HUMAN COMPUTER INTERACTION

LECTURE 1

Introduction to HCI

- DEFINITIONS
- **Definition 1** - HCI is the study and practice of usability – It is about understanding and creating software, other technology that people will want to use, will be able to use and will find effective when used.

Usability is one of the key concepts in HCI. It is concerned with making systems easy to learn and use. 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

“A usable software is one that supports the effective and efficient completion of tasks in given work context”

Benefits of more usable software to users include

- Increased productivity
- Increased accuracy of data input and interpretation
- Decreased user errors
- Decreased user training and cost
- Decreased need for ongoing technical support.

- **Definition 2** – HCI is the study of how people use computer systems to perform certain tasks – HCI tries to provide us with all understanding of the computer and the person using it, so as to make the interaction between them more effective.
- **Definition 3** – HCI concerns with process of design, evaluation and implementation of interactive computing systems for human use, plus the study of major phenomena surrounding them.

Importance of HCI – HCI will be increasingly important in following areas

- As a part of software development process and system design methods.
- As a part of future legal requirements for software.
- As the basis for a set of usability criteria to evaluate and choose from competing products.
- As the basis for successful marketing strategy to small business user.

The Goals of HCI

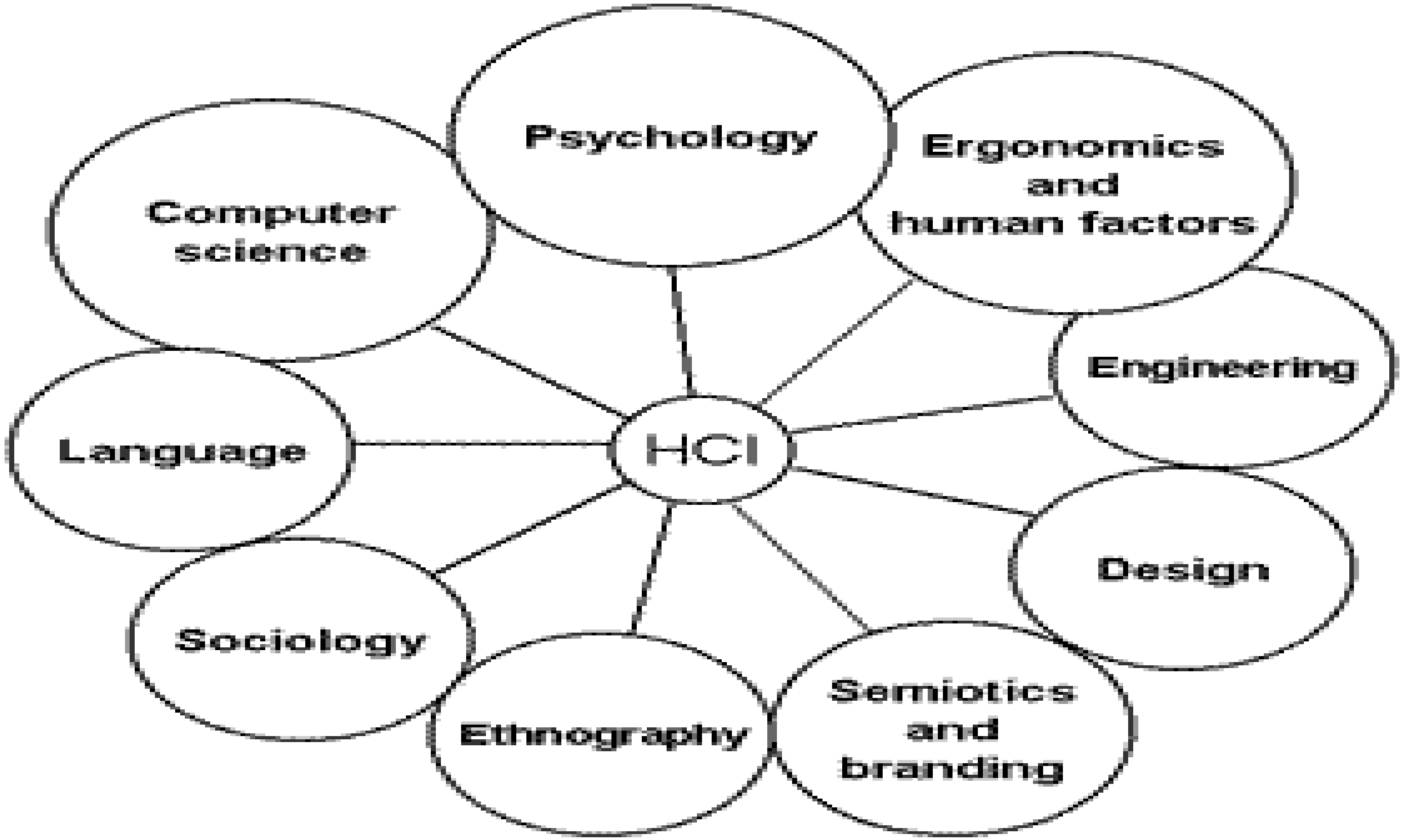
The goals of HCI are to produce usable and safe systems, as well as functional systems. In order o produce computer systems with good usability.

Developers must attempt to:

- understand the factors that determine how people use technology
- develop tools and techniques to enable building suitable systems
- achieve efficient, effective, and safe interaction
- put people first

Underlying the whole theme of HCI is the belief that people using a computer system should come first. Their needs, capabilities and preferences for conducting various tasks should direct developers in the way that they design systems. People should not have to change the way that they use a system in order to fit in with it. Instead, the system should be designed to match their requirements.

The Field of HCI
(Human Computer Interaction)



Disciplines contributing to HCI

The field of HCI covers a wide range of topics, and its development has relied on contributions from many disciplines.

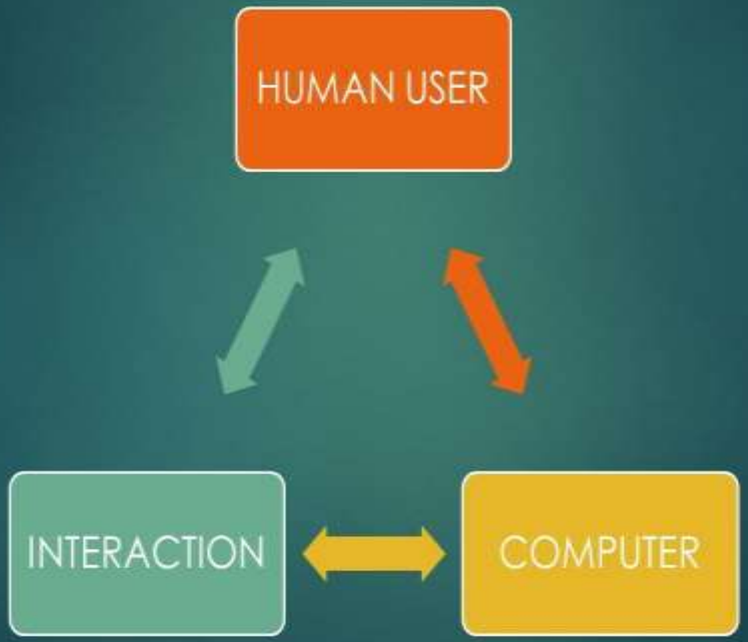
Some of the main disciplines which have contributed to HCI are:

- **Computer Science**
  Technology, Software design, development & maintenance, User Interface Management Systems (UIMS) & User Interface Development Environments (UIDE), Prototyping tools, Graphics.

- **Cognitive Psychology**
  Information processing, Capabilities, Limitations, Cooperative working, Performance prediction.

- **Social Psychology**
  Social & organizational structures
- **Ergonomics/Human Factors**
  Hardware design
  Display readability
- **Linguistics**
  Natural language interfaces
- **Artificial Intelligence**
  Intelligent software
- **Philosophy, Sociology & Anthropology**
  Computer supported cooperative work (CSCW)
- **Engineering & Design**
  Graphic design, Engineering principles

COMPONENTS OF HCI



- Human – are good at sensing low level stimuli, pattern recognition, inductive reasoning, multiple strategies, adapting to hard things.

- Computers – good at counting and measuring, accurate storage and recall, rapid and consistent responses, data processing, repetitive actions.

- Interaction – The list of skills making humans to do what humans do best and computers to do their task.

User(Human)

By *user* we may mean an individual user, a group of users working together, or a sequence of users in an organization, each dealing with some part of the task or process. The user is whoever is trying to get the job done using the technology.

- The human is the central character in any discussion of interactive systems. The requirements of the user should therefore be our first priority.

Study of the human psychology is the basic for HCI. This may seem inappropriate for designing and building interactive systems but it is not.

- In order to design something for someone understanding of their capabilities and limitations is a must. There is need to find if there are things that they will find difficult or even impossible.
- This understanding helps in encouraging which people feel more comfortable.

- The study of psychology involves how humans perceive the world around them, how they store and process information and solve problems.
- For this study there are many models which were proposed earlier such as "**Model human processor**" which is a simplified view of the human processing involved in interaction with computer systems.

Model human processor

The model comprises three subsystems

1.The perceptual system- handling sensory stimulus from the outside world.

2.The motor system which controls actions.

3.The cognitive system which provides the processing needed to connect the two

- Each of these subsystems has its own processor and memory, although the complexity of these varies depends upon the tasks the system has to perform.
- The model also includes a member of principles of operation which dictate the behavior of the system under certain conditions.

- The study needed for HCI is done by treating user as an information processing system , by comparing with conventional computer system.
- Information comes in , is stored and processed, and information is passed out.

- Therefore the study focuses on three components of the system as

1. Input-output channels
2. Memory
3. Processing

- In the study of human, we are dealing with an intelligent information processing system, and therefore it includes problem solving , learning and making mistakes.
- The human, unlike the computer is also influenced by external factors such as the social and organizational environment and there is need to be aware of these influences.

HUMAN COMPUTER INTERACTION

LECTURE 2

Input-Output channels:

- A persons interaction with the outside world occurs through information being received and sent.
- Input in human occurs mainly through senses and output through the motor control of the effectors.
- Here are five senses

1. Sight
2. Hearing
3. Touch
4. Taste
5. Smell

- The first three are the most important to HCI

Vision:

- Human Vision is a highly complex activity with a range of physical and perceptual limitations, yet it is the primary source of information.

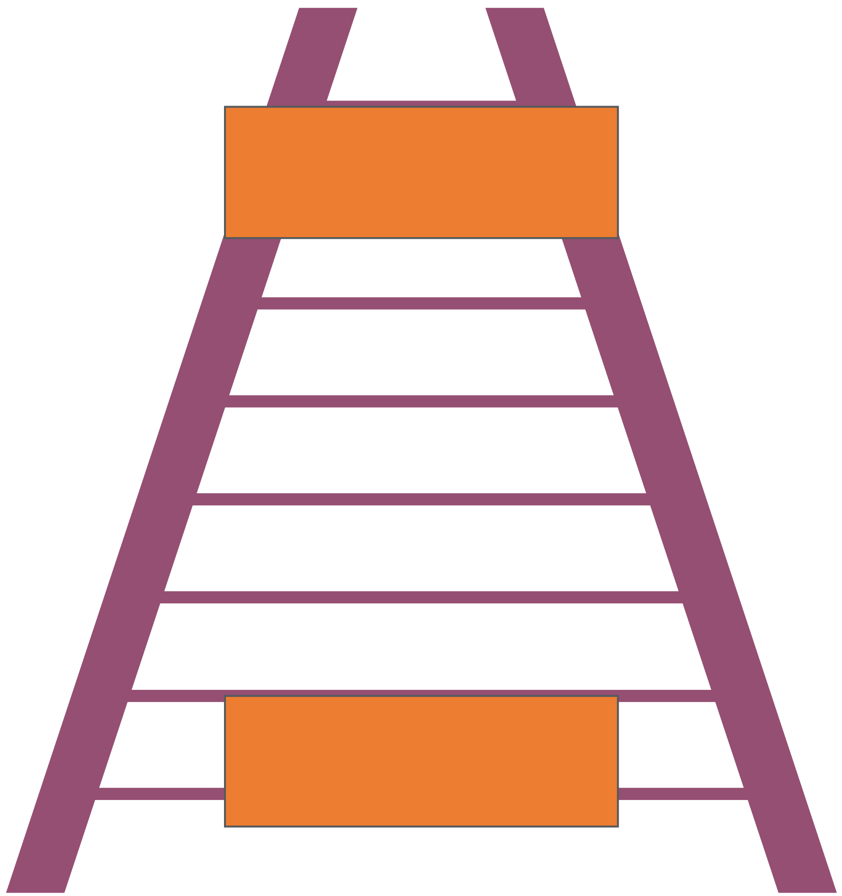
Visual perception is divided into two stages-The physical reception of the stimulus from the outside world, and the processing interpretation of that stimulus.

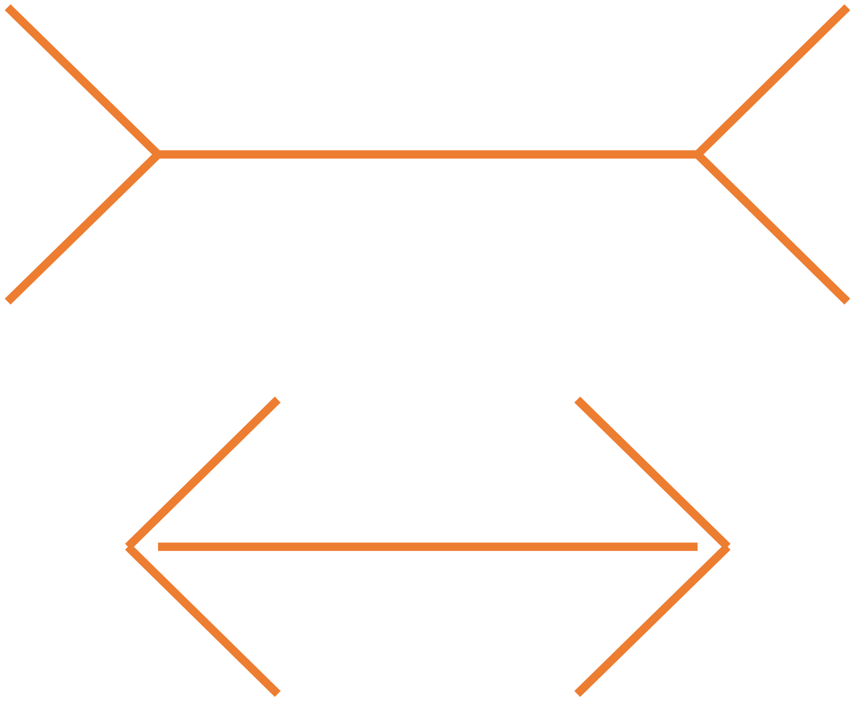
- We need to understand both stages as both influence what can and what cant be perceived visually by a human being, which is turn directly affects the way that we design computer systems.

- Human eye-Vision begins with light. The eye is a mechanism for receiving light and transforming it into electrical energy.
- Light is reflected from objects in the world and their image is focused upside down on the back of the eye. The receptors in the eye transform it into electrical signals which are passed to the brain.
- The retina of the eye is light sensitive and contains two types of photo receptors : Rods and Cones.
- Rods are highly sensitive to light and therefore allow us to see under a low level of illumination.
- Cones are the second type of receptor in the eye. They are less sensitive to light than the rods and can therefore tolerate more light.
- There are three types of cone, each sensitive to a different wavelength of light. This allows color vision.

Visual Perception:

- Understanding the basic construction of the eye goes somewhere to explaining the physical mechanism of the vision but physical perception is more than this.
- The information received by the visual apparatus must be filtered and passed to processing elements which allow us to recognize coherent scenes, disambiguate relative distance and differentiate color.
- **Perceiving size and depth** – Eye perceive size, depth by considering how the image appears on the retina. The size of the image is specified as visual angle.
- If we draw a line from the top of the object to a central point on the front of the eye and 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.
- Visual angle is affected by both the size of the object and its distance from the eye.





- **Perception of size** – Visual angle of object is reduced as it gets away, we might expect that we would perceive the object as smaller.
- In fact, our perception of an object size remains constant even if its visual angle changes.
- So a person height is perceived as constant even if they move far from you.
- This is the law of size constancy and it indicates that our perception of size relies on factors other than visual angle.
- **Perception of depth** – If objects overlap, the object which is partially covered is perceived to be in the background and therefore far away.
- Similarly the size and height of the object in our field of view provides a hint of its distance.
- If we expect an object to be of a certain size then we can judge its distance accordingly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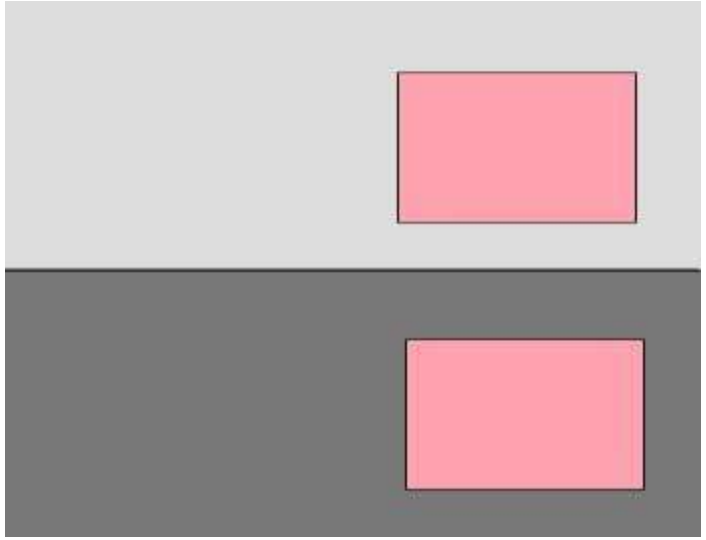
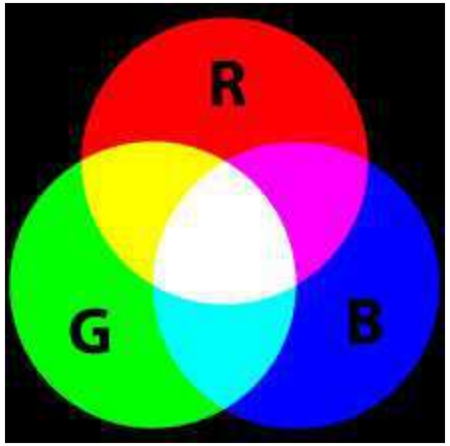
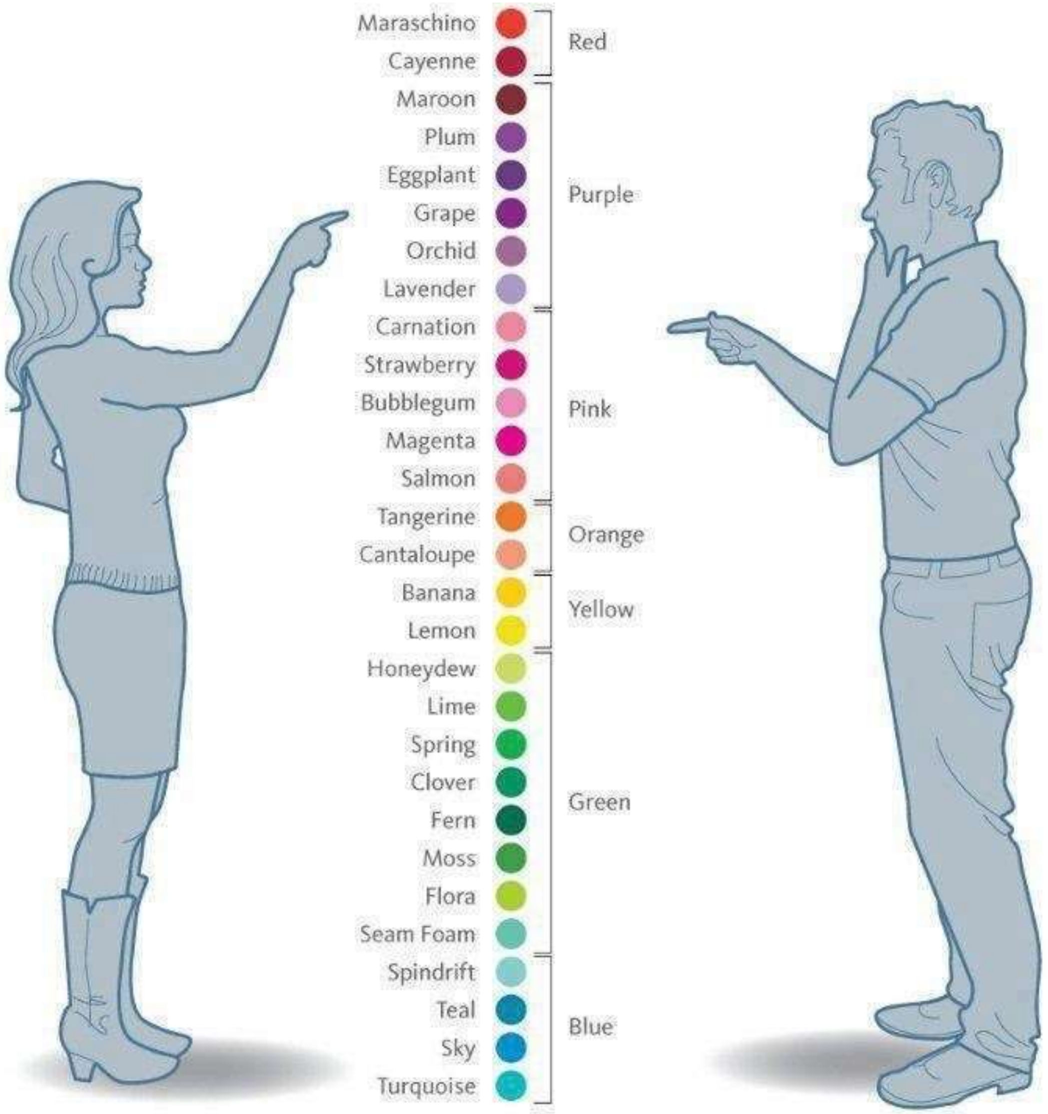
- **Perceiving Brightness** – Brightness is in fact a subject to reaction to levels of light. It is affected by luminance which is the amount of light falling on the object surface and its reflective properties.
- Contrast is relative to luminance it is a function of the luminance of an object and the luminance of its background. Visual activity increases with increased luminance.



