth
  - visual angle indicates how much of view object occupies (relates to size and distance from eye)

Visual Angles

- The size of that image is specified as a visual angle. If we were to draw a line from the top of the object to a central point on the front of the eye and a second line from the bottom of the object to the same point, the visual angle of the object is the angle between these two lines.

Identifying the larger objects

- Visual angle is affected by both the size of the object and its distance from the eye. Therefore if two objects are at the same distance, the larger one will have the larger visual angle.

Colour

- made up of hue, intensity, saturation
- cones sensitive to colour wavelengths
- 8% males and 1% females colour blind

How do we really Read?

- visual pattern perceived
- decoded using internal representation of language
- interpreted using knowledge of syntax, semantics
- Word shape is important to recognition
- Negative contrast (dark characters on a light screen) improves reading from computer screen.

  (black letters on white space)

Hearing

- Provides information about environment:

you recognize distances, directions, objects with the sound

- Physical apparatus:
  - outer ear – protects inner and amplifies sound
  - middle ear – transmits sound waves as vibrations to inner ear
  - inner ear – chemical transmitters are released and cause impulses in auditory nerve
- Sound
  - pitch – sound frequency
  - loudness – amplitude

Interpreting sound

- Humans can hear frequencies from 20Hz to 15kHz
- Auditory system filters sounds
  - can attend to sounds over background noise.

Uses of non-speech sounds

- Attention – to attract the user's attention to a critical situation or to the end of a process.
- Status information – continuous background sounds can be used to convey status information. For example, monitoring the progress of a process (without the need for visual attention).
- Confirmation – a sound associated with an action to confirm that the action has been carried out. For example, associating a sound with deleting a file.
- Navigation – using changing sound to indicate where the user is in a system.

Touch

- Provides important feedback about environment.
- May be key sense for someone who is visually impaired.
- Stimulus received via receptors in the skin:
  - thermoreceptors – heat and cold
  - mechanoreceptors – pressure (some instant, some continuous)
- Some areas more sensitive than others e.g. fingers.

Movement

- Time taken to respond to stimulus:
  - reaction time + movement time
  - E.g. distance between two moving vehicles
- Movement time dependent on age, fitness etc. (User dependent variable)
- **Hint for Design:**

If you want to inform something quickly, you have to use audio based interaction. It is faster than visual interaction.

Human Memory Management

- Sensory Memory
- Short Term Memory
- Long Term Memory

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

Short-term memory (STM)

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

Long-term memory (LTM)

- Memory of the past
- Repository for all our knowledge
  - slow access
  - huge or unlimited capacity
- Two types
  - episodic – serial memory of events
  - semantic – structured memory of facts, concepts, skills

HUMAN THINKING AND PROBLEM SOLVING

- Thinking
  - Deduction
  - Induction
  - Abduction

Deduction:

- derive logically necessary conclusion from given premises.
- e.g. If it is Friday then she will go to work

It is Friday , Therefore she will go to work.

Inductive Reasoning

- generalize from cases seen to cases unseen
- e.g. all elephants we have seen have trunks therefore all elephants have trunks.

Abductive reasoning

- reasoning from event to cause
- e.g. Sam drives fast when drunk. If I see Sam driving fast, assume drunk.

HNDIT HNDIT2052

Principles of User Interface Design

Lecture 03: Design Principles: Color

An Introduction to Color Theory and Color Palettes

- Have you ever seen a color that immediately reminds you of a certain brand? Perhaps you've struggled to feel at ease in a room with a clashing color scheme, or returned an item of clothing you received as a gift because the color wasn't quite right.
- Colors have immeasurable power to inform our mood, emotions and thoughts. Research by the Color Research Institute reveals that people make a subconscious judgment within 90 seconds of seeing a product, and between 62% and 90% of that judgment is based on color alone.

An Introduction…

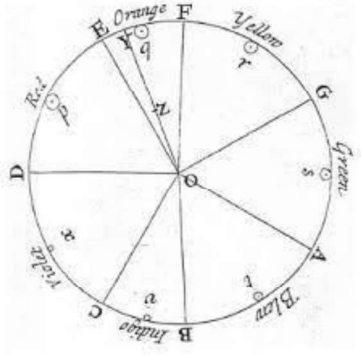
- User interface (UI) designers have the challenging task of incorporating color into their interface in a way that strongly communicates a brand's visual identity. A website's color palette may seem like a matter of personal taste on the part of the client, but in reality, UI designers rely on a framework called color theory: a multi-layered set of guidelines that inform the use of color in design.

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.
- To pick the best colors every time, designers use a color wheel and refer to extensive collected knowledge about human optical ability, psychology, culture and more.
- Modern color theory is largely based on Isaac Newton's color wheel (1666).
- The basic color wheel displays three categories of color; **primary colors, secondary colors, and tertiary colors.**

Isaac Newton's color wheel

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



Primary colors

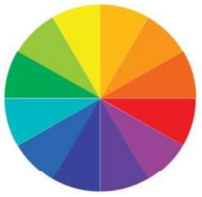
- **Primary colors** are colors you can't create by combining two or more other colors.
- The primary colors are red, blue, and yellow.

Secondary colors

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

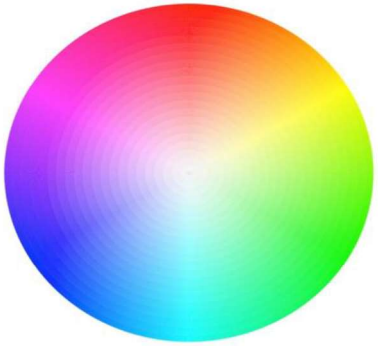
Tertiary colors

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



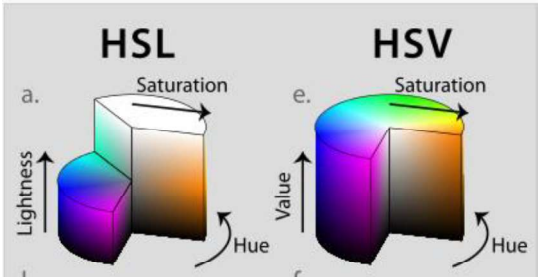
Color wheel

- The color wheel serves as more than just a chart for primary, secondary, and tertiary colors.
- It goes beyond that to encompass hues, tints, tones, and shades associated with each color.
- This visualization of color relationships along the spectrum of a rainbow aids designers in crafting unique color palettes that enhance aesthetic balance.



Dimension of color(HSL/HSV/HSB)

- HSL,HSV,HSB
  - HSL stands for *hue*, *saturation*, and *lightness*.
  - HSV stands for *hue*, *saturation*, and *value*, and is also often called **HSB** (*B* for *brightness*)

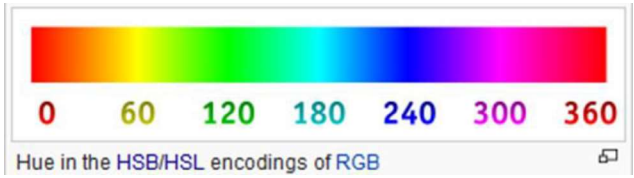


Main integral parts of color:

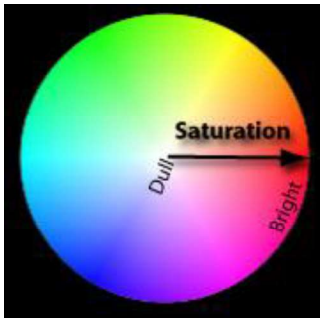
- Hue
- Saturation (also called “chroma”)
- Value

Hue

- Hue refers to the pure pigment of a color, without tint or shade. In that respect, hue can be interpreted as the origin of a color. Any one of the six primary and secondary colors is a hue.
- The three primary hues in light are red, green, and blue. Thus, that is why televisions, computer monitors, and other full-range, electronic color visual displays



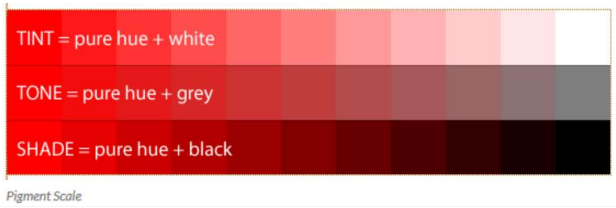
The Color Wheel: Saturation



- Saturation or Chroma is the intensity of a color.
- A highly saturated color is bright and appears closer to the edge of the wheel.
- A more unsaturated color is dull.
- A color with no saturation is achromatic or in the grey scale.

Saturation…

- **Shade**
  Shade refers to how much black is added into the hue. As such, shade darkens a color.
- **Tint**
  The opposite of shade, tint refers to how much white is added to a color. As such, tint lightens a color.
- **Tone**
  Tone is the result of a color that has had both white and black added to it. In other words, tone refers to any hue that has been modified with the addition of grey—as long as the grey is purely neutral (only containing white and black).



Pigment Scale

Saturation…

- *Colorfulness* is the visual sensation according to which the perceived color of an area appears to be more or less chromatic.

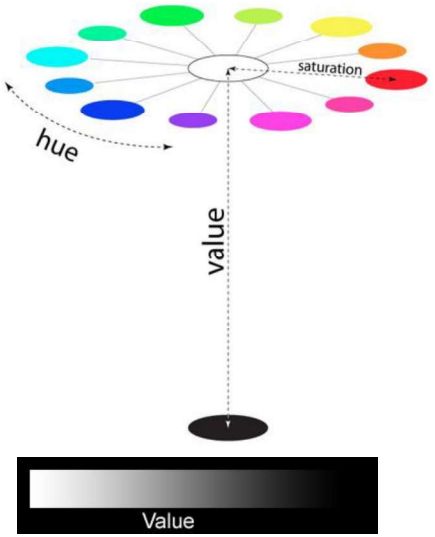

Original image, with relatively muted colors


L*C*h (CIELAB) chroma increased 50%

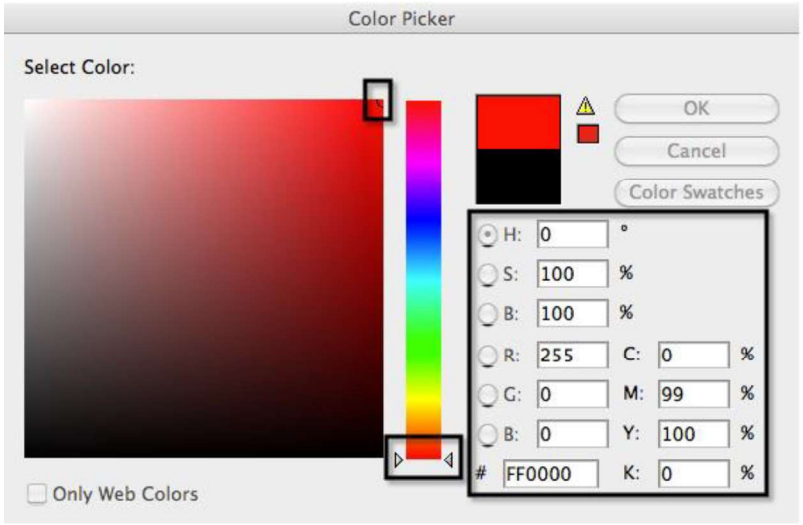

HSL saturation increased 50%; notice that changing HSL saturation also affects the perceived lightness of a color

Value

- Now let's add "value" to the HSV scale. Value is the dimension of lightness/darkness.
- In terms of a spectral definition of color, value describes the overall intensity or strength of the light.
- If hue can be thought of as a dimension going around a wheel, then value is a linear axis running through the middle of the wheel, as seen in the figure.



Adobe color picker



Color depth

- Color depth, also known as bit depth, is either the number of bits used to indicate the color of a single pixel, or the number of bits used for each color component of a single pixel.
- When referring to a pixel, the concept can be defined as bits per pixel.

Color depth …

- How many colors are needed?
- 1 bit -Black and White 

- 8 bit (256 shadows) 
- 8 bits for each R,G and B
  - 24 bits (16.7 million colors)

Color depth…

- Black and white
  - =1bit
- Gray Scale
  - 8 bit(256 shadows)
- Indexed Color
  - 8 bit (217-256 color pallet)
- Full color
  - 8 bit each for RGB
  - 24 bit (16.7 million colors)
- Medical / Professional photography
  - 30~48 bit (10~16 bit/RGB)
  - (Preserve detail/accuracy in editing)

Graphic/Image Data Structure

- Black and White

=1bit

Mono-chrome image

Each pixel is stored as a single bit (0 or 1). A 640 X 480 monochrome image requires 37.5 Kbytes.

- Gray Scale

=8 bit (256 shadows)

Each pixel is usually stored as a byte (0 to 255 levels)

A 640 x 480 gray-scale image requires over 300 Kbytes

- Indexed Color
  - 8 bit (217~256 color pallet)

    One byte for each pixel support 256 colors A 640 x 480 8-bit color image required 307.2 Kbytes

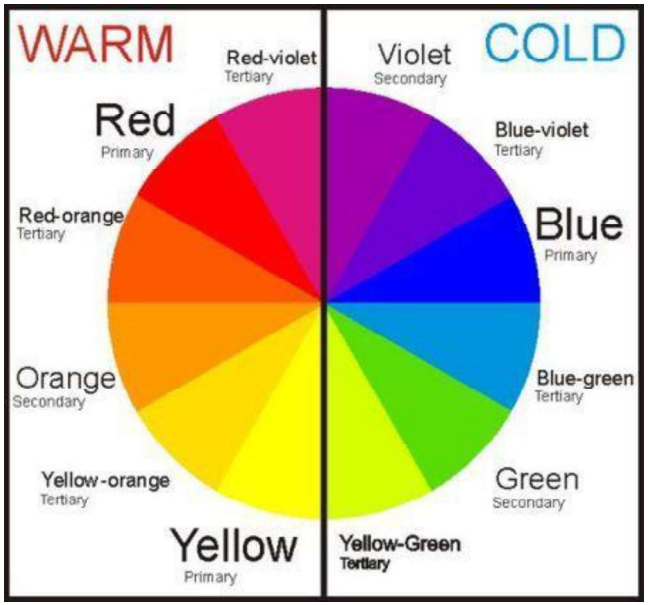
- Full color/true color
  - 8 bit each for RGB
  - 24 bit (16.7 million colors)

Three byte for each pixel support 256x256x256 colors A 640x480 24-bit color image requires 921.6 Kbytes.

Color temperature

Warm, cool and neutral colors

- **Warm colors** encompass various shades of yellow and red, while **cool colors** exhibit a tint of blue, green, or purple. **Neutral colors**, on the other hand, consist of brown, gray, black, and white.
- The temperature of a color holds considerable influence over our emotional reactions.
- In the realm of color psychology, warm colors evoke feelings of excitement, optimism, and creativity, while cool colors represent peace, tranquillity, and harmony.



The importance of color harmony

- Color harmony refers to the use of color combinations that are visually pleasing for the human eye.
- Color palettes can either promote contrast or consonance, but as long as they make sense together, they can still result in a visually satisfying effect.
- When it comes to UI design, color harmony is what all designers strive to achieve. Based on the psychological need for balance, color harmony engages the viewer and establishes a sense of order.
- A lack of harmony in a color palette can either result in an interface being under-stimulating (boring) or over-stimulating (chaotic and messy).

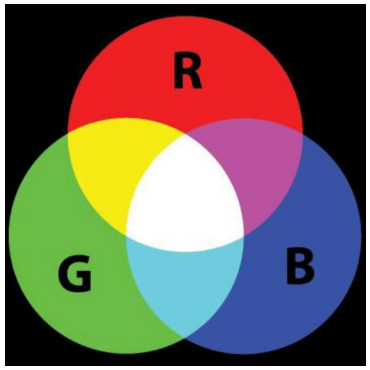
Color Models

- A color model is an orderly system for creating a whole range of colors from a small set of primary colors.
- There are two types of color models:
  - Subtractive color models
  - Additive color models

Additive color models

- **Additive Color**
  - Additive color synthesis is the creation of color by mixing colors of *light*.

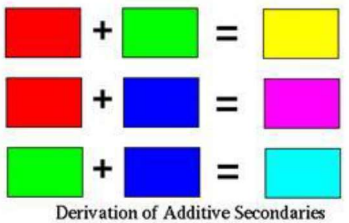
  The **Additive**, or **light** theory deals with radiated and filtered light.
- **The additive color model (RGB)**
  - RGB stands for red, green, and blue, and is based on the additive color model of light waves that dictates that the more color you add, the closer the color gets to white.
  - The RGB color model forms the basis of all electronic screens, and as a result, is the model used most often by UI designers.



Additive Color ….

Red + Green = Yellow
Red + Blue = Magenta
Green + Blue = Cyan
Printers' primaries—yellow, cyan, and magenta—
are typically used by professional designers and printing presses .

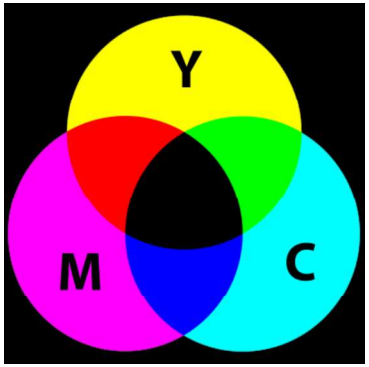
When all of the colors of the spectrum are combined, they add up to white light.
2 parts Red + 1 part Green = Orange
2 parts Green + 1 part Red = Lime
4 parts Red + 1 part Blue + 1 part Green = Brown



Derivation of Additive Secondaries from Additive Primary Colors.

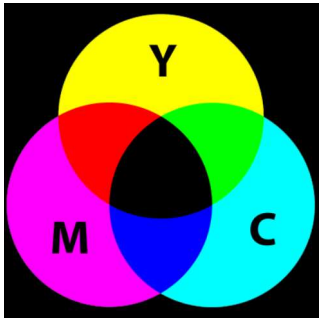
Subtractive color

- **The subtractive color model (CMYK)**
  CMYK is known as the subtractive color model, which obtains colors by the subtraction of light. CMYK stands for cyan, magenta, yellow, and black, and it is mostly used in physical printing.
- Subtractive color synthesis is the creation of color by mixing colors of *pigment,* such as paint or ink in your computer's printer.
- This type of color is what is used in the art and design world. When learning basic color theory, art students typically use familiar colors like red, yellow, and blue.

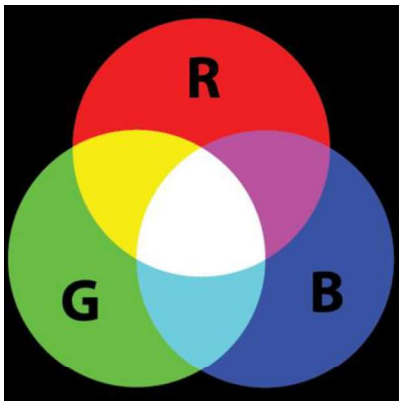


Subtractive Theory

- Black absorbs most light
- White reflects most light
- Coloured Pigments absorb light and reflect only the frequency of the pigment colour.
- All colours other than the pigment colours are absorbed so this is called subtractive colour theory.
- The primary colours in Subtractive Theory are:
  - Cyan (C)
  - Magenta (M)
  - Yellow (Y)
  - Black (K)
- Subtractive or Pigment Theory is used in printing and painting.



