CS8079 HUMAN COMPUTER INTERACTION L T P C

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OBJECTIVES:

- To learn the foundations of Human Computer Interaction.
- To become familiar with the design technologies for individuals and persons with disabilities.
- To be aware of mobile HCI.
- To learn the guidelines for user interface.

UNIT I FOUNDATIONS OF HCI 9

The Human: I/O channels – Memory – Reasoning and problem solving; The Computer: Devices – Memory – processing and networks; Interaction: Models – frameworks – Ergonomics – styles – elements – interactivity- Paradigms. – Case Studies

UNIT II DESIGN & SOFTWARE PROCESS 9

Interactive Design: Basics – process – scenarios – navigation – screen design – Iteration and prototyping. HCI in software process: Software life cycle – usability engineering – Prototyping in practice – design rationale. Design rules: principles, standards, guidelines, rules. Evaluation Techniques – Universal Design

UNIT III MODELS AND THEORIES 9

HCI Models: Cognitive models: Socio-Organizational issues and stakeholder requirements –Communication and collaboration models-Hypertext, Multimedia and WWW.

UNIT IV MOBILE HCI 9

Mobile Ecosystem: Platforms, Application frameworks- Types of Mobile Applications: Widgets, Applications, Games- Mobile Information Architecture, Mobile 2.0, Mobile Design: Elements of Mobile Design, Tools. – Case Studies

UNIT V WEB INTERFACE DESIGN 9

Designing Web Interfaces – Drag & Drop, Direct Selection, Contextual Tools, Overlays, Inlays and Virtual Pages, Process Flow – Case Studies

TOTAL :45 PERIODS

OUTCOMES:

Upon completion of the course, the students should be able to:

- Design effective dialog for HCI
- Design effective HCI for individuals and persons with disabilities.
- Assess the importance of user feedback.
- Explain the HCI implications for designing multimedia/ ecommerce/ e-learning Web sites.
- Develop meaningful user interface.

TEXT BOOKS:

1. Alan Dix, Janet Finlay, Gregory Abowd, Russell Beale, —Human Computer Interaction, 3rd Edition, Pearson Education, 2004 (UNIT I, II & III)
2. Brian Fling, —Mobile Design and Development, First Edition, O'Reilly Media Inc., 2009 (UNIT – IV)
3. Bill Scott and Theresa Neil, —Designing Web Interfaces, First Edition, O'Reilly, 2009. (UNIT-V)

UNIT I

FOUNDATIONS OF HCI

The Human: I/O channels - Memory - Reasoning and problem solving; The computer: Devices - Memory - processing and networks; Interaction: Models - frameworks - Ergonomics - styles - elements - interactivity - Paradigms.

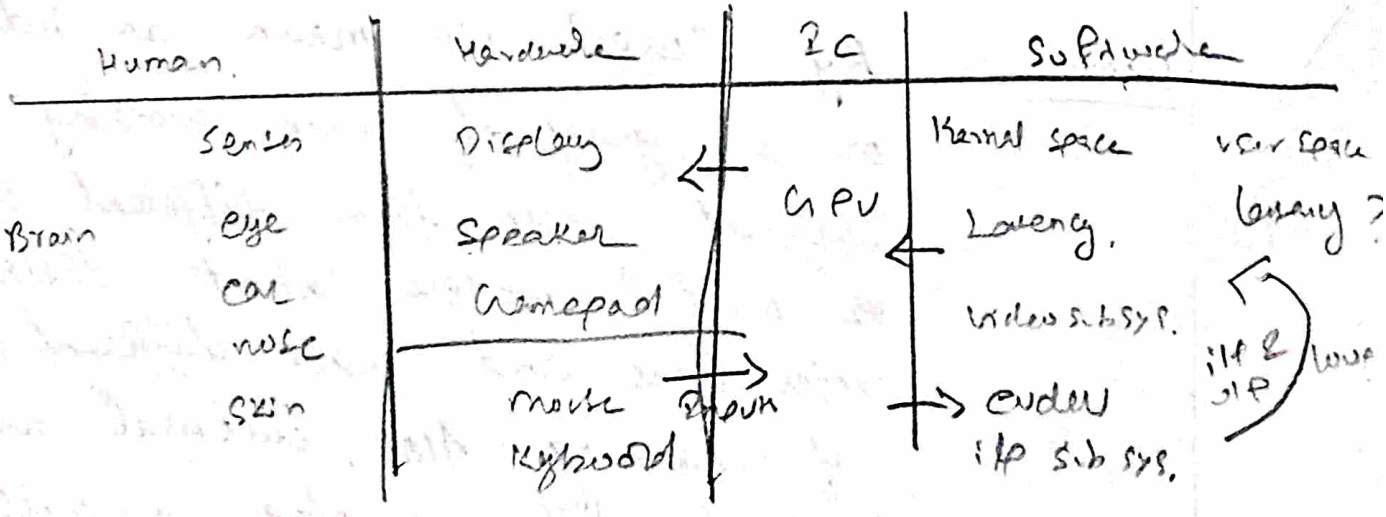
Introduction:

Human - computer interaction (commonly referred to as HCI) researches the design and use of computer technology, focused on the interfaces between people (users) and computers. Researchers in the field of HCI both observe the ways in which humans interact with computers and design technologies that let humans interact with computers in novel ways.

Users - By "user", we mean an individual, or a group of users working together. Different users form different conceptions or mental models about their interactions and have different ways of learning. Also, cultural and rational differences play a part.

Computer - When we talk about the computer, we are referring to any technology ranging from desktop computers, to large scale computer systems. For example, if we are discussing the design of a website, then the website itself would be refered to as 'the computee'. Devices such as mobile phones or VCR can also be considered so.

Interaction - There are obvious differences between humans and machines. In spite of these, HCI attempts to ensure that both get on with each other and interact. Inorder to achieve a usable system, you need to apply what you know about humans and computers throughout the design process. It is vital to find a balance between what would be ideal for the users and what is feasible in reality.



Goals of HCI

The goals of HCI are to produce usable and safe systems, as well as functional systems. In order to produce computer systems with good usability, developers must attempt to: understand the factors that determine how people use technology, develop tools and techniques to enable building suitable systems, achieve efficient interaction

Usability is one of the key concepts in HCI. A usable system is:

- easy to learn
- easy to remember how to use
- effective to use
- efficient to use
- safe to use
- enjoyable to use

Factors in HCI

There are a large number of factors which should be considered in the analysis and design of a system using HCI principles. Many factors are listed below

Organisation Factors

- Training, job design, politics, role
- Environmental factors
- Noise, heating, lighting, ventilation
- Health and safety factors

The User

- Cognitive processes and capabilities
- Motivation, enjoyment, satisfaction
- Comfort factors
- Seating, equipment, layout

User Interface:

Interfaces include input devices, output devices, dialogue structures, use of colour, icons, commands, navigation, graphics, natural language, user support, multimedia.

Task Factors:

Easy, complex, novel, task allocation, monitoring skills.

Constraints:

Cost, timescales, budgets, staff, equipment, buildings.

System Functionality: Hardware, software, application

INPUT- OUTPUT CHANNELS

A person's interaction with the outside world occurs through information being received and sent: input and output. In an interaction with a computer the user receives information that is output by the computer, and responds by providing input to the computer — the users's output becomes the computer's input and vice-versa.

For escample, sight maybe used primarily in receiving information from the computer, but also provide information to the computer. Input in the human occurs mainly through the senses and output through the motor control of the effectors.

There are five major senses: sight, hearing, touch, taste and smell. Of these, the first three are the most important to HCI. Taste and smell do not currently play a significant role in HCI. But they could play a specialized role in augmented reality systems. Vision, hearing and touch are central.

There are a number of effectors, including

fingers, eyes, head and vocal system. In the interaction with the computer, the fingers play the primary role.

Vision

Human Vision is a highly complex activity with a range of physical and perceptual limitations. We can roughly divide visual perception into two stages: the physical reception of the stimulus from the outside world and the processing and interpretation of stimulus.

The Human Eye

Vision begins with light. The eye has a mechanism for receiving light and transforming it into electrical energy. Light is reflected from objects in the world. The images are focussed upside down on the back of the eye.

The eye has a number of important components. The cornea and lens at the front of the eye focus the light into a sharp image on the retina. The retina is light sensitive and contains two types of photo-receptors: rods & cones.

Rods are highly sensitive to light and

Visual Perception

The information received by the eye must be filtered and passed to processing elements which allow us to recognize coherent scenes.

Reflected light light from the object forms an upside-down image on the retina. The size of that image is specified as a visual angle. Figure illustrates this visual angle. Visual angle is affected by both the size of the object and the distance from the eye. It is given in either degrees or minutes of arc, where 1 degree is equivalent to 60 minutes of arc.

Perceiving brightness

An aspect of visual perception is the perception of brightness. It is a subjective reaction to levels of light. Luminance is a physical characteristic & can be measured using a photometer. Constrast is related to luminance. it is a function of the luminance of an object and the luminance of its background.

Perceiving Colour

Colour is made up of three components: hue; intensity and saturation. Hue is determined by the spectral wavelength of the light.

allow us to see under a low level of illumination. They are unable to resolve fine detail and are subjected to light saturation. This is the reason for the temporary blindness we get from a darkened room into sunlight. There are approximately 120 million rods per eye. Rods dominate peripheral vision.

Cones are the receptor that are less sensitive to light than cones. Therefore they can tolerate more light. There are 3 types of cone, each sensitive to a different wavelength of light. This allows color vision. The eye has approximately 6 million cones, mainly concentrated on the fovea, a small area of the retina on which images are fixated.

There is a blind spot in the retina where the optic nerve enters the eye. The blind spot has no rods or cones, our visual system compensates for this so that in normal circumstances we are unaware of it.

X-cells are concentrated in the fovea. They are responsible for early detection of pattern. Y-cells are widely distributed in the retina. They are responsible for early detection of movement.

Blues have short wavelengths, greens medium and reds long.

Capabilities and Limitations of Visual Processing

Visual processing involves the transformation and interpretation of a complete image from the light that is thrown into the retina. Colour and brightness of objects are perceived as constant, in spite of changes in luminance.

Reading

There are several stages in the reading process. First, the visual pattern of the word on the page is perceived. It is then decoded with reference to an internal representation of language. The final stages of language processing include syntactic and semantic analysis and operate on phrases or sentences.

Adults read approximately 250 words a minute. It is unlikely that words are scanned serially, character by character, since experiments have shown that words can be recognized as quickly as single characters. There are evidence that reading from a computer screen is slower than from a book.

Hearing

The sense of hearing is often considered secondary to sight. Hearing begins with vibrations in the air or sound waves. The ear receives these vibrations and transmits them, through various stages to the auditory nerves. The ear comprises 3 sections: Outer ear, middle ear & innear ear.

The outer ear is the visible part of the ear. It has the pinna, which is the structure that is attached to the sides of the head, and the auditory canal. It serves two provisions, First, it protects the middle ear from damage. The auditory canal contains wasc which prevents dust, dirt from entering the middle ear. Also, it amplifies some sounds.

Processing Sound:

Pitch is the frequency of a sound. A low frequency produces a ~~h~~ low pitch and a high frequency, a high pitch. Loudness is proportional to the amplitude of sound. The frequency remains constant. The human ear can hear frequencies from 20 Hz to 15 kHz. It can distinguish frequency changes of less than 1.5 Hz at low frequencies.

Touch

Touch provides us with vital information about our environment. It tells us when we touch something hot or cold. The skin contains three types of sensory receptor: thermo receptors respond to heat and cold. The nocireceptors respond to intense pressure, heat and pain. The mechanoreceptors respond to pressure. The apparatus of touch differs from that of sight and hearing in that it is not localized.

Movement

A simple action such as hitting a button in response to a question involves a number of stages. The stimulus is received through the sensory receptors and transmitted to the brain. The question is processed and a valid response generated.

Movement is dependent largely on the physical characteristics of the subjects. Reaction time varies according to the sensory channel through which the stimulus is received.