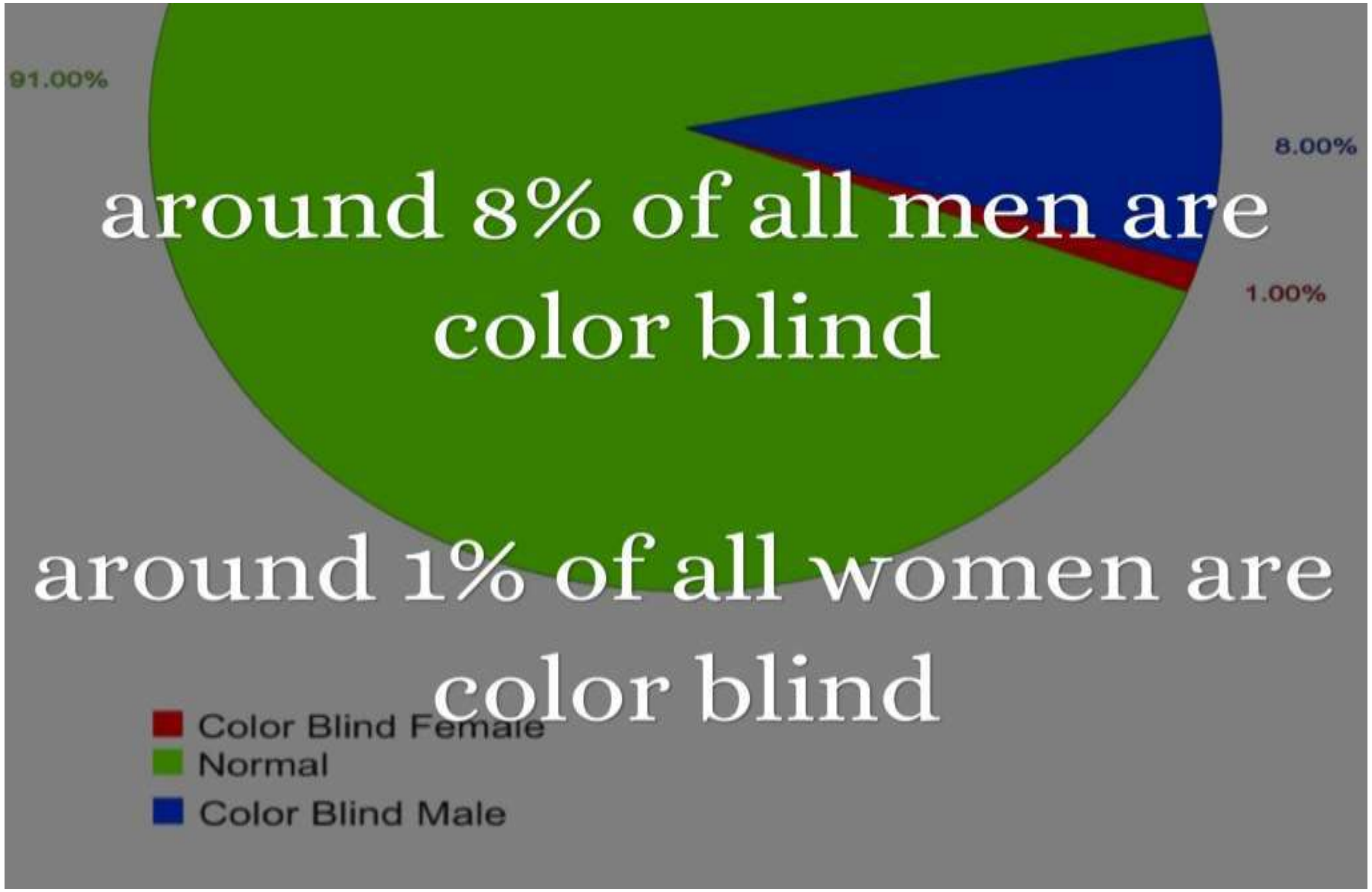
Perceiving Color –Color is usually regarded is being made up of three components: hue, intensity and saturation.

- Hue is determined by the spectral wavelength of light.
- Blues have short wavelength ,green medium and red long.
- Intensity is brightness of color and saturation is the amount whiteness in the color.
- By varying these two, we can perceive seven million different colors.
- However, the number of colors that can be identified by an individual without training is very few.





Maraschino
Cayenne
Red
Maroon
Plum
Eggplant
Grape
Orchid
Lavender
Purple
Carnation
Strawberry
Bubblegum
Magenta
Salmon
Pink
Tangerine
Cantaloupe
Orange
Banana
Lemon
Yellow
Honeydew
Lime
Spring
Clover
Fern
Moss
Flora
Seam Foam
Green
Spindrift
Teal
Sky
Turquoise
Blue


91.00%
8.00%
1.00%
around 8% of all men are color blind
around 1% of all women are color blind
Color Blind Female
Normal
Color Blind Male

- **Hearing**-the sense of hearing is often considered secondary to sight but we tend to underestimate the amount of information that we receive through ears.
- Hearing begins with vibrations in the air or sound waves.
- The ear receives their vibrations and transmits them through various stages, to the auditory nerves.
- Sound is changed or vibrations in air pressure.
- It has number of characteristics which we can differentiate.
- Pitch is the frequency of the sound. A low frequency produces low pitch. A high frequency produces high pitch.
- Loudness is proportional to the amplitude of the sound , the frequency remains constant.

- Timbre relates to the types of the sound: sound may have same pitch and loudness but be made by different instruments and so vary in timbre.
- Location of sound can be identified since the two ears receive slightly different sound, owing to the time difference between the sound reaching the two ears and the reduction in intensity caused by the sound waves reflecting from the head.
- The human ear can hear frequencies from above 20HZ to 15KHZ.
- The auditory system performs some filtering of the sounds received , to ignore background noise and concentrate on important information.
- Sound can convey a remarkable amount of information but rarely used to its potential in interface design.
- The ear can differentiate sound changes and can recognize familiar sounds without concentrating attention on the sound source.
- This suggests that sound could be used more extensively in interface design.

- **Touch** – The third and last of senses important for HCI is Touch or haptic perception. Touch is an important means of feedback and is needed in using computer systems.
- Feeling buttons depress is an important part of the task of pressing button.
- For average person, haptic perception is a secondary source of information but those whose often senses are impaired, it may be more important.
- For such users, interfaces such as braille may be the primary source of information in the interaction.
- In Haptic perception, we receive stimuli through the skin
- The skin contains three types of sensory receptor: Thermoreceptors-respond to heat and cold, non receptors respond to intense pressure, heat and pain and mechanoreceptors respond to pressure.
- It is the last of these that we are concerned with in relation to HCI.

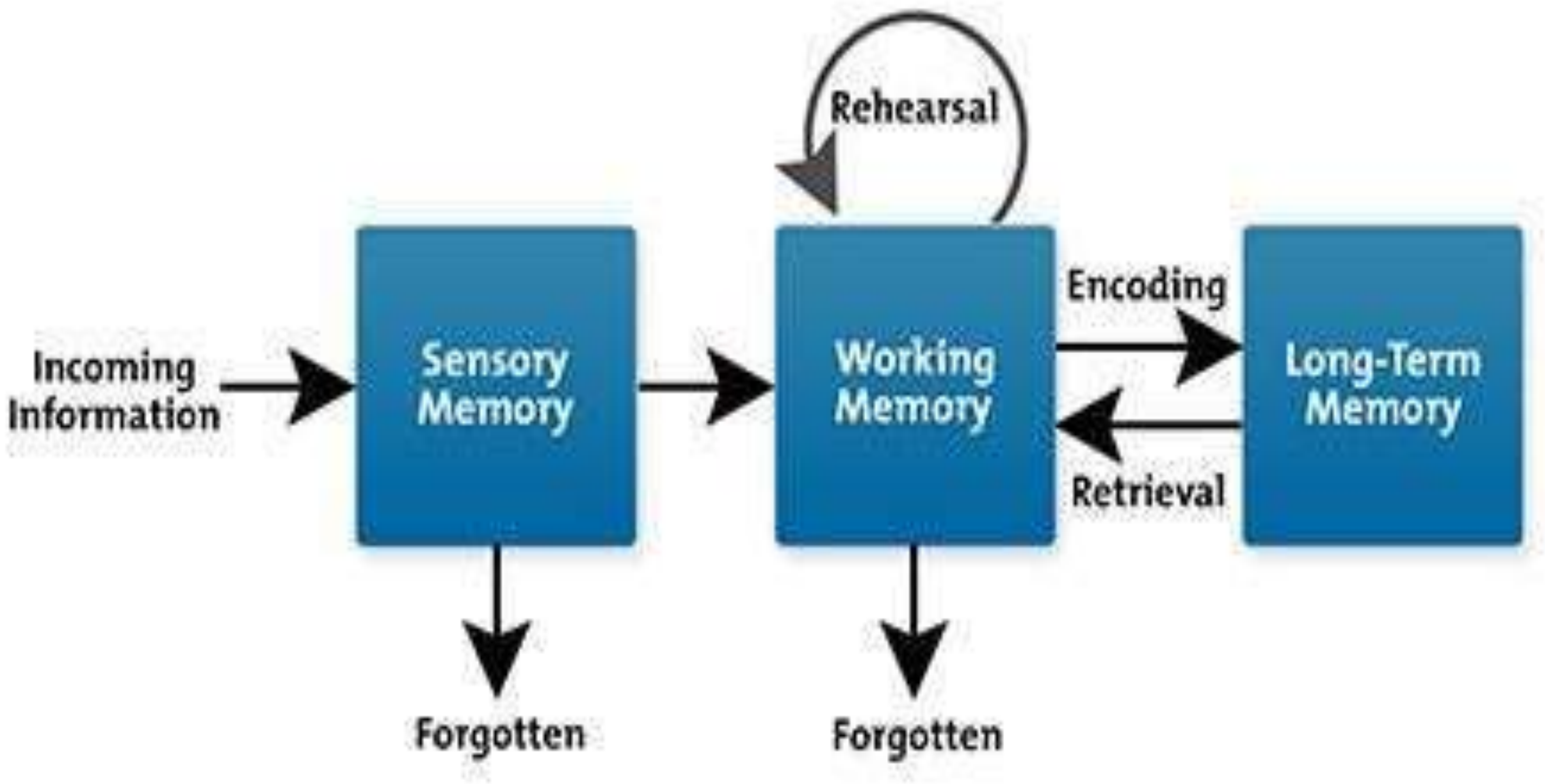
- There are two kinds of mechanoreceptors which respond to different type of pressures.
- **Rapidly adapting mechanoreceptors** respond to immediate pressure. These receptors also react more quickly with increased pressure.
- **Slowly adapting mechanoreceptors** respond to continuously applied pressure.
- Although the whole body contains such receptors, some areas have greater sensitivity than others. The figures and thumbs have the highest sensitivity.

HUMAN COMPUTER INTERACTION

LECTURE 3

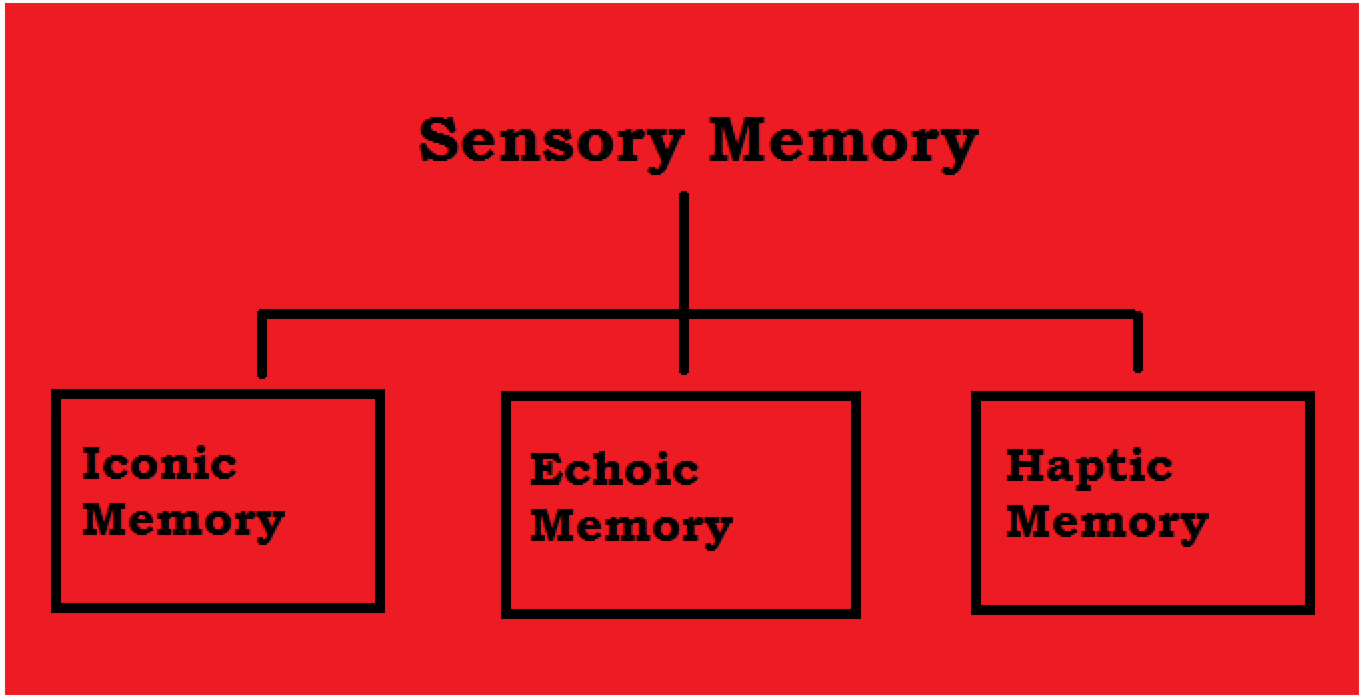
Human Memory:

- There are three types of memory - sensory buffers, short-term memory, long-term memory



Sensory Memory – The sensory memory act as buffers for stimuli received through the sensors.

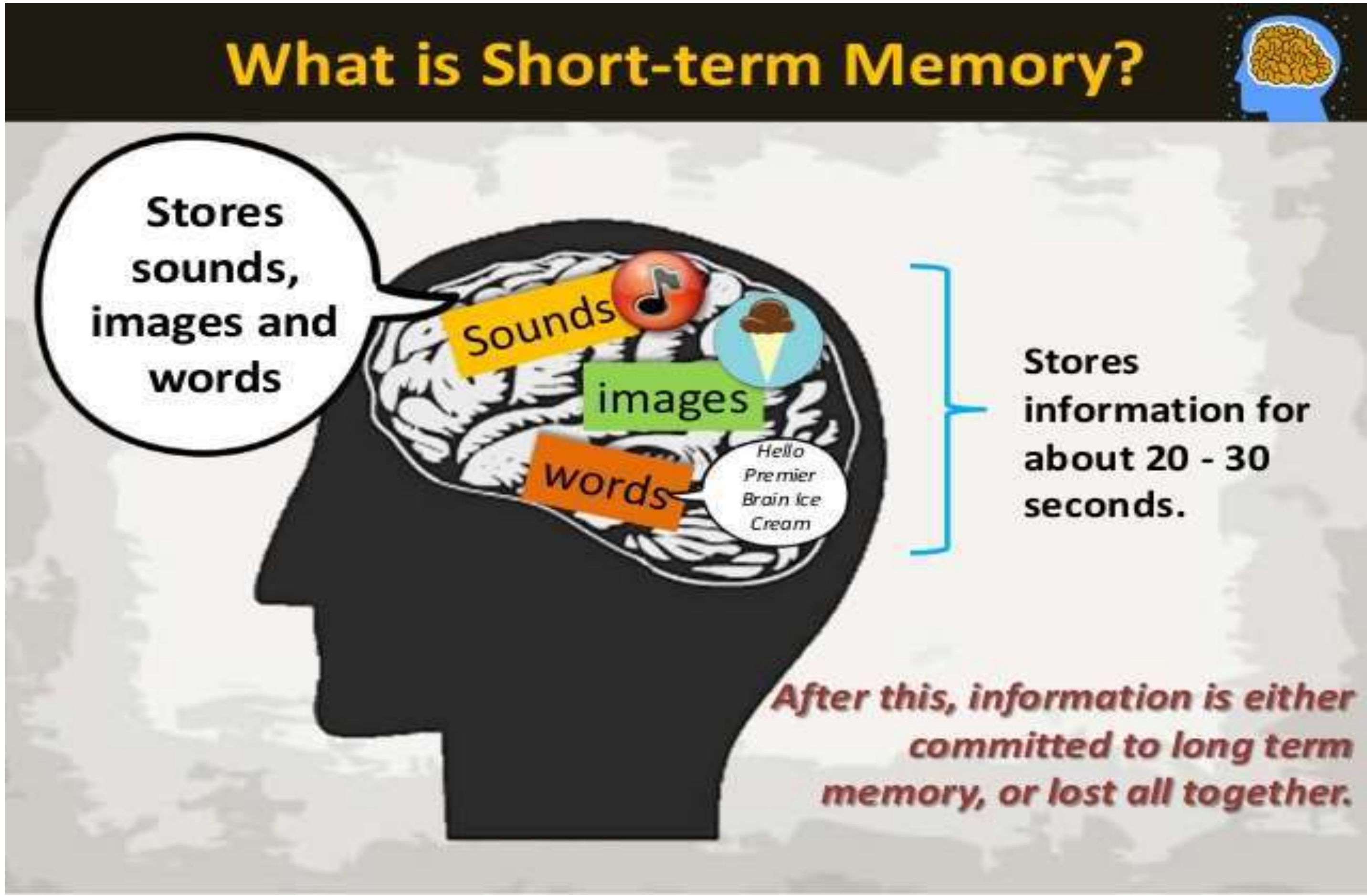
- A sensory memory exists for each sensory channel. These memories are constantly overwritten by new information coming in on these channels.



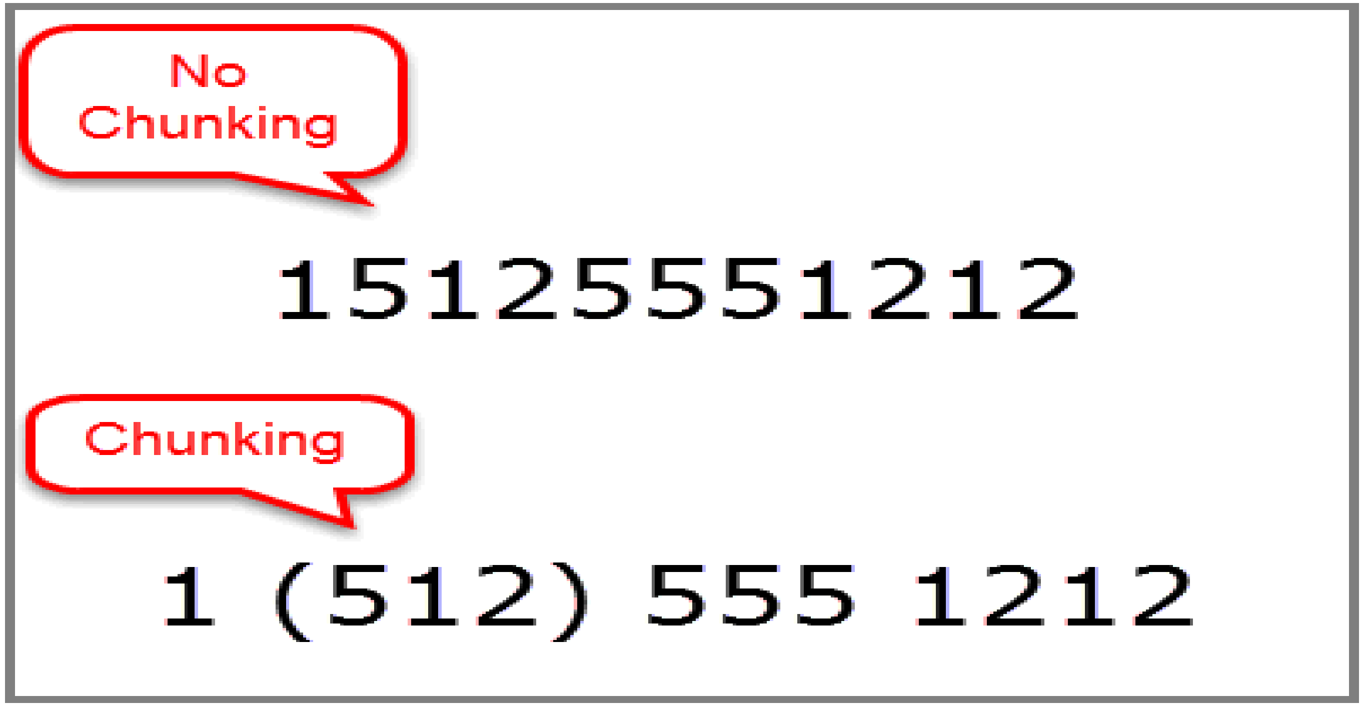
- Information is passed from sensory memory into short-term memory by attention, thereby filtering the stimuli to only those which are of interest at a given time.
- It is clear that we are able to focus our attention selectively, choosing to attend to one thing rather than other.
- This is due to limited capacity of our sensory and mental process.

- **Short term memory** - Short term memory or working memory acts as a 'Scratch-pad' for temporary recall of information.

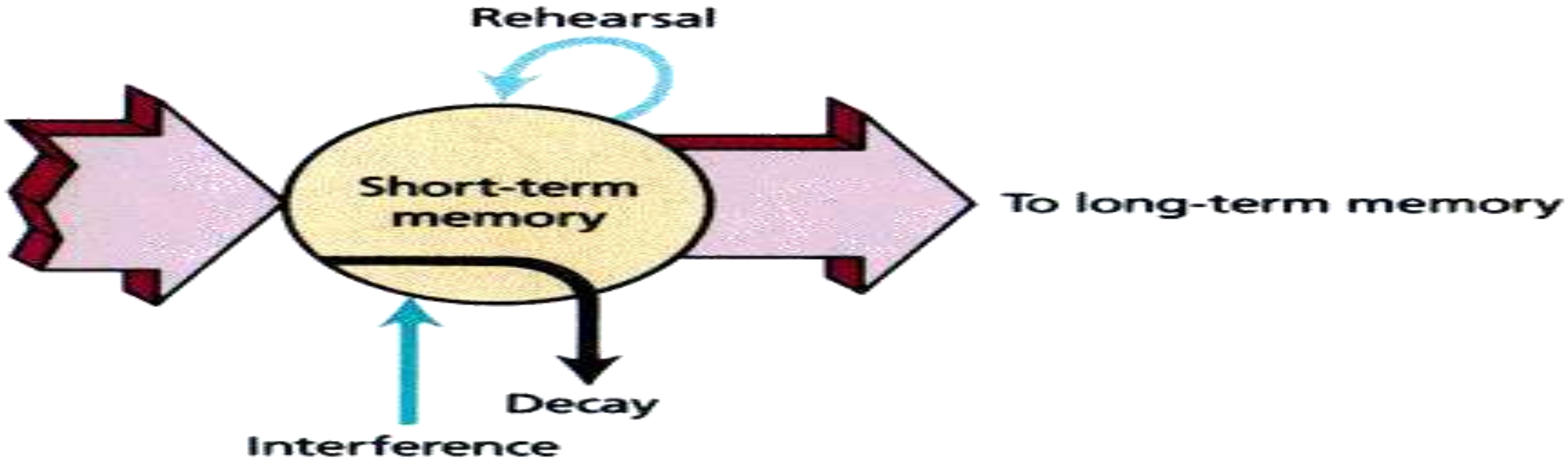
- Short term memory can be accessed rapidly in the order of 70ms.However, it also decays rapidly in the order of 200ms.