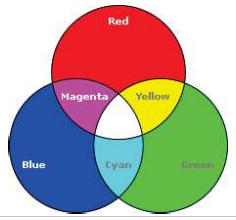
Additive Theory (RGB color model)

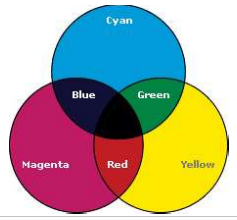


- Black radiates no light
- White (sun) radiates all light
- Video is the process of capturing and radiating light, therefore it uses Additive (Light) Theory not Subtractive (Pigment) Theory.
- The primary colours in Additive Theory are:
  - Red (R)
  - Green (G)
  - Blue (B)
- The primary colours add together to make white
- Light Theory is also called Additive Theory.
- Light Theory is used in Television, theater lighting, computer monitors, and video production.

RGB vs CMYK

RGB Color Model	CMYK Color Model
Additive color model	Subtractive color model
For computer displays	For printed material
Uses light to display color	Uses ink to display color
Colors result from transmitted light	Colors result from reflected light
Red + Green + Blue = White	Cyan + Magenta + Yellow = Black





Introduction to color palettes

- A color palette is the range of colors that can be displayed on a device screen or other interface, or. in some cases, a collection of colors and tools for use in paint and. illustration programs
- A color palette is a combination of colors used by UI designers when designing an interface.
- When used correctly, color palettes form the visual foundation of your brand, help to maintain consistency, and make your user interface aesthetically pleasing and enjoyable to use.
- color palettes are commonly used in digital design, presented as a combination of HEX codes.

HEX codes:

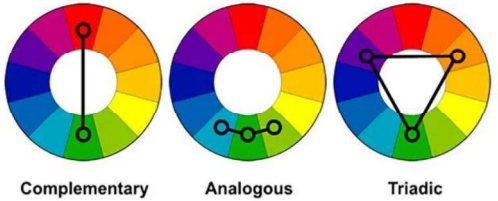
#XXXXXX

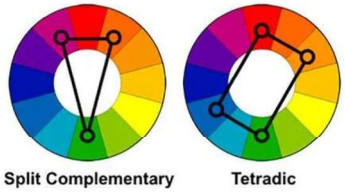
#FF0000	#00FF00	#0000FF

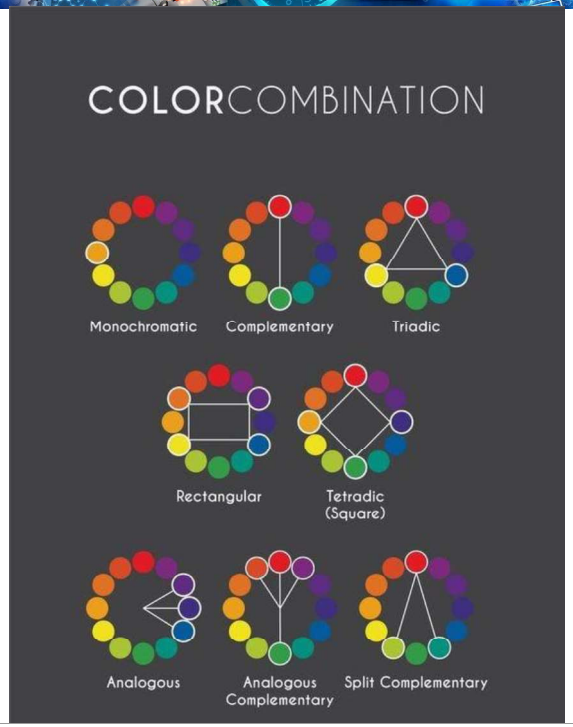
Online Color picker: https://htmlcolorcodes.com/

What are the different types of color palettes?

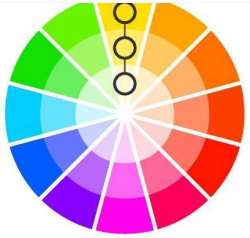
- Colors can be combined to form one of five color palettes that are commonly used by UI designers







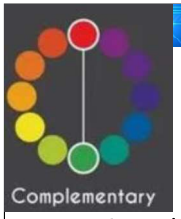
Monochromatic



- Monochromatic color refers to **a color scheme that is comprised of variations of one color**.
- A monochromatic color scheme is one constructed of various hues, values, and intensities of a single color
- For example, the global brand Coca-Cola famously uses a monochromatic red color scheme.
- This particular color scheme is extremely versatile and has good impact aesthetically.

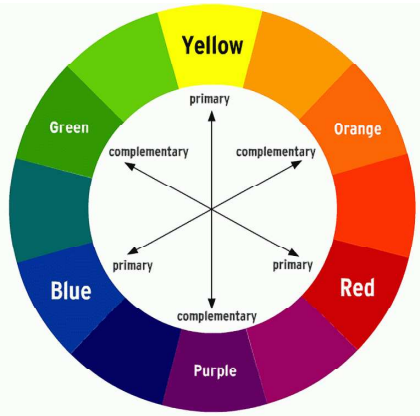
Analogous

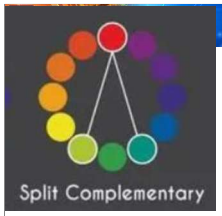
- An analogous color scheme is formed of three colors that are located next to each other on the color wheel.
- This type of color scheme is often seen in nature and looks cohesive due to the relatively close shades included.
- Analogous color palettes are commonly used when no contrast is needed—for example, on the background of web pages or banners.
- great way to add subtle touches to a design



Complementary

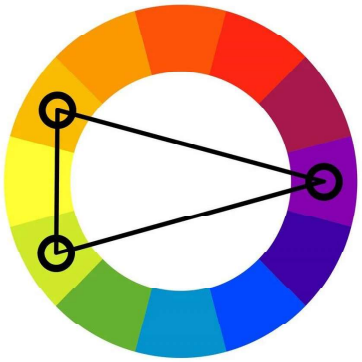
- Complementary color palettes are comprised of colors that are placed in front of each other on the color wheel (opposite colors).
- While the name may suggest otherwise, complementary color palettes are actually the opposite of analogous and monochromatic color palettes, as they aim to produce contrast.
- For example, a red button on a blue background will stand out on any interface.
- This type of color scheme is commonly used for high-impact designs and to draw attention to key elements.





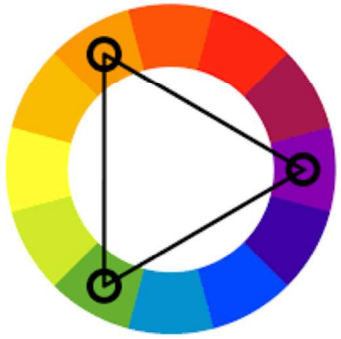
Split-complementary

- The split-complementary color palette differs from the complementary color palette only in that it employs a higher number of colors.
- For example, if you choose the color blue, you'll then need to take the two colors that are adjacent to its opposite color, which in this case would be yellow and red.
- This color scheme is great for subtle yet elegant designs, as the extra color helps to break up the intense contrast of the two main colors.



Triadic

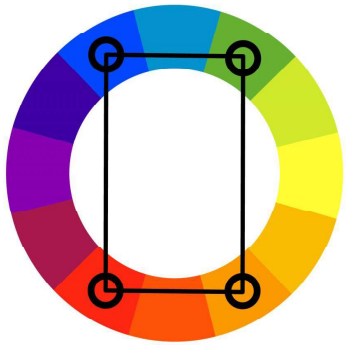
- The triadic color scheme is based on three separate colors that are equidistant on the color wheel.
- Most designers employ the triadic color scheme by choosing one dominant color, and using the other two colors as accents.
- This type of color scheme is best used for attention-grabbing designs that require strong yet equally represented colors.



Tetradic

(double complementary/rectangular)

- Commonly used by more experienced designers, the tetradic color scheme employs two sets of complementary pairs—four colors from the color wheel in total that should form a rectangle when connected.
- While it's a little harder to balance, it makes for a visually stunning end effect!
- very aggressive color scheme, needing very good planning and very emotional approach to relations of these colors.



Tetradic

(double complementary/rectangular)

- always vibrant, scared and colorful, there is equal tension between all colors
- Google, Microsoft, eBay (and some other corporate companies) use tetradic colors in their logos. Colorful palettes create a sense of openness, diversity and optimism, which are positive for a consumer brand.

How to choose a color palette

1. Research your audience
2. Consider color psychology
3. Choose your colors wisely
4. Don't skimp on contrast
5. Stick to UI conventions
6. Get feedback

The best tools for choosing a color palette

- Below, we've rounded up the three best tools for generating online color palettes.
  - Adobe Color
  - Coolors
  - Adobe Illustrator color guide

The Psychology of Color

- It’s important to remember that color is not only aesthetically pleasing; it also has an influence on human psychology.
- Colors have the ability to evoke different emotions, create a vibe, and even alter someone’s attitude or perception. That’s why it’s essential to choose the right color scheme for your design.
- For example, many studies have found that the color blue is linked to feelings of calmness, stability, and trustworthiness, while the color yellow is associated with joy and optimism. On the other hand, red often implies energy and excitement and green often conveys a sense of health and vitality.

Understanding Color Theory in Design

- A deep understanding of color theory is essential for effective design not only look great, but also evoke a certain feeling or emotion in the viewer.
- Color plays a big role in marketing and branding and can influence emotions, preferences, and even behavior.
- Get familiar with the color wheel, as well as the different color schemes and their impact on the psychology of color.
- With enough practice, you’ll be able to make your designs stand out with a mastery of color theory.

Evolving Technologies for Rich Interaction

Compiled by: M.N.M. SHAKOOR

Agenda

1. What is "Rich Interaction"?
2. The role of technology for text, audio and video-based input and output

Interaction

- Human-to-Human : Interaction is therefore a process of information transfer.
- Human-to-Computer : Interaction is a process of information transfer, from the user to the computer and from the computer to the user.

Batch to real time processing

- At very first, things are started with batch processing. Those days, people had to work with very slow output devices and they had to wait hours even days.
  - **Batch processing** - Slow output and delayed feedback (Ex: punch card, Line printer)
- But nowadays, we are not willing to wait even 5 seconds. Now we love to work with rapid feedback. Oh, now we have real time processing.
  - **Real time processing** - Fast output and rapid feedback (today most of the time)

Batch to real time processing

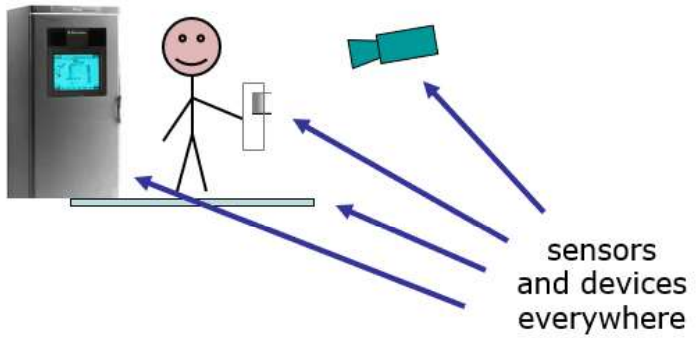
- Consider following well known examples.
  - Ex1: When you send a letter to a friend in your hometown, you will have to wait for his reply (few days)
  - Ex2: When you make a call to your friend, you will hear his reply in the next few seconds
- Now you can realize that real time processing is better than batch. But, there are some occasion we have to do in batch type.

Interaction

1. Traditional Computing and Traditional interaction
   - Traditional computing uses direct input mechanism like keyboard and mouse
   - Most of the input methods like keyboards and mice are not intuitive (intuitive mean, based on the felling rather than direct command) and also require direct touches on the machine.
2. Perceptual Computing and Rich interaction
   - Perceptual computing is a technology that uses voice commands, facial recognition, and gesture controls to interact with a computer
   - The computer and the applications "perceive" the user's intentions based on the sensor data it collects.

Rich Interaction

Rich Interaction



Rich Interaction

- In rich interaction, we are most concentrating on devices or systems which are very intelligent and make decisions without the help of humans.
- So, for rich interaction, systems need various types of sensors to collect information form users

Sensor based system

- Systems which uses sensors to gain data form user is commonly known as sensor-based system.
- More sensors mean more accurate data.
- Some sensor-based systems may employ quite simple sensors, for example the door open/closed sensor for car courtesy lights.
- In the sensor based system, the sensors may have to somehow filter or pre-process their outputs before passing on their data.
- Finally, almost all the devices you that comes today are based on sensors.
- There is no rich interaction without sensors.

1. What sensors will do?
   - Sensors can convert a physical signal into an electrical signal that can be manipulated symbolically on the computer.
2. Today many devices like tablets and handheld devices incorporate a wide range of hardware sensors. These sensors enable
   - High definition image processing,
   - Audio processing, motion detection,
   - Environmental conditions detection,
   - Geographical and proximity location detection, and many more……

- Some of the sensors used by modern smart phone are listed below with their basic duties.
  - Proximity sensor – identify nearby object
  - Accelerometer – determine acceleration (based on pressure on crystal censors)
  - Gyroscope – determine orientation (based on Earth's gravity)
  - Magnetometer – measures magnetic fields
  - Barometer – measure air pressure
  - Light sensor – measure light intensity
  - NFC (Near field communication) sensor – create p2p short range RFID communication
  - Figure print sensor – catch finger print

- Simple Rich Interaction in a System (Smart Phone)
  - When you take call at the moment you bring the phone near to your ear the screen automatically turns off.
  - It is done using a very simple sensor called Proximity sensor. Hence, the interaction between the device and the user is rich.
  - User feels it is comfortable that the screen won't be touched during a call.
  - So, the role of the sensor is to take the input whether there is any object close to the phone. If it is true, the OS turns off the screen.

Direct and indirect input devices

- Direct devices have no intermediary; the movement of the body equals the input to the machine
- Examples of direct devices are keyboard, touch screens, light pens, and voice recognition systems.
- Direct devices do not require conscious mental translation; the movement effort matches the display distance

Direct and indirect input devices

- Indirect devices translate some action of the human body into data.
- Examples include a computer mouse, a rotary encoder (containing a knob for movement and a button for activation), or a joystick.

Text based input devices

Keyboards

- Most common text input device
- Allows rapid entry of text by experienced users
- Keypress closes connection, causing a character code to be sent
- Usually connected by cable, but can be wireless

Keyboards

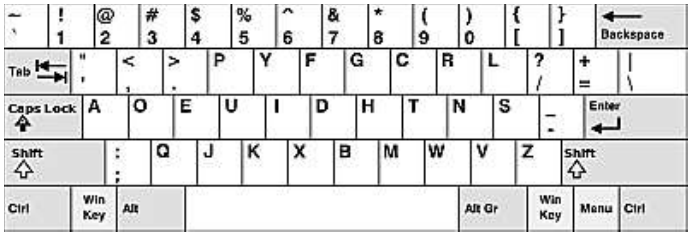
- There are three main keyboard layouts available
  1. QWERTY
  2. Alphabetic
  3. Dvorak

Keyboards

- This is the standardized layout
- But
  1. QWERTY arrangement not optimal for typing
  2. Non – alphanumeric keys are placed differently
  3. Accented symbols needed for different scripts
  4. Minor differences in between UK and USA keyboards

- Alphabetic
  1. Keys arranged in alphabetic order
  2. Not faster for trained typists
  3. Not faster for beginners either!
  4. Used in some pocket electronic personal organizers some keyboard

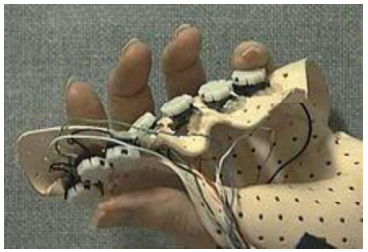
- Dvorak
  1. Common letters under dominant fingers
  2. Biased towards right hand
  3. Common combinations of letters alternate between hands
  4. 10-15% improvement in speed and reduction in fatigue
  5. But, large social base of QWERTY typist produces market pressures not to change



Special keyboards

✓**Chorded keyboard** (chorded keyset, chord keyboard or chording keyboard)

- keyset or chorded keyboard is a computer input device that allows the user to enter characters or commands formed by pressing several keys together, like playing a "chord" on a piano
  - Only has few keys (4 or 5)
  - Letters typed as combination of keypresses
  - Compact size (ideal for portable applications)
  - Short learning time (keypresses reflect letter shape)
  - Fast (once you have trained)

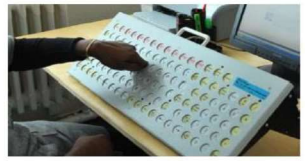


Have you ever seen this type of keyboards?

Head or mouth stick keyboard

Natural shape keyboard

Finger Friendly flat keyboard



Expanded keyboard

Numeric keypads

- Number keypads occur in various contexts including calculators, telephones and ATM cash dispensers

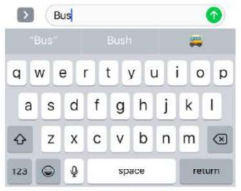
Calculator


ATM


Phone

Virtual key board

- A virtual keyboard is a software component that allows a user to enter characters.
- A virtual keyboard can usually be operated with multiple input devices, which may include a touch screen, an actual keyboard and a computer mouse.
- Try "OSK" Run command on windows.



Virtual key board – on IOS 10


Virtual key board – VK200 KeyFob

The VK200 KEYFOB® projects a keyboard on any flat surface. You can type away accompanied by simulated keyboard sound feedback with its built-in display screen showing your key presses in real time for faster typing. With 78 keys and a full size QWERTY layout the laser virtual keyboard approaches typing speeds of a standard keyboard.

Handwriting recognition

- The translation of handwritings into digital format
  - obtain data about handwritings and interpret understandable handwritten input from sources
  - such as paper documents, photographs, touch-screens and other devices.

➢There are Two types of handwriting recognition

1. Online (Real Time) Recognition (on PDA or smart phone)
2. Offline Recognition (OCR Technology)

Pointing and touch sensitive devices

Pointing and touch sensitive devices

- Pointing devices allow the user to point, position and select items, either directly or by manipulating a pointer on the screen.

1. Mouse
   - Handheld pointing device
     - ✓ very common
     - ✓ easy to use
   - Two characteristics
     - ✓ planar movement
     - ✓ buttons

   (usually from 1 to 3 buttons on top, used for making a selection, indicating an option, or to initiate drawing etc.)

- Two methods for detecting motion

1. Mechanical
   - Ball on underside of mouse turns as mouse is moved
   - Rotates orthogonal potentiometers
   - Can be used on almost any flat surface
2. Optical
   - light emitting diode on underside of mouse
   - may use special grid like pad or just on desk
   - less susceptible to dust and dirt
   - detects fluctuating alterations in reflected light intensity to calculate relative motion in (x, z) plane

Even by foot …

- Although most mice are hand operated, not all are – there have been experiments with a device called the foot mouse.
- As the name implies, it is a foot-operated device. This kind of mouse is not very common but common in
  - ✓ Car pedals
  - ✓ Sewing machine speed control
  - ✓ Organ and piano pedals

Touch pad

- Touchpads are touch-sensitive tablets usually around 2–3 inches (50–75 mm) square.
- 'stroke' to move mouse pointer
- used mainly in laptop computers
- good 'acceleration' settings important
  - ➢ fast stroke
    - ✓ lots of pixels per inch moved
    - ✓ initial movement to the target
  - ➢ slow stroke
    - ✓ less pixels per inch
    - ✓ for accurate positioning

Trackball

- The trackball is really just an upside-down mouse!
- A weighted ball faces upwards and is rotated inside a static housing, the motion being detected in the same way as for a mechanical mouse, and the relative motion of the ball moves the cursor.
- Because of this, the trackball requires no additional space in which to operate, and is therefore a very compact device. Trackballs used in some portable and notebook computers

Joystick

- Joystick is an indirect input device with which movements of the stick cause a corresponding movement of the screen cursor.
- Often used for computer games aircraft controls and 3D navigation.
- There are two types of joystick: the **absolute** and the **isometric**.