Speed and accuracy of movement are important considerations in the design of interactive systems. The target maybe a button, menu or an icon. The time taken to hit a

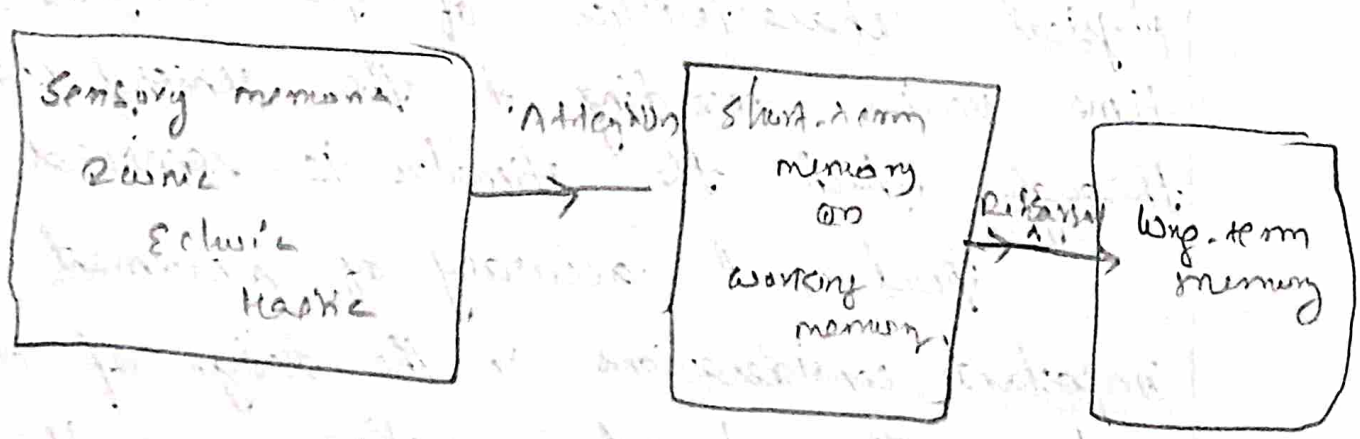
target is a function of the size of the target and the distance that has to be moved. This is summed up by Fitt's Law.

$$\text{Movement time} = a + b \log_2 (\text{distance}/\text{size} + 1)$$

where a and b are empirically determined constants.

II. HUMAN MEMORY

Memory is the second part of our model of the human as an information processing system. Memory is associated with each levels of processing. There are three types of memory or memory function: sensory buffers, short-term memory or working memory and long-term memory. These memories interact with information being processed and passed between memory stores.



Model of the structure of Memory

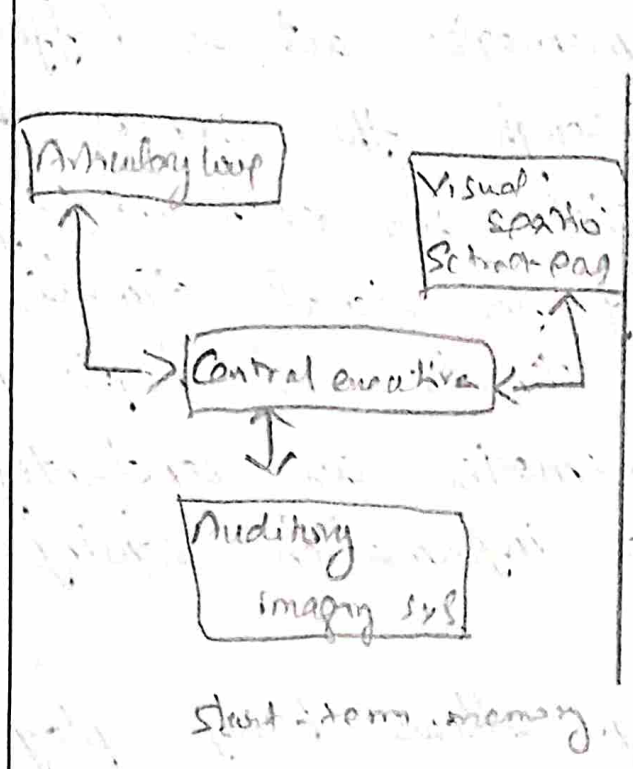
Sensory Memory

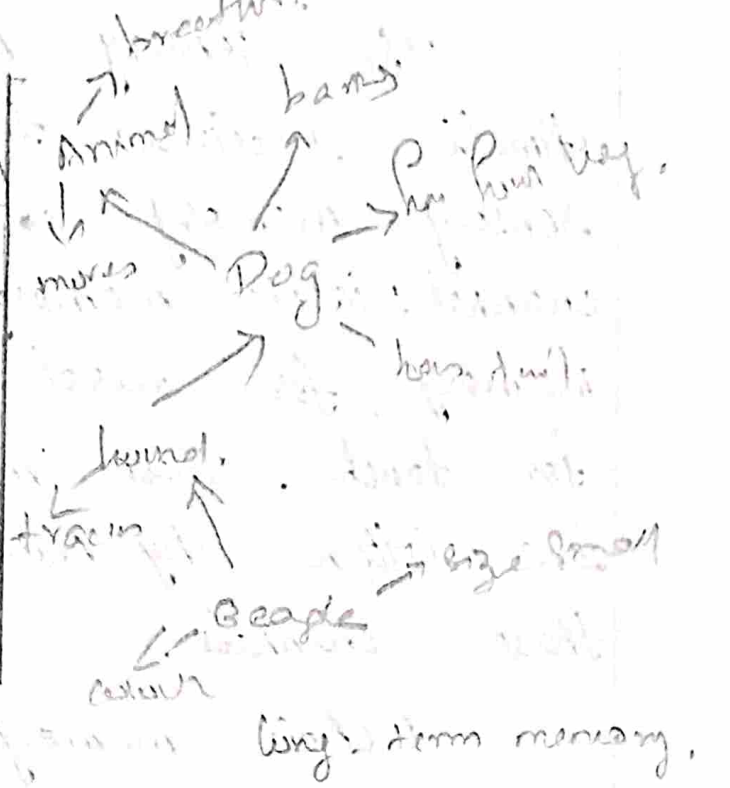
The sensory memories act as buffers for stimuli received through the senses. A sensory memory exists for each sensory channel: iconic memory for visual stimuli, echoic memory for aural stimuli and haptic memory for touch. These memories are constantly overwritten by new information coming in on these channels.

Echoic memory allows brief play-back of ~~mere~~ information. Information is passed from sensory memory into short-term memory by attention.

Short-term Memory

Short-term memory or working memory acts as a scratch pad for temporary recall of information. It can be accessed rapidly, in the order of 70 ms. Also, it decays rapidly, in the order of 200 ms. There are two basic methods for measuring memory capacity. The first involves determining the length of a sequence which can be remembered in order. The second allows items to be freely recalled in any order.





Long-term Memory

Long-term memory is our main resource. Here, we store factual information, procedural rules of behaviour, in fact everything that we know.

It has huge capacity and a relatively slow access time of approximately a tenth of a second. Thirdly, forgetting occurs more slowly in long-term memory. It is intended for the long-term storage of information. Unlike working memory, there is little decay.

There are two types of long-term memory: episodic memory and semantic memory.

We can reconstruct the actual events that took place at a given point in our lives. Semantic memory is a structured record of facts, concepts and skills that we have acquired.

Long term memory processes

This process can be optimized in a number of ways. In experiments, it was discovered that the amount learned was directly proportional to the amount of time spent learning. This is known as total time hypothesis. However, some studies suggest that learning time is most effective if it is distributed over time.

Information retrieval has two types: recall and recognition. In recall, the information is produced from memory. In recognition, the presentation of the information provides the knowledge that the information has been seen before. Recognition is the less complex cognitive activity since the information is provided as a cue.

Also, there are two main theories of forgetting: decay and interference.

III. THINKING: REASONING AND PROBLEM SOLVING

Humans are able to use information to reason and solve problems. Human thought is conscious and self-aware.

Thinking can require different amounts of knowledge.

Reasoning

Reasoning is the process by which we use the knowledge we have to draw conclusions or infer something new about the domain of interest. There are a number of different types of reasoning: deductive, inductive and abductive.

Deductive Reasoning

Deductive reasoning derives the logically necessary conclusion from the given premises. For example, If it is Friday then she will go to work. It is Friday, therefore she will go to work.

Inductive Reasoning

Inductive is generalizing from cases we have seen to infer information about cases

we have not seen. Induction is a useful process, which we use constantly in learning about our environment: We can never see all the elephants that have ever lived or will ever live, but we have certain knowledge about elephants which we are prepared to trust for all practical purposes which has been inferred by induction.

The highlight is that even if we saw an elephant without a trunk, we would be unlikely to move from our position that 'All Elephants have trunks', since we are better at using positive than negative evidence.

Abductive Reasoning

The third type of reasoning is abduction. Abduction reasons from a fact to the action or state that caused it. This is the method we use to derive explanations for the events we observe.

Problem Solving

Human problem solving is characterized by the ability to adapt the information we have to deal with new situations. often solutions seem to be original & creative

Analogy in Problem Solving

A third element of problem solving is the use of analogy. Similarities between the known domain and the new one are noted and operators from the known domain are transferred to the new one.

Skill acquisition

A commonly studied domain is Chess playing. It is particularly suitable since it lends itself easily to representation in terms of problem space theory. The initial state is the opening board position; the goal state is one player checkmating the other; operators to move states are legal moves of chess.

Errors and Mental models

Human capability for interpreting and manipulating information is quite impressive. Some are trivial, resulting in no more than temporary inconvenience. Others may be more serious, requiring substantial effort to correct. In real-world problems, finding the knowledge required to solve the problem may be part of the problem.

IV. THE COMPUTER

A typical Computer System

A typical computer system includes a keyboard, a mouse and a colour screen. The screen layout is shown alongside it. Data have to be entered into and obtained from a system and there are also many different types of user, each with their own unique requirements.

Levels of Interaction - Batch Processing

There was minimal interaction with the machine: the user would simply dump a pile of punched cards onto a reader. With batch processing, the interaction takes place over hours or days.

In constrast, the typical desktop computer system has interactions taking seconds or fractions of a second. The field of Human-Computer Interaction largely grew due to this change in interactive pace. A computer system comprises various elements, each of which affects the user of the system.

→ Input devices for interactive use, allowing text entry, drawing and selection from screen

text entry : traditional keyboard, phone text entry, speech and handwriting

pointing : principally the mouse, touchpad, stylus and other 3D interaction devices.

→ Output display devices for interaction

i) Different types of screen mostly form of bitmap display

ii) Large displays for shared and public use

iii) Digital paper may be usable in the near future

→ Virtual reality systems and 3D visualization which have special interaction and display display devices

→ Various devices in the physical world:

i) physical controls and dedicated displays

ii) sound, smell and haptic feedback

iii) Movement, temperature, bio-sign sensors.

→ Memory

i) Short-term Memory : RAM

ii) Long-term memory : ROM

iii) capacity limitations to documents and video storage

Processing:

→ the effects when systems run too slow or too fast, the myth of the infinitely fast machine

→ limitations on processing speed

Network Hubs

→ switches

→ Bridges

→ Routers and Gateways

→ Network interface cards, ISDN adapters

→ Wireless access points (WAPs)

Interaction Models

Interaction involves two participants: the user & the system. The interface must translate between them to allow the interaction to be successful. The use of models of interaction can help us to understand what is going on in the interaction. Also, they provide framework to compare different interaction styles

The terms of Interaction

The purpose of an interactive system is to aid a user in accomplishing goals from application domain.

A domain defines an area of expertise & knowledge in some real-world activity. Some examples of domains are graphic design, authoring and process control in a factory.

A domain consists of concepts that highlight its important aspects. Tasks are operations to manipulate the concept of a domain.

The execution-evaluation cycle

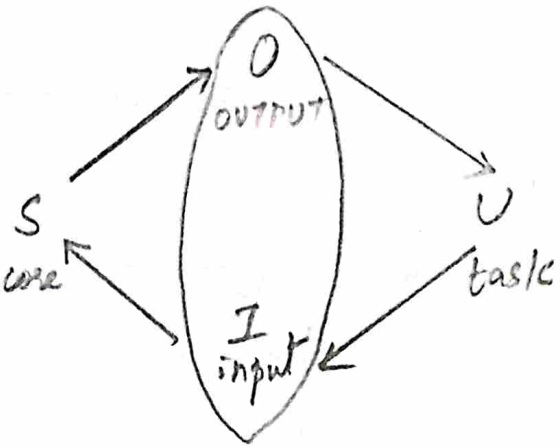
The interaction cycle can be divided into two major phases: execution and evaluation. The stages in Norman's model of interactions are as follows:

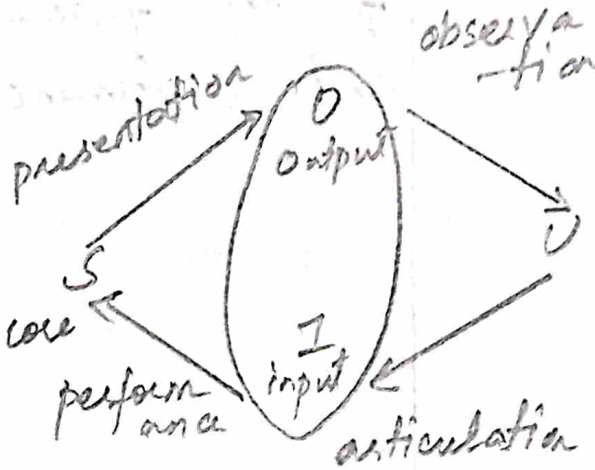
1. Establishing the goal
2. Forming the intention
3. Specifying the action sequence.
4. Executing the action
5. Perceiving the system state
6. Interpreting the system state
7. Evaluating the system state with goals and intentions.