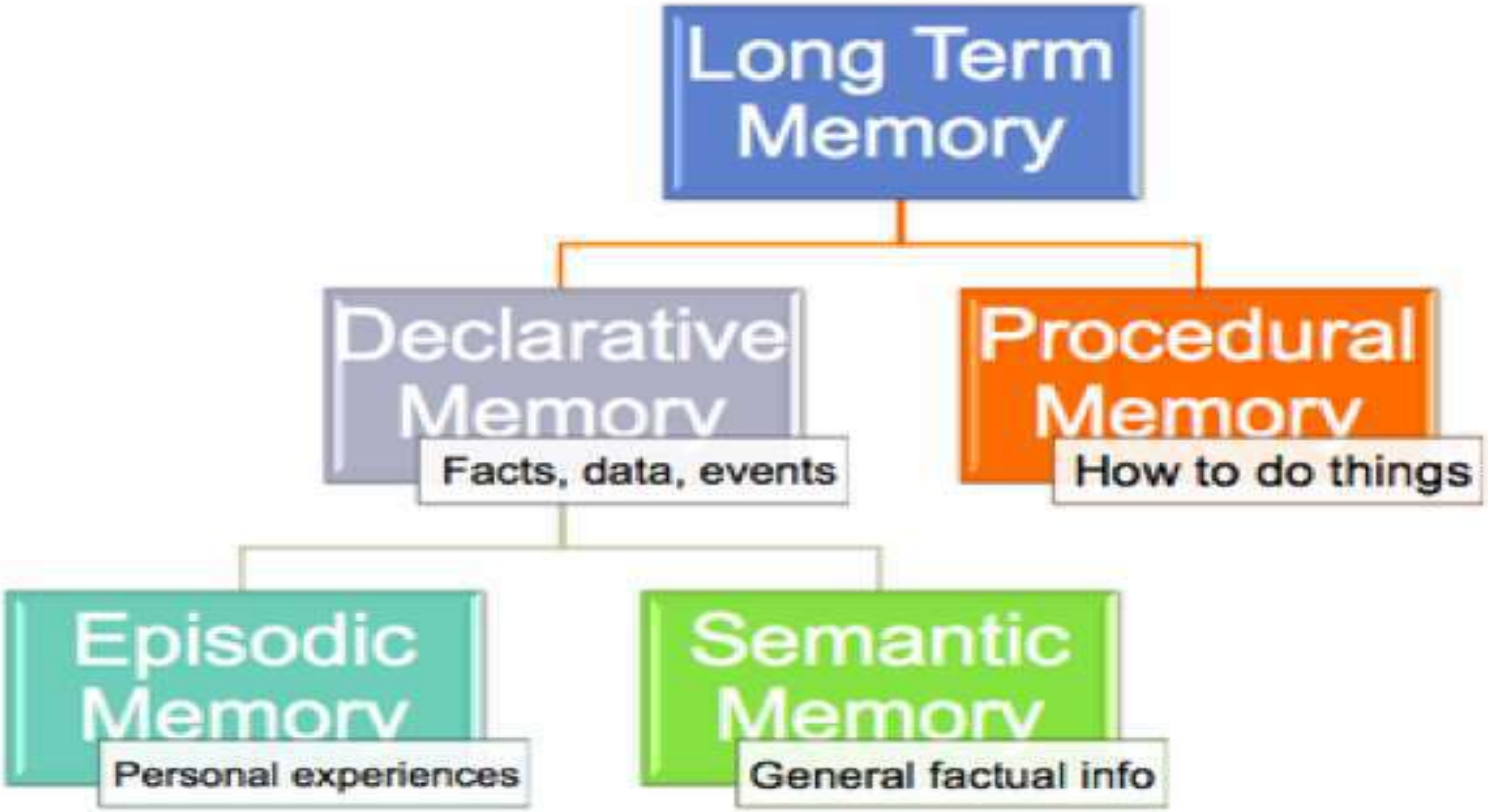
- Chunking information can increase the short term memory capacity.
- The limited capacity of Short term memory produces a subconscious desire to create chunks to optimize the use of memory.
- The successful formation of a chunk is known as closure.



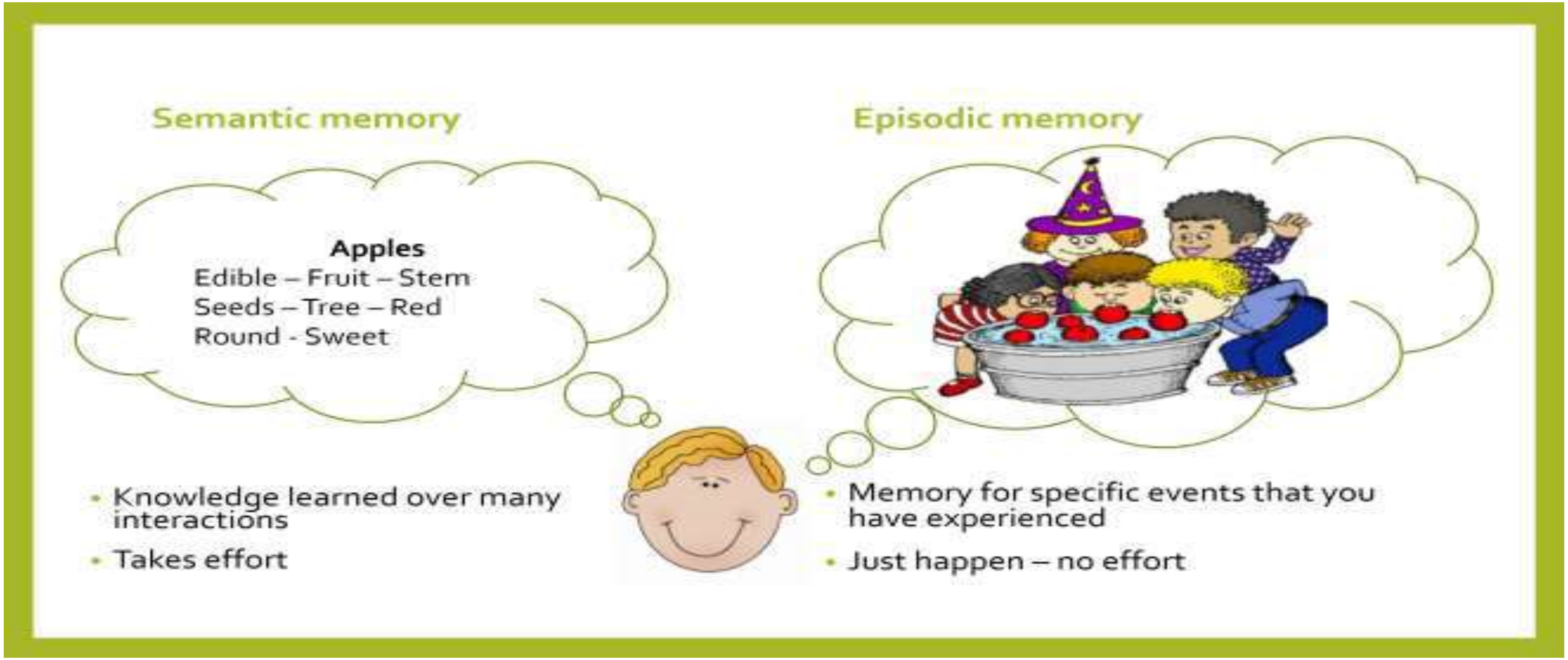
- Short term memory recall is damaged by interference of other information but not necessarily.
- Short term memory is not a unitary system but is made up of number of components, including a visual channel and articulatory channel.
- Interference only occurs if tasks utilize the same channel.



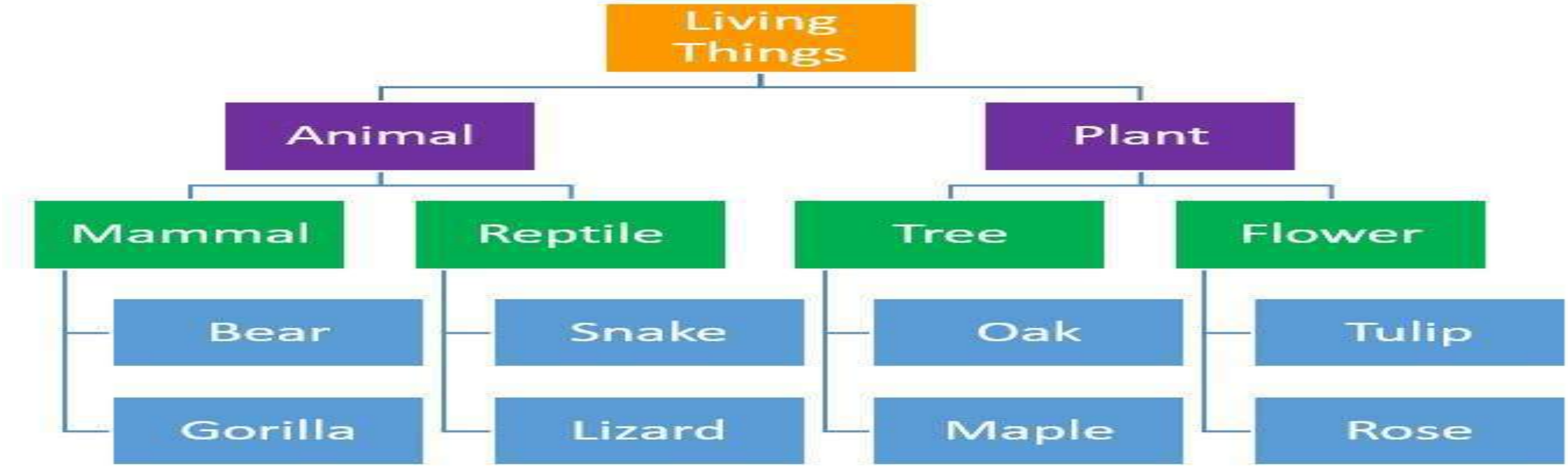
- **Long term memory** – there are two types of long term memory- episodic memory and semantic memory.



- **Episodic memory** represents our memory of events and experiences in a serial form. It is from this memory that 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. Semantic memory is structured in some way to allow access to information, representation of relationships between pieces of information and inference.
- One model for the way in which semantic memory is structured is as a network. Items are associated to each other in classes, and may inherit attributes from parent classes.
- This model is known as semantic network.

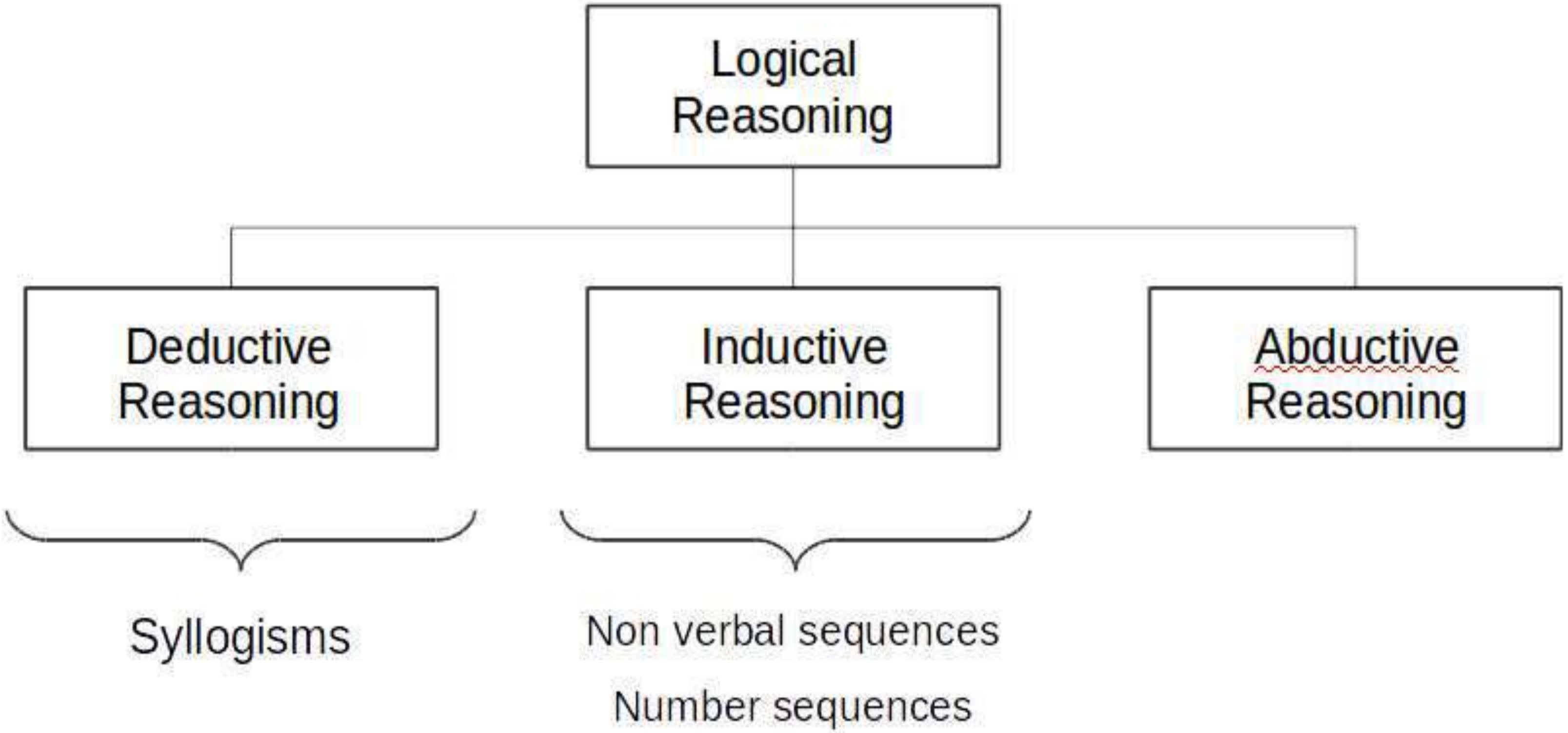


Thinking – Reasoning and Problem Solving:-

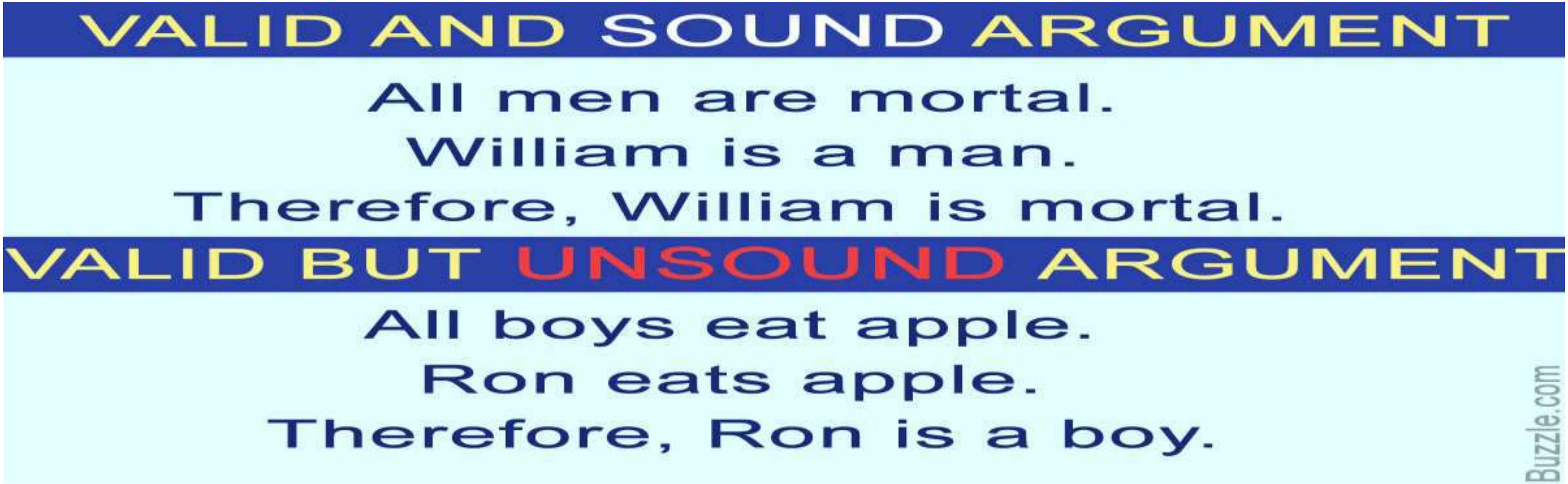
- The process of how information is processed and manipulated in human is most complex and it is the one which separates human from other information processing systems.
- When compared to other information processing system, humans are able to reason and solve problems even if the information is partial and unavailable.
- We are able to think about things of which we have no experience and solve problems which we have never seen before.
- Thinking can require different amounts of knowledge. Some thinking activities are very directed and knowledge required is constrained. Other requires vast amounts of knowledge from different domains.
- There are two categories of thinking – Reasoning and Problem solving.

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 different types of reasoning – Deductive, Inductive, Abductive.



Deductive Reasoning: Deductive Reasoning drives the logically necessary conclusion from the given premises. It is important to note that this is the logical conclusion not necessarily have to be a truth.



Inductive Reasoning: Induction is generalizing from cases we have seen to infer information about cases we have not seen. Induction is useful process, which we use constantly in learning about our environment.

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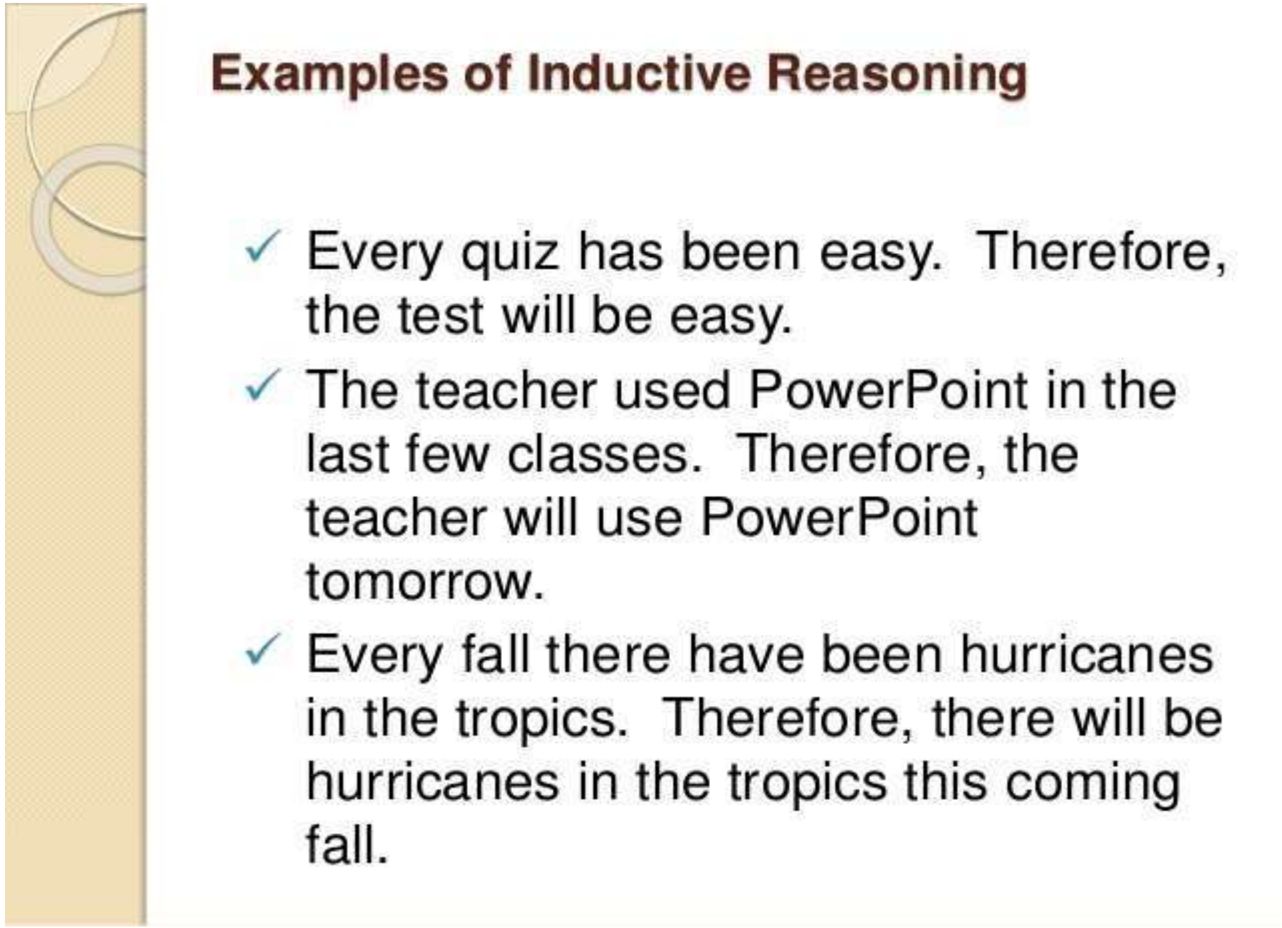


- **Abductive Reasoning**: Abductive reasons from a fact to the action or state that caused it. This is the method we use to derive explanations for the events we observe. In spite of its unreliability it is clear that people do infer explanations in and hold on to them until they have evidence to support an alternative theory.

Abductive Reasoning - Examples

The bus is late. I heard about a motorbike crash on the radio. The crash has probably held the bus up.	That man looks tired and he's wearing gym clothes. He's probably been to the gym.	Cleaning the wound seems to prevent infection. Infectious materials might be carried in dirt.