Keyboard nipple

- Its look like a miniature joystick in the middle of the keyboard and act as a tiny isometric joystick.
- It is usually difficult for novices to use
- Like the joystick, the nipple controls the rate of movement across the screen

Touch screen

- Touchscreens are another method of allowing the user to point and select objects on the screen, but they are much more direct than the mouse, as they detect the presence of the user's finger, or a stylus, on the screen itself.
- Because the user indicates exactly which item is required by pointing to it, no mapping is required and therefore this is a direct device.
- Advantage
  - ✓ Fast, and requires no specialized pointer
  - ✓ Good for menu selection
  - ✓ Suitable for use in hostile environment: clean and safe from damage
- Disadvantages
  - ✓ Finger can mark screen
  - ✓ Imprecise (finger is a fairly blunt instrument!)
  - ✓ Difficult to select small regions or perform accurate drawing
  - ✓ Lifting arm can be tiring

Stylus and Light pen

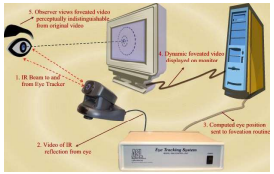
1. Stylus
   - Very direct and obvious to use
   - Small pen-like pointer to draw directly on screen
   - May use touch sensitive surface or magnetic detection
   - Used in PDA, tablets PCs and drawing tables
   - But can obscure screen
2. Light pen
   - Very direct and obvious to use
   - Suitable for non-sensitive screens
   - Uses light from screen to detect location
   - Now rarely used
   - But can obscure screen

Digitizing tablet

- The digitizing tablet is a more specialized device typically used for freehand drawing, but may also be used as a mouse substitute.
- This is an indirect device since there is a mapping from the plane of operation of the tablet to the screen.
- Various kind of technologies are used by digitizing tablet.
  1. The resistive tablet
  2. The magnetic tablet
  3. The sonic tablet

Eye gaze technology

- Allows to control the computer by simply looking at it!
- Some systems require you to wear special glasses or a small head-mounted box, others are built into the screen or sit as a small box below the screen.
  - ✓Control interface by eye gaze direction
  - ✓Uses special type camera and uses laser beam (very low power!) reflected off retina
  - ✓Eye gaze is a very fast and accurate device, but the more accurate versions can be expensive.
  - ✓For high accuracy requires headset
  - ➢Ex: Google glass



Discrete positioning controls

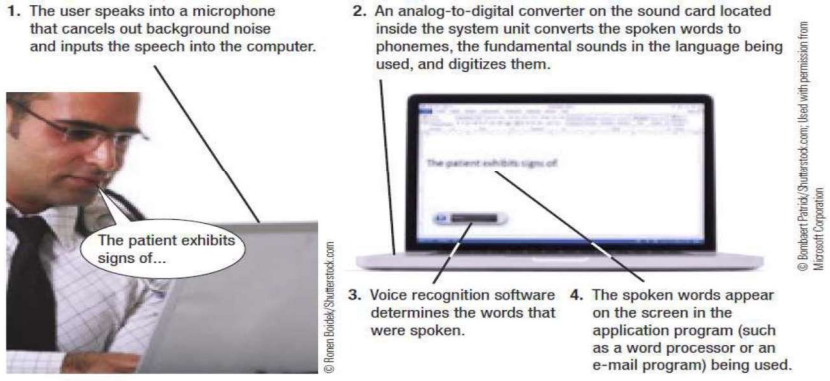
- Small devices such as mobile phones, television remote controls often require discrete control,
  - either dedicated to a particular function such as volume, or for use as general menu selection.
- You may see some mobile phone has a single central joystick-like device.
- This can be pushed left/right, up/down to navigate within the small 3 × 3 array of graphical icons as well as select from text menus.

Audio based input devices

Audio Based Input Devices

- Audio input devices records the analog sound convert it into digital form for further processing.
- Ex:
  - ✓Microphone
  - ✓Music Instrument

Microphone



Music Input Systems

- Used to input music
  - Existing music can be input using CDs or a Web download
  - For original compositions, microphones, keyboard controllers, and guitar controllers can be used to input music

Music input systems. Musicians can input original compositions into a computer via microphones, MIDI keyboards and guitars, and other devices.

Video based input devices

Video Based Input Devices

- Video input devices are used to entering full motion video recording into a computer.
- Also stores the video on a hard disk or other medium.
- Ex:
  - ✓Digital Video Cameras
  - ✓Camera (Web Cam)

1. Digital Video Cameras
   - Digital Video Cameras can store sequence of digital images on magnetic tape, memory stick, DVDs or HDD inbuilt in the camera.
   - Can be directly used as a video input device to record videos in the computer system or recorded videos can be imported in the system with required software and hardware.

2. Camera (Web Cam)
   - Web cams are small video cameras designed to sit on the top of the monitor.
   - It directly feeds in the video input to the computer through USB port.
   - Web cams are generally used for the purpose of video conferencing over the Internet or recording small video lectures.
   - The video quality of web cams are not as good as digital camcorders.
   - Many laptops are now coming with inbuilt web cams.

Output Devices

Output Devices

- A hardware component capable of conveying information to the user.
- Ex of output devices:
  1. Monitors
  2. Printers
  3. Multimedia Projectors
  4. Audio-output systems

Monitors

- Monitor is a TV like device that display information.
- It can display text as well as graphic images in a color or black & white while based on the monitor type.
- Monitors are classified on the basis of color and signals.
  1. Based on color
     1) Monochrome
     2) Gray scale
     3) Multi color
  2. Based on signal
     1) Digital
     2) Analog

Based on Color

- Monochrome – It display two colors, one on the foreground and one on the background. The colors can be black and white, green and black or amber and black.
- Gray scale – Special type of monochrome monitor capable of displaying different shades of gray.
- Multi color – They are called RGB monitors, they accept three separate signals Red, Green and Blue. A multi color monitor can display any color.

Based on Signal

1) Digital monitor – It accepts digital signals rather than analog. Digital monitors are fast and produce clear images.

   ✓Ex: LCD Monitor, LED Display

2) Analog monitor – This is the traditional type of color display that has been used for years in television. In reality all monitors based on CRT technology are analog. The monitor consumes much space.

Printers

- Printer is a peripheral which makes a persistent human readable representation of graphics or text on paper or similar physical media.
- Types of Printer:
  1. Impact printer
  2. Non impact printer

Impact Printers

- Impact printers use the typewriter approach of physically striking a typeface against the paper and inked ribbon. Impact printers can print a character or an entire line at a time. Impact printers are low-cost printers useful for bulk printing.

✓ Ex:

1. Dot matrix printers
2. Daisy wheel printers
3. Drum printers

Dot matrix Printer

- Dot Matrix Printers print one character at a time.
- It creates dots that form characters & graphics when tiny ink strike an inked ribbon.
- They can print only in black and white.
- Commonly used in payroll and accounting.
- Disadvantage is: Printer quality and loud noise during processing.

Daisy Wheel Printers

- Daisy Wheel Printers print one character at a time.
- They produce letter quality document which is better than a dot matrix printer.
- The print head of the printer is like a daisy flower, hence the name.
- These printers are slow, can only print text (not graphics), and are costly in comparison to dot matrix printers.

Drum printers

- Drum Printers are line printers.
- They are expensive and faster than character printers but produce a low quality output.
- They can print 200–2500 lines per minute.
- Drum printers are generally used for voluminous print outputs.

Non-Impact Printers

- Printers do not hit or impact a ribbon to print.
- They use electro-static chemicals and ink-jet technologies.
- Non-impact printers are faster and quieter than impact printers.
- They produce high quality output and can be used for printing text and graphics both in black and white, and color.
  - ✓ Ex:
    1. Ink-jet printers
    2. Laser printers

Ink-Jet printers

- Ink-jet Printers spray ink drops directly on the paper like a jet.
- They produce high quality graphics and text.
- Ink-jet printers are commonly found in homes and offices.
- Disadvantages:
  1. The page per printing cost of these printers is very high.
  2. They cannot take multiple carbon copies.

Laser printers

- Laser printer utilizes a laser beam to produce an image.
- Laser Printers provide highest quality of text and graphics printing.
- Laser printers process and store the entire page before printing and are also known as page printers.
- They are faster and expensive than impact printers. Laser printers are used in applications requiring high quality voluminous printing.

Projector

- A projector is a device that enables an image or video and reproduce them onto a screen, wall, or other surface.
- These devices are commonly used in meetings and presentations as they allow for a large image to be shown so everyone in a room can seen.
- Types of Projectors:
    1. Liquid Crystal Display (LCD) projectors
    2. Digital Light Processing (DLP) projectors

Audio-output systems

- Any device that attaches to computer of playing sound such as music or speech.
- Sound cards enable the computer output sound through speakers.
- Speakers are required to listen to music and video CD/DVD sound.
- Some monitors have built in speakers.
- Types of audio output device:
    1. Speakers
    2. Headphones
    3. Sound Card

HNDIT HNDIT2052

Principles of User Interface Design

Lecture 04: Design Principles: Typography

Typography

- Typography is the design of arranging text and modifying letters (type glyphs)
- Typography is so much more than choosing a nice font for your website or app
- Typography is all about using typefaces and fonts in a way that makes the copy legible, clear, and enjoyable to read.
- Typography involves font style, appearance, and structure, aiming to elicit certain emotions and convey specific messages to the end-user.

Why typography is important

- 95% of the information on the web is written language.
  - "Oliver reichenstein, 2006"

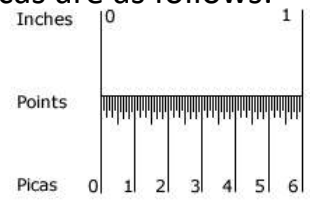
Why typography is important

- Ensure the visual balance of the website or app
- (it's the job of the UI designer to optimize the website's accessibility by keeping the typography highly readable.)
- Reflect personality and looks professional
- Helps to be consistent
- Hold the attention of the readers by being impactful and memorable.
- Set the right tone and create context
  - influence decision making by observing how users digest and perceive the information conveyed by the text

Type Measurements (Points and Picas)

- **Points:**
  - Points are very small units to measure both type size and the size of the space between lines of type.
  - Typography's point measurement system was derived from handsetting type back in the fifteenth century.
- **Picas:**
  - **Picas** are larger units used to measure lines of type.
- The measurements for Points and Picas are as follows:

12 Points = 1 Pica
6 Picas = 1 inch



Typography basics

- Typeface
- Font
- Classification
- Anatomy

Typeface

- The overall appearance of a family of fonts

Times New Roman
Times New Roman Italic
Times New Roman Bold
Times New Roman Bold Italic

Myriad Pro Light
Myriad Pro Light Italic
Myriad Pro Regular
Myriad Pro Italic
Myriad Pro Bold
Myriad Pro Bold Italic
Myriad Pro Condensed
Myriad Pro Condensed Italic
Myriad Pro Semibold
Myriad Pro Bold SemiExtended

Helvetica Neue 25 Ultra Light
Helvetica Neue 35 Thin
Helvetica Neue 45 Light
Helvetica Neue 55 Roman
Helvetica Neue 65 Medium
Helvetica Neue 75 Bold
Helvetica Neue 85 Heavy
Helvetica Neue 95 Black

Font

- A specific file (digital file) of that family

Times New Roman
Times New Roman Italic
Times New Roman Bold
Times New Roman Bold Italic

Times new roman font-family includes 04 fonts here

Classification
(Types of Fontfaces/typeface)

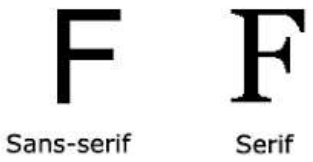
- There are five basic classifications of typefaces:
  - **Serif**
  - **Sans serif**
  - Script
  - Monospaced
  - Display

Types of Fontfaces

Generic family	Font family	Description
Serif	Times New Roman Georgia	Serif fonts have small lines at the ends on some characters
Sans-serif	Arial Verdana	"Sans" means without - these fonts do not have the lines at the ends of characters
Monospace	Courier New Lucida Console	All monospace characters have the same width

Serif & Sans-serif

- The difference between serif and sans serif fonts is the little decorative lines on the ends of the letters in serif fonts. Sans serif fonts do not have these extra lines, which is why they are called sans serif fonts since “sans” means without.



Serif & Sans-serif

Serif	Sans-serif
The go-to choice for print More legible	Better for digital interfaces

- As a general rule,
  - **serif** and **sans serif** typefaces are used for either body copy or headlines (including titles, logos, etc.)
  - **script** and **display** typefaces are only used for headlines.
  - **Monospaced** typefaces are *generally* used for displaying code, though they can also be used for body and headline copy, and were originally used on typewriters.

- Words are purposeful collections of letters
  - Letters combine to create words.
  - A word is a language unit.
  - Words are semiotic in that they are a collection of abstract symbolic glyphs whose meaning must be learned.
  - A word can have multiple meanings.

- Words have syllables
  - Syllables are word sound parts (pronounced components)
  - For example, typography is spoken as ty POG ra phy. This represents four syllables and one or more may have spoken emphasis
  - When a word is broken at the end of a line, it can be split up from one line to the next using a hyphen at a syllable break:

    The digital era is liberating **typog_raphy** because now the imaginable is implementable.

- Words are separated by **horizontal space** and lines of words are separated by **vertical space (line space/leading).**
- Horizontal word space is usually slightly more than the width of a lower case letter i.

Words contained by margins

- There are four main kinds of left and right margin justifications affecting word space.
  - Flush left
  - Centered
  - Flush right
  - Justified

JUSTIFIED

This is dummy copy. You're not really supposed to read dummy copy, it is just a place holder for people who need some type to visualize what the actual copy might look like if it were real content. If you want to read, I might suggest a good book, perhaps Hemingway or Melville. That's why they call it dummy copy. This is dummy copy. You're not really supposed to read dummy copy, it is just a place holder for people who need some type to visualize what the actual copy might look like if it were real content.

FLUSH LEFT

This is dummy copy. You're not really supposed to read dummy copy, it is just a place holder for people who need some type to visualize what the actual copy might look like if it were real content. If you want to read, I might suggest a good book, perhaps Hemingway or Melville. That's why they call it dummy copy. This is dummy copy. You're not really supposed to read dummy copy, it is just a place holder for people who need some type to visualize what the actual copy might look like if it were real content.

FLUSH RIGHT

This is dummy copy. You're not really supposed to read dummy copy, it is just a place holder for people who need some type to visualize what the actual copy might look like if it were real content. If you want to read, I might suggest a good book, perhaps Hemingway or Melville. That's why they call it dummy copy. This is dummy copy. You're not really supposed to read dummy copy, it is just a place holder for people who need some type to visualize what the actual copy might look like if it were real content.

CENTERED

This is dummy copy. You're not really supposed to read dummy copy, it is just a place holder for people who need some type to visualize what the actual copy might look like if it were real content. If you want to read, I might suggest a good book, perhaps Hemingway or Melville. That's why they call it dummy copy. This is dummy copy. You're not really supposed to read dummy copy, it is just a place holder for people who need some type to visualize what the actual copy might look like if it were real content.

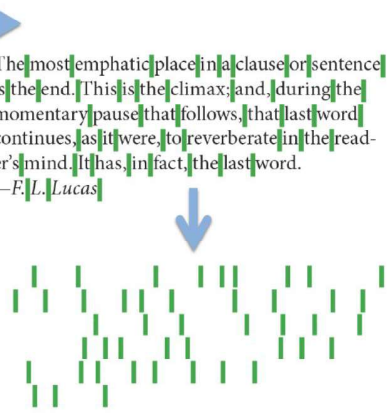
Words are separated

- It is desirable to have even word spacing for easier reading.
- Type set **flush left** (ragged right) may cause some lines to end shorter than the set width but the word space will remain consistent.
- When type is set **justified**, the word spacing increases or decreases to keep the margins flush left and flush right on every line.

Words are separated evenly with FL and FR

Flush Left
Even word space

The most emphatic place in a clause or sentence is the end. This is the climax; and, during the momentary pause that follows, that last word continues, as it were, to reverberate in the reader's mind. It has, in fact, the last word.
—*F. L. Lucas*



Word spaces are shown in green. These are all even.

Flush Left Paragraph Alignment

- The left side of the paragraph is straight (or flush) and the right side is called ragged.
- The great thing about this alignment is that the word spacing is even and rivers are eliminated.
- This alignment is great for narrow columns.
- This is greatly controlled by the overall width of the paragraph, the typeface choice, the type size and the use of small amounts of hyphenation (for large words only).

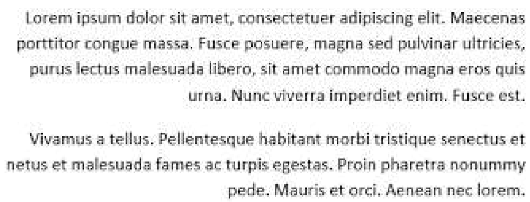
This is dummy copy. You're not really supposed to read dummy copy, it is just a place holder for people who need some type to visualize what the actual copy might look like if it were real content. If you want to read, I might suggest a good book, perhaps Hemingway or Melville. That's why they call it dummy copy. This is dummy copy. You're not really supposed to read dummy copy, it is just a place holder for people who need some type to visualize what the actual copy might look like if it were real content.

This is dummy copy. You're not really supposed to read dummy copy, it is just a place holder for people who need some type to visualize what the actual copy might look like if it were real content. If you want to read, I might suggest a good book, perhaps Hemingway or Melville. That's why they call it dummy copy. This is dummy copy. You're not really supposed to read dummy copy, it is just a place holder for people who need some type to visualize what the actual copy might look like if it were real content.

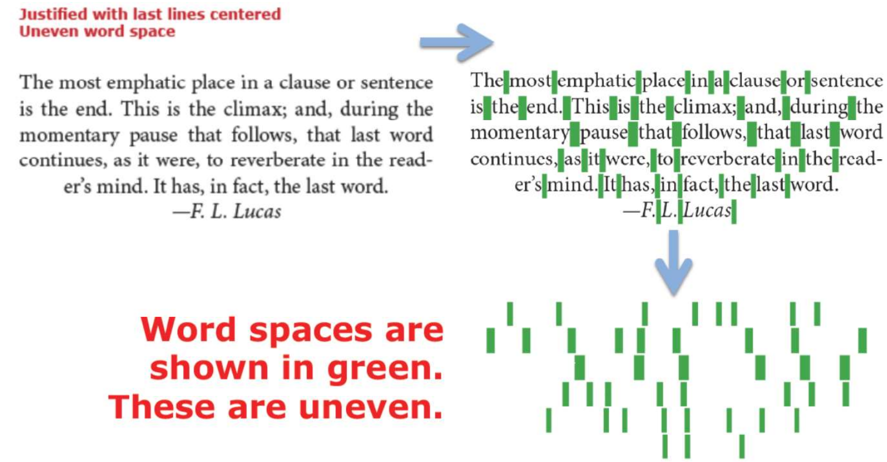
The rag should be between one-fifth and one-seventh the width of the paragraph.

Flush Right Paragraph Alignment

- This is opposite to the flush left alignment as the ragged edge appears on the left side of the paragraph and the straight (flush) edge on the right.
- Word spacing is even which eliminates rivers, there is a limited need for hyphenation and the ragged edge should look pleasing.
- However, this alignment is demanding to read as the reader is continually searching for the beginning of each line as this varies throughout the paragraph due to the ragged edge.
- It should therefore only be used for short amounts of copy such as image captions.