The interaction framework:

The interaction framework attempts a more realistic description of interaction by including the system explicitly. It has four components:

Norman uses this model of interaction to demonstrate why some interfaces causes problems. The nodes represent the four components — the System, the User, the Input and the Output. Each component has its own language.





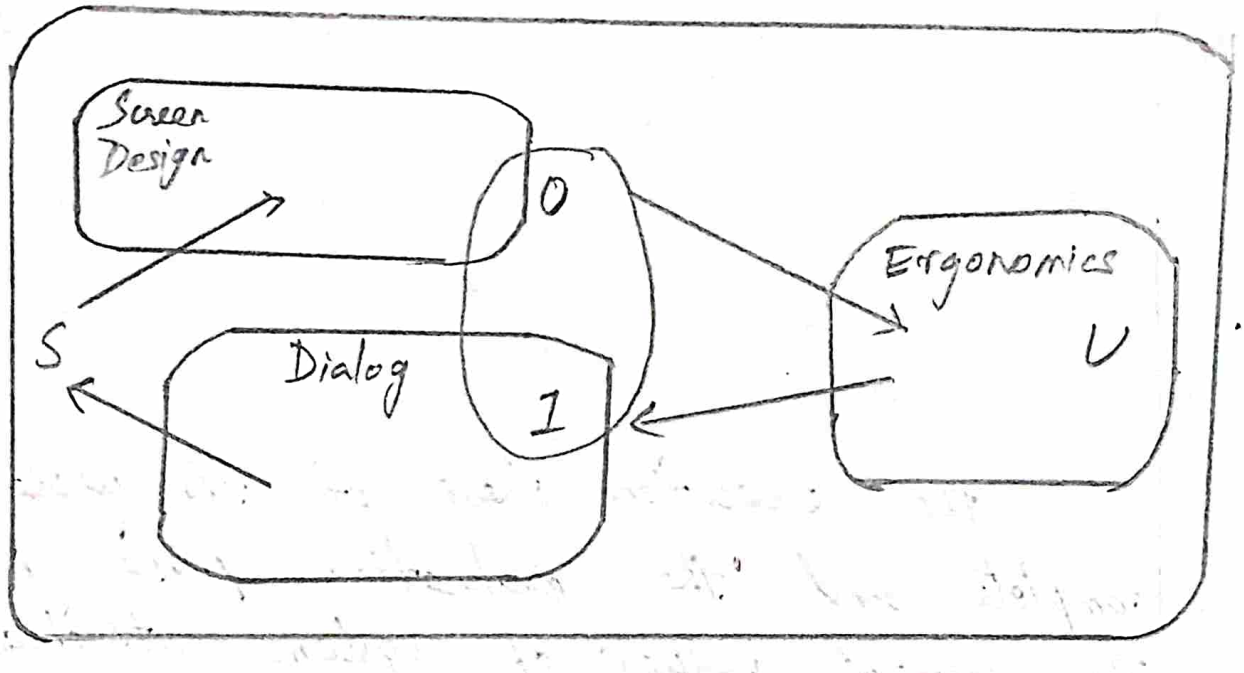
The execution phase of the cycle is complete and the evaluation phase begins. The current values of system attributes are rendered as features of the output. There are four main translations in the interaction.

1. articulation
2. performance
3. presentation
4. observation

The interaction framework is presented as a means to judge the overall usability of an system.

Frameworks and HCI

The field of ergonomics addresses issues on the user side of the interface, covering input and output. Dialog design and interface styles can be placed along the input branch of the framework, addressing both articulation and performance.



Ergonomics

Ergonomics is the study of the physical characteristics of the interaction: how the controls are designed, the physical environment in which the interaction takes place, and the layout and physical qualities of the screen.

In seeking to evaluate these aspects of the interaction, ergonomics touches upon human psychology and system constraints.

Arrangement of controls and displays

The exact organization that will suggest depends on the domain and the application.

i) Functional controls & displays

ii) Sequential controls & displays

iii) Frequency controls & displays

Physical environment of the interaction

Physical issues in the layout and arrangement of the machine interface. This will depend on the domain and will be more critical in specific control and operational settings. A first consideration is the size of the users.

Health Issues

There are a number of factors that may affect the use of more general computers. These are factors in the physical environment that directly affect the quality of the interaction and the user's

Performance

Users should be able to reach all controls comfortably and see all displays.

Temperature

Extremes of hot or cold will affect performance & in excessive cases, health. Studies show that performance deteriorates at high or low temperatures.

Lighting

The lighting level will again depend on the work environment. Adequate lighting should be provided to all users without discomfort.

Noise

Excessive noise can be harmful to health. Noise levels should be maintained at a comfortable level in the work environment.

IV. INTERACTION STYLES

Interaction can be seen as a dialog between the computer and the user. The choice of interface style can have a profound effect on the nature of dialog

i) command line interface

ii) menus

iii) natural language

iv) question/answer and query dialog

v) form-fills and spreadsheets
vi) WIMP
vii) point and click
viii) Three-dimensional interfaces

Command Line Interface

The command line interface was the first interactive dialog style to be commonly used. It provides a means of expressing instructions to the computer directly. They are powerful in that they offer direct access to system functionality. They are also flexible. The commands used should be terms within vocabulary of the user.

Menus

In a menu-driven interface, the set of options available to the user is displayed on the screen and selected using the mouse, or keys. They need to be meaningfully grouped.

Natural Language

Language is ambiguous at a number of levels. The syntax or structure of a phase should be clear.

Question/Answer and Query Dialog

Question and answer dialog is a simple mechanism for providing input to an application. The user is asked a series of questions. They are appropriate for restricted domains.

Form-fills and Spreadsheets

They are primarily for data entry but can be useful in data retrieval applications. Mostly, they allow easy movement around the form and allow some fields to be left blank.

Spreadsheets are a sophisticated variation of form filling. They consists of a grid of cells each of which contain a value or formula. The user is free to manipulate values at will.

WIMP Interface

WIMP stands for windows, icons, menus and pointers (sometimes windows) and is the default interface style for the majority of interactive computer systems in use today. Examples include WIMP interface for IBM PC compatibles, MacOs for Apple Macintosh compatibles.

Point-and-click interfaces

This is closely related to the WIMP style. It is not tied to mouse-based interfaces and is used in touchscreen information systems. Often, it is combined with a menu-driven interface.

Three-Dimensional interfaces

The most important example is Virtual Reality. Such interfaces have a light source at their top right. The simplest technique is where ordinary WIMP elements, buttons, scroll bars, are given a 3D appearance.

Interactivity

Dialog design is focussed on the choice and specification of appropriate sequences of actions and corresponding changes in the interface state. It ignores the semantic level of an interface: for example, the validation of numeric information in a forms-based system.

Interactivity is crucial in determining the feel of a WIMP environment. All WIMP systems have virtually the same elements: windows, icons, menus, pointers.

In WIMP environments, the user takes the initiative with many options and often many applications simultaneously available. It is critical in dealing with errors.

PARADIGMS

Time Sharing

The concept of time sharing is by which a single computer could support multiple users. The computer could now project itself as a dedicated partner with each individual user. The throughput of information is increased.

Video Display Units

In mid-1950s researches were experimenting with the possibility of presenting and manipulating information from a computer in the form of images on a video display unit (VDU). The earliest applications were developed in military applications, most notably the Semi-Automatic Ground Environment (SAGE) project of the US Air Force.

Personal Computing

Programming toolkits provide a means for those with computing skills. The powerful tools of the hacker could be made accessible to the computer novice was a graphic programming language for children called LOGO.

Window Systems and the WIMP Interface

One presentation mechanism for achieving this dialog partition is to separate physically the different logical threads of user-computer conversation.

Hypertext

Hypertext is text which contains links to other texts. The term was coined by Ted Nelson around 1965. It includes graphic, video and sound.

Computer-supported cooperative Work

Personal computing provides individuals with enough computing power. These networks became widespread. One result of this reconnection was the emergence of (CSCW) computer-supported cooperative work.

The World Wide Web

This is a global information medium which users can read and write via computers connected to the internet. Web is a service that operates over the internet, just as e-mail also does.

The computers of the internet all communicate using common data transmission protocols (TCP/IP) and addressing systems.

Ubiquitous Computing

It is a paradigm in which the processing of information is linked with each activity or object. It involves connecting electronic devices. Devices that use ubiquitous computing have constant availability and are completely connected. It is also known as pervasive computing.

UNIT - II

DESIGN & SOFTWARE PROCESS

Interactive Design Basics - process - scenarios - navigation - screen design - Iteration and prototyping. HCI in software process - software life cycle - usability engineering - Prototyping in pratice - design rationale. Design rules - principles, standards, guidelines, rules. Evaluation Techniques - Universal Design

INTERACTIVE DESIGN BASICS

Interaction design is about creating interventions in often complex situations using technology of many kinds including PC software, the web and physical devices.

→ Design involves achieving goals within constraints and trade-off between these understanding the raw materials: computer & human

→ The design process has several stages and is iterative and never complete

→ Interactions starts with getting to know the users and their context.

→ Scenarios are rich design stories, which can be used and reused throughout design.

→ Users need to find their way around a system. This involves:

i) Helping users know where they are, what they can do next

ii) creating overall structures that are easy to understand and fit the user's needs designing comprehensible screens and control panels.

→ Complexity of design means we don't get it right first time:

i) we need iterations and prototypes to try out and evaluate

ii) Iterations should not get trapped in local maxima

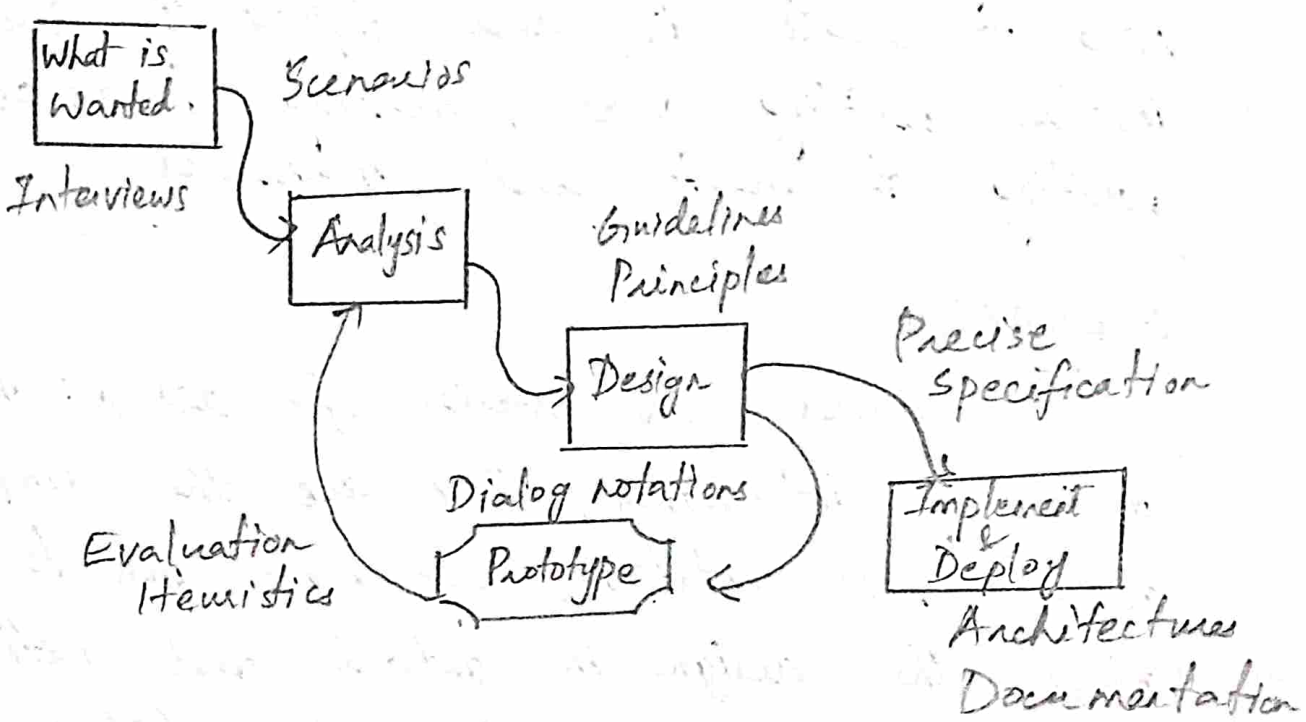
iii) The purpose of the design should be clear

iv) The constraints involved such as copyright protection and standards should be considered

v) Choosing the optimum trade-off for achieving the optimum goal of design.