In all of these cases we are starting with a fact (or a conclusion) and working backwards to try to find an explanation that fits best. Hence: "*inference to the best explanation.*"

HUMAN COMPUTER INTERACTION

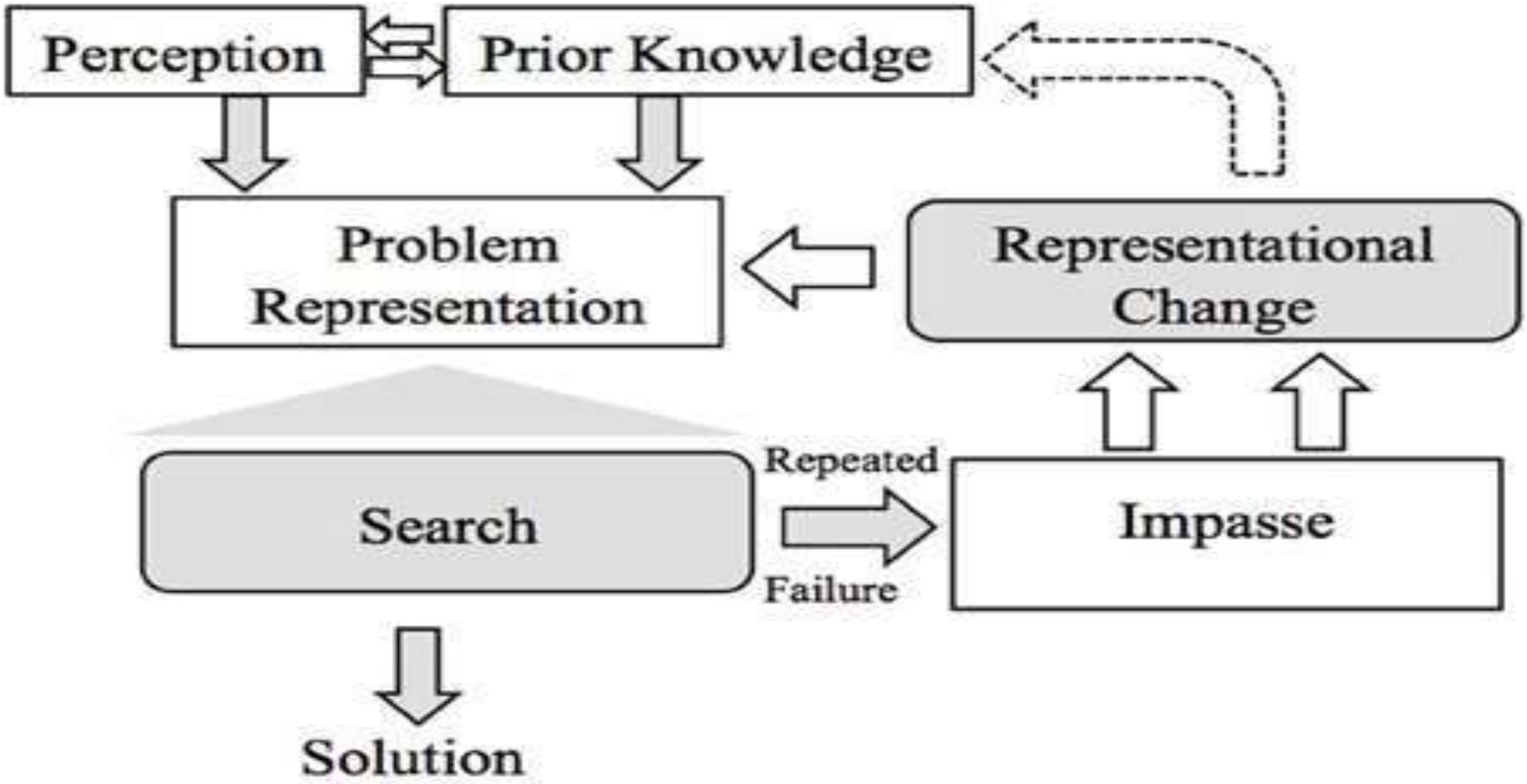
LECTURE 4

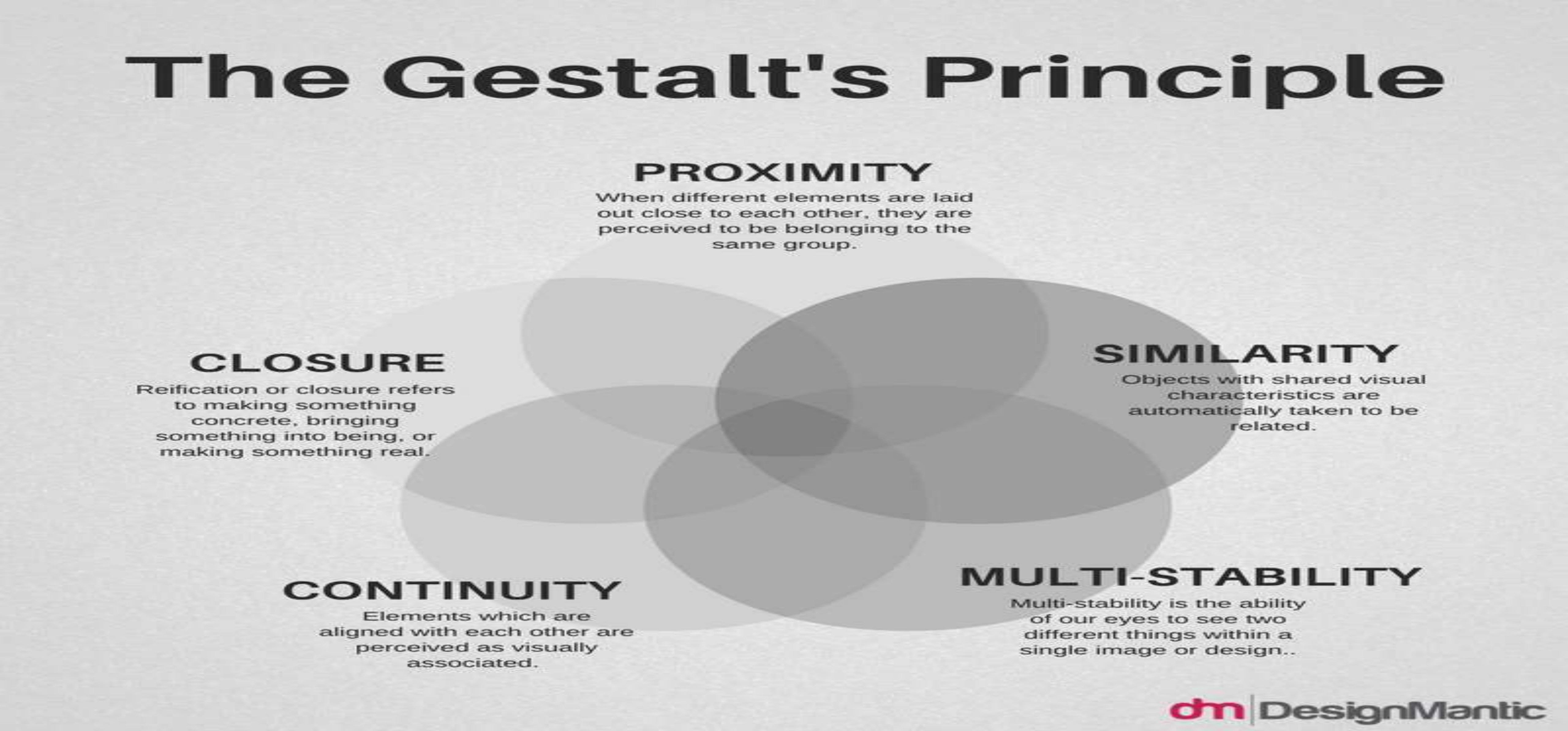
Problem solving: If reasoning is a means of inferring new information from what is already known, problem solving is the process of finding a solution to an unfamiliar task, using knowledge we have.

- Human problem solving is characterised by the ability to adapt the information we have to deal with new situations.
- There are number of different views of how people solve problems.
- The earliest is the Gestalt View that problem solving both reuse of knowledge and insight.
- A second major theory proposed was the problem space theory which takes the view that the mind is a limited information processor.

Gestalt Theory: Problem solving is both and productive and reproductive.

- Productive problem solving involves insight and restructuring of problem.
- Reproductive problem solving draws on previous experience.
- Reproductive problem solving could be a delay to finding solution, since a persons fixed thoughts of known aspects may dominate and so be unable to see novel interpretations that might lead to a solution.
- Although Gestalt theory is attractive in terms of its description of human problem solving, it does not provide sufficient evidence or structure to support its theories.
- It does not explain when restructuring occurs or what insight is .


Perception
Prior Knowledge
Problem Representation
Representational Change
Search
Repeated
Failure
Impasse
Solution

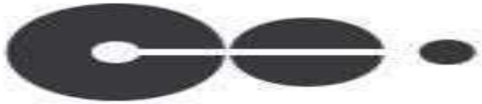

The Gestalt's Principle
PROXIMITY
When different elements are laid out close to each other, they are perceived to be belonging to the same group.
CLOSURE
Reification or closure refers to making something concrete, bringing something into being, or making something real.
SIMILARITY
Objects with shared visual characteristics are automatically taken to be related.
CONTINUITY
Elements which are aligned with each other are perceived as visually associated.
MULTI-STABILITY
Multi-stability is the ability of our eyes to see two different things within a single image or design..
DesignMantic

PROXIMITY

When objects placed together, the eye perceives them as a group.

SIMILARITY

When objects look similar to one another, the eye perceives them as a group or pattern.



CONTINUANCE

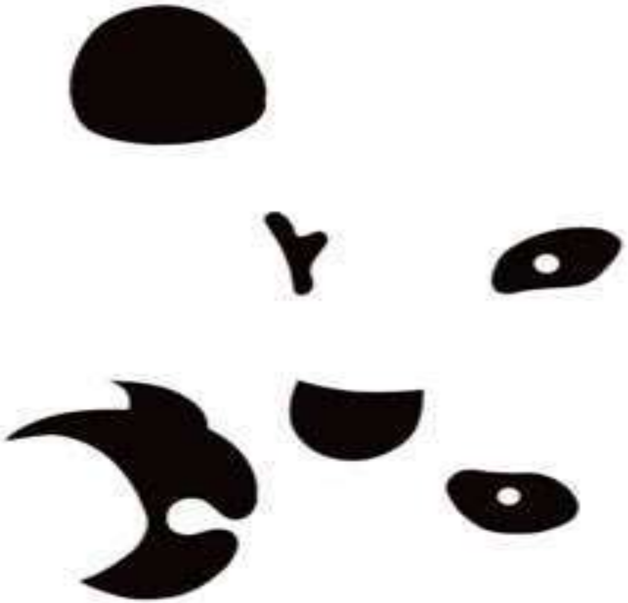
The eye is compelled to move from one object through another.

CLOSURE

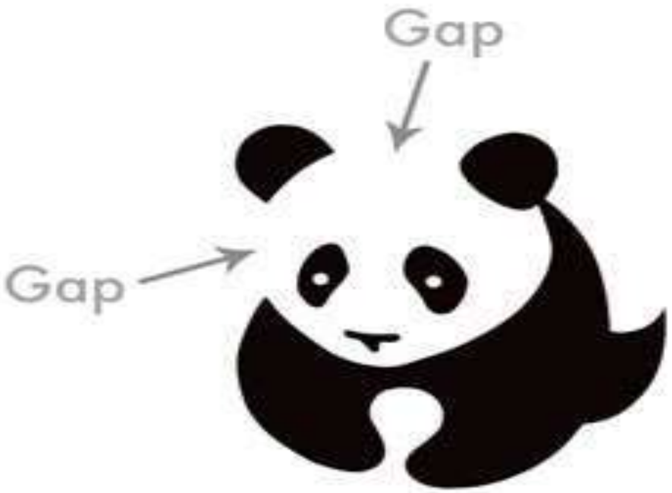
When an object is incomplete or not completely enclosed.

FIGURE & GROUND

When the eye differentiates an object from its surrounding area.



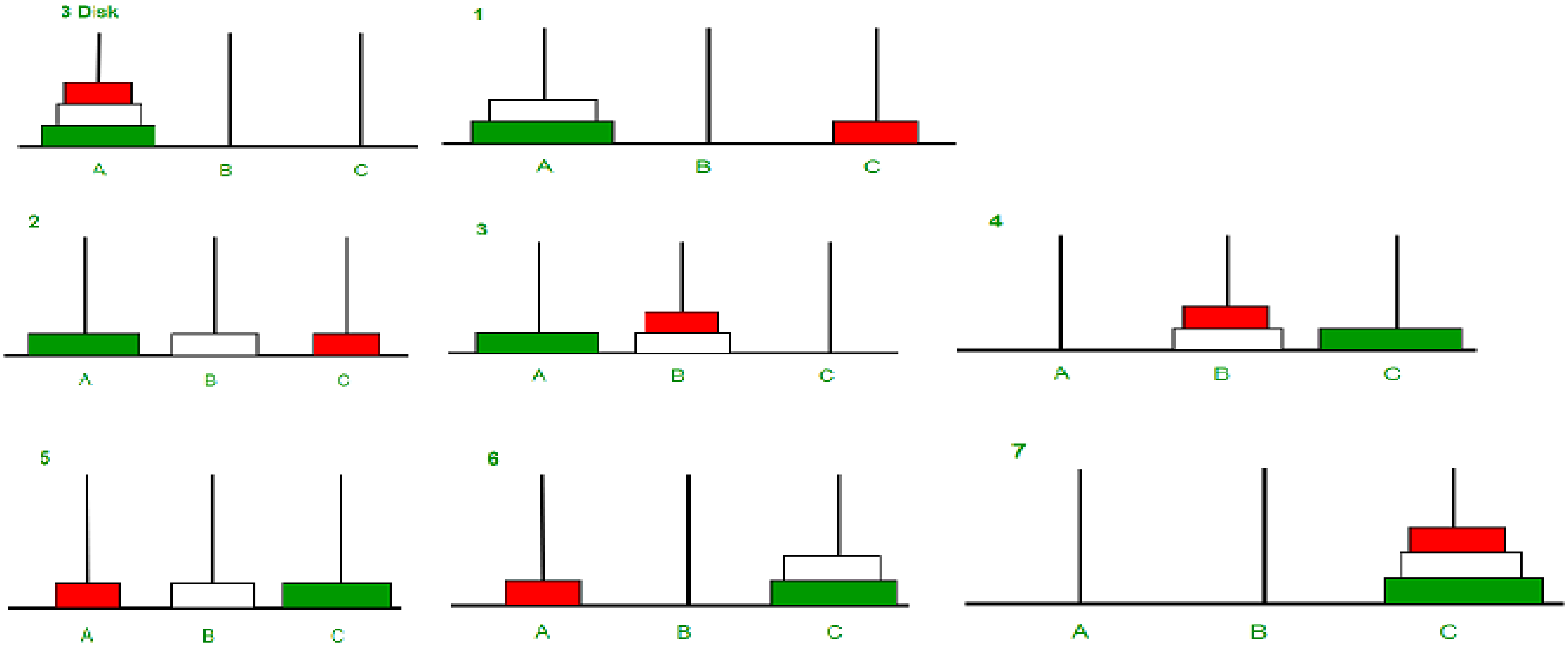
No Familiar Shape



The Mind Fills the Gaps

Figure / Ground

- **Problem Space Theory-** Theory propose that problem solving centres on problem space.
- The problem space comprises problem states, and problem solving involves generating these states using legal state transition operators.
- The problem has an initial state and a goal state and people use the operators to move from initial to goal state.
- If problem spaces are huge, heuristics are employed to select appropriate operators to reach the goal.
- One such approach is means – ends analysis.
- In means – ends analysis, the initial status is compared with goal state and an operator chosen to reduce the difference between two.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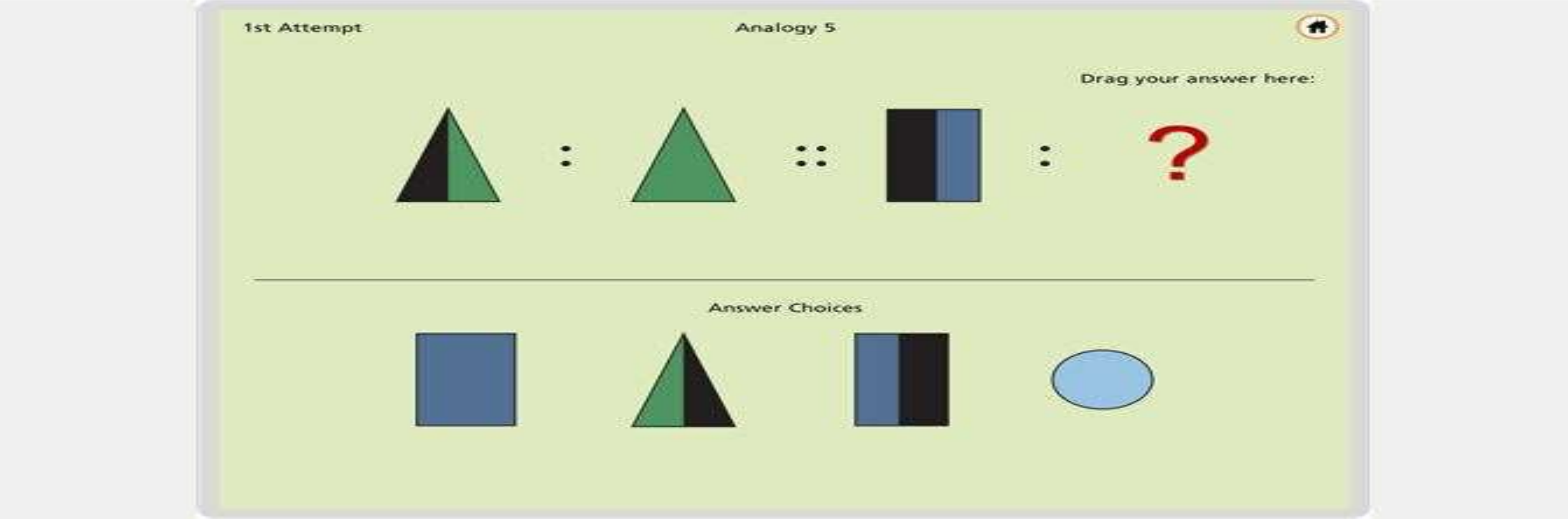
7
A
B
C

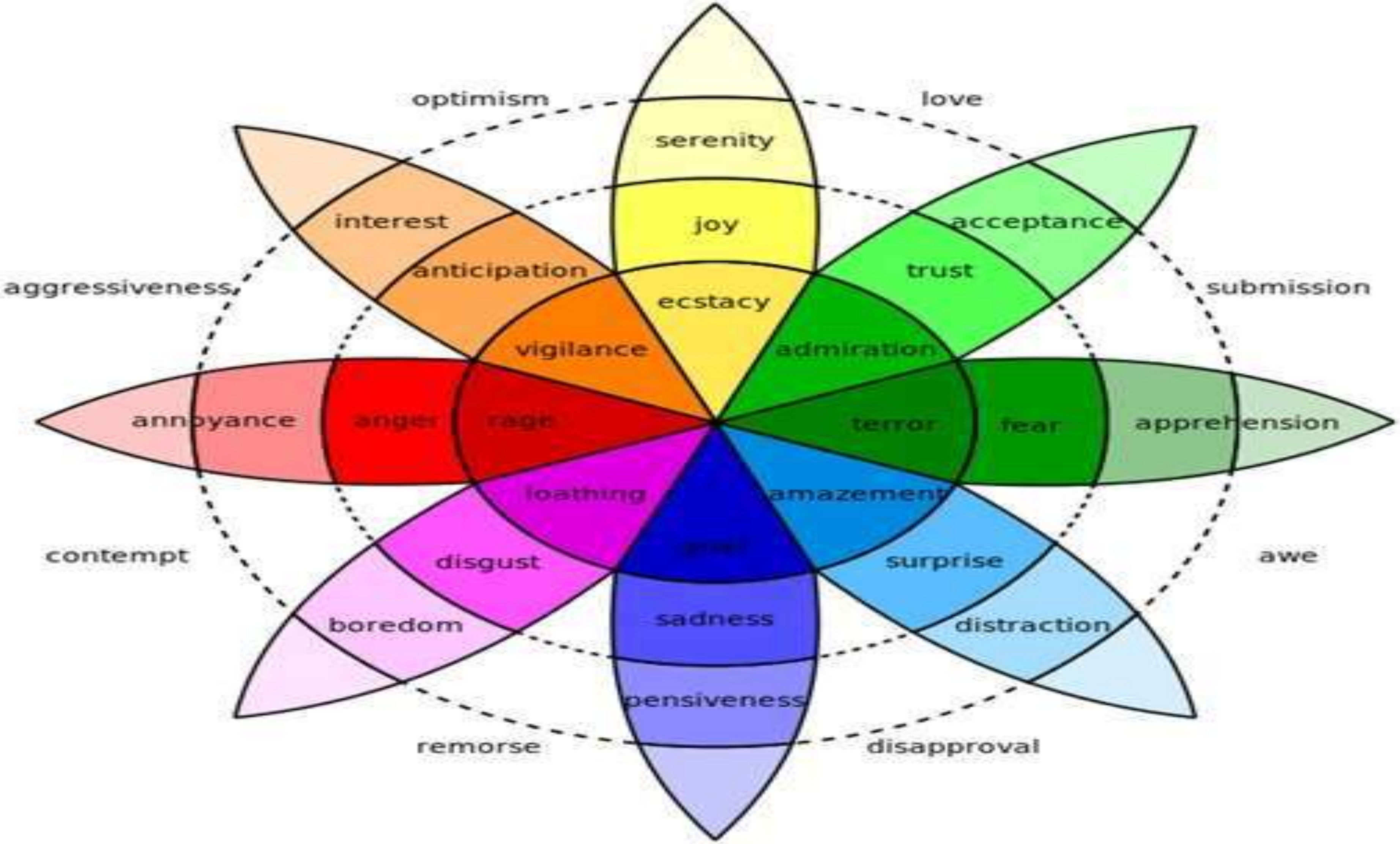
- Analogy in problem solving – A third element of problem solving is the use of analogy. Here we are interested in how people solve novel problems.
- One suggestion is that this is done by mapping knowledge related to similar known domain to new problem called analogical mapping.
- Similarities between the known domain and the new one are noted and operators from the known domain are transferred to the new one.



Emotion: Human emotion is more complex than human perceptual abilities.

- Our emotional response to situations affects how we perform.
- Positive emotions enable us to think more creatively to solve complex problems, whereas negative emotion pushes us into narrow thinking.
- A problem that may be easy to solve when user is relaxed will become difficult if we are frustrated or afraid.
- Emotion involves both physical and cognitive events.
- Our body responds biologically to an external stimulus and we interpret that in some way as a particular emotion.
- That biological response is known as affect- changes the way we deal with different situations and this has an impact on the way we interact with computer systems.

- Negative affect can make it harder to do even easy tasks, positive affect can make it easier to do difficult tasks.
- This suggests that in situations of stress, people will be less able to cope with complex problem solving or managing difficult interfaces, whereas if people are relaxed they will be more forgiving of limitations in the design.
- It suggests that if we build interfaces that promote positive responses for example by using aesthetics or reward then they are likely more successful.


optimism
love
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joy
acceptance
anticipation
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aggressiveness
submission
ecstacy
vigilance
admiration
annoyance
anger
rage
terror
fear
apprehension
loathing
amazement
contempt
disgust
awe
surprise
boredom
sadness
distraction
pensiveness
remorse
disapproval

Psychology and the design of interactive systems:

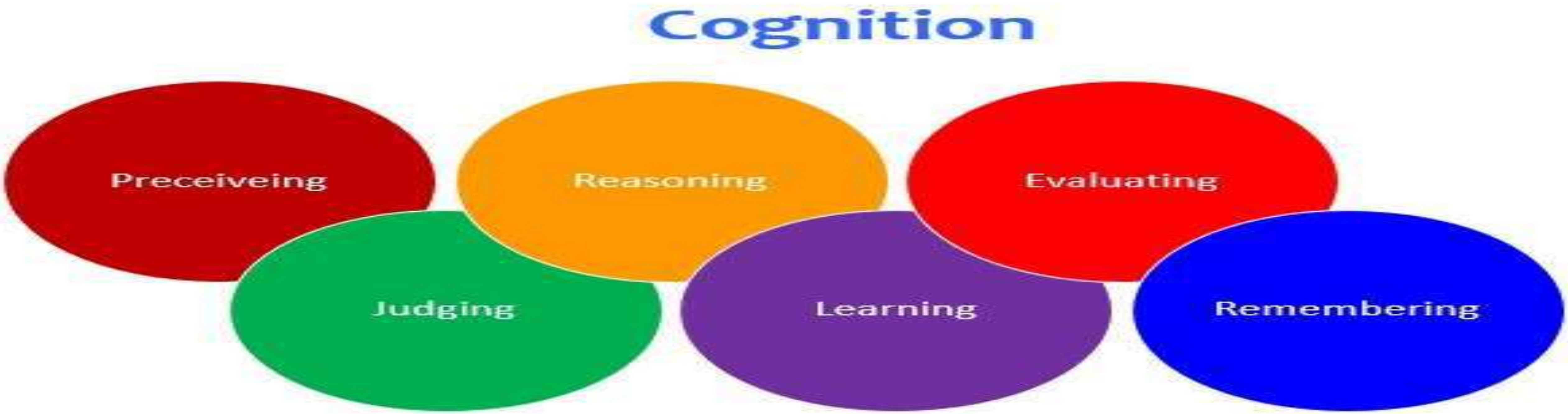
- The study of way human receive, process and store information, solve problem is completed but how to apply that knowledge is not clear.
- Some conclusion can be made such as recognition is easier than recall.
- In order to apply psychological principal in design, we need to understand its context, both in terms of when it fits in wider field of psychology and in terms of measures used and subjects involved.
- Principles and results from research in psychology have been included in guidelines of design, models to support design and techniques for evaluating design.