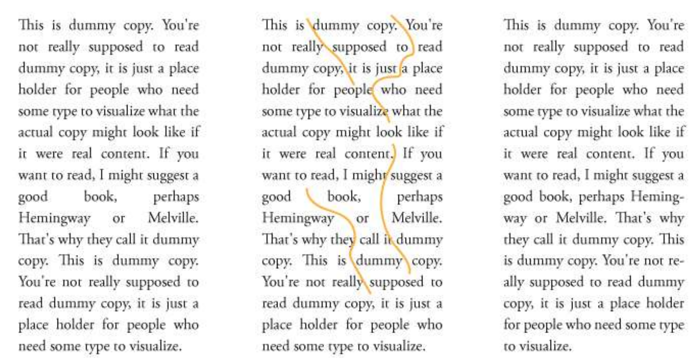
Words are separated unevenly with justified



Justified Paragraph Alignment

- To create the straight edges on each side of the paragraph requires the words to be unevenly spaced and this is where the main issue lies. When a line within a paragraph contains a number of large words, gaps of white space can appear.
- Furthermore, when these gaps appear over multiple lines we get what is described as "**white rivers**" running through the entire paragraph.
- Not only are these unsightly, they hinder readability.

- Rivers can be minimised in a number of ways.
  - Generally, the narrower the paragraph the more rivers will appear. Therefore, wider paragraphs will contain less rivers, but you don't want to go too wide as your reader will lose their place within the paragraph and end up reading the same line twice



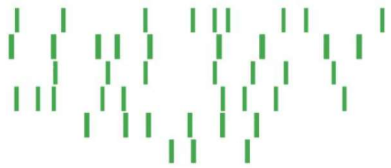
Left and Middle: Justified alignment can cause unsightly gaps within a paragraph called rivers.
Right: Hyphenation can reduce rivers.

Improved justified word spacing

The most emphatic place in a clause or sentence is the end. This is the climax; and, during the momentary pause that follows, that last word continues, as it were, to reverberate in the reader's mind. It has, in fact, the last word.
—*F. L. Lucas*

The most emphatic place in a clause or sentence is the end. This is the climax; and, during the momentary pause that follows, that last word continues, as it were, to reverberate in the reader's mind. It has, in fact, the last word.
—*F. L. Lucas*

Word spaces are shown in green. These are more even.



Words set as all caps are harder to read

THE MOST EMPHATIC PLACE IN A CLAUSE OR SENTENCE IS THE END. THIS IS THE CLIMAX; AND, DURING THE MOMENTARY PAUSE THAT FOLLOWS, THAT LAST WORD CONTINUES, AS IT WERE, TO REVERBERATE IN THE READER'S MIND. IT HAS, IN FACT, THE LAST WORD.
—*F. L. Lucas*

Words set as all caps are harder to read

- When text is set in only uppercase letters, it's commonly abbreviated as **all-caps**.
- It is best to keep it brief, such as for titles or emphasis.
- Don't use it for body text.
- If you have to use uppercase text within body text, consider using **small-caps**.
- Small caps are designed to feel more at home with the rest of the lowercase type and won't "shout" so much at the reader.

Small caps for quiet emphasis

The most emphatic place in a clause or sentence is the end. This is the climax; and, during the momentary pause that follows, that last word continues, as it were, to reverberate in the reader's mind. It has, in fact, the last word.
—*F. L. LUCAS*

Small caps

All-caps vs Small-caps

- VIDEO PROVIDES A POWERFUL WAY TO HELP YOU PROVE YOUR POINT. WHEN YOU CLICK ONLINE VIDEO, YOU CAN PASTE IN THE EMBED CODE FOR THE VIDEO YOU WANT TO ADD. YOU CAN ALSO TYPE A KEYWORD TO SEARCH ONLINE FOR THE VIDEO THAT BEST FITS YOUR DOCUMENT. VIDEO PROVIDES A POWERFUL WAY TO HELP YOU PROVE YOUR POINT.

All-caps

- Video provides a powerful way to help you prove your point. When you click Online Video, you can paste in the embed code for the video you want to add. You can also type a keyword to search online for the video that best fits your document.Video provides a powerful way to help you prove your point.

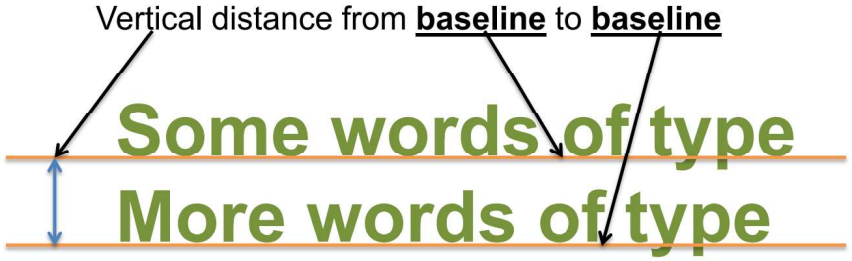
Small-caps

Typographical terms

- Leading/ Line space
- Ascenders and descenders
- Negative leading
- Kerning/ letter-spacing
- Tracking/ Word-spacing

Leading/ Line space

- Leading is the space between lines of type.
- It is generally measured from baseline to baseline and expressed in points.



Leading/ Line space

Good

Pellentesque habitant morbi tristique senectus et netus et malesuada fames ac turpis egestas. Vestibulum tortor quam, feugiat vitae, ultricies eget, tempor sit amet, ante. Donec eu libero sit amet quam egestas semper. Aenean ultricies mi vitae est. Mauris placerat eleifend leo.

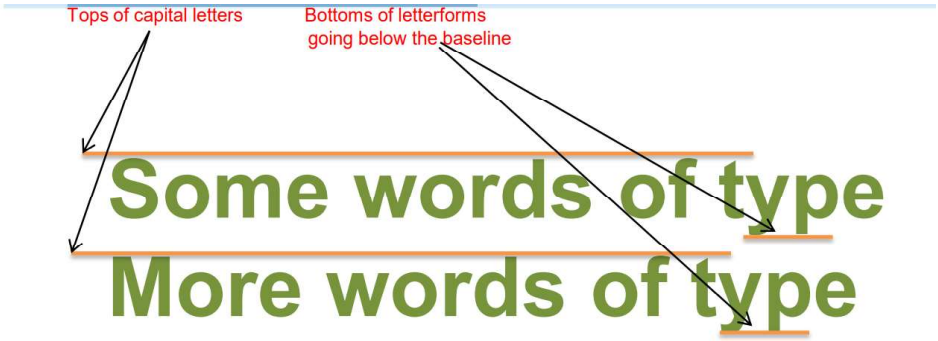
Bad

Pellentesque habitant morbi tristique senectus et netus et malesuada fames ac turpis egestas. Vestibulum tortor quam, feugiat vitae, ultricies eget, tempor sit amet, ante. Donec eu libero sit amet quam egestas semper. Aenean ultricies mi vitae est. Mauris placerat eleifend leo.

Bad

Pellentesque habitant morbi tristique senectus et netus et malesuada fames ac turpis egestas. Vestibulum tortor quam, feugiat vitae, ultricies eget, tempor sit amet, ante. Donec eu libero sit amet quam egestas semper. Aenean ultricies mi vitae est. Mauris placerat eleifend leo.

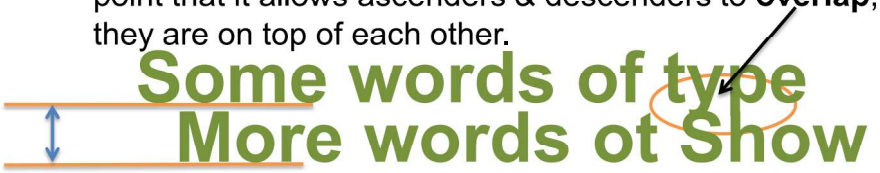
Ascenders and descenders



Vertical distance from baseline to baseline allows ascenders & descenders to just **touch**

Negative leading

Vertical distance from baseline to baseline decreased to the point that it allows ascenders & descenders to **overlap**, if they are on top of each other.



Negative leading

When there are all capital (upper case) letters the words can be set this way because they usually have no descenders to overlap with cap-height letters.

CAPITAL LETTERS
DON'T USUALLY
HAVE DESCENDERS

Negative leading

Too many words using negative leading impairs legibility

Upper and lower case letters have a tighter look set this way but avoid overlaps

Kerning /letters-pacing

- The adjustment of spacing of two particular characters to correct visually uneven spacing.
- Kerning is the adjustment of space between pairs of letters.
- Some pairs of letters create awkward spaces. Kerning adds or subtracts space between letters to create more visually appealing and readable text.
- Be applied to text to create special text effects for headlines, subheads, newsletter nameplates, and logos.

Tracking/ word-spacing

- The amount of space between a group of letters to affect density in a line or block of text.
- Adjustment of space for groups of letters and entire blocks of text.
- Use tracking to change the overall appearance and readability of the text, making it more open and airy or more dense.
- be applied to text to create special text effects for headlines, subheads, newsletter nameplates, and logos.
- Exaggerated tracking can produce an effective and eye-catching title. Extreme kerning or over-kerning creates special effects with tightly spaced or overlapping characters, perhaps for a newsletter nameplate.

Kerning VS Tracking

- **Kerning** and **Tracking** are two related and frequently confused typographical terms. Both refer to the adjustment of space between characters of type.
- Kerning and tracking can also be applied to text to create special text effects for headlines, subheads, newsletter nameplates, and logos.

Font File Formats

- **PostScript Type 1**
- **OpenType**
- **TrueType**

PostScript Type 1

- Adobe PostScript fonts launched the desktop publishing industry and are used today by publishers, corporations, and government agencies for high-quality output to laser printers, imagesetters, and platesetters.
- Each PostScript font requires two files, one for the screen and one for use by the printer's RIP (raster image processor).
- Mac OS X is the only operating system that provides native PostScript Type 1 font support.

OpenType.

- OpenType fonts (extension .otf) can contain 65,000 different glyphs, so type can be set in non-Roman languages such as Japanese, Chinese, and Korean. There are Macintosh- and Windows-specific OpenType formats; Mac OS X supports both.
- Font format developed by Adobe and Microsoft; combines aspects of PostScript and TrueType font formats; fully scalable, meaning the font can be resized without losing quality.

TrueType

- TrueType fonts (extension .ttf) are typically used in home and office environments.
- A single file contains both screen and printer font information.
- Font file format created by Apple, but used on both Macintosh and Windows platforms; can be resized to any size without losing quality; also looks the same when printed as it does on the screen.
- The TrueType font is the most common font format used by both Mac OS X and Windows platforms.

Typography in UID

- Good typography will :
  - Build brand recognition by subliminally encouraging your users to associate the typeface featured on your site with your brand
  - Influence decision making by observing how users digest and perceive the information conveyed by the text
  - Hold the attention of the readers by being impactful and memorable.

Choosing your fonts

- Focus on brand's personality, the product or service on offer, and the audience.
- Playing around too much with font styles should be avoided.
- Ensure your fonts are web browser friendly.

Typography

- Typography should blend seamlessly with the other elements in the interface and act as the glue that holds it all together. It should set the overall tone of the product, working in harmony with the rest of the graphics to create an **aesthetically pleasing overall visual balance.**

Activity

- What factors should be considered when selecting a typeface for a UI design?

Answer ?

HNDIT HNDIT2052

Principles of User Interface Design

Lecture 04: User-Centered Designing

What is User-Centered Design (UCD)

- A broad term to describe design processes in which end-users influence how a design takes shape.
- It is both a broad philosophy and variety of methods.
- An iterative design process in which designers focus on the users and their needs in each phase of the design process.

- There is a spectrum of ways in which users are involved in UCD but the important concept is that **users are involved one way or another.**
- For example, some types of UCD consult users about their needs and involve them at specific times during the design process; **typically during requirements gathering and usability testing.**
- At the opposite end of the spectrum there are UCD methods in which users have a deep impact on the design by being involved as partners with designers throughout the design process
- In other words, User-centered design (UCD) is an approach for employing usability.

- It is a structured product development methodology that involves users throughout all stages of product / software development, in order to create a Web Site OR Web Application OR Desktop Application that meets users' needs.
- This approach considers an organization's business objectives and the user's needs, limitations, and preferences.

How UCD Originated?

- The term ‘user-centered design’ originated in Donald Norman’s research laboratory at the University of California San Diego (UCSD) in the 1980s and became widely used after the publication of a co-authored book entitled: User-Centered System Design: New Perspectives on HumanComputer Interaction (Norman & Draper, 1986).

How UCD Originated?

- He offers four basic suggestions on how a design should be:
  - Make it easy to determine what actions are possible at any moment.
  - Make things visible, including the conceptual model of the system, the alternative actions, and the results of actions.
  - Make it easy to evaluate the current state of the system.
  - Follow natural mappings between intentions and the required actions; between actions and the resulting effect; and between the information that is visible and the interpretation of the system state.

How UCD Originated?

- These recommendations **place the user at the center of the design**.
- The role of the designer is to facilitate the task for the user and to make sure that the user is able to make use of the product as intended and with a minimum effort to learn how to use it.
- Telling designers that products should be intuitive is not enough; some design principles are needed to guide the design. Norman (1988) suggested that the seven principles of design are essential for facilitating the designer’s task

User-Centered Design

- Avoid bad Design, instead use UCD to make good designs

Which design is good?

Why it is good or bad?

USABILITY

GOLDEN RULES OF DESIGN FOR HCI

- A number of advocates of user-centered design have presented sets of '**golden rules**' or **heuristics**.
- While these are inevitably 'broad-brush' design rules, which may not be always be applicable to every situation, they do provide a useful checklist or summary of the essence of design advice.
- It is clear that any designer following even these simple rules will produce a better system than one who ignores them.
- There are many sets of heuristics, but the most well used are **Nielsen's ten heuristics**, **Shneiderman's eight golden rules** and **Norman's seven principles**.

Norman's seven principles

1. Use both knowledge in the world and knowledge in the head.
2. Simplify the structure of tasks.
3. Make things visible.
4. Get the mappings right.
5. Exploit the power of constraints, both natural and artificial.
6. Design for error.
7. When all else fails, standardize.

Use both knowledge in the world and knowledge in the head

- People work better when the knowledge they need to do a task is available externally – either explicitly or through the constraints imposed by the environment.
- But experts also need to be able to internalize regular tasks to increase their efficiency.
- So systems should provide the necessary knowledge within the environment and their operation should be transparent to support the user in building an appropriate mental model of what is going on.

Simplify the structure of tasks

- Tasks need to be simple in order to avoid complex problem solving and excessive memory load.
- There are a number of ways to simplify the structure of tasks.
  - One is to provide mental aids to help the user keep track of stages in a more complex task.
  - Another is to use technology to provide the user with more information about the task and better feedback.
  - A third approach is to automate the task or part of it, as long as this does not detract from the user's experience.
  - The final approach to simplification is to change the nature of the task so that it becomes something more simple.
- In all of this, it is important not to take control away from the user.

Make things visible

- Bridge the gulfs of execution and evaluation.
- The interface should make clear what the system can do and how this is achieved, and should enable the user to see clearly the effect of their actions on the system.

Get the mappings right.

- User *intentions* should map clearly onto system controls.
- User *actions* should map clearly onto system events.
- So it should be clear what does what and by how much.
- Controls, sliders and dials should reflect the task – so a small movement has a small effect and a large movement a large effect.

Exploit the power of constraints, both natural and artificial

- Constraints are things in the world that make it impossible to do anything but the correct action in the correct way.
- A simple example is a jigsaw puzzle, where the pieces only fit together in one way.

- Here the physical constraints of the design guide the user to complete the task.

Design for error

- To err is human, so anticipate the errors the user could make and design recovery into the system.

When all else fails, standardize

- If there are no natural mappings then arbitrary mappings should be standardized so that users only have to learn them once.
- It is this standardization principle that enables drivers to get into a new car and drive it with very little difficulty – key controls are standardized.
- Occasionally one might switch on the indicator lights instead of the windscreen wipers, but the critical controls (accelerator, brake, clutch, steering) are always the same.

Activity

- Identify application of Norman's seven principles in designing, in the login form you designed before.

Shneiderman's Eight Golden Rules of Interface Design

- Shneiderman's eight golden rules provide a convenient and succinct summary of the key principles of interface design.
- They are intended to be used during design but can also be applied, like Nielsen's heuristics, to the evaluation of systems.

Shneiderman's Eight Golden

1. Strive for Consistency.
2. Cater to Universal Usability.
3. Offer Informative feedback.
4. Design Dialogs to yield closure.
5. Prevent Errors.
6. Permit easy reversal of actions.
7. Support internal locus of control.
8. Reduce short term memory load.

1. Strive for Consistency.

- Strive for consistency in action sequences, layout, terminology, command use and so on.
- Utilize familiar icons, colors, menu hierarchy when designing similar situations and sequence of actions.
- This consistency will allow you to develop your identity and not lose users.

Few of Google products

2. Cater to Universal Usability.

- Enable frequent users to use shortcuts, such as abbreviations, special key sequences and macros, to perform regular, familiar actions more quickly.
- As the frequency of use increases, so do the user's desires to reduce the number of interactions and to increase the pace of interaction.
- Abbreviations, function keys, hidden commands, and macro facilities are very helpful to an expert user.
- For example, Windows provide users with keyboard shortcuts for copying and pasting, **ctrl+c** **ctrl+v**
- so as the user becomes more experienced, they can navigate and operate the user interface more quickly and effortlessly.

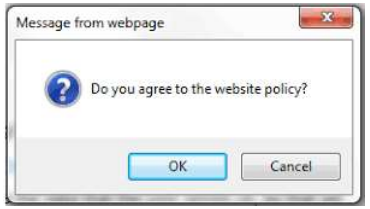
3. Offer Informative feedback.

- Offer informative feedback for every user action, at a level appropriate to the magnitude of the action.
- For every operator action, there should be some system feedback.
- For frequent and minor actions, the response can be modest, while for infrequent and major actions, the response should be more substantial.

3. Offer Informative feedback. (cont'd..)

- A bad example we often see is when an error message shows an error-code instead of a human-readable and meaningful message.

- Good examples

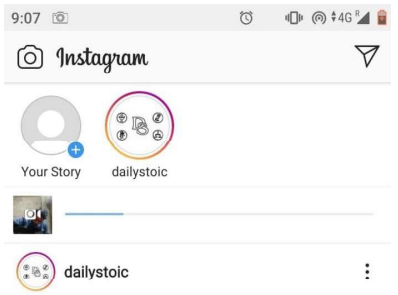


4. Design Dialogs to yield closure.

- Design dialogs to yield closure so that the user knows when they have completed a task.
- Sequences of actions should be organized into groups with a beginning, middle, and end.
- The informative feedback at the completion of a group of actions gives the operators the satisfaction of accomplishment, a sense of relief, the signal to drop contingency plans and options from their minds, and an indication that the way is clear to prepare for the next group of actions.

4. Design Dialogs to yield closure. (cont'd…)

- For example, e-commerce websites move users from selecting products to the checkout, ending with a clear confirmation page that completes the transaction.
- Another example



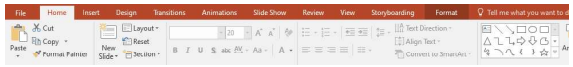
5. Prevent Errors.