The golden rule of design is to understand the materials (i.e) computers & people.

PROCESS OF DESIGN



Requirements → What is wanted. The first stage is establishing what exactly is needed. As a precursor to this, it is usually necessary to find out what is happening

Analysis → The results of observation and interview need to be ordered in some way to bring out key issues and communicate with later stages of design.

Design → There are numerous rules, guidelines and design principles to design.

Iteration and Prototyping → We need to evaluate a design to see how well it is working and the scope of improvements

Implementation and Deployment

After the design process completion, we need to create it and deploy it. This will involve writing code, making hardware, writing documents and manuals.

SCENARIOS

Scenarios are stories for design: rich stories of interaction. They are the simplest design representation. They make you to think about the design in detail and notice potential problems before they happen.

- Communicate with others
- Validate other models
- Express dynamics

NAVIGATION DESIGN

It is the process or activity of accurately ascertaining one's position & plan and following a route.

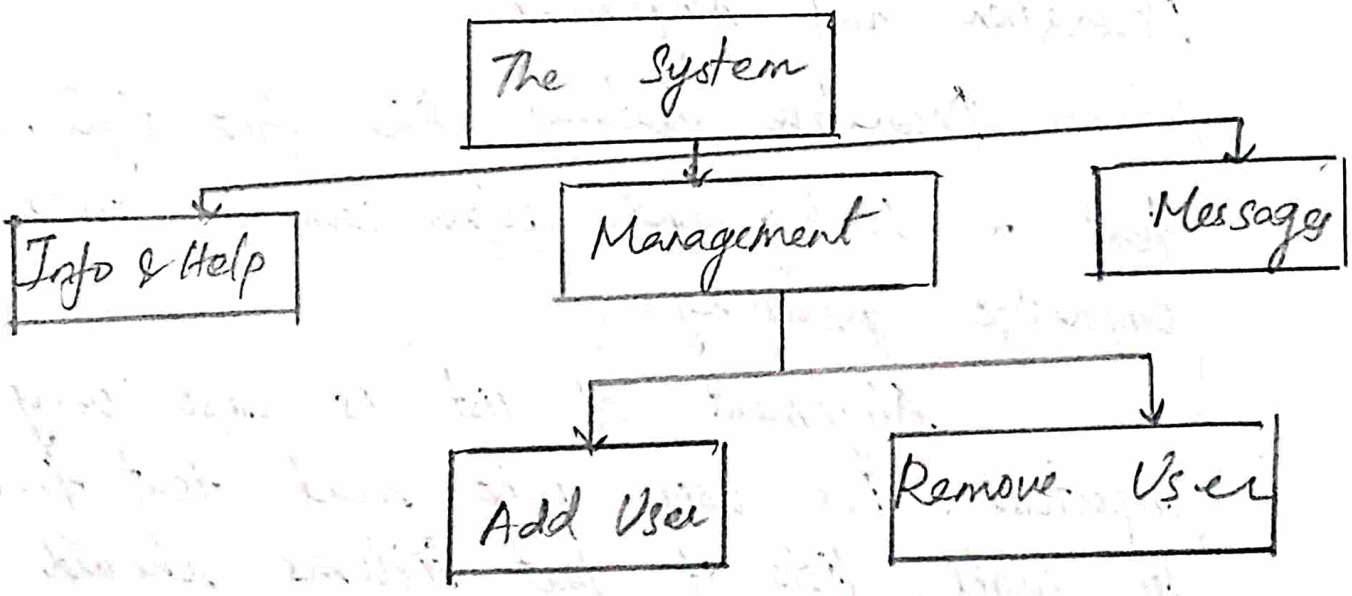
Widgets are the appropriate choice and wording in menus and buttons will help you know how to use them.

Screens or Windows help you to find things & understand the logical grouping.

Navigation within the application happens when the button is pressed and where the next interaction occurs. The word processor has to read documents from disk. To do the goal seeking, it is important knowing

→ where you are
→ what you can do
→ where you are going - or what will happen
- where you have been - or what you have done.

Global Structure



The hierarchy links screens, pages or states in logical groupings. This actually helps to structure the system.

SCREEN DESIGN AND LAYOUT

Tools for Layout

We have a number of visual tools available to help us suggest to the user appropriate ways to read & interact with a screen or device.

Grouping and structure involves grouping things that logically belong together. This may involve multiple levels of structure. In a potential design for an ordering screen, the details for billing and delivery are grouped together spatially.

Decoration and Alignment

Decorative features like font style, and text or background colors can be used to emphasize groupings.

Alignment of lists is also very important. For users who read text from left to right, lists of text items should be aligned to the left. And numbers should be to the right or at the decimal point.

White Space

Spacing or white space is any section of a document that is unused or space

around an object. White spaces help separate paragraphs of text, graphics and other portions of a document, and helps a document look less crowded. Using white space effectively in a document keeps the reader reading the document and helps the reader.

White space is created by pressing the return key or the tab key and can also be created by setting the document's margins.

User Action and Control:

- Entering Information

The task analysis techniques can help in grouping screen items. Many of the same layout issues for data presentation also apply to fields of data entry.

- Knowing What to do

If everyone designs buttons to look the same and menus to look the same, then users will be able to recognize them.

Standards help for common actions such as save, delete or print. There are difficult problems in multimedia applications where one can choose a non-standard also

- Presenting Information

The way of presenting information on screen depends on the kind of information: text, numbers, maps, tables; And the technology to present it: character display, line drawing, graphics and virtual reality.

The file listing is alphabetic but it makes very difficult to find recently updated files.

Aesthetics and Utility

The beauty and utility may sometimes be at odds. For example, an industrial control panel will often be built up of the individual controls of several subsystems. The resulting inconsistency in appearance may look a mess.

It can also be viewed in well designed posters and multimedia systems. Backdrop behind text must be low contrast inorder to leave the text readable.

For example, the sleek curves of a car is a differentiator.

Making a mess : Colour and 3D

The increasing use of 3D effects in interfaces has posed a new set of problems for text and numerical information. Whilst excellent for presenting physical information and certain sorts of graphs, text presented in perspective can be difficult to read.

Localization / Internationalization

If you are working in a different country, you might see a document being word processed where the the text of the document and the file names are in the local language. But all the menus and instructions are still in English.

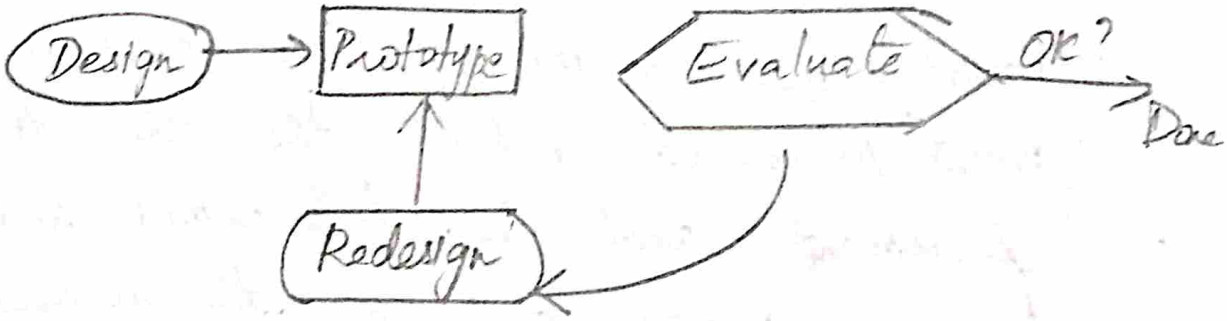
The process of making software suitable for different languages and cultures is called localization. Many interface construction toolkits make this easy using resources.

ITERATION AND PROTOTYPING

All interaction design includes some form of iteration of ideas. Any prototypes, can be evaluated to see whether they are acceptable

and whether there is room for improvement. This sort of evaluation intended to improve design is formative evaluation. This is in contrast to summative evaluation which is performed at the end to verify if the product is good enough.

So iteration and prototyping are the universally accepted best approach for interaction design.



Prototyping is an example of a hill-climbing approach. You start somewhere, evaluate it to see how to make it better, change it to make it better and then keep doing this again until it can't get better.

HCI IN THE SOFTWARE PROCESS

→ Software engineering provides a means of understanding the structure of the design process,

→ Usability engineering promotes the use of explicit criteria to judge the success of a product

→ Iterative design practices work to incorporate crucial customer feedback early in the design process to inform critical decisions

→ Design involves making many decisions among numerous alternatives. Design rationale provides an explicit means of recording these design decisions and the context in which the decisions were made.

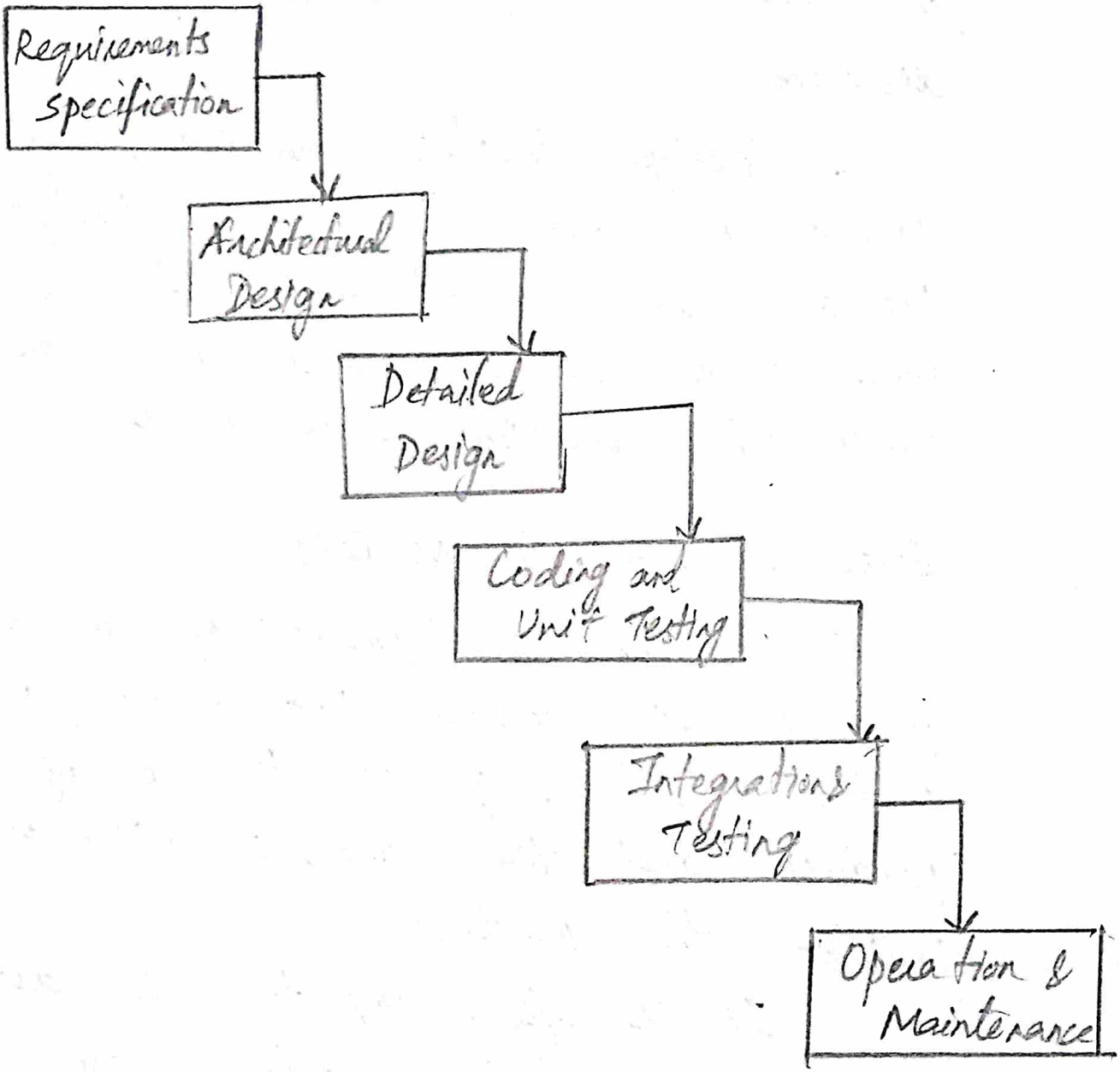
Software LifeCycle Models:

In the development of a software product, we consider two main parties: the customer who requires the use of the product and the designer who must provide the product.

It is often important to distinguish between the customer who is the client of the designing company and the customer who is the eventual user of the system.

The group of people who negotiate the features of the intended system with the designer may never be actual users of the system.