HUMAN COMPUTER INTERACTION

LECTURE 5,6

Cognition:

- Cognition is the mental action or process of acquiring knowledge and understanding through thought, experience and the senses.
- There are many different kinds of cognition such as thinking , remembering, learning, daydreaming, decision making, seeing, reading, writing and talking.



- There are two general modes of cognition : Experimental and Reflective cognition.
- **Experiential Cognition** is a state of mind in which we perceive , act and react to events around us effectively and effortlessly.
- It requires reaching a certain level of expertise and engagement.
- Examples include driving a car , reading a book, having a conversation, and playing a video game.

Reflective cognition involves thinking, comparing, and decision making. This kind of cognition is what leads to new ideas and creativity.

Examples include designing ,learning and writing a book .

- Both modes of cognition are essential for everyday life but each requires different kinds of technological support. The study of human cognition can help understand human abilities and limitations when interacting with technologies.
- HCI focusses on examining cognitive aspects of interaction design.
- We analyze about what humans are good and bad at and show how this knowledge can be used to inform the design of technologies that both extend human capabilities and compensate for their weakness.
- The study of cognitive based conceptual frameworks helps in explaining the way humans interact with computers.

Cognitive Frameworks:

- A number of conceptual frameworks and theories have been developed to explain and predict user behavior based on theories of cognition.
- There are three early **internal frameworks** that focus primarily on mental process and three **external frameworks** that explain how humans interact and use technologies.

Internal frameworks : Mental models

Gulfs of execution and evaluation

Information processing

External frameworks : Distributed cognition

External cognition

Embodied interaction

Internal Frameworks

- **Mental models:** People primarily develop knowledge of how to interact with systems and to a lesser extent how that system works. The two kinds of knowledge were often referred to as users mental model.
- It is assumed that mental models are used by people to reason about a system and try to find out what to do when something unexpected happens. The more someone learn about a system and how it functions the more their mental model develops.
- Within cognitive psychology , mental models have been projected as internal constructions of some aspect of external world that are manipulated , enabling predictions and inferences to be made.
- This can involve both unconscious and conscious mental process where images and analogies are activated.

- If people could develop better mental models of interactive systems they would be in a better position to know how to carry out their tasks efficiently and know what to do if a system started malfunctioning.
- If Interactive technologies could be designed to be more transparent, then it might be easier to understand them in terms of how they work and what to do when they don’t.
- Transparency involves

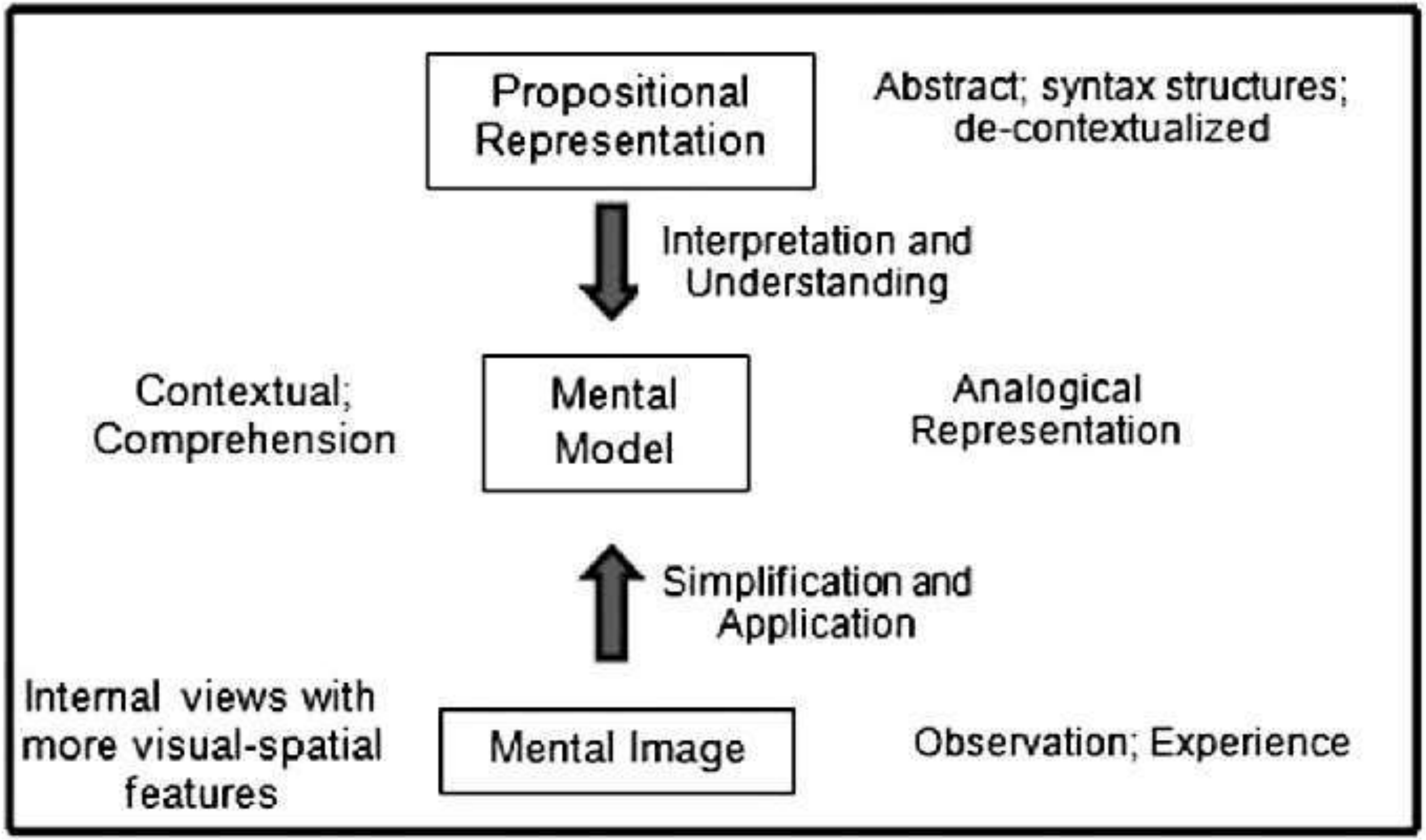
    -Useful feedback in response to user input.

    -Easy to understand and easy ways of interacting.
- It also requires providing the right kind and level of information in the form of

    -clear and easy to follow instructions.

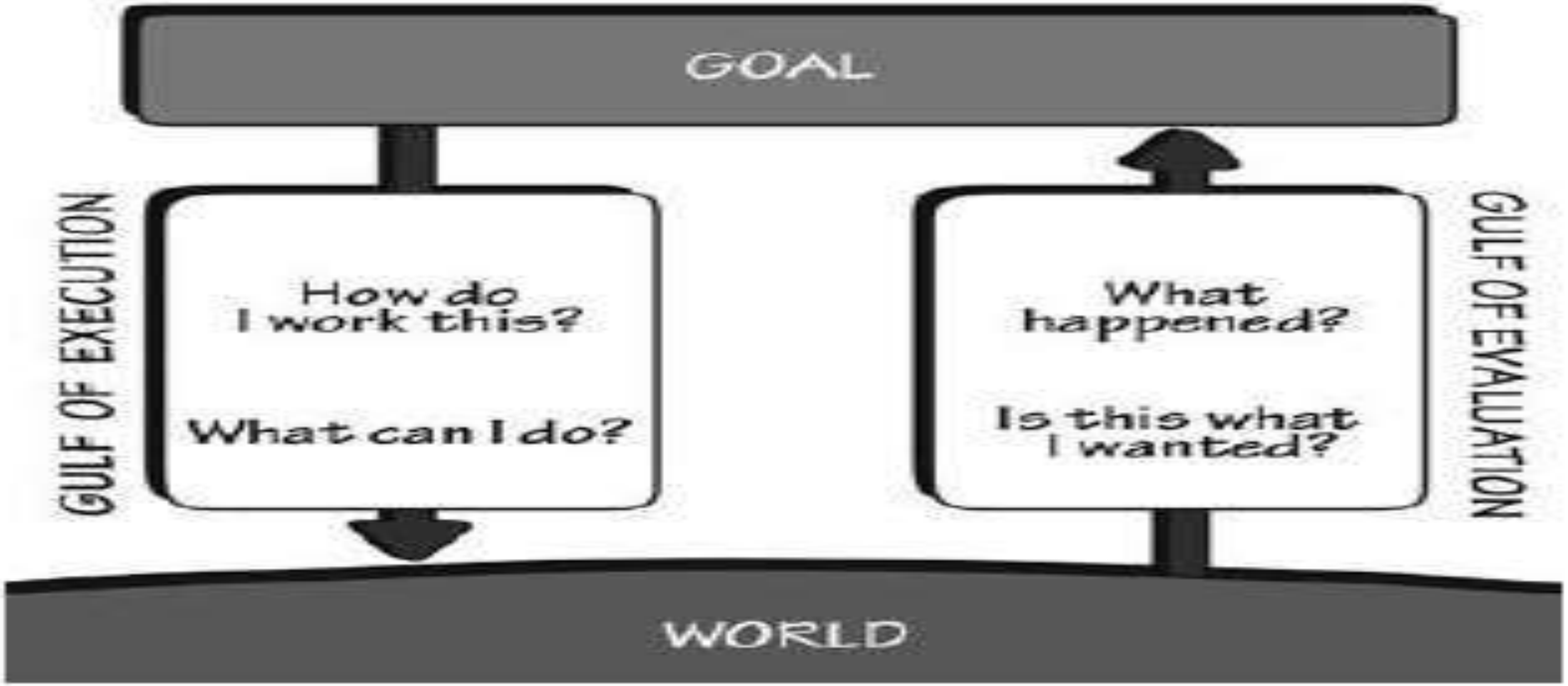
    -appropriate online help and tutorials.

    -context sensitive guidance for users, at their level of experience.


Propositional Representation
Abstract; syntax structures; de-contextualized
Interpretation and Understanding
Contextual; Comprehension
Mental Model
Analogical Representation
Simplification and Application
Internal views with more visual-spatial features
Mental Image
Observation; Experience

Gulfs of execution and evaluation:

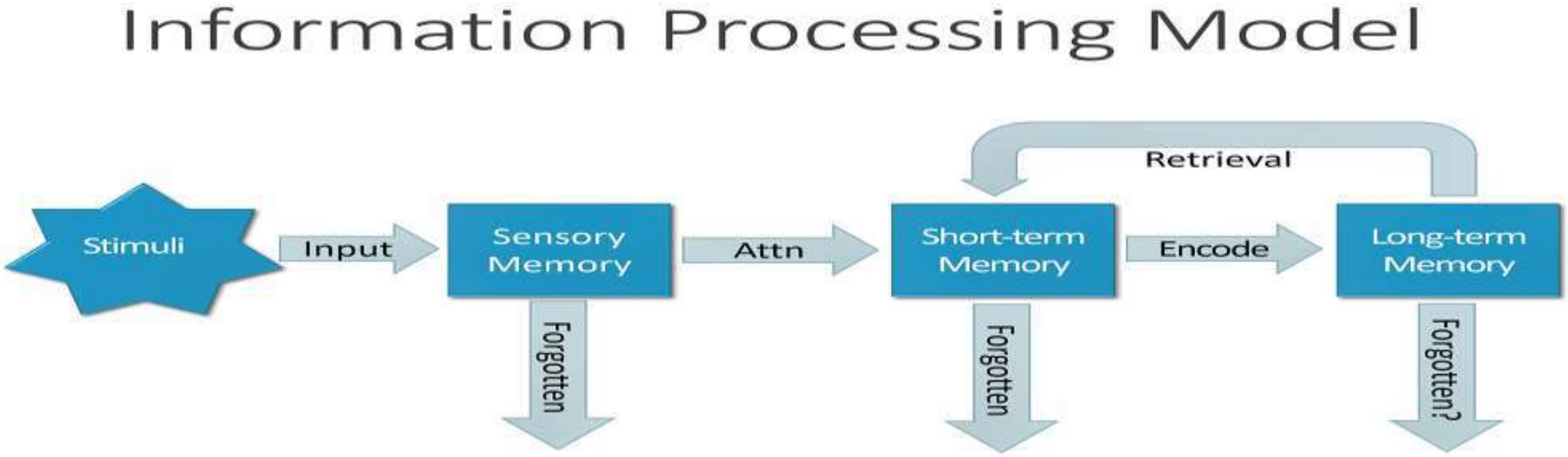
- The gulf of execution and the gulf of evaluation describe the gaps that exist between the user and the interface. They are intended to show how to design to enable the user to cope with them.
- The first one-The gulf of execution describes the distance from the user to the physical system, while the second one-the gulf of evaluation is the distance from physical system to the user.
- The designers and users need to concern themselves with how to bridge the gulfs in order to reduce the cognitive effort required to perform a task.
- This can be achieved by designing usable interfaces that match the psychological characteristics of the user and by the user learning to create goals, plans and actions sequences that fit with how the interface works.


GOAL
GULF OF EXECUTION
How do I work this?
What can I do?
What happened?
Is this what I wanted?
GULF OF EVALUATION
WORLD

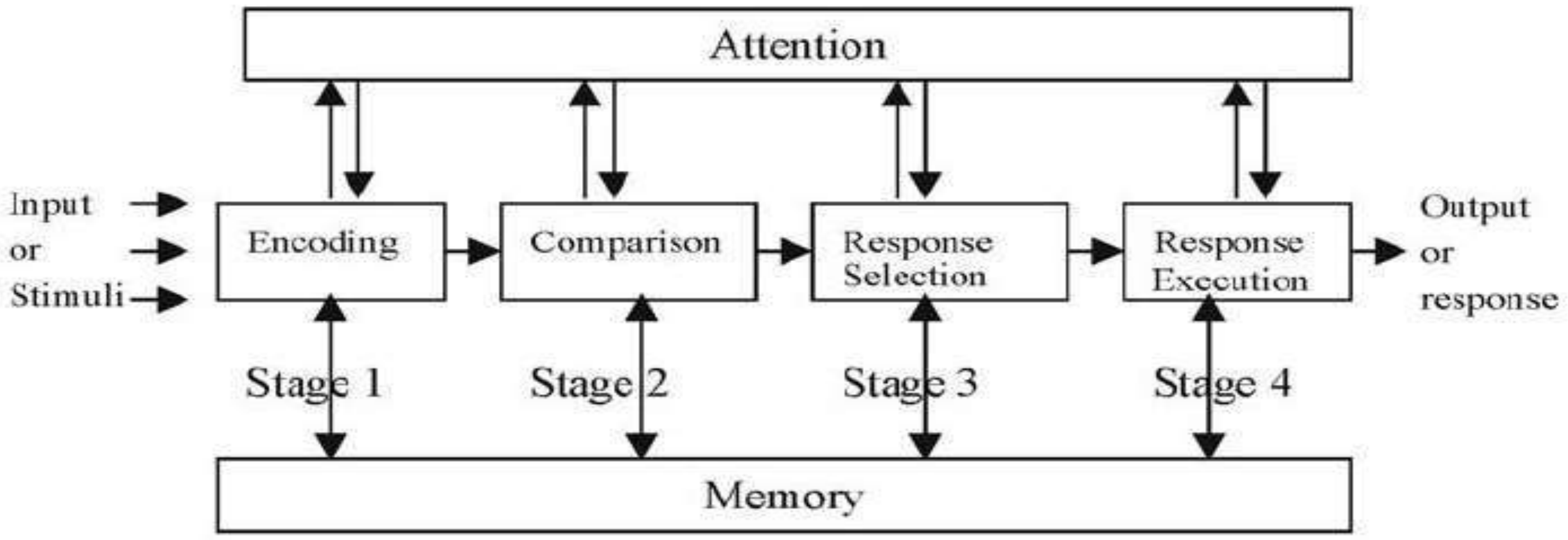

Gulf of
Execution
Gulf of
Evaluation
Intention
User has a goal
Evaluation
Action
specification
Interpretation
Perception
Execution

Information processing:

- Another classic approach to conceptualizing how the mind works has been to use metaphors and analogies.
- One prevalent metaphor from cognitive psychology is the idea that the mind is an information processor.
- Information is thought to enter and exit in the mind through a series of ordered processing stages.



- Human Information processing model consists of four stages – Encoding, Comparison , Response Selection, Response Execution.



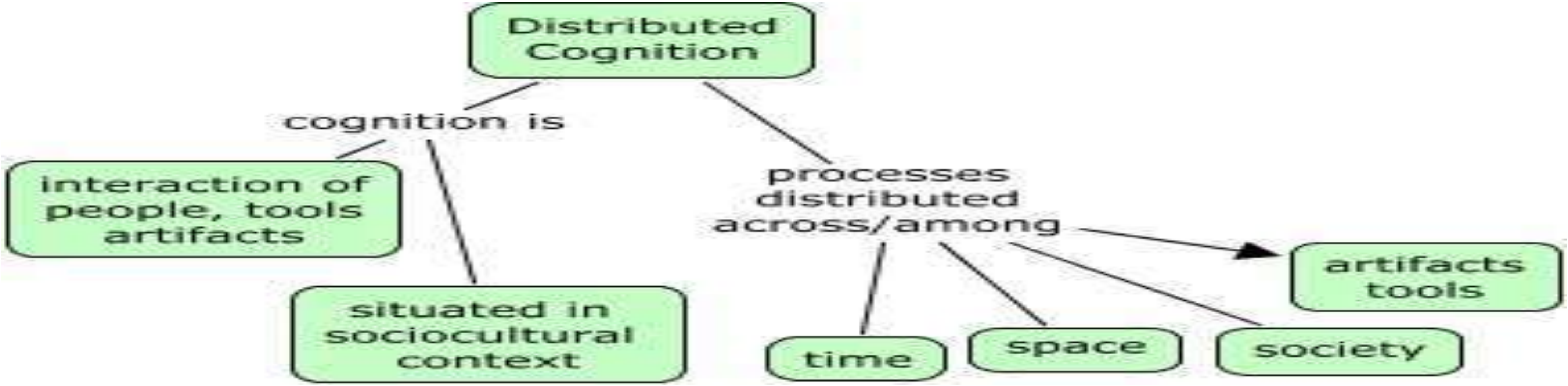
- Within these stages, various processes are assumed to act upon mental representations.

- Mental representations are assumed to comprise images, mental models, rules and other forms of knowledge.
- The information processing model provides a basis from which to make predictions about human performance.
- Hypothesis can be made about how long someone will take to perceive and respond to a stimulus and what occur if a person is overloaded with too much information.
- One of the first HCI models to be derived from the information processing theory was the human processor model, which modelled the cognitive processors of a user interacting with the computer.
- The model predicts which cognitive processors are involved when a user interacts with a computer, enabling calculations to be made of how long a user will take to carry out various tasks.

External Frameworks:

- **Distributed cognition** : The distributed cognition approach studies the nature of cognitive phenomena across individuals and internal and external representations.
- It involves describing a cognitive system , which projects interactions among people and environment there are working in.
- A primary objective of distributed cognition approach is to describe these interactions in terms of how information is propagated through different media.
- By this it is meant how information is represented and re-represented as it moves across individuals.
- These transformations of information are referred to as changes in representation state.

- A distributed cognition analysis involves examining:
  - -the distributed problem solving that takes place.
  - -the role of verbal and non-verbal behaviour.
  - -the various coordinating mechanisms that are used.
  - -the various ways communication takes place as the collaboration activity process.
  - -How knowledge shared and accessed.



External cognition:

- External cognition is concerned with explaining the cognitive processes involved when we interact with different external representations.
- A main goal is to explicate the cognitive benefits of using different representations for different cognitive activities and the process involved.
- The main ones include

1. Externalizing to reduce memory load.
2. Computational offloading.
3. Annotating and cognitive tracing.

Externalizing to reduce memory load:

- Numerous strategies have been developed for transforming knowledge into external representations to reduce memory load.
- Ones such strategy is externalizing things we find difficult to remember such as birthdays , appointments and addresses.
- Diaries , personal remainders are examples of cognitive artifacts that are commonly used for this purpose.
- Externalizing , therefore can help reduce peoples memory burden by

  -reminding them to do something.

  -reminding them of what to do.

  -reminding them of when to do something.

Computational offloading:

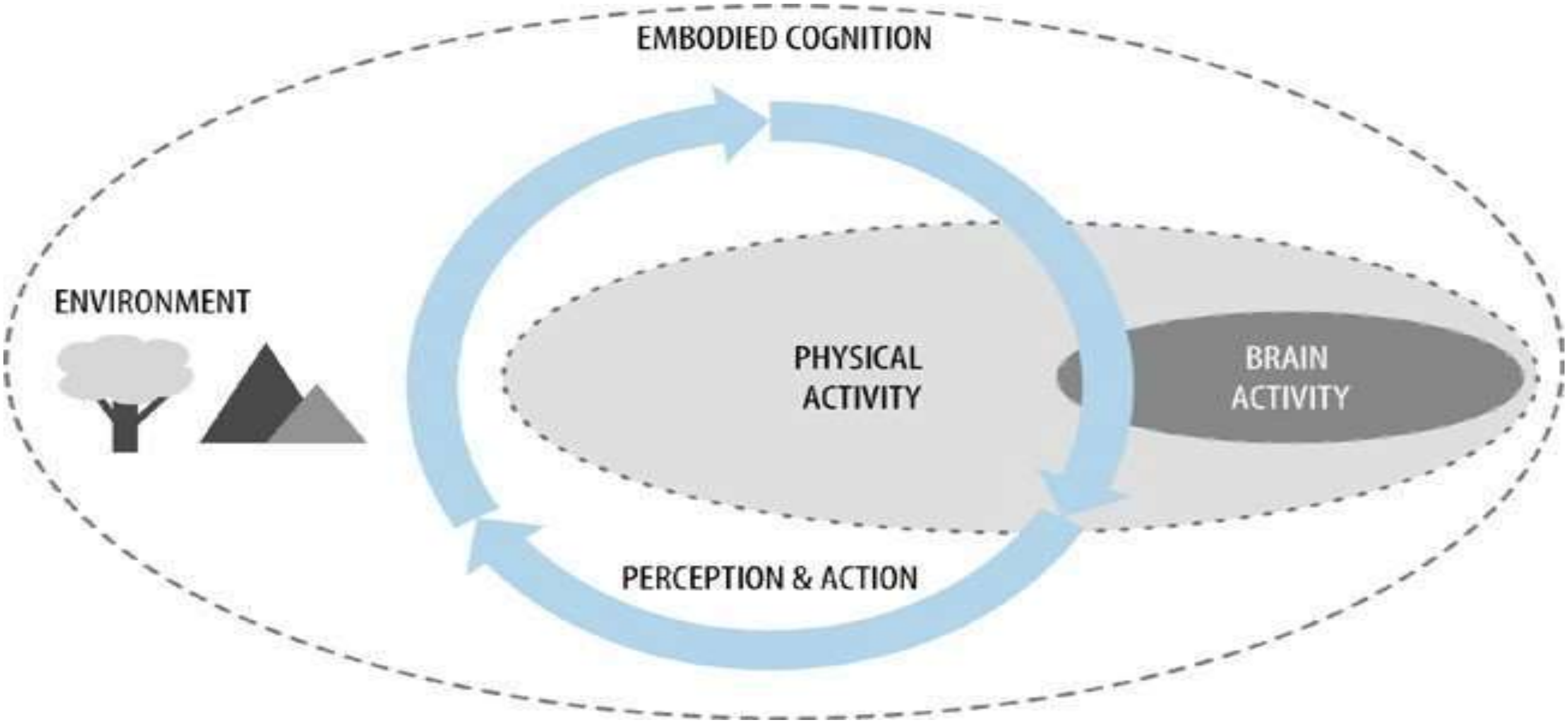
- Computational offloading occurs when we use a tool or device in conjunction with an external representation to help us carry on a computation.
- An example is using a pen and paper to solve math problem.