- Offer error prevention and simple error handling so that, ideally, users are prevented from making mistakes and, if they do, they are offered clear and informative instructions to enable them to recover.
- As much as possible, design the system so the user cannot make a serious error.
- If an error is made, the system should be able to detect the error and offer simple, comprehensible mechanisms for handling the error.

5. Prevent Errors. (cont'd)

- Flag the text fields where the users forgot to provide input in an online form.

- Do not allow alphabetic characters in numeric entry fields
- Gray out menu items that are not appropriate

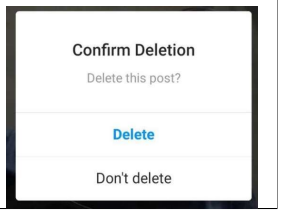


6. Permit easy reversal of actions.

- Permit easy reversal of actions in order to relieve anxiety and encourage exploration, since the user knows that he can always return to the previous state.
- The units of reversibility may be a single action, a data entry, or a complete group of actions.
- For example undo and redo options in Ms office sw

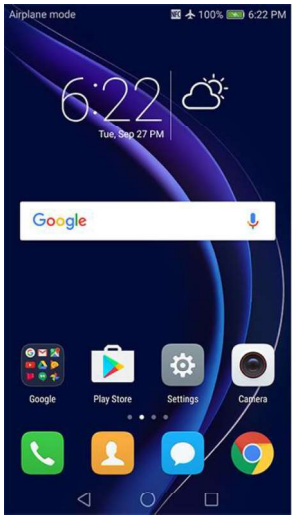
7. Support internal locus of control.

- Support internal locus of control so that the user is in control of the system, which responds to his actions.
- Experienced operators strongly desire the sense that they are in charge of the system and that the system responds to their actions.
- Design the system to make users the initiators of actions rather than the responders.
- Allow your users to be the initiators of actions. Allow your users to be the initiators of actions.



8. Reduce short term memory load.

- The limitation of human information processing in short-term memory requires that displays be kept simple, multiple page displays be consolidated, window-motion frequency be reduced, and sufficient training time be allotted for codes, mnemonics, and sequences of actions.
- The rule of thumb is that humans can remember “seven plus or minus two chunks” of information



Shneiderman’s Eight Golden

5. Offer error prevention and simple error handling so that, ideally, 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 in order to relieve anxiety and encourage exploration, since the user knows that he can always return to the previous state.
7. Support internal locus of control so that the user is in control of the system, which responds to his actions.
8. Reduce short-term memory load by keeping displays simple, consolidating multiple page displays and providing time for learning action sequences.

Activity 08

- Identify few human-centered applications and list which features make it human-centered.

BY: M.N.M SHAKOOR

INTERACTION MODELLING AND DESIGN

AGENDA

1. INTERACTION MODEL
2. TWO GULFS IN THE INTERACTION
3. IMPORTANCE OF ERGONOMICS
4. DIFFERENT INTERACTION STYLES AND PARADIGMS
5. WIMP COMPONENTS IN GUI DESIGN

INTERACTION MODEL

What is Interaction?

- Interaction involves at least two participants:
  - the user and the system.
- The interaction success depends on the interface translation.
- So, Interaction is communication.

User ⟷ System

Interaction Model

- The use of models of interaction
  - to understand exactly what is going on in the interaction
  - identify the likely root of difficulties.
  - provide us with a framework to compare different interaction styles and to consider interaction problems.

The terms of Interaction

- A domain –
  - defines an area of expertise and knowledge in some real-world activity.
    - Ex: graphic design
- Tasks –
  - operations to manipulate the concepts of a domain.
    - Ex: select fill tool, click over triangle
- A goal –
  - what you want to achieve
  - is the desired output from a performed task.
    - Ex: create a solid red triangle

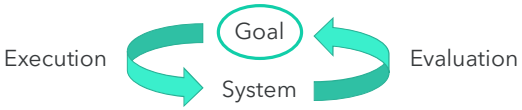
1. Execution
2. Evaluation

- The user formulates a plan of action, which is then executed at the computer interface.
- When the plan, or part of the plan, has been executed, the user observes the computer interface to evaluate the result of the executed plan, and to determine further actions.
- The interactive cycle can be divided into two major phases: **execution** and **evaluation**.
- These can then be subdivided into further stages, seven in all. The stages in Norman's model of interaction are as follows:

Donald Norman's Model

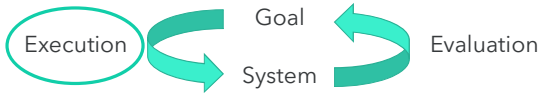
1. Establishing the goal.
2. Forming the intention.
3. Specifying the action sequence.
4. Executing the action.
5. Perceiving the system state.
6. Interpreting the system state.
7. Evaluating the system state with respect to the goals and intentions.

The execution–evaluation cycle



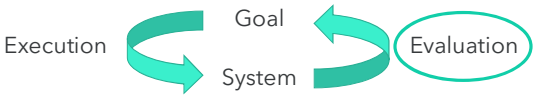
1. Establishing the goal.
2. Forming the intention.
3. Specifying the action sequence.
4. Executing the action.
5. Perceiving the system state.
6. Interpreting the system state.
7. Evaluating the system state with respect to the goals and intentions.

The execution–evaluation cycle



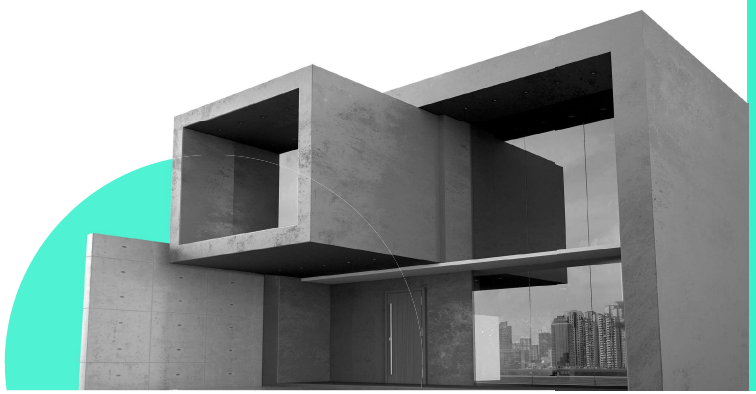
1. Establishing the goal.
2. Forming the intention.
3. Specifying the action sequence.
4. Executing the action.
5. Perceiving the system state.
6. Interpreting the system state.
7. Evaluating the system state with respect to the goals and intentions.

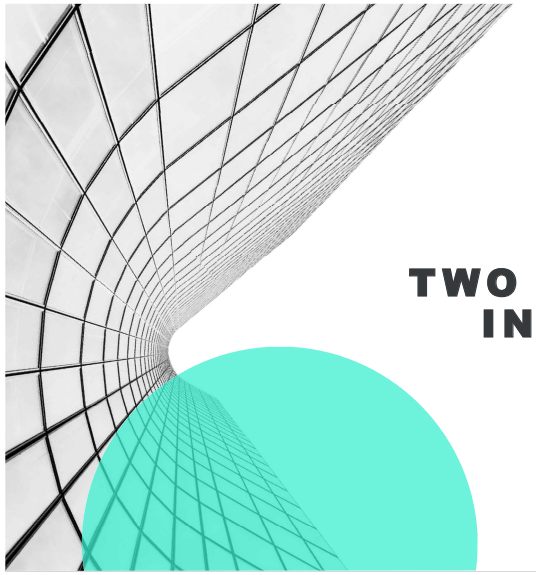
The execution–evaluation cycle



1. Establishing the goal.
2. Forming the intention.
3. Specifying the action sequence.
4. Executing the action.
5. Perceiving the system state.
6. Interpreting the system state.
7. Evaluating the system state with respect to the goals and intentions.

Ex: Imagine you are sitting reading as evening falls you decide you need more light;……





TWO GULFS IN THE INTERACTION

1. Gulf of Execution

   user's formulation of actions

   ≠ actions allowed by the system

1. Gulf of Evaluation

   user's expectation of changed system state

   ≠ actual presentation of this state

IMPORTANCE OF ERGONOMICS

Ergonomics

- ✓ Study of the physical characteristics of interaction.
- ✓ Also known as human factors but this can also be used to mean much of HCI!
- ✓ Ergonomics good at defining standards and guidelines for constraining the way we design certain aspects of systems.
- ✓ Here we consider a few of the issues addressed by ergonomics as an introduction to the field. We will briefly look at the,
  1. Arrangement of controls and displays
  2. The physical environment of the interaction
  3. Health issues
  4. The use of color

Arrangement of controls and displays

1. Sets of controls and parts of the display should be grouped logically to allow rapid access by the user,

   Ex:
   - User uses a spreadsheet on a PC
   - Uses a plant control, aviation and air traffic control.

Arrangement of controls and displays

2. The possible organization include the following;

   a) functional controls and displays are organized so that those that are functionally related are placed together;

   b) sequential controls and displays are organized to reflect the order of their use in a typical interaction (this may be especially appropriate in domains where a particular task sequence is enforced, such as aviation);

   c) frequency controls and displays are organized according to how frequently they are used, with the most commonly used controls being the most easily accessible.

The physical environment of the interaction

1. Where will the system be used?
2. By whom will it be used?
3. Will users be sitting, standing or moving about?

Health issues

- Below factors that directly affect the quality of the interaction and the user's performance:

1. Physical position

- ✓ Users should be able to reach all controls comfortably and see all displays.
- ✓ Users should not be expected to stand for long periods and, if sitting, should be provided with back support.

2. Temperature

- ✓ Extremes of hot or cold will affect performance and, in excessive cases, health.
- ✓ Experimental studies show that performance deteriorates at high or low temperatures, with users being unable to concentrate efficiently.

3. Lighting

- ✓ Adequate lighting should be provided to allow users to see the computer screen without discomfort or eyestrain.
- ✓ The light source should also be positioned to avoid glare affecting the display.

4. Noise

- ✓ Noise levels should be maintained at a comfortable level in the work environment. This does not necessarily mean no noise at all. Noise can be a stimulus to users and can provide needed confirmation of system activity.

5. Time

- ✓ The time users spend using the system should also be controlled.

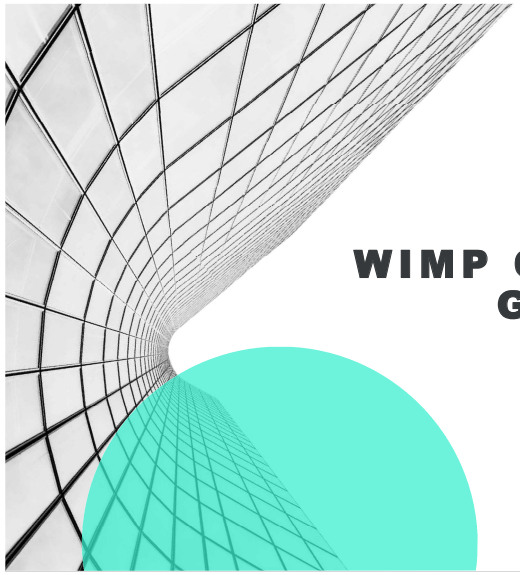
The use of Color

- Red, green and yellow are colors frequently associated with stop, go and standby respectively.
- Therefore, red may be used to indicate emergency and alarms; green, normal activity; and yellow, standby and auxiliary function.
- For example,
  - ✓ Red is associated with danger and warnings in most western cultures, but in China it symbolizes happiness and good fortune.
  - ✓ The color of mourning is black in some cultures and white in others.

DIFFERENT INTERACTION STYLES AND PARADIGMS

Common Interaction Styles

1. Command line interface
2. Menus
3. Natural language
4. Question/answer and query dialog
5. Form-fills and spreadsheets
6. WIMP
7. Point and click
8. Three-dimensional interfaces.



WIMP COMPONENTS IN GUI DESIGN

WIMP Interface

- ✓ **W**indows
- ✓ **I**cons
- ✓ **M**enu
- ✓ **P**ointers
- ✓ … or **W**indows, **I**cons, **M**ice and **P**ull down menus.
- ✓ and is the default interface style for the majority of interactive computer systems especially in the PC and desktop workstation arena.

WIMP Interface

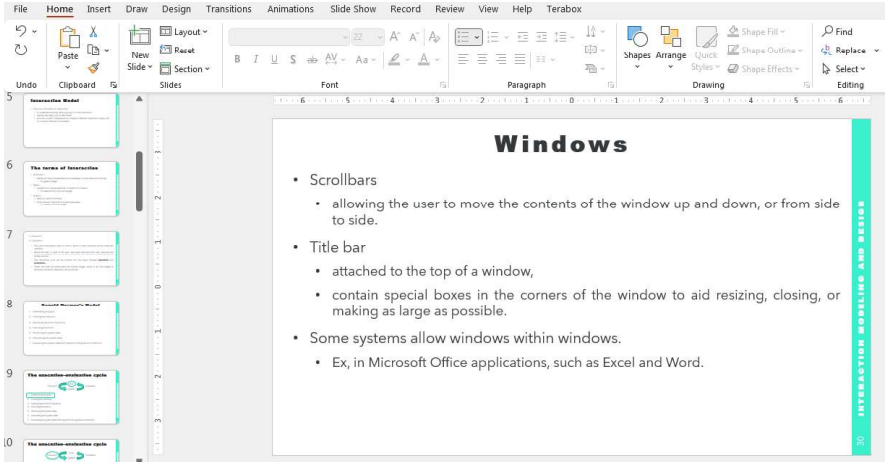
Windows

- Windows are areas of the screen that behave as if they were independent terminals in their own right.
- A window
  - ✓ can usually contain text or graphics,
  - ✓ can be moved or resized.
- If one window overlaps the other, the back window is partially obscured, and then refreshed when exposed again.
- Overlapping windows can cause problems by obscuring vital information, so windows may also be tiled.
- Alternatively, windows may be placed in a cascading fashion, where each new window is placed slightly to the left and below the previous window.

Windows

- Scrollbars
  - allowing the user to move the contents of the window up and down, or from side to side.
- Title bar
  - attached to the top of a window,
  - contain special boxes in the corners of the window to aid resizing, closing, or making as large as possible.
- Some systems allow windows within windows.
  - Ex, in Microsoft Office applications, such as Excel and Word.

Windows



Icons

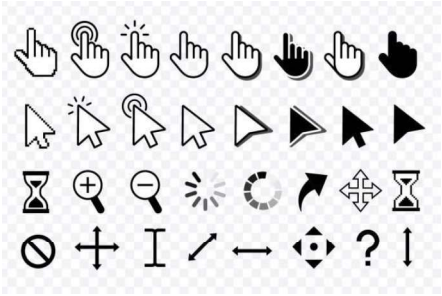
- A small picture is used to represent a closed window, and this representation is known as **an icon**.
- By allowing icons, many windows can be available on the screen at the same time, ready to be expanded to their full size by clicking on the icon.
- Shrinking a window to its icon is known as iconifying the window.
- The icon saves space on the screen and serves as a reminder to the user that he can subsequently resume the dialog by opening up the window.
- Icons can also be used to represent other aspects of the system, such as a wastebasket for throwing unwanted files into, or various disks, programs or functions that are accessible to the user.

Icons

- Icons can take many forms:
  - they can be realistic representations of the objects that they stand for,
  - or they can be highly stylized.
  - They can even be arbitrary symbols, but these can be difficult for users to interpret.

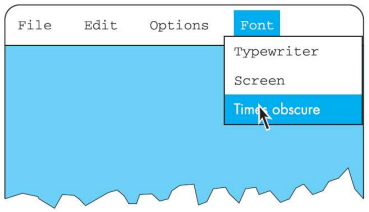
Pointers

- The pointer is an important component of the WIMP interface, since the interaction style required by WIMP relies very much on **pointing and selecting** things such as **icons**.
- uses mouse, trackpad, joystick, trackball, cursor keys or keyboard shortcuts.
- wide variety of graphical images.



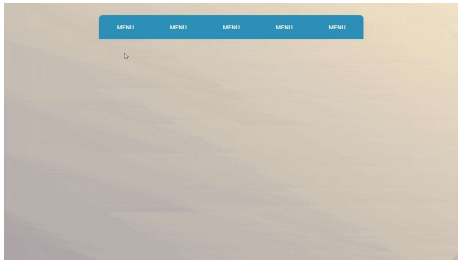
Menus

- A menu presents a choice of operations or services that can be performed by the system at a given time.
- the names used for the commands in the menu should be meaningful and informative.
- Menus are inefficient when they have too many items, and so cascading menus are utilized, in which item selection opens up another menu adjacent to the item, allowing refinement of the selection.



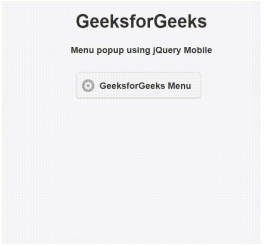
Kinds of Menus

- Menu Bar at top of screen (normally)
  - ✓ **drop down menu** mouse click reveals menu
  - ✓ **fall down menus** mouse just moves over bar!



Kinds of Menus

- Contextual menu appears where you are
  - ✓ **pop up menus** actions for selected object
  - ✓ **pie menus** arranged in a circle
    - ➢ easier to select item (larger target area)
    - ➢ quicker (same distance to any option)
    - ➢ but not widely used!



Kinds of Menus

- Cascading menus
  - ✓ hierarchical menu structure
  - ✓ menu selection opens new menu

Menus design issues

1. which kind to use
2. what to include in menus at all
3. words to use (action or description)
4. how to group items
5. choice of keyboard accelerators

Principles of User Interface Design

Interaction Modeling and Design

Sub topics

- Interaction Model
- Two gulfs in the interaction
- Ergonomics
- Interaction Styles
- WIMP Components for Interaction

Interaction Model

- Interaction between User and System
- User would communicate to the system
- System has difference devices for communication

Modeling Human Computer Interaction(HCI)

- GOMS models (Goals, Operations, Methods and Selection rules)
- KLM methods
- Normans “7 stages”

GOMS Model

- GOMS(Goal, Operators, Method and Selection)
- Goals – what user intends to do
- Operators – actions performed to reach the goal
- Methods – sequence of operators to accomplish the goal (Many methods possible)
- Selection rule – how the user selects the method

KLM(Keystroke Level Model) methods

- Can be used to estimate the time taken to complete simple data input tasks
  - using a computer and mouse
- Model helps to investigate and discover more efficient data input methods to a system

Why we need a model ?