We describe the activities of the waterfall model of the software life cycle.



Requirements Specification

This begins at the start of the product development. Though the requirements are from the customer's perspective, if they are to be met by the software product they must be formulated in a language suitable for implementation.

Requirements are usually expressed in the native language of the customer. The executable languages for software are less natural and are more closely related to a mathematical language.

Task analysis techniques, which are used to express work domain requirements in a form that is both expressive and precise

Architectural Design

The requirements specification concentra-tes on what the system is supposed to do. The next activities concentrate on how the system provides the services expected from it. Next is a high-level decomposition of the system into components that can either be brought in from existing software products.

An architectural design performs this decomposition. It must describe the inter-dependencies between separate components and the sharing of resources that will arise between components. Whether the existing software products or to be developed from scratch is found.

Detailed Design

The architectural design provides a decomposition of the system description that allows for isolated development of separate components which will later be integrated. The designer must provide a sufficiently detailed description so that they may be implemented in some programming language.

The detailed design is a refinement of the component description provided by the architectural design. Choosing the best refinement is important.

Coding and Unit Testing

After coding, the component can be tested to verify that it performs correctly, according to some test criteria that were earlier determined.

The transformation from the detailed design to the implementation is from one mathematical representation to another. More practical work concentrates on the automatic generation of tests from output of earlier activities.

Integration and Testing

Once enough components have been implemented and individually tested, they must be integrated as described in the architectural design. Further testing is done to ensure correct behaviour.

Some acceptance testing is performed to ensure that the system meets their requirements. It is only after acceptance of the integrated system that the product is finally released to the customer.

Maintenance

After product release, all work on the system is considered under the category of maintenance. Consequently, the majority of the lifetime of a product is spent in the maintenance activity. It involves the correction of errors in the system which are discovered after release and the revision of the system services to satisfy requirements that were not realized during previous development.

USABILITY ENGINEERING

In relation to the software life cycle one of the important features of usability engineering is the inclusion of a usability specification, forming part of the requirements specification that concentrates on features of the user-system interaction.

Attribute	Backward Recoverability
Measuring concept	– Undo an erraneous programming sequence
Measuring Method	– Number of explicit user actions to undo current program
Now Level	– No current product allows such an undo
Worst case	– As many actions as it takes to program in mistake
Planned Level	– A maximum of two explicit user actions
Best case	– One explicit cancel action

this is the sample usability specification for undo with a VCR.

Recoverability refers to the ability to reach a desired goal after recognition of some error in previous interaction. The recovery procedure can be in either a backward or forward sense. Current VCR design has resulted in interactive system that are difficult to use.

Backward recoverability is the ability to undo an erroneous programming sequence.

Criteria by which Measuring Method can be Determined:

1. Time to complete a task
2. Per cent of task completed
3. Per cent of task completed per unit time
4. Ratio of successes to failures
5. Time spent in errors
6. Per cent or number of errors
7. Per cent or number of competitors better than it
8. Number of commands used
9. Frequency of help and documentation use

10. Percent of favorable/unfavorable user comments
11. Number of repetitions of failed commands
12. Number of runs of successes & of failures
13. Number of times interface misleads the user
14. Number of good and bad features recalled by users
15. Number of available commands not invoked
16. Number of regressive behaviors
17. Number of users preferring your system
18. Number of times users need to work around a problem
19. Number of times the user is disrupted from a work task.
20. Number of times user loses control of the system.
21. Number of times user expresses frustation or satisfaction.

This gives the criteria by which measuring method can be determined.

Problem with Usability Engineering

The major feature of usability engineering is the assertion of explicit usability metrics early on in the design process.

The problem with usability metrics is that they rely on measurements of very specific user actions in very specific situations.

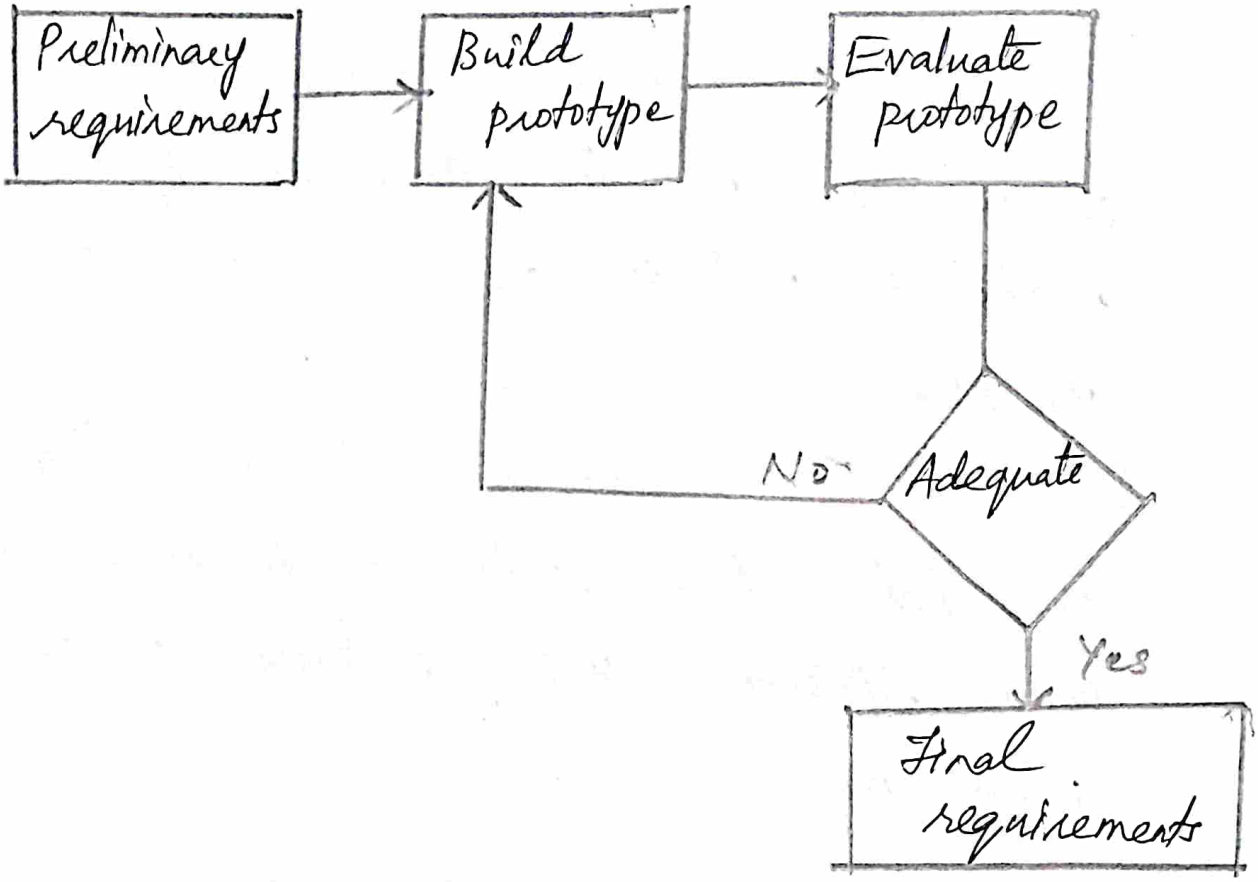
ITERATIVE DESIGN AND PROTOTYPING

The design can be modified to correct any false assumptions that were revealed in the testing. This is the essence of iterative design.

There are three main approaches to prototyping:

Throw-away:

The prototype is built and tested. The design knowledge gained from this exercise is used to build the final product, but the actual prototype is discarded.



Incremental :

The final product is built as separate components, one at a time. There is no overall design for the final system, but it is partitioned into independent & smaller components. The final product is then released as a series of products, each subsequent release including one more component

Evolutionary :

This prototyping fits in well with the modifications which must be made to the system that arise during the operation

Prototypes differ according to the amount of functionality and performance they provide relative to the final product. The level of functionality and importance of a prototype lies in its projected realism.

Building prototype takes times and it can be seen as precious time taken away from the real design task..

Techniques for prototyping

Probably the simplest notion of a prototype is the storyboard, which is a graphical depiction of the outward appearance of the intended system. Story-boards and animation techniques are not sufficient for this purpose.

Some portion of the functionality must be simulated by the design team.

HyperTalk and many similar languages allow the programmer to attach functional behaviour to the specific interactions that the user will be able to do.

DESIGN RATIONALE

Design rationale is the information that explains why a computer system is the way it is, including its structural or architectural description.

In this sense, design rationale does not fit squarely into the software life cycle.

In an explicit form, a design rationale provides a communication mechanism among the members of a design team so that during later stages of design, it is possible to understand critical decisions.

→ Accumulated knowledge in the form of design rationales for a set of products can be reused

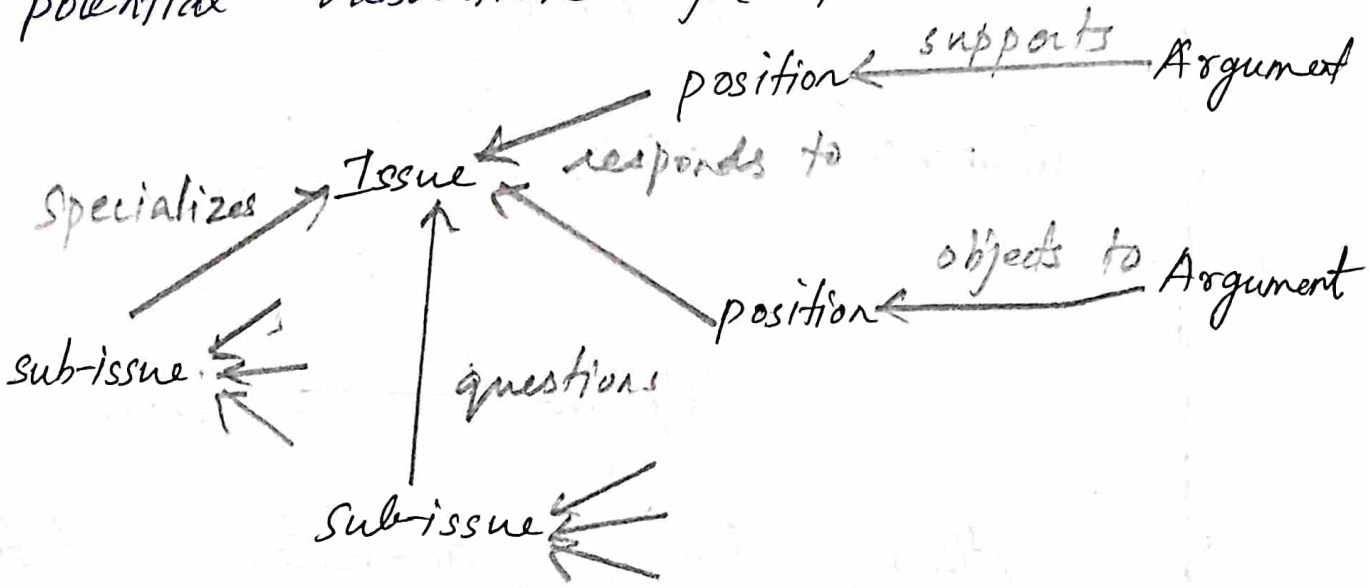
→ The effort required to produce a design rationale forces the designer to deliberate more carefully about the design decisions.

In the area of HCI, design rationale has been very important.

Process-Oriented design rationale

Rationale is based on Rittel's issue-based information system. A root issue is identified which represents the main problem or question that the argument is addressing.

Various positions are put forth as potential resolutions for the root issue.



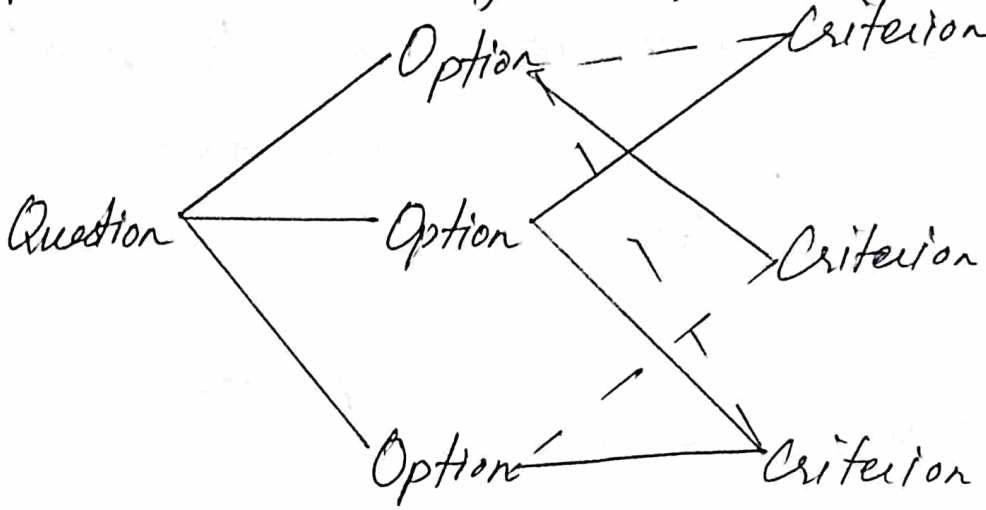
A graphical version of IBIS has been defined by Conklin and Yakemovic called gIBIS.