Annotating and cognitive tracing:

- Another way in which we externalized our cognition is by modifying representations to reflect changes that are taking place that we wish to mark.
- Annotating involves modifying external representations such as crossing off or underlying items.
- Cognitive tracing involves externally manipulating items into different orders or structures.

Embodied interaction:

- HCI which group out of collaboration between computer scientist and psychologist initially adopted an information processing perspective but was criticize as failing to account for the ways that people get things done in real situations.
- Approaches that focus on practical engagement in real social and physical contexts and the flexible ways were included into interaction.
- One of the approach is embodied interaction.
- This has been applied quite broadly to : hci , including work that focuses on the emotional quality of interaction with technology , on publicly available actions in physically shared spaces , and on the role of the body in mediating our interaction with technology.
- These theories of embodied cognition are more useful in the ways that people experience the world through physical interaction.


EMBODIED COGNITION
ENVIRONMENT
PHYSICAL ACTIVITY
BRAIN ACTIVITY
PERCEPTION & ACTION

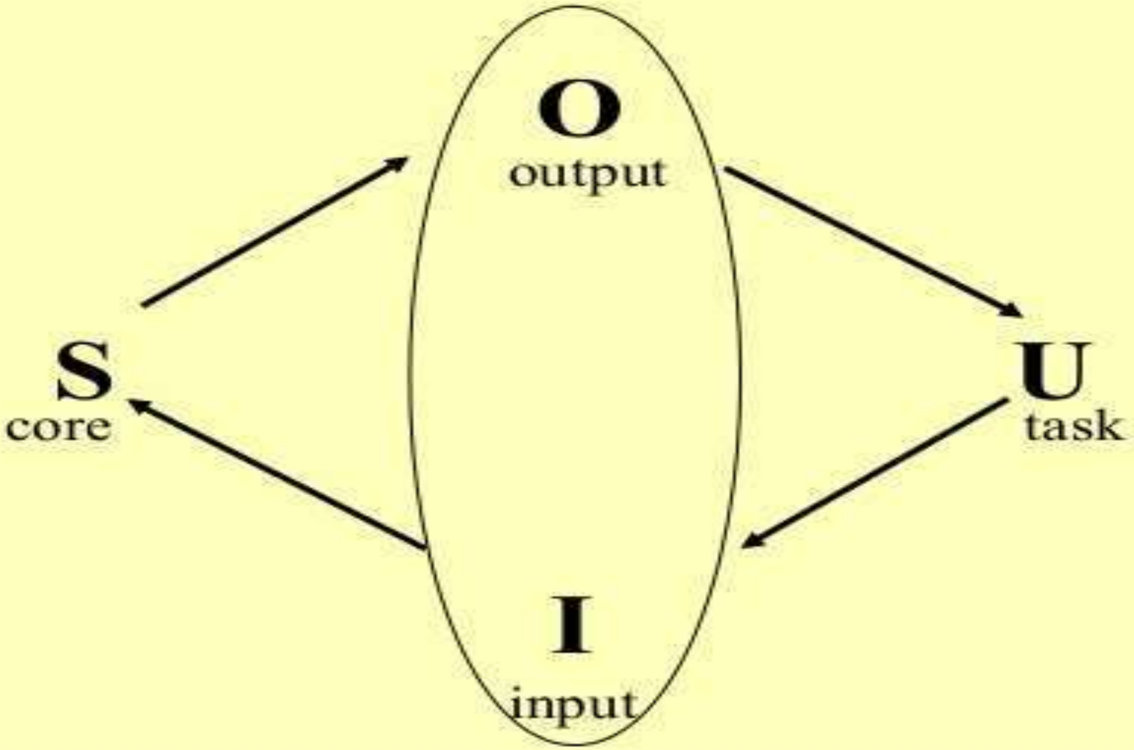
HUMAN COMPUTER INTERACTION

LECTURE 7,8

Models of Interaction:

- Interaction involves atleast two participants- the user and the system.
- Both are complex and very different from each other in the way that they communicate and view the domain and the task. The interface must therefore effectively translate between them to allow the interaction to be successful.
- The use of models of interaction can help to understand what is going on in interaction and identify the likely root of difficulties. They also provide us with a framework to compare different interaction styles and to consider interaction problems.

Interaction framework



Interaction Model

Some terms of Interaction

domain – the area of work under study

e.g. graphic design

goal – what you want to achieve

e.g. create a solid red triangle

task – how you go about doing it
– ultimately in terms of operations or actions

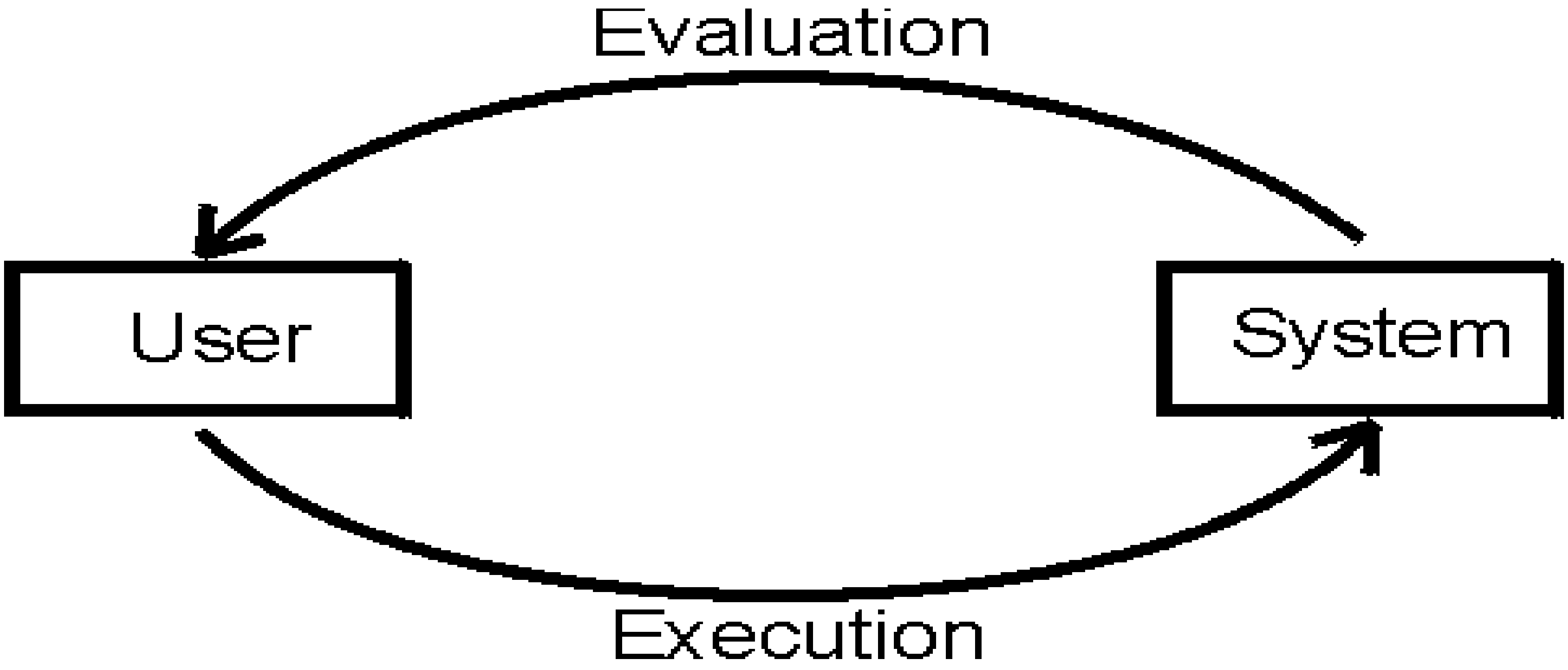
e.g. … select fill tool, click over triangle

Note …

- traditional interaction …
- use of terms differs a lot especially task/goal !!!

The execution – evaluation cycle:

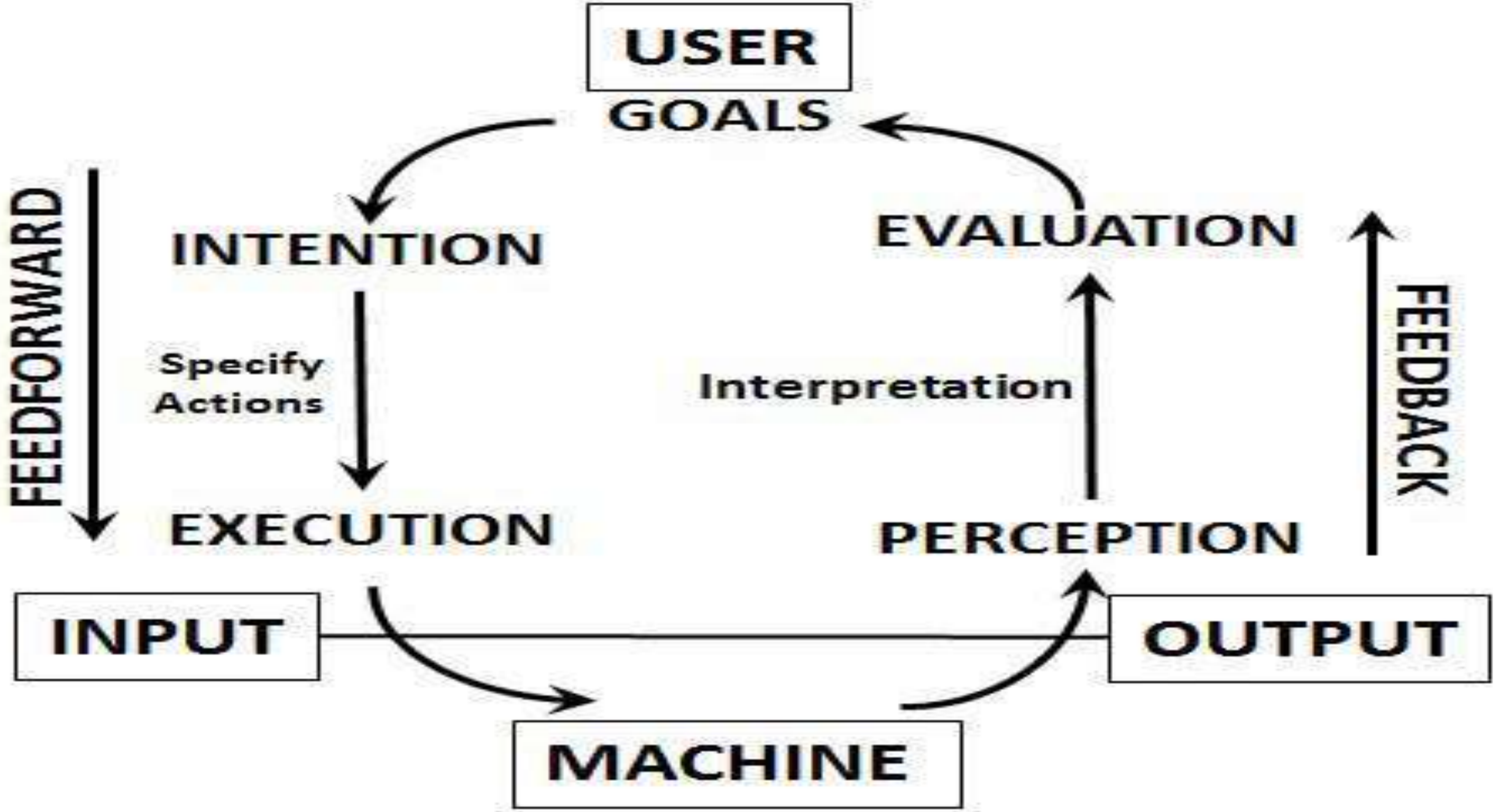
- Normans model of interaction is the most influential in HCI because of its closeness to understanding of the interaction between human user and computer.
- The user formulates a plan of action, which is then executed at the computer interface.
- When the plan, or the part of the plan, has been executed, the user observes the computer interface to evaluate the result of the executed plan to determine further actions.
- The interaction cycle can be divided into two major phases: execution and evaluation.



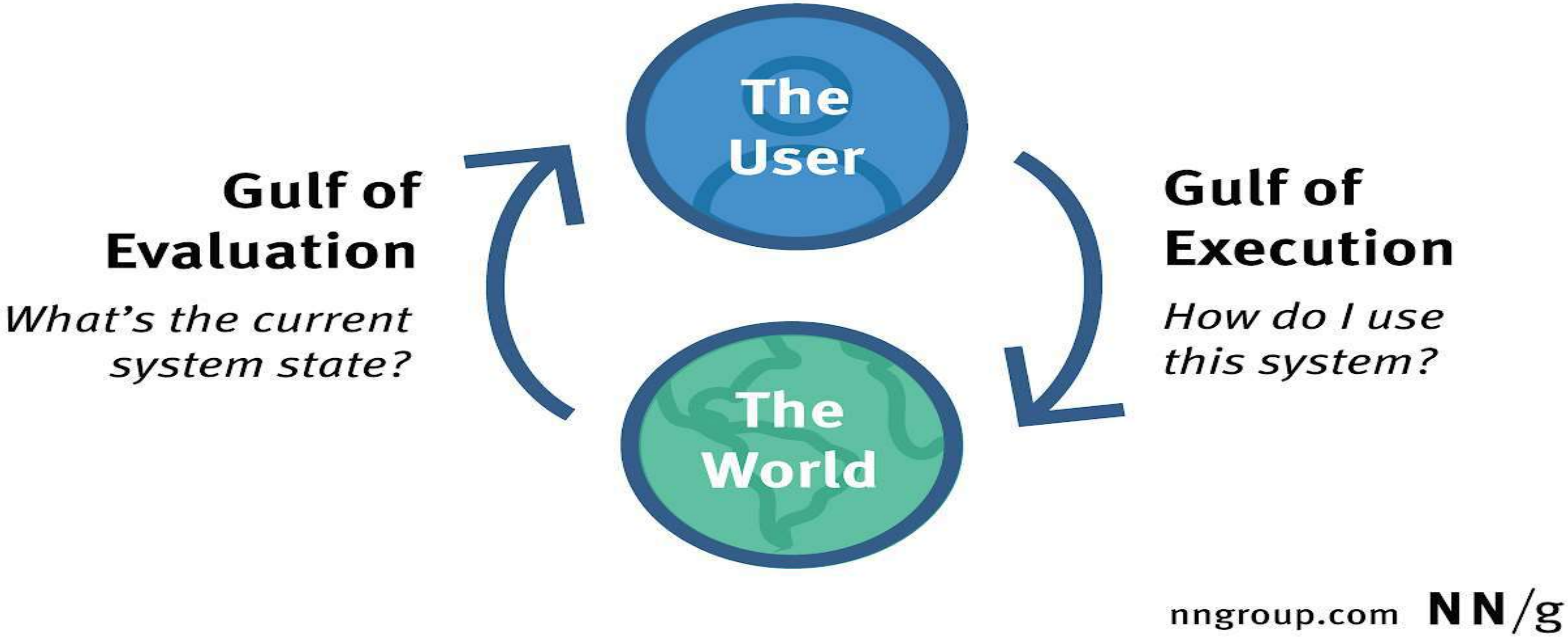
Norman's Interaction Cycle

- These can be sub-divided into seven stages.
- The stages in **Normans model of interaction** 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


USER
GOALS
FEEDFORWARD
INTENTION
Specify Actions
EXECUTION
EVALUATION
Interpretation
PERCEPTION
FEEDBACK
INPUT
OUTPUT
MACHINE

- Each stage is an activity of user
- First the user forms a goal. This is the users notion of what needs to be done and is framed in terms of the domain, in the task language.
- It needs to be translated into more specific interaction, and the actual actions that will reach the goal, before it can be executed by the user.
- The user perceives the new state of the system, after execution of the action sequence and interprets it in terms of his expectations.
- If the system states reflects the user goals than the computer has done what user wanted and the interaction has been successful.
- Normans uses this model of interaction to demonstrate why some interfaces cause problems to their users.
- This is described in terms of Gulfs of execution and the Gulfs of evaluation.


Gulf of Evaluation
What's the current system state?
The User
The World
Gulf of Execution
How do I use this system?
nngroup.com NN/g

Using Normans model

Some systems are harder to use than others

Gulf of Execution

user's formulation of actions

$\neq$ actions allowed by the system

Gulf of execution is the difference between the user formulation of actions to reach the goal and the actions allowed by system

Gulf of Evaluation

user's expectation of changed system state

$\neq$ actual presentation of this state

Gulf of explanation (or evaluation) is the distance between the the physical representation of the system state and the expectation of the user

- The Gulfs of execution is the difference between user formulation of the actions to reach the goals and the action allowed by the system.
- The Gulf of evaluation is the distance between physical presentation of the system state and the expectation of the user.
- If the user can readily evaluate the presentation in terms of his goal, the Gulf of evaluation is small.
- The more effort that is required on the part of the user to interpret the presentation, the less effective the interaction.

Ergonomics:

- Ergonomics is the study of physical characteristics of the interaction: how the controls are designed, the physical environment in which the interaction takes place, and the layout and physical quantities of the screen.
- The primary focus is on user performance an how the interface chances this.
- To evaluate these aspects of interaction, Ergonomics will touch upon human psychology and system constraints.
- The Ergonomics deals about arrangement of controls and displays, the physical environment, health issues and the use of color.
- These are intended only to give an indication of types of issues and problems addressed by Ergonomics.

Stress
Optimize
Neck
Interactions
Human
Anatomy
Biomechanics
Healthy
Posture
Backache
Performance
Business
ERGONOMICS
Position
Comfort
Industrial
Strain
Well-Being
Health
Process
Therapeutic
Pain
Scientific
Design
Factor
Functional
Proper
Office
Work
Physiology
Spinal
Employee
Shoulder
Data
Injury
Chair

Arrangement of controls and displays:

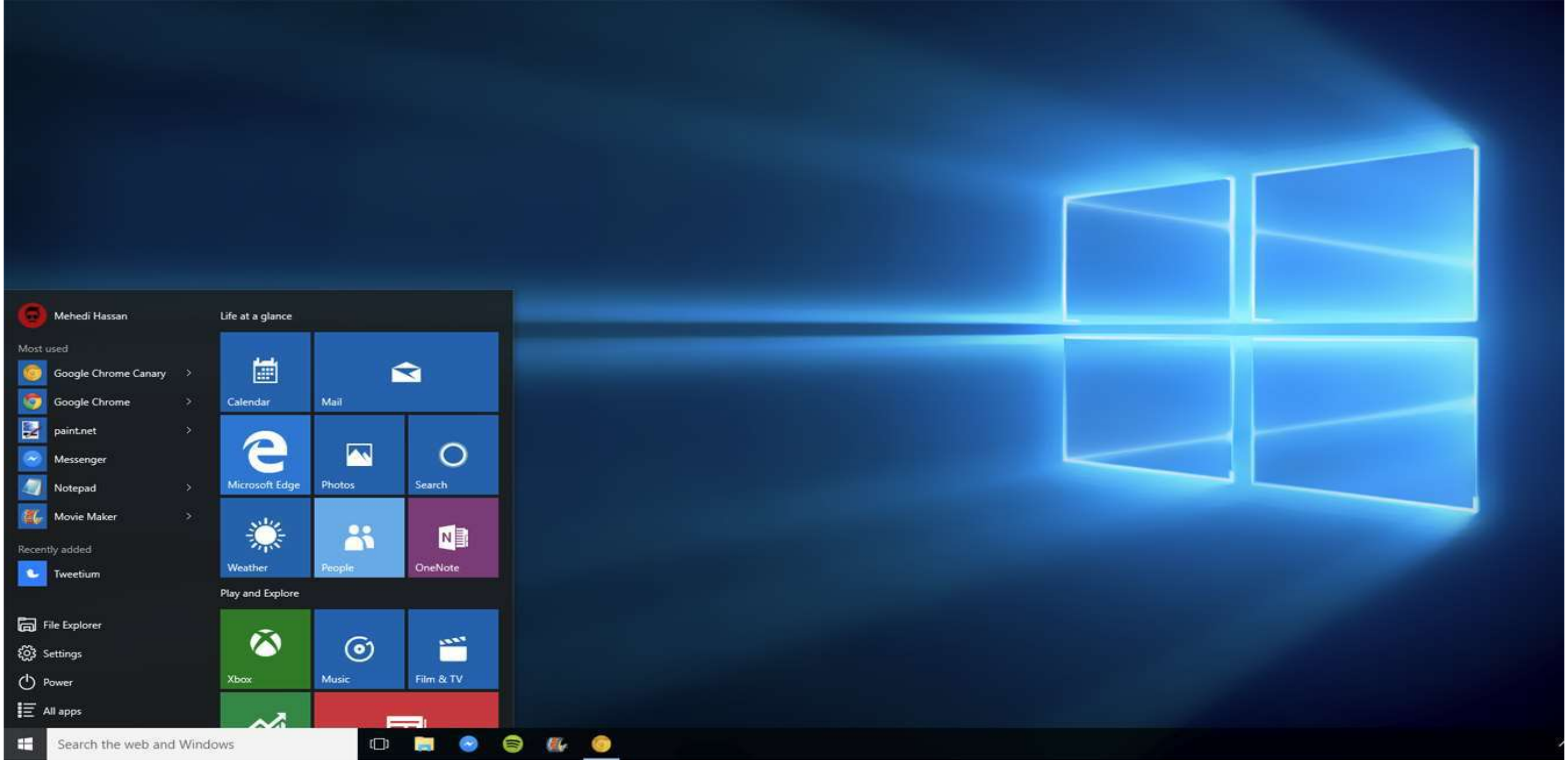
- In additional to cognitive aspects of design, physical aspects are also important.
- Sets of controls and parts of the display should be grouped logically to allow rapid access by user. Inappropriate placement of controls and displays can lead to inefficiency.
- The exact organization will depend in the domain and the application but possible organization include the following:

-Functional controls and displays are organized as that functionally related are placed together.

-sequential controls and displays are organized to reflect the order of their use in interaction.