- Understand a complex system and complex behavior
- Multitasking capability of device would make it a complex
  - No common language to communicate in the interaction (User and System)
  - Interface is used for translation
  - Success of interaction ▫ Effective translation

Language of communication

- Two main components of interaction
  - System
  - User
- Language of system – core language
- Language of user – task language

Donald Norman's model of interaction

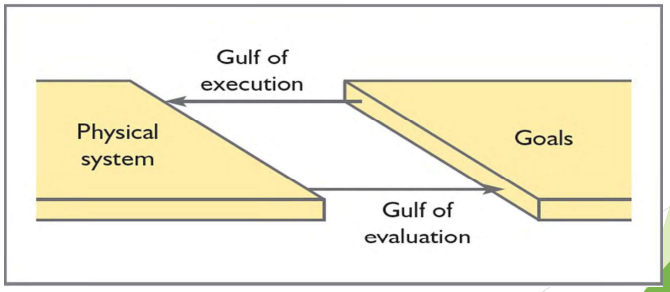
- At the computer interface user executes plan of action
- User observers intermediate actions while executing action
- *Norman's model concentrates on user's view of the interface*

Two Gulf in the Interactions

- Some systems harder to use other
- *The problem of how an individual translates intentions into action*
- *How an individual understands, or evaluates, the effects of actions and knows when his or her goals are satisfied*

Bridging the gap of execution

- There is a Role of the Mental Model to Reduce two gaps



- **Gulf of Execution** and **Gulf of Evaluation** is a cycle between "*Know, Do, Feel*"
- Normally in a software system, conceptual mismatches could be found between designer's model and the user's model
- Which are always associated with the human experiences having through the life
- The both models are incomplete, inconsistent, unstable in time

- There are some ways minimize the differences from user's perceived execution actions to the required actions
- The differences between above two models are also known as Gulf of Execution/Evaluation

Some facts to reduce the gulfs in a software system

- Determine the function of the device
- Tell what actions are possible
- Determine mapping from intention to physical movement
- Perform the action Tell if system is in desired state
- Determine mapping from system state to interpretation
- Tell what state the system is in

Ergonomics

- People spend many hours in front of computers
- Careless use of devices without considering effect on the human body
  - Repetitive Stress Injuries (RSI)
- RSI includes pain on eyes and other body parts
- Ergonomics manages these issues by improving the product design and workspace arrangement

Benefits of Ergonomics

- Improves employee's health
- Prevents injuries in the workplace
- Improves employee moral, productivity, and job satisfaction
- Lowers operational costs of running a business
- Lower health care costs

Common Health Issues

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

Some Ways to address Ergonomics

- Arrangement of controls and displays
- Take small breaks
- Use standard devices
- Sit correct position
- Do eye exercises

Interaction styles

- Common Interaction Styles
  - Command line interface
  - Menus
  - Natural language based interfaces
  - Question/answer and query dialogue
  - Form-fills and spreadsheets
  - WIMP (Windows Icon Menu Pointer)
  - Point and click
  - Three-dimensional interfaces
  - Speech Interaction

Command line interface

- Expressing instructions to the computer directly
- Using
  - unction keys, single characters, short abbreviations, whole words, or a combination
- Better for expert users
- Direct access to system functionality

Menus

- Set of options displayed on the screen
- Easier to use
- Names should be meaningful
- Selected by
  - numbers, letters, arrow keys, mouse
- Often options hierarchically grouped

Natural language

- Familiar to user
- speech recognition or typed natural language
- Problems
  - Not clear the speech
  - Different meaning

Query interfaces

- Question/answer interfaces
- Often used in information systems
- Query by Example (QBE) – Easy to access any user / easy to understand
- None Text Query – not contain much more text

Form – fills

- Primarily for data entry
- Screen like paper form
- Requires
  - Good design
  - Correction facilities
- Very easy to use
- No technical training require
- Not expected database knowledge

WIMP Components for Interaction

- Windows Icon Menus Pointers
- Default style for majority of interactive computer systems

Windows

- Areas of the screen
- Can contain text or graphics
- Can be moved or resized
- Can overlap and each other

Icons

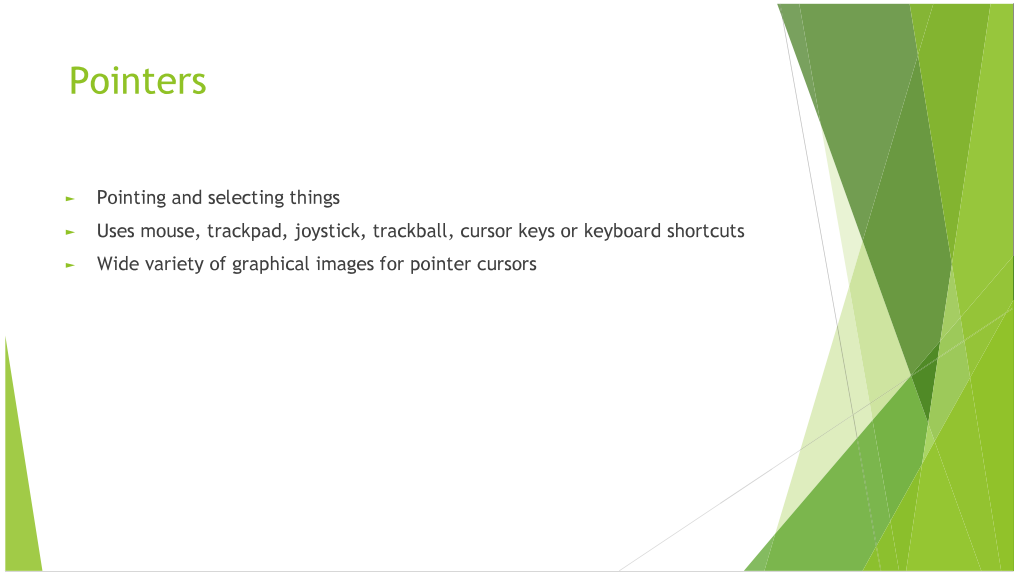
- Small picture or image
- Represents some object in the interface

Menus

- Choice of operations or services offered on the screen
- Required option selected with pointer
- Problem
  - Takes lot of screen space
- Solution
  - Design pop up menus (appears when that is needed)

Pointers

- Pointing and selecting things
- Uses mouse, trackpad, joystick, trackball, cursor keys or keyboard shortcuts
- Wide variety of graphical images for pointer cursors



HNDIT2052 : Principles of User Interface Design

Lecture 06: Usability & Accessibility

Outline

- Define the usability, accessibility and acceptability
- Importance of usability and accessibility
- General guidelines and principles applied in usability

GOOD DESIGN…

- "The interactive systems designer aims to produce systems and products that are accessible, usable, socially and economically acceptable"
- "The interactive systems designer aims to produce systems that are learnable, effective and accommodating"
- "The aim of the interactive systems designer is to balance the PACT elements with respect to a domain"

USABILITY

- The original definition of usability is that "systems should be easy to use, easy to learn, flexible and should engender a good attitude in people" **(Shackel, 1990).**
- Usability is a **quality attribute** that assesses how easy user interfaces are to use.
- Usability refers to the quality of the interaction in terms of parameters such as time taken to perform tasks, number of errors made and the time to become a competent user.
- Clearly a system must be accessible before it is usable.

USABILITY

- Usability is defined by **5 quality component;**
  - **Learnability**: How easy is it for users to accomplish basic tasks the first time they encounter the design?
  - **Efficiency**: Once users have learned the design, how quickly can they perform tasks?
  - **Memorability**: When users return to the design after a period of not using it, how easily can they reestablish proficiency?
  - **Errors**: How many errors do users make, how severe are these errors, and how easily can they recover from the errors?
  - **Satisfaction**: How pleasant is it to use the design?

IMPORTANCE OF USABILITY

- A system with a high degree of usability will have the following characteristics:

I. It will be efficient in that people will be able to do things using an appropriate amount of effort.

II. It will be effective in that it contains the appropriate functions and information content, organized in an appropriate manner.

III. It will be easy to learn how to do things and remember how to do them after a while.

IV. It will be safe to operate in the variety of contexts in which it will be used.

V. It will have high utility in that it does the things that people want to get done.

IMPORTANCE OF USABILITY

Usability is a necessary condition for survival.

The first law of **ecommerce** is that if users **cannot *find*** the product, they **cannot *buy*** it either.

- **Usability** is a necessary condition for survival.
  - If a website is difficult to use, people **leave**.
  - If the homepage fails to clearly state what a company offers and what users can do on the site, people **leave**.
  - If users get lost on a website, they **leave**.
  - If a website's information is hard to read or doesn't answer users' key questions, they **leave**.
- Note a pattern here?
  - There's no such thing as a user reading a website manual or otherwise spending much time trying to figure out an interface.
  - There are plenty of other websites available; leaving is the first line of defense when users encounter a difficulty.

ACCESSIBILITY FAILS…

- People will be excluded from accessing interactive systems because of:
- **Physically** people can be excluded because of inappropriate siting of equipment or through input and output devices making excessive demands on their abilities.
- For example,
  - an ATM may be positioned too high for a person in a wheelchair to reach,
  - a mouse may be too big for a child's hand
- **Conceptually** people may be excluded because they cannot understand complicated instructions or obscure commands or they cannot form a clear mental model of the system.
- **Economically** people are excluded if they cannot afford some essential technology.

ACCESSIBILITY

- Accessibility concerns removing the barriers that would otherwise exclude some people from using the system at all.
- The United Nations and the World Wide Web Consortium (W3C) have declarations and guidelines on ensuring that everyone can get access to information that is delivered through software technologies.

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.
  - A computer playing loud music would generally be considered to be unacceptable in an office environment.

ACCESSIBILITY FAILS…

- **Cultural exclusion** results from designers making inappropriate assumptions about how people work and organize their lives.
  - For example, using a metaphor based on American football would exclude those who do not understand the game.
- **Social exclusion** can occur if equipment is unavailable at an appropriate time and place or if people are not members of a particular social group and cannot understand particular social messages.

AS A WAY OF ENSURING AN ACCESSIBLE SYSTEM, DESIGNERS SHOULD:

- Include people with special needs in requirements analysis and testing of existing systems;
- Consider whether new features affect users with special needs (positively or negatively) and note this in the specification;
- Take account of guidelines - include evaluation against guidelines;
- Include special needs users in usability testing and beta tests.

How to Improve Usability

- **User testing:**
  - Get hold of some representative users,
  - Ask the users to perform representative tasks with the design.
  - Observe what the users do, where they succeed, and where they have difficulties with the user interface. Shut up and let the users do the talking.

How to Improve Usability

- **Iterative design:**
  - The more versions and interface ideas you test with users, the better.
- **Follow design guidelines/ rules:**
  - Nielsen's ten heuristics
  - Shneiderman's eight golden rules and Norman's seven principles.

Activity

- Usability gives advantages to all the parties including Users and the Business. List advantages of usability to Users and Business separately

HNDIT
HNDIT2052
Principles of User Interface Design

Week 7 – PACT Analysis

Module Data

- GPA
- 3 Credits
- 30 Hours - Lectures
- 30 Hours - Practical/Tutorials
- 90 Hours - Student activities
- 150 Hours - Notional hours

Aim & Objectives

- To develop an awareness of various approaches to the design of contemporary user interfaces
- To identify key principles by which effective contemporary user interfaces are designed

Learning Outcomes (LO)

After successful completion of this course the student should be able to:

- LO1: Describe the key principles of user interface design
- LO2: Describe a variety of approaches to user interface design
- LO3: Identify a variety of methods for evaluating the design of user interfaces
- LO4: Apply the knowledge learned in this module to create simple user interfaces

Assessment & weighting

On-line quizzes						20%
Group Assignment						20%
Final Examination (3 hour paper)						60%
Total						100%

Learning Resources

Required Textbook and Resources

David Benyon, Designing Interactive Systems: A comprehensive guide to HCI, UX and interaction design, Pearson, 2013. PLEASE NOTE: The 4th Edition is due to be published during 2019 and will replace the 3rd edition listed above. 1447920112 9781447920113

Recommended Additional Resources

F.E. Ritter, G.D. Baxter, and E.F. Churchill Foundations for Designing User–Centred Systems: What System Designers need to know about People, Springer, 2014. 144715133X 978-1447151333

M.B. Rosson and J Carroll, Usability Engineering: Scenario–Based Development of Human–Computer Interaction, Morgan Kaufmann, 2002. 1558607129 978-1558607125

- Importance of PACT framework relationships among people, activities, context and technologies

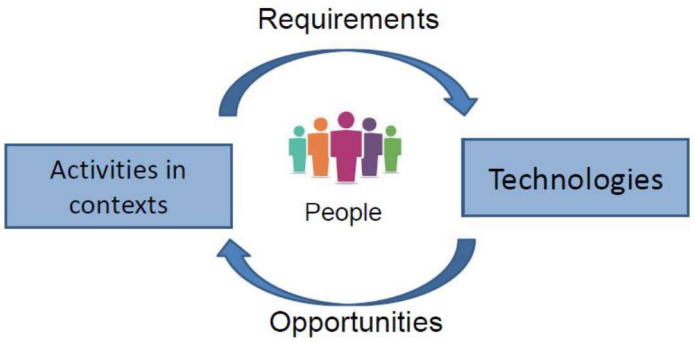
PACT analysis

- **P**eople
- **A**ctivities
- **C**ontext
- **T**echnologies

Aims

- Activities and technologies
- The main characteristics of people
  - relevant to designing interactive systems
- The main issues of activities
  - –and the contexts in which they occur
- The key features of interactive technologies

Activities and technologies



PACT analysis

- **P**eople
- **A**ctivities
- Context of use
- **T**echnologies

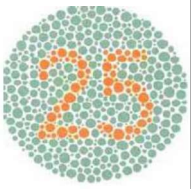
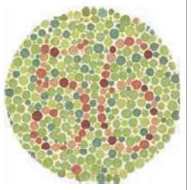
Physical differences

- Physical characteristics: height, weight
- Senses: sight, hearing, touch, smell, taste



Physical differences

- Colour blindness
  - inability to distinguish red and green colours affects~8% males
- Short-sightedness, long-sightedness
- Hearing and finger dexterity impairments
- Large fingers vs small buttons

Ergonomics

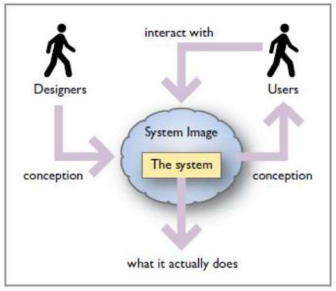
- The term was coined in 1948 to describe the study of the relationships between people and their environment.
- Multidisciplinary discipline includes
  - the working environment
  - safety issues
  - anatomy and physiology
  - psychology

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
- •Develop through interacting with systems

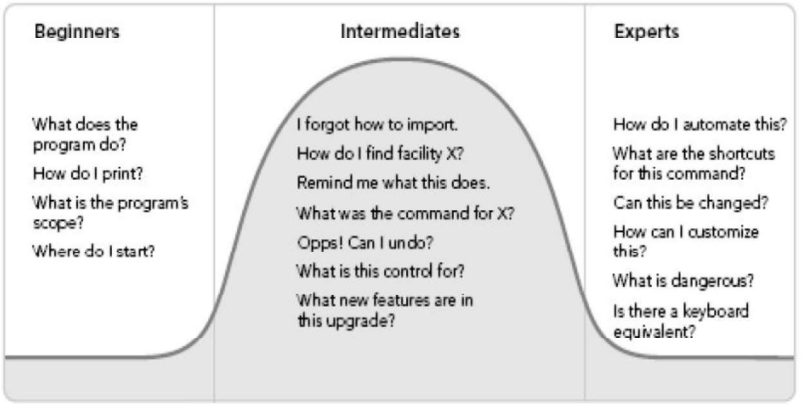


Social differences

- •the reason for use technologies
  - –The goals and motivations in using technology
- •Beginner, intermediate and expert users
- •Motivations to learn and use particular system
  - –beginner needs to be guided
  - –experts use a system regularly and learn all sorts of details
  - –intermediate need to remember how to use

USER NEEDS ANALYSIS: PERSONAS AND SCENARIOS

Different experience levels



Beginners

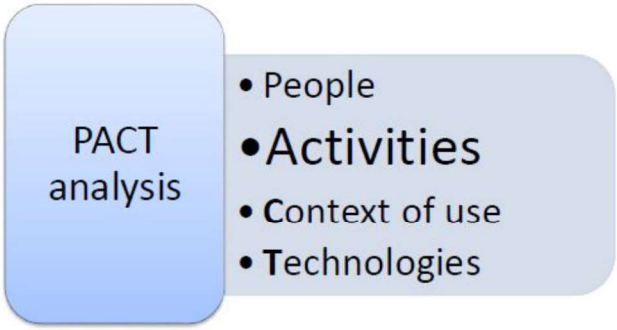
- Need extra help for the program until they became intermediates
- They may not recall from use to use exactly which command is needed to act on a particular object,
  - but they will definitely remember the relationships between objects and actions.

Intermediates

- need access to tools.
  - They don't need scope and purpose explained to them because they already know these things
  - tooltips
- know how to use reference materials.
  - They are motivated to dig deeper and learn, as long as they don't have to tackle too much at once

Experts

- Demand faster access to their regularworking set of tools, which may be quite large.
  - want shortcuts to everything
- seek to learn more and to see more connections between their actions and the product's behaviour and representation.
- appreciate new, powerful features.



Activities

- Temporal aspects
- Cooperation
- Complexity
- Safety-critical
- The nature of content

Activities

- Temporal aspects
  - –frequency
    - Frequent tasks –easy to do
    - Infrequent tasks –easy to learn or remember how to do
  - –Time pressure
    - Quiet or busy
  - –Single or continuous actions
    - Can be interrupted?
      - –If Yes –let user find their place
  - –Acceptable response time

Activities

- Cooperation
  - –One or more users?
  - –For collaborative activities
    - Awareness
    - Coordination
    - Communication

Activities

- complexity
  - –Well-defined task
    - can be accomplished by steo by step design
  - –for a vague activity people have to be able
    - to browse around
    - see different types of information
    - move from one think to another
    - …

Activities

- Safety-critical aspects
  - –any mistake could result in in an injury or serious accident
  - –designers must pay attention to ensuring that mistakes do not have a serious effect
- Designers must
  - –think what happens when people make mistakes and errors
  - –design for that circumstances

Activities: Content

- Data requirements
  - –What is input?
    - large/modest/small amount of required data?
  - –How to input?
  - –What is output?
    - alphanumerical data, video records, other media
- good content:
  - –accurate, up to date, relevant, good presented

PACT analysis

- **P**eople
- **A**ctivities
- **C**ontext of use
- **T**echnologies

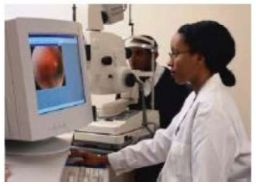
The physical context

- Environment in which activity happens
- Physical environment
  - –temperature, humidity, atmospheric pressure,



Social contexts

- Social environment
  - –private issues
  - –individual or group activity



Organizational contexts



- Changes in technologies alter com
and
  power structures
- Automation can have affects
  - –such as deskilling

PACT analysis

- **P**eople
- **A**ctivities
- Context of use
- **Technologies**

Technologies

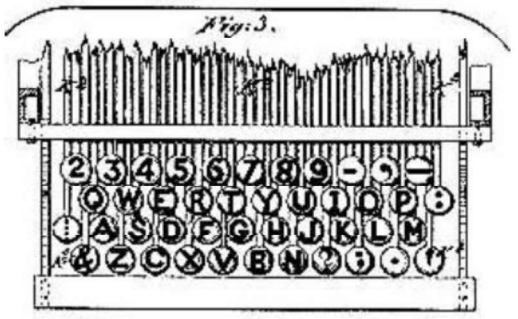
- Input devices
  - – switches and buttons facilitate instructions
    - •take up space



QWERTY keyboard

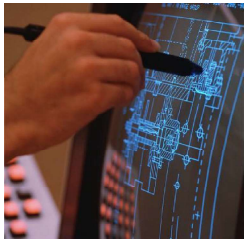
- 1868
- Christopher Latham Sholes
- solved the jams when the keys
- 150 words per min

QWERTY layout



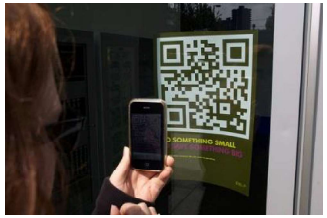
Technologies

- Input devices
  - –touch screens
  - –pointing devices, e.g. mouse, stylus
  - –trackball
  - –joystick



Technologies

- Input devices
  - – gestures
  - – QR codes



Output technologies

Flexible organic light-emitting diode

2D and 3D printers

Haptic technologies

Communication

- Between people and between devices
  - –Bandwidth and speed are critical
  - –Wired with fibre-optic cables
    - The fastest communication
- –Wireless, Wi-Fi
  - •quite limited in range
  - •need to be within a few metres
  - •4G fast and wide coverage
- –Bluetooth, NFC

Content

- •Good content
  - –accurate, up to date, relevant and well presented
- •Characteristics of the data influence input methods
  - –Barcodes –for data that does not change often
  - –Touchscreens –for a few options to choose from
  - –Speech input
    - •if there is no noise and few commands to enter

Scoping the problem with PACT

- •Right mix
  - –of technologies
  - –to support activities
  - –being undertaken by people
  - –in different contexts

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

Summary

- People: physical, psychological and usage
- Activities: temporal, cooperation, complexity, safety-critical, content
- Contexts: physical, social, organizational
- Technologies: input, output, communication and content
- Undertaking a PACT analysis of a situation is a useful way of scoping a design problem.