Design Space Analysis

A more deliberative approach to design rationale which emphasizes a post hoc structuring of the space of design alternatives in a design project.

their approach, embodied in the Questions, Options and Criteria (QOC) notation is characterized as design space analysis issues.

Questions in a design space analysis are therefore similar to issues in IBIS except in the way they are captured



Options provide alternative solutions to the question. The key to an effective design space analysis using the QOC notation in deciding the right questions.

Decision Representation Language (DRL) structures the design space in a similar fashion to QOC.

The major overhead such as analysis is a disadvantage. When time is scarce, these kinds of overhead costs needs to be trimmed.

DESIGN RULES

- Designing for maximum usability is the goal of interactive systems design
- Abstract principles offer a way of understanding usability in a more general sense
- Design rules in the form of standards and guidelines provide direction for design
- The essential characteristics of good design are summarized through golden rules
- Design patterns provide a potentially generative approach to capturing & reusing design knowledge.

Principles to Support Usability:

1) Predictability
2) Synthesizability
3) Familiarity
4) Generalizability
5) Consistency

Predictability:

It is distinguished from deterministic behavior of the computer system alone. Most computer systems are ultimately deterministic machines.

Synthesizability:

When an operation changes some aspect of the internal state, it is important that the change is seen by the user. The principle of honesty relates to the ability of UI to provide an observable change.

Familiarity:

New users of a system bring with them a wealth of experience. For a new user, the familiarity of an interactive system measures the correlation between the user's existing knowledge and the knowledge required for effective interaction.

Generalizability:

It leads to a more complete predictive model of the system for the user. We can apply generalization to situations.

Consistency:

It relates to the likeness in behavior arising from similar situations or similar tasks. The user relies on a consistent interface. It can be expressed in terms of the form of input expressions.

STANDARDS

Standards for interactive system design are usually set by national or international bodies to ensure compliance with a set of design rules.

Standards can apply specifically to either hardware or the software used to build the system.

A given standards institutions, such as BSI or ISO has standards for hardware in place before software. For example, an Interim Defense Standard 00-25 on Human Factors for designers of equipment

- PART 1 Introduction
- PART 2 Body Size
- PART 3 Body Strength & Stamina

- PART 4 Workplace Design
- PART 5 Stresses & Hazards
- PART 6 Vision & Lighting
- PART 7 Visual Displays
- PART 8 Auditory Information
- PART 9 Voice communication
- PART 10 Controls
- PART 11 Design
- PART 12 Systems.

GUIDELINES

A major concern for all of the general guidelines is the subject of dialog styles. Most guidelines are applicable for the implementation of anyone of these dialog styles in isolation

Comparison of dialog styles

Smith & Mosier	Mayhew
Form filling	Fill-in forms
Menu selection	Menus
Graphic selection	Direct Manipulation
Natural Language	Natural Language
Function keys	Function keys

RULES AND HEVRISTICS

1. Strive for consistency in action sequences, layout, terminology

2. Enable frequent users to use macros, shortcuts, familar actions

3. Offer informative feedback

4. Design dialogs to yield closure so that user knows when they have completed a task.

5. Offer error prevention and simple error handling & offer clear and informative instructions.

6. Support internal locus of control so that the user is in control of the system.

7. Permit easy reversal of actions in order to relieve anxiety and encourage exploration.

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

EVALUATION TECHNIQUES

✱ Evaluation

- tests usability and functionality of system
- occurs in laboratory / field
- evaluates both design & implementation
- should be considered at all stages in the design life cycle

✱ Goals of Evaluation

- Assess extent of system functionality
- Assess effect of interface on user
- Identify specific problems

✱ Usage of Evaluation

- Depends on testing purposes
- Depends on the stage in the development cycle
- Depends on resources available
- Analytic inspection: Heuristic
- Principles : Cognitive walkthrough

UNIVERSAL DESIGN:

Principles:

- Equitable use
- Flexibility in use
- simple & intuitive
- Perceptible information
- Tolerance for error
- Low physical effort

Multi-Sensory Systems:

More than one sensory channel in interaction. For example, sounds, text, hypertext, video.

Particularly good for users with special needs and virtual reality. The five senses together provide a fuller interaction with the natural world. Also good with general terminology, speech, non-speech sounds, handwriting.

Unit - III

Models and Theories.

Cognitive Models:

→ A cognitive model can substitute for a human user to predict how users will perform on a system before it is implemented or even prototyped.

→ Cognitive models are as follows.

1. Goal and task hierarchies (GOMS, CCT)
2. Linguistic Notations (BNF, TAG)
3. Physical and device models (KLM)
4. Automating Inspection Methods.

GOMS :

→ The GOMS is an acronym for Goals, Operators, Methods and Selection.

→ GOMS is a task analysis technique.

→ GOMS is family of user interface

modelling techniques :

→ GOMS has 4 components .

* Goals
* Operators
* Methods
* Selection

Example:

Goal : PHOTOCOPY_PAPER

Goal : LOCATE_ARTICLE

Goal : PHOTOCOPY - PAGE repeat until no more pages .

[select goal : SELECT - PAGE --> CHOOSE - PAGE-TO-COPY]

Goal : ORIENT PAGE

OPEN : COVER

POSITION : PAGE

CLOSE : COVER

PRESS : BUTTON

Goal : VERIFY - COPY .

EXAMINE - COPY .

Goal : COLLECT - COPY .

LOCATE - OUT-TRAY

REMOVE - COPY (outer goal satisfied)

Goal: Retrieve - Journal

Open - Cover

Remove - Journal

Close - cover.

Cognitive Complex Theory:

→ Cognitive complexity is a psychological characteristic or psychological variable that indicates how complex or simple is the frame and perceptual skill of a person.

→ CCT has two parallel descriptions: One of the user's goals and the other of the computer system.

→ The description of the user's goal is based on a GOMS - like goal hierarchy, but is expressed primarily using production rules.

Linguistic Models:

→ Linguistic models represent the user system grammar.

→ Backus - Naur Form can be used to define the syntax of a language.

→ It is based on techniques developed for use with natural languages, but was specifically designed for use with computing language.

TAG:

→ Task Action Grammar (TAG) attempts to deal with some of these problems by including elements such as parameterized grammar rules, to emphasize consistency and encoding the user's world knowledge.

Physical and Device Model: (KLM)

→ The Keystroke - Level Model (KLM) predicts how long it will take an expert user to accomplish a routine task without errors using an interactive computer system.

→ The actions are termed keystroke level if they are at the level of actions like pressing keys, moving the mouse, pressing buttons.

→ The total of the operator times is the estimated time to complete the task.

K - Keystroking

B - Pressing a mouse button

P - Pointing, moving the mouse.

H - Homing, switching

D - Drawing lines

M - Mentally preparing for a physical Action.

R - System Response.

KLM	GOMS
(i) Model creation is Quick & easy	(i) Time consuming to create model.
(ii) No selection rules are used.	(ii) Selection Rules are used.
(iii) No methods	(iii) Methods are informal Programs
(iv) Only Operators on Keystroke level.	(iv) It is very flexible.

Cognitive Architecture :

→ Interacting Cognitive Subsystem (ICS) Model

* The ICS model is based on detailed Cognitive experimentation which suggests that the human mind works by different subsystems passing information from one to another and copying it in the process.

* In this way, each subsystem has its own memory. Different systems operate with different coding, for instance, Verbal, Visual, auditory.

* There are higher order system that translate these coding and integrate the information.

* The architecture of ICS is built up by the coordinated activity of nine smaller subsystems :

→ Each subsystem has the same generic structure.

→ A subsystem is described in terms of its typed inputs and outputs along with memory store for holding typed information.

→ It has transformation functions for processing the input and producing the output and permanently stored information.

→ An example of a central subsystem is specialized for handling some aspects of external or internal processing.

Socio Organizational Issues and Stakeholder Requirements:

→ It is a pattern of relationships between and among individuals and social groups.

→ Characteristics of social organization can include qualities such as sexual composition, Spatiotemporal cohesion, leadership

structure, division of labor, communication systems and so on.

Computer-Supported Co-operative Work:

→ The term computer-supported Co-operative Work (CSCW) seems to assume that groups will be acting in a cooperative manner.

→ CSCW is the study of the tools and techniques of groupware as well as their psychological, social and Organizational effects.

→ CSCW studies the use of groupware. CSCW is the study of the tools and techniques of groupware. as so

Main Challenge:

1. Presence of Collaborators
2. Behaviours and actions of Collaborators
3. Presence of resource
4. Knowledge and expectation of counterparts.

Stake holders:

→ A stakeholder is as anyone who is affected by the success or failure of the system.

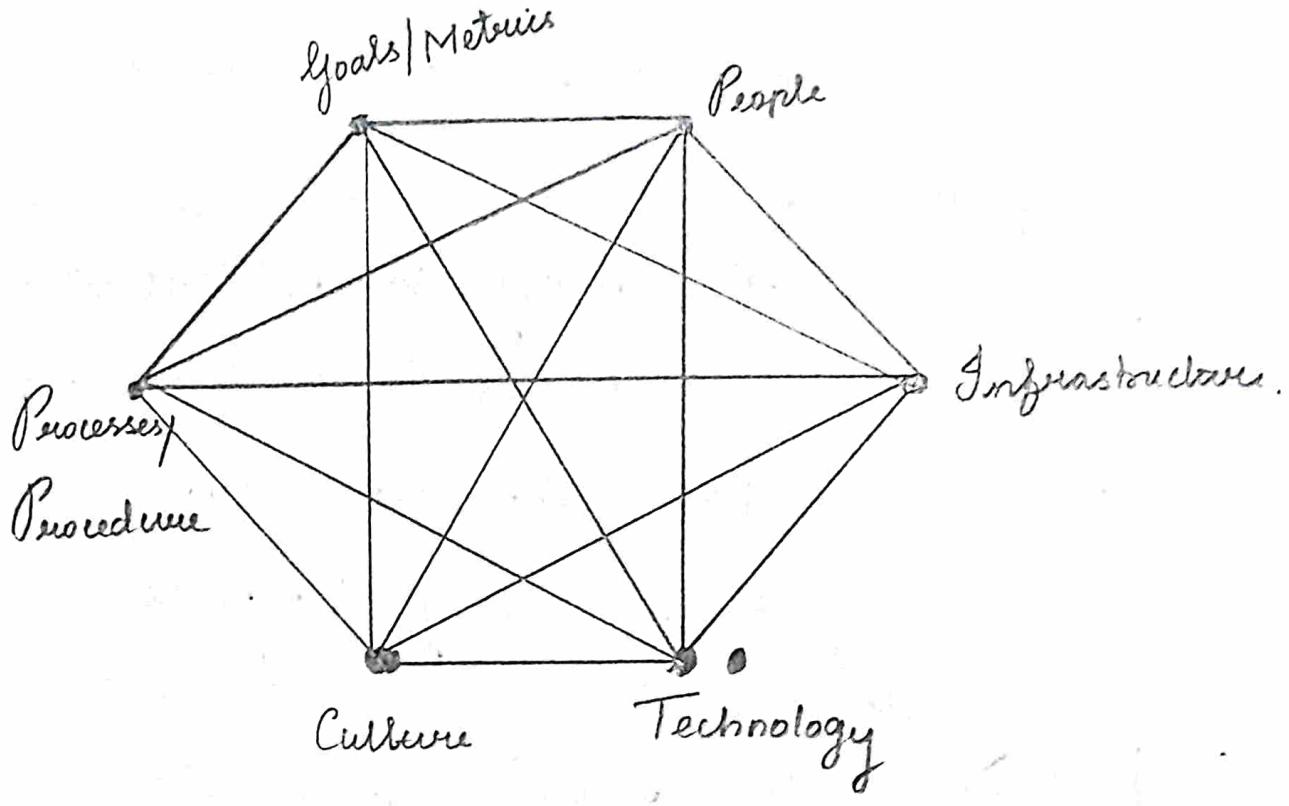
* Primary stakeholders are people who ~~do not fall into either of the first~~ actually use the system, the end users.

* Secondary stakeholders are people who do not directly use the system, but receive output from it or provide input to it.

* Tertiary stakeholder are people who do not fall into either of the first two categories but who are directly affected by the success or failure of the system.