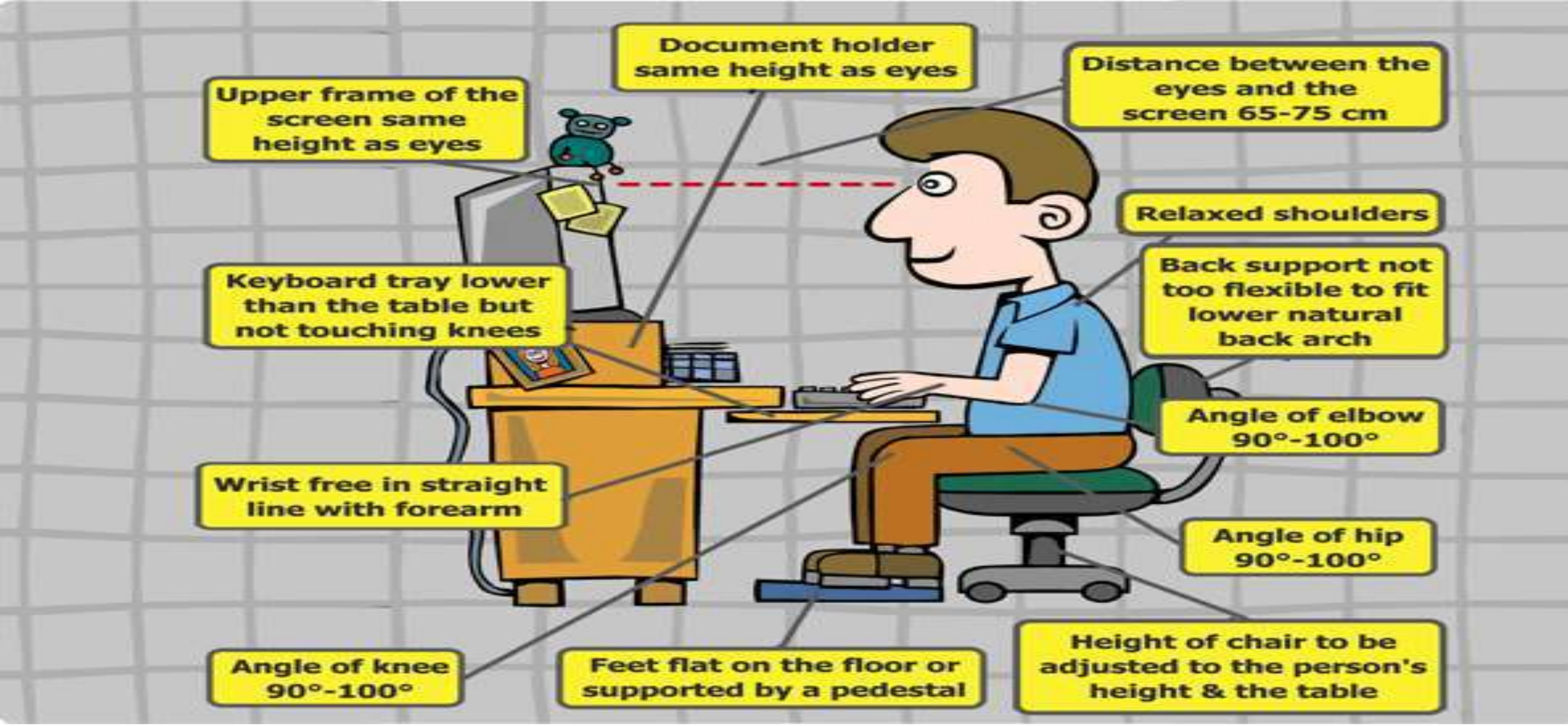
-frequency controls and displays are organized according to how frequently they are used.

- In addition to the controls and displays in relation to each other , the entire system interface must be arranged appropriately in relation to the users position.


Mehedi Hassan
Most used
Google Chrome Canary
Google Chrome
paint.net
Messenger
Notepad
Movie Maker
Recently added
Tweetium
File Explorer
Settings
Power
All apps
Life at a glance
Calendar
Mail
Microsoft Edge
Photos
Search
Weather
People
OneNote
Play and Explore
Xbox
Music
Film & TV
Search the web and Windows

The Physical Environment of Interaction:

- Ergonomics is also concerned with the design of work environment.
- The physical environment in which the system is used may influence how well it is accepted and even the health and safety of its users.
- In a system even a smallest user should be able to reach all the contexts.
- All users should be compatibly able to see critical displays and users should be seated comfort for long periods of use.


Document holder same height as eyes
Distance between the eyes and the screen 65-75 cm
Upper frame of the screen same height as eyes
Relaxed shoulders
Back support not too flexible to fit lower natural back arch
Keyboard tray lower than the table but not touching knees
Angle of elbow 90°-100°
Wrist free in straight line with forearm
Angle of hip 90°-100°
Angle of knee 90°-100°
Feet flat on the floor or supported by a pedestal
Height of chair to be adjusted to the person's height & the table

Health Issues- Possible consequences of our design on health and safety of users should be considered while designing interface.

- There are many factors that may effect the use of poorly design interface.
- These are the factors in physical environment that directly effect the quality of interaction and user performance

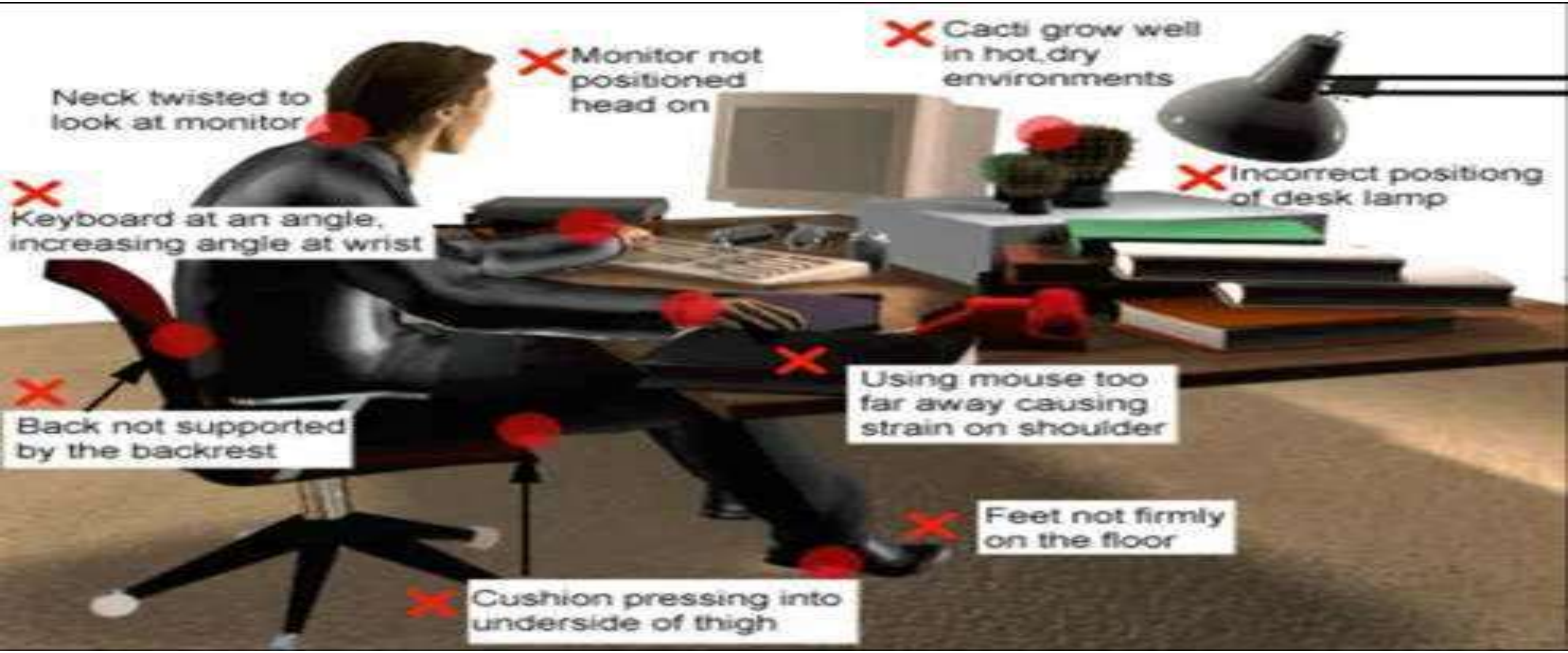
-Physical position – users should be able to reach all controls comfortably and see all displays.

-Temperature-experimental studies how the performance decreases at high and low temperatures with users being usable to concentrate effectively.

-Lighting -adequate lighting should be provided to allow users to see the computer screen without discomfort.

-Noise-noise levels should be maintained at a comfortable level in the work environment.

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


Neck twisted to look at monitor
Monitor not positioned head on
Cacti grow well in hot,dry environments
Incorrect positiong of desk lamp
Keyboard at an angle, increasing angle at wrist
Back not supported by the backrest
Using mouse too far away causing strain on shoulder
Feet not firmly on the floor
Cushion pressing into underside of thigh

The Use of Color - Ergonomics has a close relationship to human psychology in that it is also concerned with the perceptual limitations of humans .

- The use of color in displays is an ergonomics issue.
- Colors used in the display should be as distinct as possible and the distinction should not be effected by changes in contrast.
- The colors used should correspond to common conventions and user expectations.
- Designers should remember that color conventions are culturally are determined.
- Awareness of culture associations of color is particularly important is designing systems and websites for global market.

Red

The colour red is shown to increase the heart rate and blood flow. It is also said to invoke emotion and passion. Also it draws attention to items that are of the colour red. If the tasks involve physical activity this is a good colour to paint your office.

Blue

Blue is known to be an excellent colour for productivity.

It is said to be:
Stable and Calming
Help workers focus

Green

Research has linked green with calm and efficiency. There seems to be a positive association between nature and regrowth. Additionally it is said to be a good colour for those who work long hours as it doesn't cause eye fatigue.

Yellow

The colour yellow is thought to be a colour of optimism, additionally it is also said to improve creativity and is a good colour if you are a designer as it encourages innovation and creative thoughts.

COLOR MEANING AROUND THE WORLD

WHITE

White: Symbolizes mourning or death in East Asia but happiness and purity in Australia, New Zealand and the Untied States

BLUE

Blue: Is the most popular corporate color in the United States but it represent cold and evil in East Asia. However, it stands for warmth in the Netherlands and in contrast coldness in Sweden, death in Iran and purity in India. Moreover, blue denotes femininity in Belgium but masculinity in Sweden and the United States.

GREEN

Green: Represents danger or disease in Malaysia, and envy in Belgium. But, it stands for love and happiness in Japan, and sincerity, trustworthiness, and dependability in China

RED

Red: Reflects ambition and desire in India, and love in China, Korea and Japan. It can also mean lucky in China, Denmark and Argentina but unlucky in Nigeria

YELLOW

Yellow: Represents warmth in the United States, but infidelity in France. It is also associated with jealousy in Russia but pleasant, happy and good taste in China. In contrast, Brazil, purple and yellow symbolize sorrow and despair

PURPLE

Purple: In western cultures, purple represents royalty. However, in eastern cultures like China and South Korea, it represents love.

Different colors have different meanings in different cultures.

HOW TO SET UP YOUR DESK FOR PRODUCTIVITY & ERGONOMICS
Choose your **office colors** carefully (green is balancing, blue stimulates concentration)
A warmer enviroment (68 to 77°F) could improve your accuracy and productivity
Place **monitor** 20-40" from your eyes and away from glare. Top of monitor should level with or below your eyes
Noise-cancelling headphones drown out distractions
Keep only items you need daily on your desk. Consider a **left-to-right workflow**
Type with **wrists flat or angled downwards**
Natural light improves mood, focus, and sleep
Limit **personal decorations.** Try just 3
Plants can boost productivity *by as much as 15%*
Adjust your chair and desk height so your arms and thighs roughly parallel to floor, feet flat on the floor
zapier
www.zapier.com
Illustrated by Owl Illustration Agency / Jan Sromek

HUMAN COMPUTER INTERACTION

LECTURE 9

Universal Usability:

- The remarkable diversity of human abilities, backgrounds, motivations ,personalities, cultures and workstyles, challenges interface designers.
- Understanding the physical ,intellectual and personality differences between users helps in gaining broadest possible set of users.
- Ultimate goal of designer is to address the needs of all users .
- Universal usability introduces the challenges projected by physical , cognitive, perceptual , personality and cultural differences.

- Challenges faced are:

1. Variations in physical abilities and physical work places
2. Diverse cognitive and perceptual abilities
3. Personality differences
4. Cultural and international diversity
5. User with disabilities
6. Older adults and children
7. Accommodating hardware and software diversity

Variations in physical abilities an physical work places –.

- The great diversity in these static measures remind that there can be an average user and that compromises must be made or multiple versions of a system must be constructed.
- Since so much of work is related to perception, designers need to be aware of the ranges of human perceptual abilities especially with regard to vision.
- Work place design is also important in ensuring high job satisfaction, good performance and low error rates.
- Incorrect table heights, uncomfortable chairs or inadequate space to place documents can substantially delay work.

Diverse cognitive and perceptual abilities - A vital foundation for interactive system designers is an understanding of the cognitive and perceptual abilities of the user.

- Ergonomics abstracts this classification of human cognitive process.
- These vital issues of cognition and perception have a strong influence on design of interactive systems.
- In any application, background experience and knowledge in the task and interface domains play key role in learning and performance.

- **Personality differences** - There are four types of Carl Fungs personality types.
- Extroversion versus Introversion- extroverts focus on external stimuli and like variety and action, where as introverts prefer familiar patterns.
- Sensing versus intuition – sensing types are attracted to establish routines, and enjoy applying known skills, whereas intuitive types like solving new problems and discovering new relations.
- Perceptive versus Judging – perceptive types like to learn about new situations but may have trouble making decisions, whereas judging types like to make a careful plan and carry through the plan.
- Feeling versus thinking – feeling types are aware of other people feelings and relate well to most people whereas thinking types are unemotional.

- **Culture and international diversity** – Another perspective on individual differences has to do with culture, ethnic or linguistic background.
- Users from traditional culture may prefer interfaces with stable display from which they select a single item, while user from novelty based cultures may prefer animated screens and multiple clicks.
- More and more is being learned about computer users from different culture but designers are still struggling to establish guidelines for designing for multiple languages and culture.
- The growth of world wide computer market means that designers must prepare for internationalization.
- Software architects that facilitates customization of local versions of user interface offer a competitive advantage.
- To develop effective designs, companies run usability studies with users from different countries, cultures and language communities.

User with disabilities:

- The flexibility of desktop, web, and mobile devices makes it possible for designers to provide special services to users who have disabilities.
- The access board spells out the guidelines for vision-impaired, hearing-impaired, and mobility-impaired users; these include keyboard or mouse alternatives, color coding, font-size settings, contrast settings, textual alternatives to images, and web features such as frames, links, and plug-ins.
- Screen magnification to enlarge portions of a display and text-to-speech conversion can be done with hardware and software supplied by many vendors.
- Text-to-speech conversion can help blind users to receive e-mail or to read text files, and speech recognition devices permit voice-controlled operation of some user interfaces.
- Speech generation and auditory interfaces are also appreciated by sighted users under difficult conditions, such as when driving an automobile, riding a bicycle, or working in bright sunshine.

- Designers can benefit by planning early to accommodate users who have disabilities, since at this point substantial improvements can be made at low or no cost.
- The potential for benefit to people with disabilities is one of the gifts of computing.
- In addition, many users are temporarily disabled : they may forget their glasses, be unable to read while driving , or struggle to hear in a noisy environment.
- Improving designs for users with disabilities is an International concern.

Older Adult Users:

- Seniority offers many pleasures and all the benefits of experience, but aging can also have negative physical , cognitive and social consequences.
- Understanding the human factors of aging can help designers to create user interfaces that facilitates access by older adult users.
- The benefits to senior citizens include improved chances for productive employment and opportunities to use writing , email, and other computer tools , plus the satisfactions of education, entertainment ,social interaction , and challenge.
- The benefits to society include increased access to seniors , which is valuable for their experience and the emotional support they can provide to others.
- The further good news is that interface designers can do much to accommodate older adult users and , thus, to give older adults access to the beneficial aspects of computing and network communication.

- Desktop , web and mobile devices can be improved for all users by providing users with control over font sizes , display contrast ,and audio levels.
- Interfaces can also be design with easier-to-use pointing devices , clearer navigation paths ,consistent layouts ,and simpler command languages to improve access for older adults and every user.
- The older adults ,who explored email ,photo sharing ,and educational games ,felt quite satisfied with themselves and were eager to learn more.
- In summary ,making computing more attractive and accessible to older adults enables them to take advantage of technology and enables others to benefit from their participation.

Children:

- Another lively community of users is children ,whose users emphasize entertainment and education.
- Even pre-readers can use computer-controlled toys ,music generators and art tools.
- The noble aspirations of designers of children’s software include educational acceleration, facilitating socialization with peers, and fostering the self-confidence that comes from skill mastery.
- For teenagers, the opportunity for empowerment are substantial.
- They often take the lead in employing new modes of communication, such as instant messaging and text messaging on cellphones, and in creating cultural or fashion trends that surprise even the designers.
- Appropriate design principles for children’s software, recognize young people’s intense desire for the kind of interactive engagement that gives them control with appropriate feedback and supports their social engagement with peers.

- Designers also have to find the balance between children's desire for challenge and parents requirements for safety.
- Children can deal with some frustrations and with threatening stories, but they also want to know that they can clear the screen, start over, and try again without severe penalties.
- Designing for younger children requires attention to their limitations.
- Designers of children's software also have a responsibility to attend to dangers, especially in web-based environments, where parental control over access to violent, racist materials is unfortunately necessary.
- The capacity for playful creativity in art, music, and writing and the value of educational activities in science and math remain potent reasons to pursue children's software.
- These and other opportunities have motivated efforts to bring low-cost computers to children around the world-hopefully coupled with rich content, parental guidance materials ,and effective teacher training.

Accommodating hardware and software diversity:

- In addition to accommodating different classes of users and skill levels, designers need to support a wide range of hardware and software platforms.
- The rapid progress of technology remains that newer systems may have a hundred or a thousand times greater storage capacity, faster processors, and higher band width networks.
- The challenge of accommodating diverse hardware is couple with the need to ensure access through many generations of software.
- This requirement can slow innovation, but the designers who plan ahead carefully to support flexible interfaces and self defining files will be rewarded with larger market shares.

- For at least the next decade, three of the main technologies will be:

1.Producing satisfying and effective internet interaction on high speed and slower connections - some technological break-throughs have already made in comparison algorithms to reduce file sizes for images, music, animations, and even video, more are needed. New technologies are needed to enable pre-fetching or scheduled down-loads.

2.Enabling access to web services from large displays and smaller mobile devices - Rewriting each web page for different display sizes may produce the best quality, but this approach is probably too costly and time-consuming for most web providers.

3.Supporting easy maintenance of or automatic conversion to multiple languages - Commercial operators recognize that they can spend their markets if they can provide access in multiple languages and across multiple countries. This means isolating text to allow easy substitution, choosing appropriate metaphors and colours, and addressing the needs of diverse cultures.

- The good news is that rethinking designs to accommodate these diverse needs can improve the quality for all users.
- As for cost, with appropriate software tools, e-commerce providers are finding that a small additional effort can expand markets by 20% or more.

HCI – MODULE 2

LECTURE 1

Good and Bad design:

- Taking into account what people are good and bad at.
- Considering what might help people with the way they currently do things.
- Thinking through what might provides quality user experience.
- Listening to what people want and gathering them involved in the design.
- Using trial and tested user-based techniques during the design process.

Interaction design:

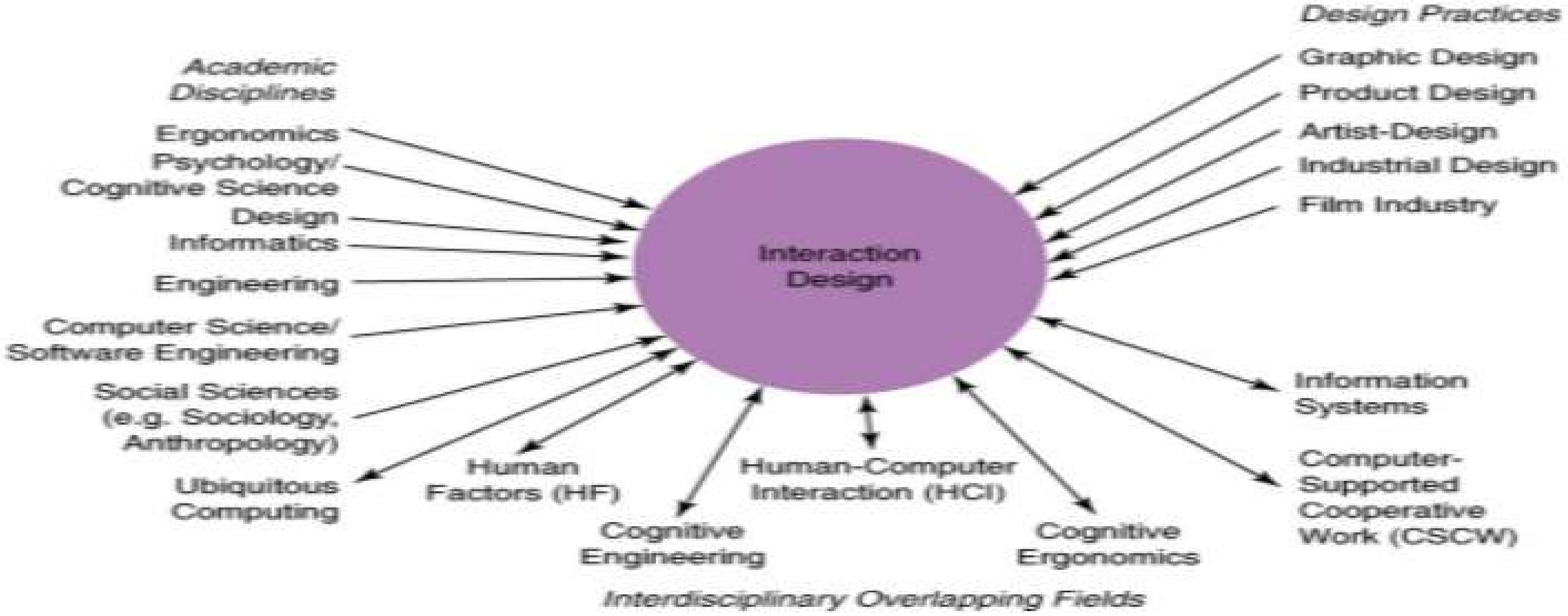
- By interaction design, we mean designing interactive products to support the way people communicate and interact in their everyday and working lives.
- It is about creating user experiences that enhance and augment the way people work, communicate, and interact.
- A number of terms have been used to emphasize different aspects of what is being designed, including user interface design, software design, user-centered design, product design, web design, experience design, and interactive system design.
- Interaction design is increasingly being accepted as the umbrella term, covering all these aspects.

- The focus of interaction design is very much concerned with practice, i.e. how to design user experiences.
- It is not wedded to a particular way of doing design, but is more eclectic, promoting the use of a range of methods, techniques, and frameworks.
- Which is given prominence or is currently in vogue will very much depend on the time and context.

The components of interaction design:

- We view interaction design as fundamental to all disciplines, fields, and approaches that are concerned with research and designing computer-based systems for people.
- The difference between interaction design and the other approaches referred vary in terms of the scope and problems they address.
- For example, information systems is concerned with the application of computing technology in domains like bussiness, health, education, where as computer-supported cooperative work(CSCW) is concerned with the need also to support multiple people working together using computer systems.

The components of interaction design



(Rogers, Sharp, & Preece, 2011)

The main difference between interactive design(ID) and human computer interaction(HCI)

- ID has cast its net much wider being concerned with the theory, research, and practice of designing user experiences for all manner of technologies, systems, and products, whereas HCI has traditionally had a narrower focus, being “concerned with the design, evaluation and implementation of interactive computing systems for human use and with the study of major phenomena surrounding them”.