Readings

- David Benyon, Phil Turner, Susan Turner. **Designing Interactive Systems: People, Activities, Contexts, Technologies.** Addison Wesley, 2005, 2014, 2019. chapter 2: PACT framework

HNDIT2052 : Principles of User Interface Design

Week 8 : The process of human centered interactive systems design

Subtopics

- Why being human centered is important
- Golden Rules of Design
- Psychological principles and interface designing
- Process of User centered Design

What is human centered design ?

Human centered design processes for interactive systems, ISO 13407 (1999), states:

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

Why being human centered is important ?

- Design is a creative process concerned with bringing about something new. It is a social activity with social consequences. It is about conscious change and communication between designers and the people who will use the system.
- Different design disciplines have different methods and techniques for helping with this process.
- Being human-centered in design is expensive. It involves observing people, talking to people and trying ideas out with people, and all this takes time.
- Being human-centered is an additional cost to any project, so businesses rightly ask whether taking so much time to talk to people, produce prototype designs and so on is worthwhile.
- The answer is a fundamental 'yes'. Taking a human-centered approach to the design of interactive systems is advantageous for a number of **reasons**.

Reasons are,

1. Return on investment
2. Safety
3. Ethics
4. Sustainability

Contd..

- Designing interactive systems is a challenging and fascinating discipline because it draws upon and affects so many features of people's lives.
- There is a huge variety of interactive systems and products, from business applications of computers to websites to dedicated information appliances to whole information spaces.
- Designing interactive systems is concerned with designing for people using technologies to undertake activities in contexts. Designing interactive systems needs to be human-centered.
  - It draws upon many different subject areas, including both engineering design and artistic design.
  - It is needed because we live in a digital age when bits are easily transformed and transmitted.
  - It is necessary if we are to have safe, effective, ethical and sustainable design

Golden Rules of Design

✓ Shneiderman's Eight Golden Rules of Interface Design

Shneiderman's eight golden rules provide a convenient and succinct summary of the key principles of interface design. They are intended to be used during design

1. ***Strive for consistency*** in action sequences, layout, terminology, command use and so on.
2. **Enable frequent users to use shortcuts**, such as abbreviations, special key sequences and macros, to perform regular, familiar actions more quickly.
3. **Offer informative feedback** for every user action, at a level appropriate to the magnitude of the action.
4. **Design dialogs to yield closure** so that the user knows when they have completed a task.

Contd..

5. Offer error prevention and simple error handling so that, ideally, 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 in order to relieve anxiety and encourage exploration, since the user knows that he can always return to the previous state.

7. Support internal locus of control so that the user is in control of the system, which responds to his actions.

8. Reduce short-term memory load by keeping displays simple, consolidating multiple page displays and providing time for learning action sequences.

Psychological principles and interface designing

- There are several psychology principles that apply to the field of UX Design. Most of these are fairly straightforward and you may already be applying them to your designs without even knowing it.
- However, the reason it's important to understand these ideas is so you can explain the meaning behind your designs, especially when presenting to stakeholders.
- It is also essential that you understand how a user feels and why they act a certain way. This will give reasoning and substance to your designs and ensure you are producing a valuable experience for your user.

Contd..

When designing a product, it's important to know what type of response you want to elicit from your users. Understanding psychology principles can influence human behavior and create a more seamless experience for your users.

1. **Hick's Law**

   The time it takes to make a decision increases with the number and complexity of choices.

2. **Cognitive Load**

   The total amount of mental effort being used in a person's working memory.

Contd..

3. Von Restorff Effect

- Also known as The Isolation Effect, predicts that when multiple similar objects are present, the one that differs from the rest is most likely to be remembered.

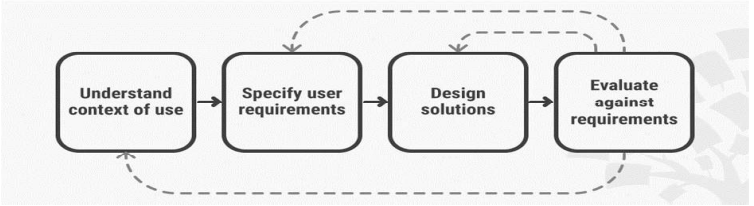
4. Serial Position Effect

- Users have a propensity to best remember the first and last items in a series.
- Serial Position Effect involves two main concepts:
  1. The Primacy Effect: Items that are presented at the beginning of a list are recalled with greater accuracy than items in the middle of a list.
  2. The Recency Effect: Items that appear at the end of a list are also more likely to elicit better recall than items presented in the middle of a list.

Process of User centered Design(UCD)

What is UCD?

- User-centered design (UCD) is a collection of processes which focus on putting users at the center of product design and development.
- *User-centered design is an iterative process that focuses on an understanding of the users and their context in all stages of design and development.*



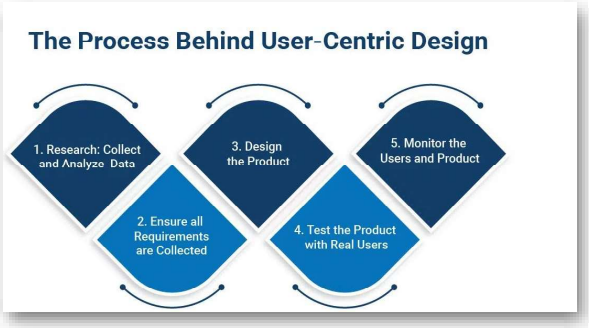
Contd..

The following are the general phases of the UCD process:

- **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.
- **Specify user requirements:** Identify any business requirements or user goals that must be met for the product to be successful.
- **Design solutions:** This part of the process may be done in stages, building from a rough concept to a complete design.
- **Evaluate designs:** Evaluation - ideally through usability testing with actual users - is as integral as quality testing is to good software development.

Contd..

To implement the user-centered design paradigm well, teams go through several steps in the product design phase. These steps can be summarized as:



Contd..

User-centered design vs. Human-centered design:

- User-centered design is very often used interchangeably with human-centered design, but there is a difference in that it is a subset of it.
- Simply put, all users are humans, but not all humans will be your users (you wish!). Thus, user-centered design requires deeper analysis of users – your target audience.
- It is not only about general characteristics of a person; it is about particular habits and preferences of target users to come up with right solutions for specific problems.

Contd..

User-centered design vs. Human-centered design:

- User-centered design takes into account age, gender, social status, education and professional background, influential factors, product usage expectations and demands and many other important things that may vary for different segments. What is critical for some may be irrelevant for others.
- User-centered design is about deep research on users' habits, from their interactions with the product to their vision of how the product should look like and behave.

Practical

1. Draft simple interfaces for a Library System using any free online UID tool?

2. Evaluate whether your drafted interfaces of the system are user centered design or not?

HNDIT2052 : Principles of User Interface Design

Week 10 : Process of GUI design

Introduction

- User interface (UI) design is the process of making interfaces in software or computerized devices with a focus on looks or style.
- In order to reach the full potential of the software system, it is important that its user interface should be designed to match the abilities, experience, and expectations of its anticipated users.
- Most of the user errors are caused by the fact that user interfaces do not consider the capabilities of real users.
- When making user interface design decisions, it is important to consider both the physical and mental capabilities of the people who use the software

Consider this

Some of the human factors to be considered are

- Limited short-term memory - Immediately remember about 7 items max…
- Humans make mistakes -Too much information and stress tend to make errors
- Different physical capabilities - color blind, sound disabilities….

UI design Principles

- User familiarity
- Consistency
- Minimal surprise
- Recoverability
- User guidance
- User Diversity

User Interaction

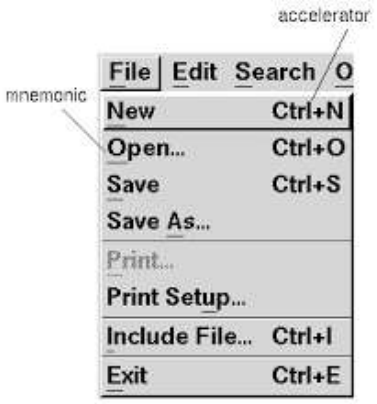
- User interaction can be simply understood as issuing/typing commands and associated data to the computer system.
- Early days Command Line was used
- Five interaction styles can be identified in these interfaces
  - Command Line
  - Menu selection
  - Form filling
  - Direct Manipulation
  - Natural Language

Command Line

- MS-DOS, Linux are examples
- Mostly used by the expert people

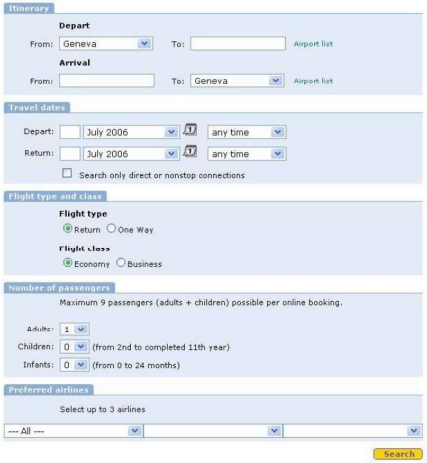
Menu selection

- In menu selection, possible user actions are listed on the screen and the user can select one of them.



Form Filling

- The user types the data in specific fields, similar to the fields on a paper. Many database applications use this style

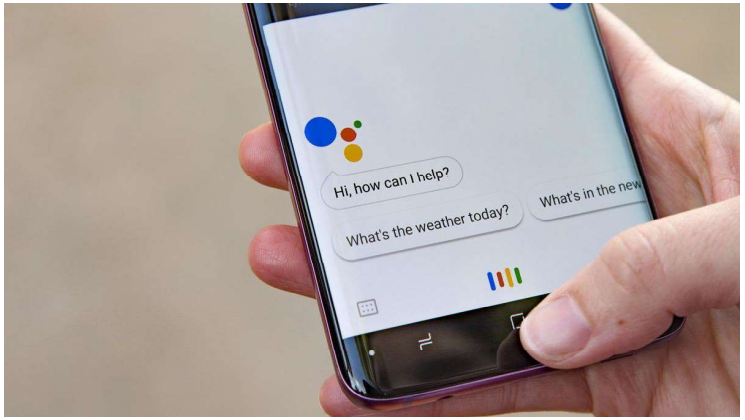


Direct Manipulation

- User can manipulate them directly by pointing, clicking, dragging, typing, etc.

Natural Language

- In this method, the user types command in natural language.

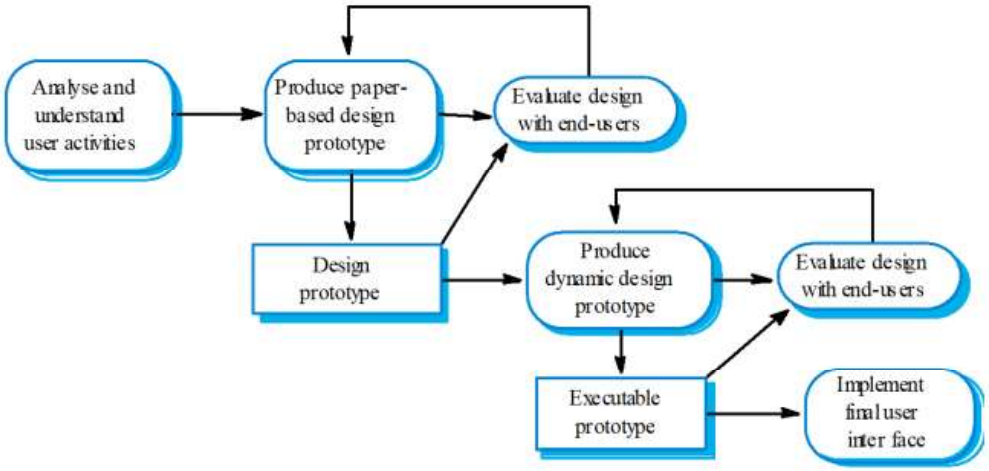


Interaction style	Main advantages	Main disadvantages	Application examples
Direct manipulation	Fast and intuitive interaction Easy to learn	May be hard to implement. Only suitable where there is a visual metaphor for tasks and objects.	Video games CAD systems
Menu selection	Avoids user error Little typing required	Slow for experienced users. Can become complex if many menu options.	Most general-purpose systems
Form fill-in	Simple data entry Easy to learn Checkable	Takes up a lot of screen space. Causes problems where user options do not match the form fields.	Stock control, Personal loan processing
Command language	Powerful and flexible	Hard to learn. Poor error management.	Operating systems, Command and control systems
Natural language	Accessible to casual users Easily extended	Requires more typing. Natural language understanding systems are unreliable.	Information retrieval systems

Process of Interface Design

- Similar to SDLC… Any model can be used such as waterfall, Spiral or Iterative.

- Three main Activities can be identified.
  - User analysis
  - System Prototyping
  - Interface evaluation



Process of Interface Design cont…

- User Analysis
  - Designer should understand what user want.
  - The analysis should be understand for both user and other designers
  - To understand the user requirements Scenarios are used.

Scenarios

- Stories about people undertaking activities in context using technology.
- Two types
  - User scenarios :-
  - Conceptual Scenarios :- conceptual scenarios are more abstract than user scenarios. Much of the context is stripped away during abstraction and similar stories are combined together.

User Scenarios:

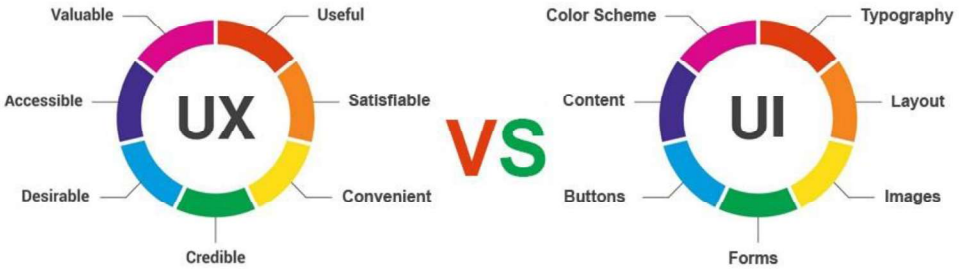
I needed to make an appointment for Kirsty, my little one. It wasn't urgent - she had been having a lot of bad ear-ache every time she had a cold but I did want to see Dr. Fox since she is so good with the children. Also, of course ideally, it had to be when Kirsty was out of school, and I could take time off work. I rang the surgery and the receptionist told me that the next appointment for Dr.Fox was the next Tuesday afternoon. That was no good since Tuesday is one of my really busy days so I asked when the next was.

The receptionist said Thursday morning. That meant making Kirsty late for school but I agreed because they sounded very busy - the other phone kept ringing in the background - and I was in a hurry myself. It was difficult to suggest a better time without knowing which appointments were still free.

Scenario cont..

- Conceptual scenario
  - ✓ People with any basic computer skills will be able to contact the doctor's surgery at any time via the Internet and see the times which are free for each doctor. They can book a time and receive confirmation of the appointment.

For your knowledge



UI prototyping

- Prototyping aims to allow users to gain direct experience with the interface
- It helps to judge the usability of an interface.
- Two stage process
  - Paper based prototypes used in early stage
  - Refined and automated design will be developed in next stage.

UI evaluation

- Asses suitability of Interfaces.
- Ideally interface should evaluate against set of Usability specification based on usability attributes.

Attribute	Description
Learnability	How long does it take a new user to become productive with the system?
Speed of operation	How well does the system response match the user's work practice?
Robustness	How tolerant is the system of user error?
Recoverability	How good is the system at recovering from user errors?
Adaptability	How closely is the system tied to a single model of work?

Guidelines

Ben Shneiderman created one of the greatest guides to solid interaction design called Designing the User Interface, which reveal his own collection of principles known as the “Eight Golden Rules of Interface Design”

1. Strive for Consistency.
2. Cater to Universal Usability.
3. Offer Informative feedback.
4. Design Dialogs to yield closure.
5. Prevent Errors.
6. Permit easy reversal of actions.
7. Support internal locus of control.
8. Reduce short term memory load.

Strive for consistency.

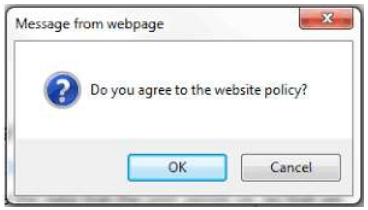
- Consistent sequences of actions should be required in similar situations
- Identical terminology should be used in prompts, menus, and help screens
- and consistent commands should be employed throughout.
- Utilize familiar icons, colors, menu hierarchy when designing similar situations and sequence of actions.
- This consistency will allow you to develop your identity and not lose users.

Enable frequent users to use shortcuts.

- As the frequency of use increases, so do the user's desires to reduce the number of interactions and to increase the pace of interaction.
- Abbreviations, function keys, hidden commands, and macro facilities are very helpful to an expert user.
- For example, Windows provide users with keyboard shortcuts for copying and pasting,
- so as the user becomes more experienced, they can navigate and operate the user interface more quickly and effortlessly.
  - ✓ ctrl+c
  - ✓ ctrl+v

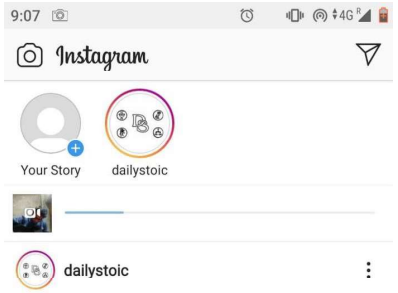
Offer informative feedback.

- For every operator action, there should be some system feedback.
- For frequent and minor actions, the response can be modest, while for infrequent and major actions, the response should be more substantial.
- A bad example we often see is when an error message shows an error-code instead of a human-readable and meaningful message.
- Good examples



Design dialog to yield closure.

- Sequences of actions should be organized into groups with a beginning, middle, and end.
- The informative feedback at the completion of a group of actions gives the operators the satisfaction of accomplishment, a sense of relief, the signal to drop contingency plans and options from their minds, and an indication that the way is clear to prepare for the next group of actions.
- For example, e-commerce websites move users from selecting products to the checkout, ending with a clear confirmation page that completes the transaction.
- Another example



Offer simple error handling.