Socio Technical Systems Theory:

→ STS in organizational development is an approach to complex Organizational work design that recognizes the interaction between people and technology in workplaces



Potential benefits are as follows:

1. Strong engagement.

2. Reliable and valid data on which to build understanding.

3. A better understanding and analysis of how the system works now.

4. A more comprehensive understanding of how the system may be improved.

5. Greater chance of successful

improvements.

Custom Methodology:

→ It is a socio-technical methodology designed to be practical to use in small organizations.

→ It is based on the User skills and Task Match (USTM) approach.

→ It is applied at the initial stage of design when a product opportunity has been identified, so the emphasis is on capturing requirements.

→ 6 Key stages:

1. Describe the Organizational context.
2. Identify and describe stakeholders.
3. Identify and describe the work groups.
4. Identify and describe task object pairs.
5. Identify stakeholder needs.
6. Consolidate and check stakeholder requirements.

Open System Task Analysis (OSTA).

→ It is an alternative socio-technical approach, which attempts to describe what happens when a technical system is introduced into an Organizational work environment.

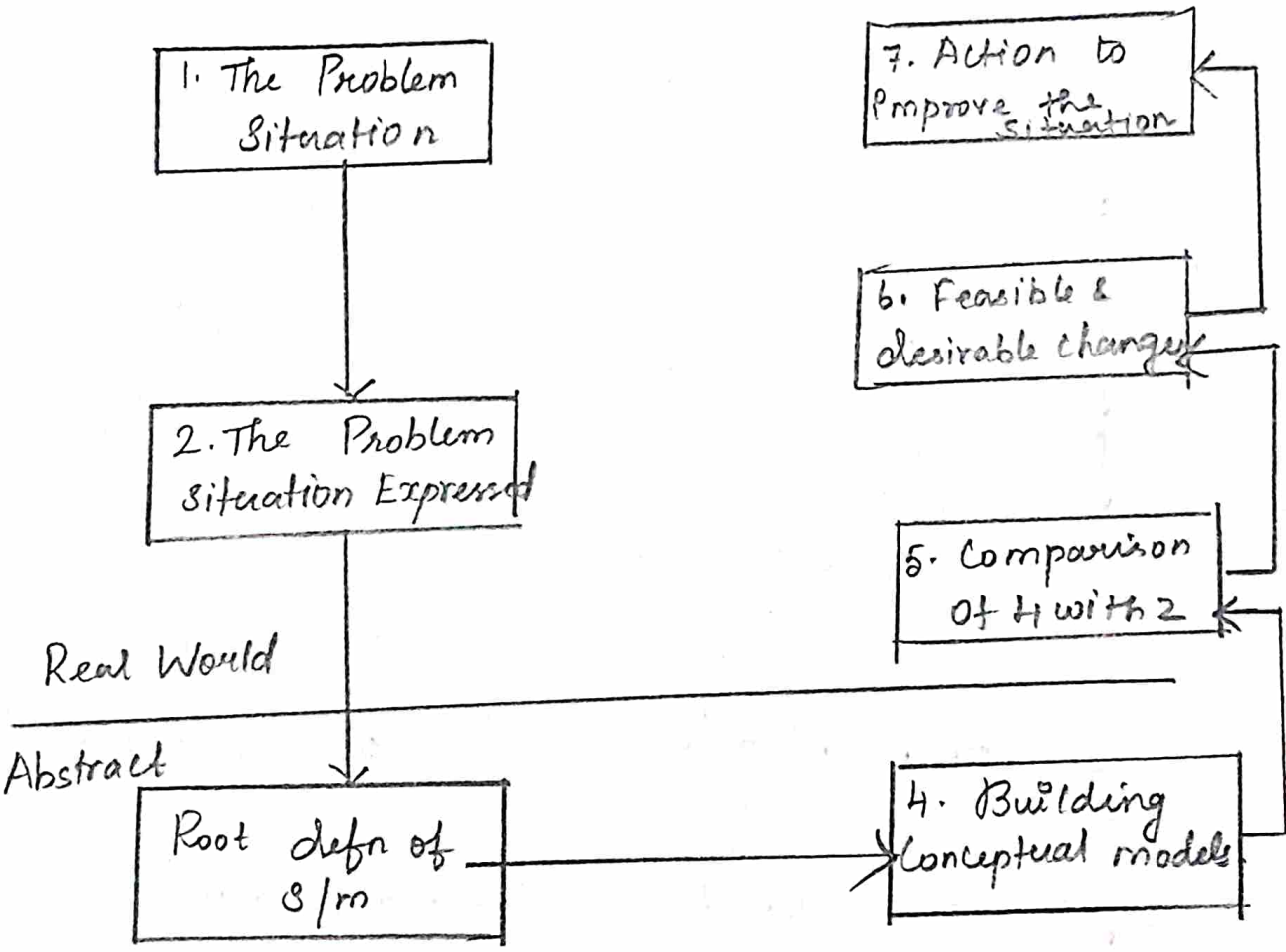
→ It specifies both social and technical aspects of the system.

Work Performing System	(5) Social System	(6) Technical System
Future Criteria	(7) Performance Satisfaction	(8) Functionality Usability acceptability.

Soft System Methodology:

→ SSM is a cyclic learning system which uses models of human activity to explore with the actors in the real

world problem situation, their perceptions of that situation and their readiness to decide upon purposeful action.



Participatory Design:

→ In participatory design, the users are involved in development of the products, in essence they are co-designers.

→ PD is a set of theories, practices and studies related to end users as full participants in activities leading to software and hardware computer products and computer based activities.

→ Other types of prototyping techniques are PICTIVE (Plastic Interface for Collaborative Technology Initiative through Video Exploration) and CARD (Collaborative Analysis of Requirements and Design.

———×———

Communication and Collaboration Models.

1. Face to Face Communication:

→ It involves speech, hearing, body language and eye-gaze.

→ A person has to be familiar with existing norms, to learn a new norm.

→ Another factor is the personal space.

→ The factor of eye-gaze is important during a video conference as the cameras are usually mounted away from the monitor and it is important to have eye control during a conversation.

→ The role of interruptions like 'um's and 'ah's are very important as they can be used by participants in conversation to claim the turn.

2. Conversation:

→ Transcripts can be used as a heavily annotated conversation structure, but still lacks the back channel information.

→ Another structure is of turn-taking, this can be interpreted as Adjacency pairs,

eg: A-x; B-x, A-y, B-y.

→ Context varies according to the conversation.

3. Group Working :

→ The roles and relationship between the group individuals are different and may change during the conversation.

→ Physical layout is important to consider here to maintain the factors in face-to-face communication.

4. Hypertext :

→ Hypertext is text which contains links to other texts.

→ Hypermedia is a term used for hypertext which is not constrained to be text.

→ Hypertext consists of nodes connected by links to form networks or webs.

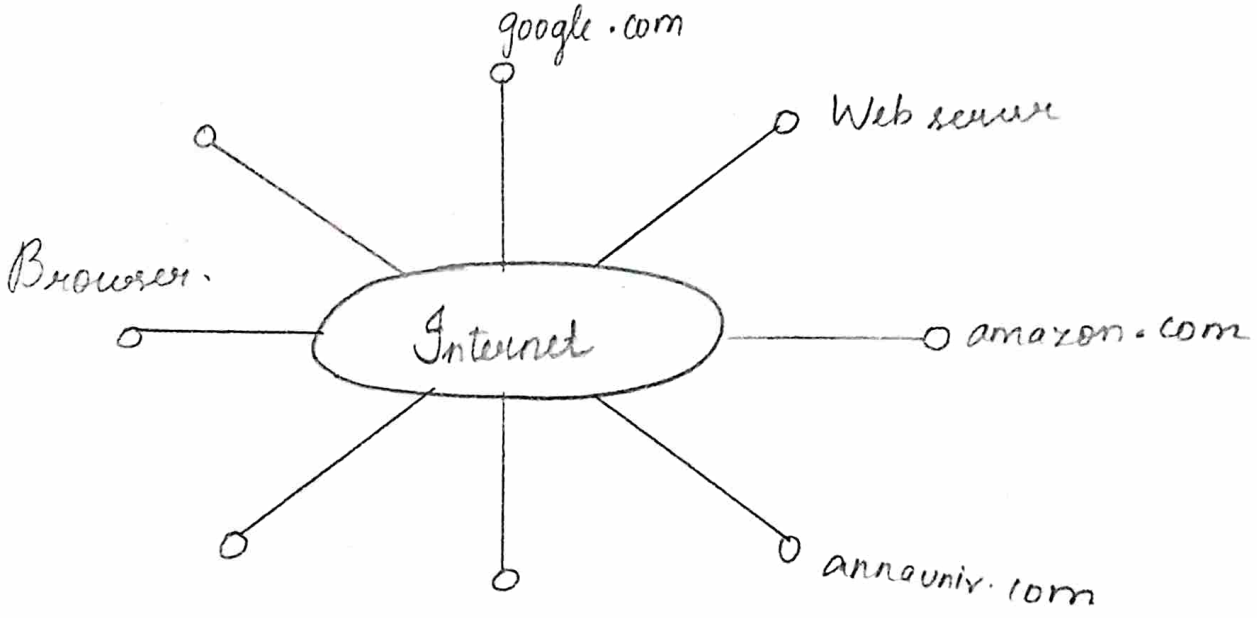
→ Depending on the system, a node can be restricted to one medium (text, graphics)

World Wide Web:

→ The WWW is an evolving system for publishing and accessing resources and services across the internet.

→ Web is an open system. Its operations are based on freely published communication standards and documents standards.

→ The web is one with respect to the types of 'resources' that can be published and shared on.



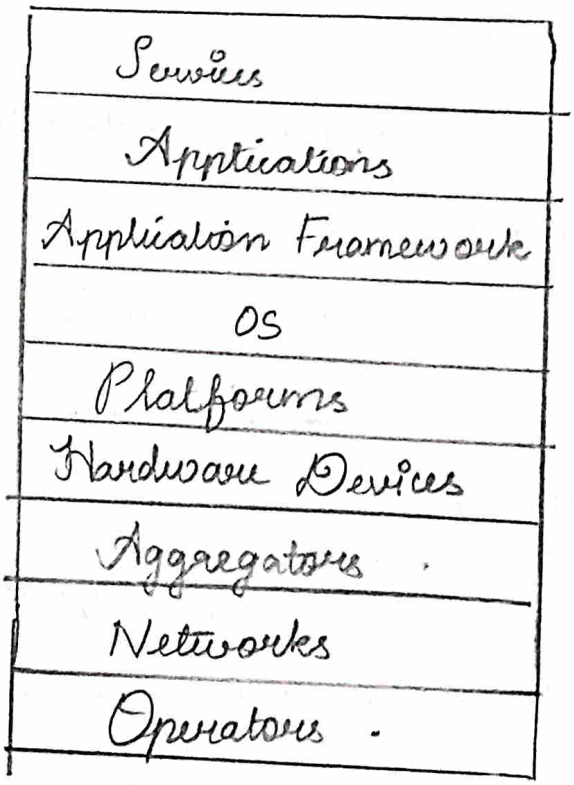
Unit - 4

Mobile HCI

Mobile Ecosystem :

→ Mobile device do not exists in a vacuum - a series of n/w and interconnected systems exists to support modern mobility.

→ The utility of modern mobile device is greatly enhanced by software applications and their supporting cloud services.



1. Operators :

→ Operators are bottom layer of

mobile ecosystem.

→ It is also referred as mobile n/w operator, mobile service provider, mobile phone operators or cellular companies.

2. Networks:

→ Operator operates wireless network.

→ A cellular n/w is a radio telecommunications network that provides wireless communications.

3. Device:

→ Cellphone handset is composed of two components.

* Radio Frequency (RF)
* Baseband.

4. Platforms:

→ Mobile platforms primary duty is to provide access to the device.

→ To run s/w and services on each of these devices.

→ Types of platforms.

* licensed
* proprietary
* Open source.

5. Operating Systems :

→ Mobile Os provides dedicated application stores for end users offering a convenient and customized means of adding functionality.

→ Examples of mobile Os are,

* Android
* Symbian
* Windows CE
* Palm os
* Linux
* Mac os X etc.

6. Application Framework :

→ An application framework is a software library that provides a fundamental structure to support the development of applications for specific environment.

7. Applications :

→ Applications are web browser, camera or media player.

———— X ————

Types of Mobile Applications :

→ The mobile medium type is the type of application framework or mobile technology that presents content or information to the user.

(i) Widgets :

→ Mobile Widgets is a mobile application which gives a fast and simple access to a set of mobile widgets.

→ These mobile widgets are a very short way to access news, fun and a multitude of Internet contents and services.

→ The mobile website widgets create elements and containers for creating a responsive mobile version of the website.