- As much as possible, design the system so the user cannot make a serious error.
- If an error is made, the system should be able to detect the error and offer simple, comprehensible mechanisms for handling the error.
- Flag the text fields where the users forgot to provide input in an online form

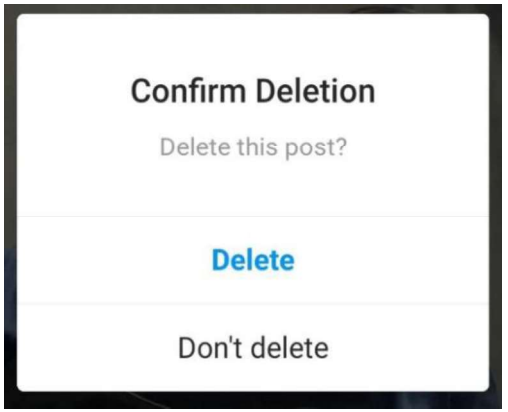
- Do not allow alphabetic characters in numeric entry fields
- Gray out menu items that are not appropriate

Permit easy reversal of actions.

- This feature relieves anxiety, since the user knows that errors can be undone
- It thus encourages exploration of unfamiliar options.
- The units of reversibility may be a single action, a data entry, or a complete group of actions.
  - ➢ For example undo and redo options in MS Office s/w

Support internal locus of control.

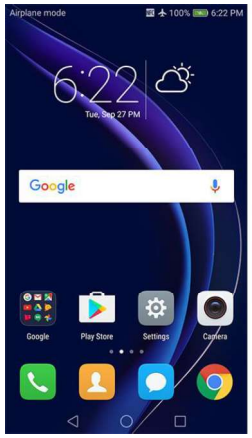
- Experienced operators strongly desire the sense that they are in charge of the system and that the system responds to their actions.
- Design the system to make users the initiators of actions rather than the responders.
- Allow your users to be the initiators of actions. Allow your users to be the initiators of actions.



Reduce short-term memory load.

- The limitation of human information processing in short-term memory requires that displays be kept simple, multiple page displays be consolidated, window - motion frequency be reduced, and sufficient training time be allotted for codes, mnemonics, and sequences of actions.

- The rule of thumb is that humans can remember “seven plus or minus two chunks” of information



THANK YOU.!

Task Analysis

By: M. N. M Shakoor

Subtopics

- Importance of task analysis for the design
- Goal, Tasks and Actions
- Hierarchical task analysis

Task Analysis

Task Analysis (TA)

- TA is
  - the study of how work is achieved by tasks

  OR
  - the study of the way people perform their jobs

1. what user do
2. what objects user interact with
3. what user need to know

Task Analysis (TA)

Task analysis to be a specific view of interactive systems design that leads to specific techniques

TA Example: Cleaning a house

- get the vacuum cleaner out
- fix the appropriate attachments
- clean the rooms
- when the dust bag gets full, empty it
- put the vacuum cleaner and tools away.

Goals, Taks and Actions

Goals

- A goal is a state of the application domain that a work system wishes to achieve.
  - ✓ Example - Goal: Reach Kandy
- Goals are specified at particular levels of abstraction
  - ✓ For example,
    - the organizational goals of a company,
    - the behavior of a software system in terms of its goals.
- It is not just people who have goals; the work system as a whole may have goals.
  - In other words, goal is defined considering both people and technology

Goals Example

- Expected/Final Goals
  - write a letter,
  - record a program on TV,
  - find the strongest mobile phone signal.
- ✓ Start State
  - no letter written,
  - the TV program not recorded,
  - the signal not confirmed as the strongest
- ➢ The agent has to undertake some activities, i.e. some tasks, in order to get it into the required state. Usually a goal can be achieved in a variety of different ways.

Goals Example cont…

- The first thing the agent has to decide is which technology and activities to use to achieve the goal. For recording a TV programme, for example, an agent could select the following activities:
  - Ask a friend to record it
  - Press 'Rec' on the PVR
  - Set the timer using a manual setting
  - Set the timer using an on-screen TV guide

Tasks

- A task is a structured set of activities required, used, or believed to be necessary by an agent to achieve a goal using a particular technology.
- A task will often consist of subtasks where a subtask is a task at a more detailed level of abstraction.
- The structure of an activity may include selecting between alternative actions, performing some actions a number of times and sequencing of actions.
- The task is broken down into more and more detailed levels of description until it is defined/described in terms of actions.

Actions

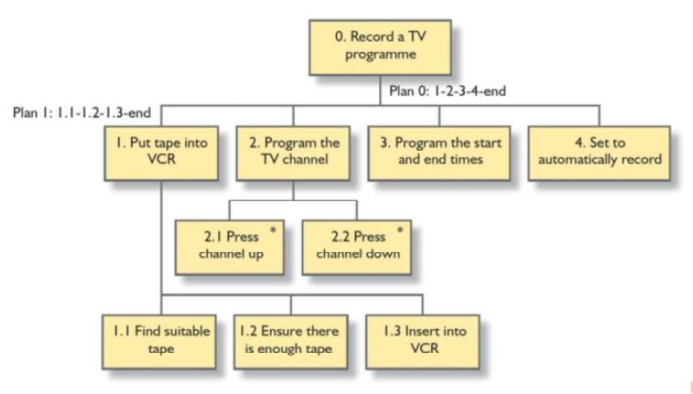
- Actions are 'simple tasks'.
- Whereas a task might include some structure such as doing things in a particular sequence, making decisions as to alternative things to do (selection) and doing things several times (iteration), an action does not.
- This structure is often called a plan or method.
- An action is a task that has no problem solving associated with it and which does not include any control structure.
- Actions and tasks will be different for different people.

Hierarchical Task Analysis (HTA)

HTA

- a graphical representation of a task structure based on a structure chart notation
  - ✓ a sequence of tasks, subtasks and actions as a hierarchy and include notational conventions to show whether an action can be repeated a number of times (iteration) and the execution of alternative actions (selection)
- Sequence is usually shown by ordering the tasks, subtasks and actions from left to right
- Annotations can be included to indicate plans
- Structured paths through the hierarchy to achieve particular goals

Example: TV Recording



Exercise: Marking a call

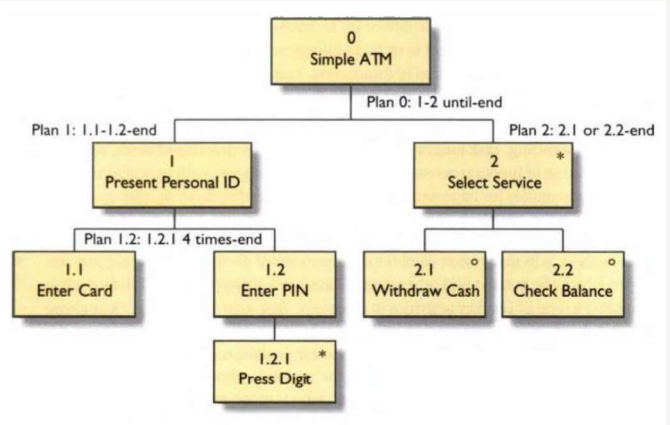
- Making a call using a mobile phone has two main routes through the hierarchy of tasks and subtasks.
- If the person's number is in the phone's address book then the caller has to find the number and press 'call'.
- If it is not, the caller has to type the number in and press 'call'.

HTA: A step-by-step guide

1. Decide on the purpose of the analysis. This is typically to help with systems design or to design training materials.
2. Define the task goals.
3. Data acquisition. How are you going to collect data? Observation, getting people to use a prototype, etc.
4. Acquire data and draft a hierarchical diagram.
5. Recheck validity of decomposition with stakeholders.
6. Identify significant operations and stop when the effects of failure are no longer significant.
7. Generate and test hypotheses concerning factors affecting learning and performance.

- *HTA is not easy !.*
- *You will not get it right first time. Repeat the process to verify the hierarchy.*

Hierarchical Task Model: ATM



Thank you

M.N.M Shakoor

Developing Effective Prototype Interfaces

By: M.N.M Shakoor

Sub Topics

1. Overview of prototyping
2. Types of prototyping

Overview of prototyping

Definitions of Prototype

- Prototyping is the process of quickly putting together a working model (a prototype) in order to test various aspects of a design, illustrate ideas or features and gather early user feedback.
- A type of development in which emphasis is placed on developing prototypes early in the development process to permit early feedback and analysis in support of the development process.

Prototyping - Make it clear

- Prototyping is a means of exploring ideas before the real implementation to verify proposed solution.
- All designers (crafts people) work on some prototypes
  - ✓ Architects create models out of paper or cardboard, or with virtual reality tools
  - ✓ Bridge builders create stress models
  - ✓ Software and Web designers create mock-ups 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
5. .....

Need for prototyping

- Enable to explore the problem space with the stakeholders to clearly identify requirements.
- Validate the possible solution or identify alternative solutions by exploring the solution space.
- A vehicle for you to communicate the possible User Interface design(s) of the system.
- Recognize the a potential foundation from which to continue developing the system.
- Validate the requirements identified or assumed in the analysis stage.

Breaking the implementation paradox

- **Build** a prototype of the basic functionality, especially the interface
- **Test** the prototype, which will uncover design errors
- **Correct** the errors
- **Repeat** until you have a clean design

➢ Prototyping is
  - ✓ A major tool for improving usability
  - ✓ Heavily used in the industry

Types of prototyping

There are two major types of prototyping:

1. Throwaway Prototyping
   - refers to the creation of a prototype that will eventually be discarded rather than becoming part of the finally delivered software.
   - Main objective is to show the user how it may work in the real system.

There are two major types of prototyping:

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.
   - This prototype will become a part of final software delivered.

Throw Away Prototype

Main Benefits	Throwaway prototyping can significantly reduce risk.
Keys to Success	Choose the prototyping language that enables quick prototyping and commit to throwing the prototype away.
When to Use	It can be used at any time on a project by any of the project's personnel. Individual project participants can realize some benefit by prototyping risky areas within their individual areas of responsibility.
Main Risks	The main risks of throwaway prototyping are not throwing it away and inefficient use of prototyping time.

Throwaway Prototyping

- Throw Away Prototype is developed from the initial requirements but is not used for the final project.
- Not an alternative for written specification of the requirements
- Some developers believe that this type is a waste of time because it will not be a part of final product
- Whether the prototype is discarded or kept for production, it is important to use an easy to use language.

Throwaway Prototyping

- The most obvious reason for using Throwaway Prototyping is that it can be done quickly.
- If the users can get quick feedback on their requirements, they may be able to refine them early in the development of the software.
- Making changes early in the development lifecycle is extremely cost effective since there is nothing at that point to redo.

Throwaway Prototyping

- If a project is changed after a considerable work has been done then small changes could require large efforts to implement since software systems have many dependencies.
- Speed is crucial in implementing a throwaway prototype, since with a limited budget of time and money little can be expanded on a prototype that will be discarded.
- Another strength of Throwaway Prototyping is its ability to construct interfaces that the users can test.

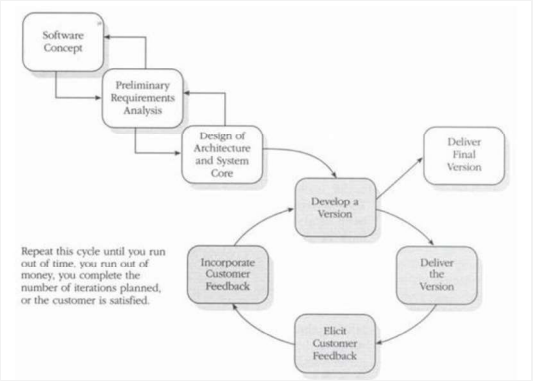
Evolutionary Prototype

- Also known as breadboard prototyping.
- Evolutionary prototyping is considered to be the most fundamental form of prototyping.
- Evolutionary prototyping main concept is to build a robust prototype and constantly improve it.
- Functional high fidelity system.
- Objective to deliver a working system to the end user.

Evolutionary Prototype

- Evolutionary prototyping acknowledges that we do not understand all the requirements and builds only those that are well understood.
- Allows the development team to add features, or make changes that couldn't be conceived during the requirements and design phase.
- Helps the developer to develop part by part of the system considering the usability aspects of the system.

Evolutionary Delivery



According to Steve McConnell, "evolutionary delivery is a lifecycle model that straddles the ground between evolutionary prototyping and staged delivery."

Questions ?

1. List down the advantages & disadvantages of prototyping
2. List down the advantages & disadvantages - Throwaway prototype
3. List down the advantages & disadvantages - Evolutionary prototype

THANK YOU.!

M.N.M SHAKOOR

Tools for prototyping

M.N.M Shakoor

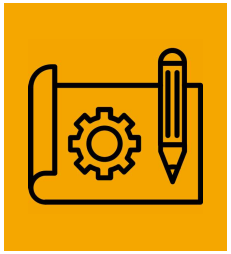
Sub topics

1. Why use prototyping tools
2. Tools available

Tools for Prototyping

- Tools are used to quickly create prototypes simulating key aspects
- Different types of tools
  - ✓ General Purpose Tools – e.g. PowerPoint
  - ✓ Wireframing (sketching) – e.g. Figma Clique favorite, Draw.io
  - ✓ UI Animation (advanced wireframing) – e.g. MS Visio
  - ✓ UI builders – e.g. Visual Basic, Dreamweaver
- Scripting language of the tool helps to improve the value of tool.

Why use Prototyping Tools



Why use Prototyping Tools (rather than writing the real code)?

- Faster
- Easier to incorporate testing changes
- Multiple UIs for same application
- Consistent user interfaces
- Easier to involve variety of specialists
- Separation of UI code from app code.
  - ✓ easier to change and maintain
- More reliable

Tools available

Basic Prototyping Tools vs. UI Builders

- Prototyping tools
  - Lay out the design of the system
    - ✓ E.g.: Visio, Dreamweaver, JustinMind etc.
- UI builders/toolkits
  - Create the code that underlies the UI in a real application
    - ✓ E.g.: visual basic, Tcl/Tk, Java GUI builders (visual café)
- Sometimes the difference is due to types of prototyping
  - Throwaway prototype
  - Evolutionary prototyping

Old Prototyping Tools

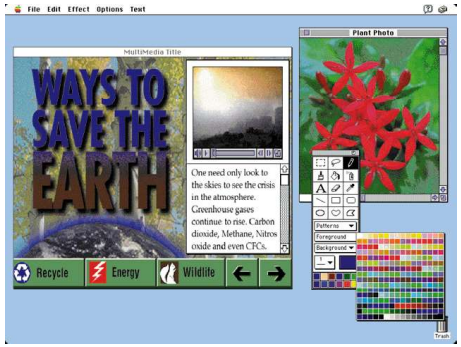
✓ Director
- most commonly used by designers
- intended for multimedia → lacks widgets
- good for non-widget UIs or the "insides" of app

✓ HyperCard
- metaphor: card transitions on button clicks
- comes with widget set
- drawing & animation more limited

✓ Both have "scripting" languages

HyperCard

- Tool palettes



General Purpose tool -PowerPoint

- Pros
  - can be used as a kind of storyboard
  - decent drawing package
  - animation features are easy to use and fairly flexible
  - the notes page feature can comment on storyboard
- Cons
  - Not much interaction facilities
    - ✓e.g. if users clicks on button A, bring up window Wa, otherwise bring up window Wb.
  - No direct scripting language (possible to use embedded objects)

UI Builders

- Visual Basic, Java, ……..
  - ✓lots of widgets (AKA controls)
  - ✓simple language
  - ✓slower than other UI builders
  - ✓widgets sets
  - ✓easily connect to code via “callbacks”
- Programming ability
  - ✓prototyping tools usually don’t require much
  - ✓UI builders usually do

UI Builders

- Performance
  - ✓prototyping tools produce slow programs
  - ✓UI builders depend on underlying language
- Widgets
  - ✓prototyping tools may not have complete set
  - ✓UI builders have widget set common to platform

Some Widgets used in prototypes

- Buttons (several types)
- Scroll bars and sliders
- Pull down menus

Some Widgets used in prototypes…

- Palettes

- Dialog boxes

- Windows

New Tools for prototyping

- Justinmind
  - http://www.justinmind.com/overview
  - http://www.youtube.com/watch?v=dJgCHAJ0r9E
- Similar tools
  - http://blog.profitbricks.com/top-29-mockup-and-wireframing-tools-for-developers/
  - http://www.sitepoint.com/tools-prototyping-wireframing/

Activity:

- Discuss how Dreamweaver could be used as a prototyping tool, its benefits and limitations.

Thank you

Developing a working prototype

By: M.N.M Shakoor

Agenda

1. Guidelines for developing a working prototype

Guidelines…

1. Work with real users
2. Collaborative Development
3. Domain understanding
4. Down to earth
5. KIS -Keep It Simple
6. Follow WYSIWYG
7. Walkthrough: Get an expert opinions
8. Prototype is not the real system
9. Consistency across the prototype
10. Working Metaphor

1. Work with real users

- Prototyping is not practical if a sample of end users is unable to participate to evaluate the prototypes
- Both developers and evaluators (representative users) should have some experience in prototyping concept and process, (otherwise it may lead to some misunderstandings)
- Committeemen from both parties (developers and users) are important when developing and evaluating prototypes

2. Collaborative Development

- Get your users stakeholders to work with the prototype.
- If it is possible, invite some candidate users to work with you when drafting or developing the prototype
- In this way, users can quickly determine whether the system will meet their needs.
- A good approach is to ask them to work through some use case scenarios using the prototype as if it were the real system.

3. Domain understanding

- Without a proper understanding about the background, such as underlying business, types of users and real infrastructure, it is hard to develop a prototype that will support to achieve goals/objectives
- Semantics of requirements depends on the working environment
- Design and develop the prototype that supports the culture of business and users in the organization
- Once again, active stakeholder participation is critical to your success.

4. Down to earth

- Consider prototype features that you can actually build.
- Christmas wish lists are for kids.
- If you cannot possibly deliver a particular functionality, do not prototype it.

5. KIS –Keep It Simple

- Not only the final system, your prototype too should be simple but You cannot make everything simple.
- Sometimes your software will be difficult to use because the problem it addresses is inherently difficult.
- Your goal is to make your user interface as easy as possible to use, not simplistic.

6. Follow WYSIWYG

- Follow the concept “WYSIWYG”, “What You See Is What You Get,” and utilize it to make sure from tentative users that
- WYSIWYN, "What You See Is What You Need.”
- Interface is the facilitator who guides the user to complete the work within the shortest possible way.
- Hence, interface should make some interest /motivate users to get what they want

7. Walkthrough: Get an expert opinions

- Get an interface expert to help on prototype design
- End users are not experts in the domain and they present things based on their views and requirements.
- It is better to obtain the assistance from User Interface specialist, a walkthrough, to make sure that you do things in the correct way

8. Prototype is not the real system

- Explain what a prototype is.
- It is natural to have misunderstandings between end users and development team, after going through the prototype.
- They may believe the work is completed or the work is a simpler thing than explained by developers.

8. Prototype is not the real system…

- users may not realize more work is left to do on the system after going through the prototype.
- To avoid this problem, point out that your prototype is like a Styrofoam model that architects build to describe the design of a house. Nobody would expect to live in a Styrofoam model, so why would anyone expect to use a system prototype to get his job done?

9. Consistency across the prototype

- Consistency across the prototype
- Yes it is a common rule in the usability of any system
- Inconsistent user interfaces lead to less usable software,
- At the same time, it will make more programming, and higher user support and high training cost

10. Working Metaphor

- Use your user language, not the technical terminology to present your prototype
- Development team may be more familiar with technical words when presenting things but it may not be something understandable to users

10. Working Metaphor…

- You need to craft your prototype by mapping concepts in user working environment to interface elements when designing any interface
- Avoid implementation technology/terminology to present things.
  - e.g. “Database” is more understandable than saying “MySQL database”

Question

- List down the advantages & disadvantages of developing a working prototype

Thank you

M.N.M Shakoor