(ii) Applications :

→ Mobile web applications refer to applications for mobile devices that require only a web browser to be installed on the device.

→ They typically use HTML and Ajax, although they may make use of augmented Rich Internet Application (RIA) technologies.

Challenges are as follows :

* Screen shape
* Screen size
* User Interaction
* Navigation
* Lower bandwidth.

(iii) Short Message Service (SMS).

→ SMS is a globally accepted wireless service that enables the transmission of alphanumeric, messages between mobile subscribers and external systems such as electronic mail, paging and voice mail s/m.

→ SMS guarantees delivery of the short message by the network.

→ SMS messages are transported in the core network using SS7.

(iv) Games :

→ A mobile game is a game played on a mobile phone, tablet, smartwatch, PDA, portable media player.

→ The final mobile medium is games, the most popular of all media available to mobile device.

Mobile Information Architecture.

→ IA plays a vital role in creating intuitive and well structured navigation, content flow and structure of a s/w, website, intranet or mobile application.

→ Mobile devices have their own set of information architecture patterns.

→ Typically the activities undertaken in defining information architecture involve:

1. Content inventory: Examination of an existing application/website to locate and identify existing app/site content.

2. Content audit: Evaluation of content hierarchy, relevance, priorities, usefulness, accuracy and overall effectiveness.

3. Information grouping: Definition of user-centered relationship between content and its types.

4. Taxonomy Development:

5. Descriptive information creation.

→ Hierarchy pattern is a standard site structure with an index page and a series of sub pages. If you are designing a responsive site you may be restricted to this, however introducing additional patterns could

allow you to tailor the experience for mobile.

→ Hub and Spoke pattern gives you a central index from which user will navigate out.

→ Nested Doll pattern leads users in a linear fashion to more detailed content.

→ Tabbed view is a pattern that regulate app user will be familiar with it

→ Bento Box / Dashboard pattern brings more detailed content directly to the index screen.

→ A prototype is an example that serves as a basis for future model.

→ Paper prototype is easy and fast to do.

Wire Frames :

Wire framing originated from making rough specifications for website page design

and resembles scenarios. or storybooks.

→ Wireframes can be pencil drawings or sketches on a white board, or they can be produced by means of a broad array of free or commercial s/w applications.

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Mobile 2.0

→ The web was a ready only medium for a majority of users.

→ When web 2.0 was invented by Tim 'O' Reilly, attitude towards the web was changed.

→ Web 2.0 tools allow library to enter into a genuine conversation with their users. Libraries are able to seek out and receive patron feedback and respond directly.

→ Many 2.0 companies are built almost entirely on user-generated content and harnessing collective intelligence.

→ Editing blogs and wikis did not

require any knowledge of HTML any more. Blogs and wikis allowed individuals and groups to claim their personal space on the web and fill it with content at relative ease.

→ Web 2.0 applications are those that make the most of the intrinsic advantages of that platform.

→ Consuming and remixing data from multiple sources, including individual users, while providing their own data and services in a form that allows remixing by others.

Web 3.0

→ Web 3.0, or the semantic web, is the web era we are currently in, or perhaps the era we are currently creating.

→ Semantic web is really the participatory web, which today includes "classics" such as YouTube, MySpace, eBay, etc.

→ A major disadvantage associated with web 2.0 is that the websites become vulnerable to abuse since, anyone can edit the content of a web 2.0 site. It is possible for a person to purposely damage or destroy the content of a website.

→ The basic idea of web 3.0 is to define structure data and link them in order to more effective discovery, automation, integration and reuse across various applications.

→ It is able to improve data management, support accessibility of mobile internet.

→ Web 3.0 supports world wide database and web oriented architecture which in earlier stage was described as a web of document.

→ Consumers can quickly capture photos and videos with cameras embedded in their mobile device.

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Mobile Design :

→ Elements of mobile designs are context, message, look and feel, layout, typograph and graphics.

1. Context :

→ It is critical to mobile design ; understanding the big picture of a users interaction with a device enables designers to create better user experience on that device.

→ Mobile is based very much on traditional understanding of context including :

* Culture
* Environmental
* The Activity
* The goals that the user has
* The attention span the user has available
* The tasks the user wants to carry out.
* The device on which the user operates

* The connection available to the user.

2. Message:

→ The message is the overall mental impression we create explicitly through visual design.

→ A "heavy" design with use of black colors and lots of graphics will tell the user to expect something more immersive.

3. Look and Feel:

→ Establishing a look and feel usually comes from design inspiration.

→ Look refers to visual design and feel rather refer to overall customer experience of using a product, service environment, machine or tool.

→ On large mobile projects or in companies with multiple designers, a style guide or pattern is crucial, maintaining consistency in the look.

4. Layout :

→ Layout is an important design element, because it is how the user will visually process the page, but structural and visual components of layout often get merged together, creating confusion and making design more diffimult to produce.

5. Color :

→ Color is one of the most importand elements of mobile design. When the users open your app what is the first thing they observe? The color.

→ Colour Palettes :

* Defining color palettes can be useful for maintaining a consistent use of color in mobile design.

→ Three basic ways to define a colour palette.

* Sequential
* Adaptive
* Inspired .

6. Typography :

→ Typography is the art and technique of arranging type to make written language legible, readable and appealing when displayed.

7. Graphics :

→ The final element is graphics, or the images that are used to establish or aid a visual experience.

→ Graphics can be used to support the look and feel, or as content displayed in line with the text.

HCI design Challenges for Mobile Devices :

Hardware Challenges :

→ Due to the limitations of size and weight for portability purpose, the interface design for mobile devices come with more

Hardware challenges.

→ These challenges includes

* limited input facilities
* limited output facilities
* Designing for mobility.

Software Challenges:

* System of menus
* The mainly and widely used alternative is the use of hierarchical menus.
* Navigation and browsing.
* Images and Icon.

Related to Mobile Devices:

a) Small screen
b) Single Windows
c) Touch screen.

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Unit-5

Web Interface Design.

Designing Web Interface.

→ Web design refers to the design of websites that are displayed on the internet. It usually refers to the user experience aspects of websites development rather than software development.

Drag and Drop:

→ It is a common feature where users can click and grab an object and drag it to a different location.

→ Drag and drop is a common action performed within a graphical user interface.

→ It involves moving the cursor over an object, selecting it and moving it to a new location.

Inserting moments.

→ Available events for using the user during drag and drop interactions are as follows.

1. Page Load
2. Mouse Hover
3. Mouse down
4. Drag Initiated
5. Drag leaves original location
6. Drag accepted
7. Drag rejected -

Actors :

→ During each event you can visually manipulate a number of actors.

→ The page elements available include page, cursor, tool tip, drag object, drag objects parent container and drop target.

Drag and Drop Module :

→ How to drag a module from its current location on a page to and drop it

into another place.

→ The drag and drop module supports animations both while sorting an element inside a list, as well as animating it from the position that the user dropped it to its final place in the list.

Drag and Drop Action :

→ Drag and Drop is also useful for invoking an action or actions on a dropped objects.

→ The drag and drop action is a common place.

→ Its most familiar example is dropping an item in the trash to perform the delete action.

Drag and Drop Examples:

* Simple Drag
* Drag Node Plugin
* Proxy Drag
* Drag constrained to a region.
* Interaction Groups.

* Using the drag skin.
* Animated Drop Targets.
* Drop based coding
* Window scrolling
* Drag Delegation with Drop Target
* Using Drag plugins with Delegate.
* List reorder w/ Bubbling.
* List reorder w/ scrolling
* Portal style
* Photo Browser.
* Drag Delegation.

Direct Selection:

→ Following are different types of selections:

1. Toggle selection (control based selection)
2. Collected selected
3. Object selection
4. Hybrid Selection.

1. Toggle Selection:

→ A checkbox control has three states.

* Unselected
* Selected
* Indeterminate

→ The last state represents a situation where a list of sub-options is grouped under a parent option and sub-options are in both selected and unselected states.

→ A toggle switch represents a physical switch that allows users to turn things on or off, like a light switch.

a) Use Toggle for Instant Response:

→ An instant response of applied setting is required without an explicit action.

→ A setting requires an on/off or show/hide function to display the result.

b) Use checkbox for setting Confirmation:

→ Applied settings need to be confirmed and reviewed by user before they are submitted.

→ Defined settings requires an action like submit, OK, Next, Apply before displaying

results.

→ User has to perform additional steps for changes to become effective.

c) Use checkbox for Multiple Choices:

→ Multiple options are available and user has to select on or more options from them.

→ Clicking multiple toggle switches one by one and waiting to see results after each click takes restra time.

d) Use checkbox for Intermediate state:

→ An intermediate selection state is required when multiple sub-options are grouped under a parent option.

→ The intermediate state will represent that multiple sub options (but not all of them) are selected in the list.

Collected Selection:

→ Collected selection is a pattern for

keeping track of selection as it spans multiple pages.

→ In Gmail, you can select items as you from page to page. The selections are remembered for each page.

→ If you select two items on page one, then move to page two and select three items, there are only three items selected.

* Toggle selection is used for selecting bookmarks for editing, deleting etc.

* Object selection is used for initiating a drag drop.

Contextual Tools:

→ Contextual Tools enable the possibility to work with an object selected on the page, such as a table, picture or drawing.

→ Contextual menus are displayed on demand and contain a small set of relevant actions, related to a control, a

piece of content, a view in an app, or an area of the UI.

→ When designed right, they deliver relevant tools for completing tasks without adding clutter to the interface.

Fitt's law:

→ Fitt's law is an ergonomic principle that ties the size of a target and its contextual proximity to each of use.

→ Fitts states that the size of the target object along with its distance from the starting location could be directly measured, allowing him to model the ease at which a person could perform the same action with a different target object.

→ Fitt's law, at its simplest form, is common sense.

→ The bigger an object and the closer it is to us, easier it is to move to.

→ Fitts' law is a model that helps

designers make educated decisions in users interface and web page layouts.

→ Contextual tools are as follows.

* Always visible tools
* Hover Reveal tools
* Normal state
* Invitation.

Contextual Tools in an Overlay:

→ Instead of placing tools beside the object being acted on, the revealed tools can be placed in an overlay.

→ An Overlay creates a slight contextual switch for the user's attention.

→ There can be issues with showing contextual tools in an overlay.

1. Providing an overlay feels heavier.
2. The overlay will usually cover the other information.
3. Most implementations shift the

content slightly between the normal view and the overlay view, causing the users to take a moment to adjust the change.

4. The overlay may get in the way of navigation.

Overlays:

→ Overlays are really light weight pop ups.

→ Browser pop ups are created as a new browser window. Lightweight overlays are shown within the browser page as an overlay.

→ Older style browser pop ups are undesirable because: Browser pop ups display in new browser window.

→ These windows often take time and a sizeable chunk of a system resource to create.

→ Types of overlay are,

1. Dialog Overlay :

→ It replaces the old style browser prop ups.

2. Detail Overlay :

→ The second type of overlay is somewhat new to web applications.

→ The detail overlay allows an overlay to present additional information when the user clicks on hovers over a link or section of content.

3. Input Overlay:

→ It is a lightweight overlay that brings additional input information for each field -labled into.

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Inlays :

→ Information or dialog with the user needs to be an overlay.

→ Types of Inlays are as follows.

1. Dialog Inlay : A simple technique is to expand a part of the page, revealing a dialog area within the page.

2. List Inlay : Lists are a great place to use inlays. Instead of requiring the user to navigate to a new page for an item's detail or popping up the information in an overlay, the information can be shown with a List Inlay in context.

3. Detail Inlay : A common idiom is to provide additional detail about items shown on a page.

Virtual Pages :

→ Patterns that support Virtual pages includes,

* Virtual Scrolling
* Inline Paging
* Scrolling Paging

* Panning
* Zoomable User Interface.

1. Virtual Paging Scrolling:

→ Virtual Scrolling demonstrate three different ways to manage the virtual space.

2. Inline Paging:

→ What if instead of scrolling through content we just wanted to make pagination feels less like a page switch.

3. Virtual Panning:

→ One way to create a virtual canvas is to allow users the freedom to roam in 2D space.

4. Scrolled Paging:

→ User can combine both scrolling and paging into scrolled paging.

5. Zooming User Interface (ZUI):

→ It is a graphical environment where users can change the scale of the viewed area in order to see more detail

or less, and browse through different documents. A ZUI is a type of GUI.

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Process Flow :

For some process flows it makes sense to keep the user on the same page throughout process.

* Google Blogger is a free publishing platform run by Google. It is designed to be easy to use so writers can upload content to their blogs via email, Google plus and various apps and programs.

* The magic Principle. Alan Cooper discusses a wonderful techniques for getting away from a technology driven approach and discovering the underlying mental model of the user.

* Interactive single page processor: Consumer products come in a variety of shapes, sizes, textures, colors, etc.

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