Who is involved in interactive systems:

- Many people are involved, ranging from social scientists to film-makers.
- This is not surprising given that technology has become such a pervasive part of our lives.
- Designers need to know many different things about user, technologies, and interactions between them in order to create effective user experiences.
- At the very least, they need to understand how people act and react to events and how they communicate and interact with each other.
- To be able to create engaging user experiences they also need to understand how emotions work, which is meant by aesthetics, desirability, and the role of narrative in human experience.
- Developers also need to understand the business side, the technical side, the manufacturing side, and the marketing side.

- Clearly, it is difficult for one person to be well versed in all or these diverse areas and also know how to apply the different forms of knowledge to the process of interaction design.
- Interaction design is mostly carried out by multidisciplinary teams, where the skill sets of engineers, designers, programmers, psychologists, sociologists, artists, toy makers, and others are drawn upon.
- It is rarely the case, however, that a design team would have all of these professionals working together.
- Who to include in a team will depend on a number of factors, including a company's design philosophy, its size, purpose, and product line.
- One of the benefits of bringing together people with different backgrounds and training is the potential of many more ideas being generated, new methods developed, and more creative and original designs being produced.
- However, the downside is the costs involved.

- The more people they are with different backgrounds in a design team, the more difficult it can be communicate and make progress forward with the designs being generated.
- People with different backgrounds have different perspectives and ways of seeing and talking about the world.

Interaction design consultants:

- Interaction design is now widespread in product development.
- In particular, website consultants, global corporations, and the computing industries have all realized its pivotal role in successful interactive products.
- The presence or absence of good interaction design can make or break a company.
- To get noticed in the highly competitive field of web products required standing out.

- Being able to say that your product is easy, effective, and engaging to use is seen as central to this.
- Marketing departments are also realizing how branding, the number of hits, customer return rate, and customer satisfaction and greatly effected by the usability of a website.
- There are many interaction design consultancies now.
- IDEO is a large global enterprise, with branches across the world and 30 years of experience in the area.
- They design products, services, and environments for other companies, pioneering new user experiences.
- They have developed thousands of products for numerous clients, each time following their particular brand of interaction design.

HCI MODULE2

LECTURE 2

Guidelines:

- From the earliest days of computing, interface designers have written down guidelines to record their insights and to try to guide the efforts of future designers.
- The early apple and Microsoft guidelines, which were influential for desktop-interface designers, have been followed by dozens of guidelines documents for the web and ,mobile devices.
- A guidelines document helps by developing a shared language and then promoting consistency among multiple designers in terminology usage, appearance and action sequence.
- It records best practices derived from partial experiences or empirical studies, which appropriate example and counter examples.
- The creation of a guidelines document engages the design community in lively discussions about input and output formats, action sequences, terminology, and hardware devices.

- The following four sections provide examples of guidelines, discuss how they can be integrated into the design process.
- The example address some key topics, but they merely sample the thousands of guidelines that have been written.

1. Navigating the interface:

- Since navigation can be difficult for many users, providing clear rules is helpful.
- The sample guidelines presented here come from the national cancer institute’s effort to assist government agencies with the design of informative web pages but these guidelines have widespread application.
- Guidelines, which offer cogent examples and impressive research support cover the design process, general principles, and specific rules.
- This sample of the guidelines gives useful advice.

- Standard task sequence – allow users to perform task in the same sequence and manner across similar conditions.
- Ensure that embedded links are descriptive – when using embedded links, the link text should accurately describe the link's destination.
- Use unique and descriptive headings – use headings that are distinct from one another and conceptually related to the content they describe.
- Use radio buttons for mutually exclusive choice – provide a radio button control when users need to choose one response from a list of mutually exclusive options.
- Develop pages that will print properly – if users are likely to print one or more pages, develop pages with widths that print properly.
- Use thumbnail images to preview larger images – when viewing full-size images is not critical, first provide a thumbnail of the image.

Guidelines to promote accessibility for users with disabilities were included

- Text alternatives – provide text alternatives for any non-text content so that it can be changed into other forms people need, such as large print, braille, speech, symbols, or simpler language.
- Time-based media – provide alternatives for time-based media synchronize equivalent alternatives with the presentation.
- Distinguishable – make it easier for users to see and hear content, including separating foreground from background. Colour is not used as the only visual means of conveying information, indicating an action, promoting a response, or distinguishing a visual element.
- Predictable – make web pages appear and operate in predictable ways.
- The goal of these guidelines is to have web-page designers use features that permit users with disabilities to employ screen readers or other special technologies to give them access to web-page content.

2. Organizing the display:

- Display design is a large topic with many special cases, five high-level goals as part of their guidelines for data display.

1. Consistency of data display – during the design process, the terminology, abbreviations, formats, colours, capitalization, and so on should all be standardized and controlled by use of a dictionary of these items.
2. Efficient information assimilations by the user – the format should be familiar to the operator and should be related to the tasks required to be performed with the data. This objective is served by rules for neat columns of data, left justification for alphanumeric data, right justification of integers, lining up of decimal points, proper spacing, use of comprehensible labels, and appropriate measurement units and number of decimal digits.

3. Minimal memory load on the user – users should not be required to remember information from one screen for use on another screen. Task should be arranged such that completion occurs with few actions, minimizing the chance of forgetting to perform a step. Labels and common format should be provided for novice or intermittent users.

4. Compatibility of data display with data entry – the format of displayed information should be linked clearly to the format of data entry. Where possible and appropriate, the output fields should also act as editable input fields.

5. Flexibility for user control of data display – users should be able to get the information from the display in the form most convenient for the task on which they are working.

3. Getting the user's attention:

- Since substantial information may be presented to users for the normal performance of their work, exceptional conditions or time-dependent information must be presented so as to attract attention.
- These guidelines detail several techniques for getting the user's attention:

- **Intensity** – use two levels only, with limited use of high intensity to draw attention.
- **Marking** – underline the item, enclosed it in a box, point to it with an arrow or use an indicator such as an asterisk, bullet, dash, plus sign, X.
- **Size** – use up to four sizes with larger sizes attracting more attention.
- **Choice of fonts** – use up to three fonts.
- **Inverse video** – use inverse colouring.

- **Blinking** – use blinking displays or blinking colour changes with great care and in limited areas. **Colour** – use up to four standard colours, with additional colours reserved for occasional use. **Audio** – use soft tones for regular positive feedback and harsh sounds for rare emergency conditions.

A few words of caution are necessary.

- There is a danger of creating cluttered displays by overusing these techniques. Some web designers use blinking advertisements or animation icons to attract attention, but users almost universally disapprove.
- Animation is appreciated primarily when it provides meaningful information, such as for a progress indicator. Novices need simple, logically organized, well label displays that guide their actions.
- Expert users prefer limited labels on fields so data values are easier to extract; subtle highlighting of changed values or positional presentation is sufficient.
- Display formats must be tested with users for comprehensibility.

4. Facilitating Data Entry :

- Data-entry task can occupy a substantial fraction of users time and can be the source of frustration and potential dangerous errors.
- Five high-level objectives as part of their guidelines for data entry.

1. **Consistency of data-entry transactions** : Similar sequences of action should be used under all conditions; similar delimiters, abbreviations, and so on should be used.

2. **Minimal Input actions by user** : fewer input actions mean a greater operator productivity and usually fewer chances for errors. Making a choice by a single key stroke, mouse selection, or finger press, rather than by typing in a lengthy string of characters, is potentially advantageous.

- Selecting from a list of choices eliminates the need for memorization, structures the decision-making task, and eliminates the possibility of typographic errors.
- However, if users must move their hands from a keyboard to a separate input device, the advantage is negated, because home-row position is lost.

- Expert users often prefer to type six to eight characters instead of moving to a mouse, joy-stick, or other selection device.
- A second aspect of this guideline is that redundant data entry should be avoided.
- It is annoying for users to enter the same information in two locations, since the double entry is perceived as a waste of effort and an opportunity for error.
- When the same information is required for two places, the system should copy the information for the user, who should still have the option of overloading it by retyping.

3. Minimal memory loads on users : when doing data entry, users should not be required to remember lengthy lists of codes and complex syntactic command strings.

4. **Compatibility of data entry with data display** : The format of data entry information should be linked closely to the format of displayed information.

5. **Flexibility for user control of data entry** : Experienced data-entry operators may prefer to enter information in a sequence that they can control.

“Guidelines documents are a wonderful starting point to give designers that benefit of experience, but they will always need management processes to facilitate education, enforcement, exemption, and enhancement”.

HCI MODULE 2

- LECTURE 3

Principles

- More fundamental, widely applicable, and enduring than guidelines
- Need more clarification
- Fundamental principles
  - Determine user's skill levels
  - Identify the tasks
- Five primary interaction styles
- Eight golden rules of interface design
- Prevent errors
- Automation and human control

Ben Shneiderman and Catherine Plaisant, *"Designing the User Interface".* Addison Wesley.

Determine user's skill levels

- "Know thy user"
- Age, gender, physical and cognitive abilities, education, cultural or ethnic background, training, motivation, goals and personality
- Design goals based on skill level
  - Novice or first-time users
  - Knowledgeable intermittent users
  - Expert frequent users
- Multi-layer designs

Identify the tasks

- Task Analysis usually involve long hours observing and interviewing users
- Decomposition of high level tasks
- Relative task frequencies

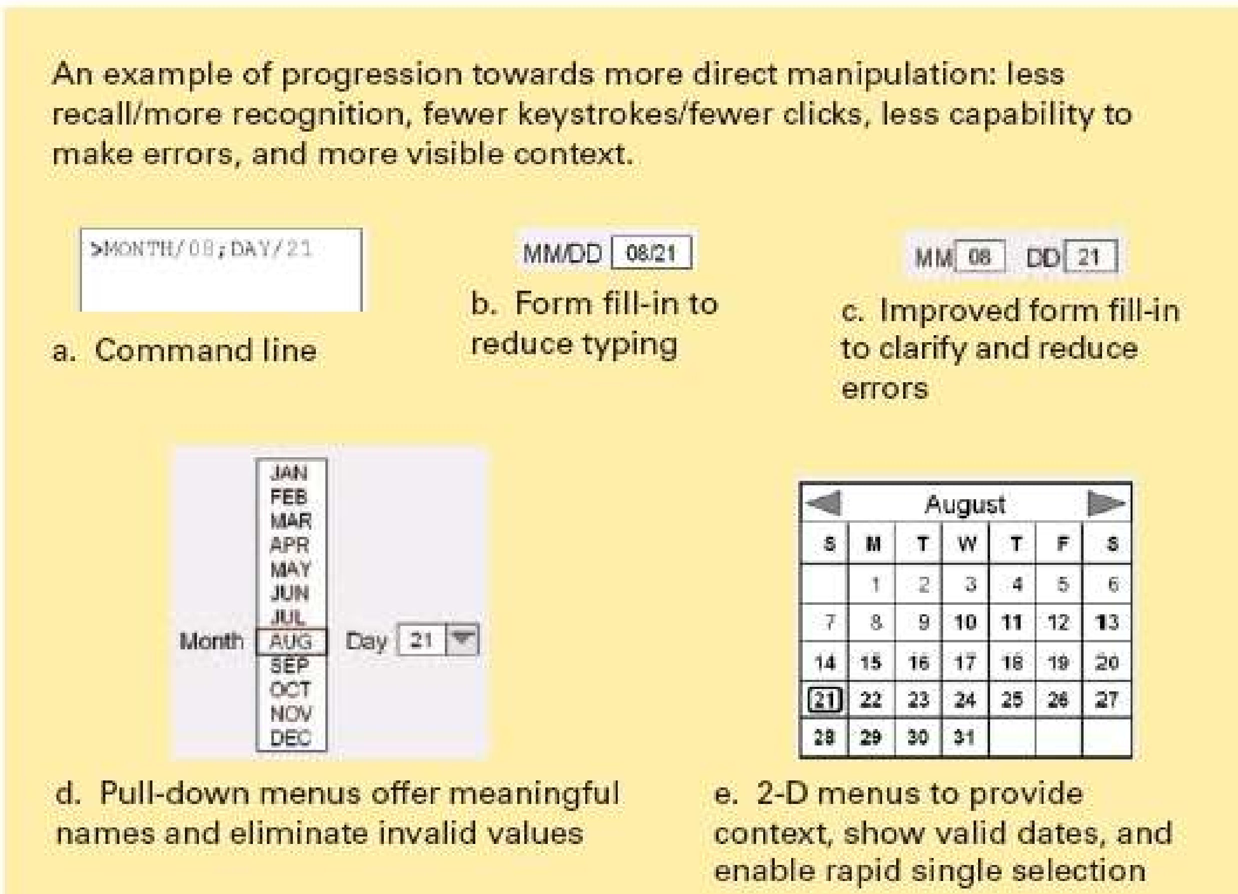
	TASK				
Job Title	Query by Patient	Update Data	Query Across Patients	Add Relations	Evaluate System
Nurse	0.14	0.11			
Physician	0.06	0.04			
Supervisor	0.01	0.01	0.04		
Appointment personnel	0.26				
Medical-record maintainer	0.07	0.04	0.04	0.01	
Clinical researcher			0.08		
Database programmer		0.02	0.02	0.05	

Choose an interaction style

- Direct Manipulation
- Menu selection
- Form fillin
- Command language
- Natural language

Advantages	Disadvantages
Direct manipulation	
Visually presents task concepts	May be hard to program
Allows easy learning	May require graphics display and pointing devices
Allows easy retention	
Allows errors to be avoided	
Encourages exploration	
Affords high subjective satisfaction	
Menu selection	
Shortens learning	Presents danger of many menus
Reduces keystrokes	May slow frequent users
Structures decision making	Consumes screen space
Permits use of dialog-management tools	Requires rapid display rate
Allows easy support of error handling	
Form fill-in	
Simplifies data entry	Consumes screen space
Requires modest training	
Gives convenient assistance	
Permits use of form-management tools	
Command language	
Flexible	Poor error handling
Appeals to "power" users	Requires substantial training and memorization
Supports user initiative	
Allows convenient creation of user-defined macros	
Natural language	
Relieves burden of learning syntax	Requires clarification dialog
	May not show context
	May require more keystrokes
	Unpredictable

Spectrum of Directness



The 8 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

Prevent errors

- Make error messages specific, positive in tone, and constructive
- Mistakes and slips (Norman, 1983)
- Correct actions
  - Gray out inappropriate actions
  - Selection rather than freestyle typing
  - Automatic completion
- Complete sequences
  - Single abstract commands
  - Macros and subroutines

Automation and human control

Humans Generally Better	Machines Generally Better
Sense low-level stimuli	Sense stimuli outside human's range
Detect stimuli in noisy background	Count or measure physical quantities
Recognize constant patterns in varying situations	Store quantities of coded information accurately
Sense unusual and unexpected events	Monitor prespecified events, especially infrequent ones
Remember principles and strategies	Make rapid and consistent responses to input signals
Retrieve pertinent details without *a priori* connection	Recall quantities of detailed information accurately
Draw on experience and adapt decisions to situation	Process quantitative data in prespecified ways
Select alternatives if original approach fails	Reason deductively: infer from a general principle
Reason inductively: generalize from observations	Perform repetitive preprogrammed actions reliably
Act in unanticipated emergencies and novel situations	Exert great, highly controlled physical force
Apply principles to solve varied problems	Perform several activities simultaneously
Make subjective evaluations	Maintain operations under heavy information load
Develop new solutions	Maintain performance over extended periods of time
Concentrate on important tasks when overload occurs	
Adapt physical response to changes in situation	

Automation and human control (cont.)

- Successful integration:
  - Users can avoid:
    - Routine, tedious, and error prone tasks
  - Users can concentrate on:
    - Making critical decisions, coping with unexpected situations, and planning future actions

Automation and human control (cont.)

- Supervisory control needed to deal with real world open systems
  - E.g. air-traffic controllers with low frequency, but high consequences of failure
  - FAA: design should place the user in control and automate only to improve system performance, without reducing human involvement

Automation and human control (cont.)

- Goals for autonomous agents
  - knows user's likes and dislikes
  - makes proper inferences
  - responds to novel situations
  - performs competently with little guidance
- Tool like interfaces versus autonomous agents
- Aviators representing human users, not computers, more successful

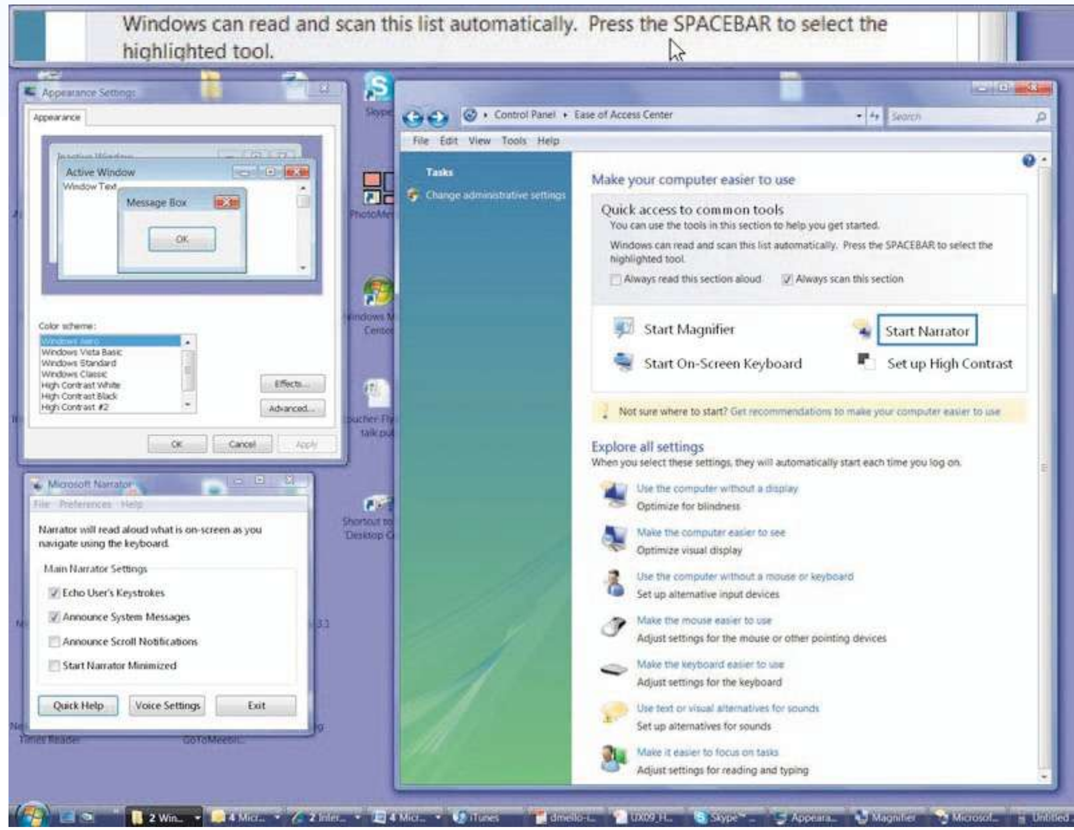
Automation and human control (cont.)

- User modeling for adaptive interfaces
  - keeps track of user performance
  - adapts behavior to suit user's needs
  - allows for automatically adapting system
    - response time, length of messages, density of feedback, content of menus, order of menu items, type of feedback, content of help screens
  - can be problematic
    - system may make surprising changes
    - user must pause to see what has happened
    - user may not be able to
      - predict next change
      - interpret what has happened
      - restore system to previous state

Automation and human control (cont.)

- **Alternative to agents:**
  - user control, responsibility, accomplishment
  - expand use of control panels
    - style sheets for word processors
    - specification boxes of query facilities
    - information-visualization tools

Automation and human control (concluded)



Features to aid in universal access

Above: Mac OS X system preference settings

Right: Windows Vista Control Panel

HCI – MODULE 2

LECTURE 4

Theories

- Beyond the specifics of guidelines
- Principles are used to develop theories
- Descriptions/explanatory or predictive
- Motor task, perceptual, or cognitive

Explanatory and predictive theories

- **Explanatory theories:**
  - Observing behavior
  - Describing activity
  - Conceiving of designs
  - Comparing high-level concepts of two designs
  - Training
- **Predictive theories:**
  - Enable designers to compare proposed designs for execution time or error rates

Perceptual, Cognitive, & Motor tasks

- **Perceptual or Cognitive subtasks theories**
  - Predicting reading times for free text, lists, or formatted displays
- **Motor-task performance times theories:**
  - Predicting keystroking or pointing times

Taxonomy (explanatory theory)

– Order on a complex set of phenomena
– Facilitate useful comparisons
– Organize a topic for newcomers
– Guide designers
– Indicate opportunities for novel products.

Conceptual, semantic, syntactic, and lexical model

- Foley and van Dam four-level approach
  - *Conceptual level:*
    - User's mental model of the interactive system
  - *Semantic level:*
    - Describes the meanings conveyed by the user's command input and by the computer's output display
  - *Syntactic level:*
    - Defines how the units (words) that convey semantics are assembled into a complete sentence that instructs the computer to perform a certain task
  - *Lexical level:*
    - Deals with device dependencies and with the precise mechanisms by which a user specifies the syntax
- Approach is convenient for designers
  - Top-down nature is easy to explain
  - Matches the software architecture
  - Allows for useful modularity during design

Stages of action models

- **Norman's seven stages of action**
  1. **Forming the goal**
  2. **Forming the intention**
  3. **Specifying the action**
  4. **Executing the action**
  5. **Perceiving the system state**
  6. **Interpreting the system state**
  7. **Evaluating the outcome**
- **Norman's contributions**
  – **Context of cycles of action and evaluation.**
  – ***Gulf of execution:* Mismatch between the user's intentions and the allowable actions**
  – ***Gulf of evaluation:* Mismatch between the system's representation and the users' expectations**

Stages of action models (cont.)

- Four principles of good design
  - State and the action alternatives should be visible
  - Should be a good conceptual model with a consistent system image
  - Interface should include good mappings that reveal the relationships between stages
  - User should receive continuous feedback
- Four critical points where user failures can occur
  - Users can form an inadequate goal
  - Might not find the correct interface object because of an incomprehensible label or icon
  - May not know how to specify or execute a desired action
  - May receive inappropriate or misleading feedback

Consistency through grammars

Consistent user interface goal

- Definition is elusive - multiple levels sometimes in conflict
- Sometimes advantageous to be inconsistent.

Consistent	**Inconsistent A**	**Inconsistent B**
delete/insert character	delete/insert character	delete/insert character
delete/insert word	remove/bring word	remove/insert word
delete/insert line	destroy/create line	delete/insert line
delete/insert paragraph	kill/birth paragraph	delete/insert paragraph

Consistency through grammars (cont.)

Inconsistent action verbs

- Take longer to learn
- Cause more errors
- Slow down users
- Harder for users to remember

The disappearance of syntax

- Users must maintain a profusion of device-dependent details in their human memory.
  - Which action erases a character
  - Which action inserts a new line after the third line of a text file
  - Which abbreviations are permissible
  - Which of the numbered function keys produces the previous screen.

The disappearance of syntax (cont.)

- Learning, use, and retention of this knowledge is hampered by two problems
  - Details vary across systems in an unpredictable manner
  - Greatly reduces the effectiveness of paired-associate learning
- Syntactic knowledge conveyed by example and repeated usage
- Syntactic knowledge is system dependent

The disappearance of syntax (concluded)

- Minimizing these burdens is the goal of most interface designers
  - Modern direct-manipulation systems
  - Familiar objects and actions representing their task objects and actions.
  - Modern user interface building tools
  - Standard widgets

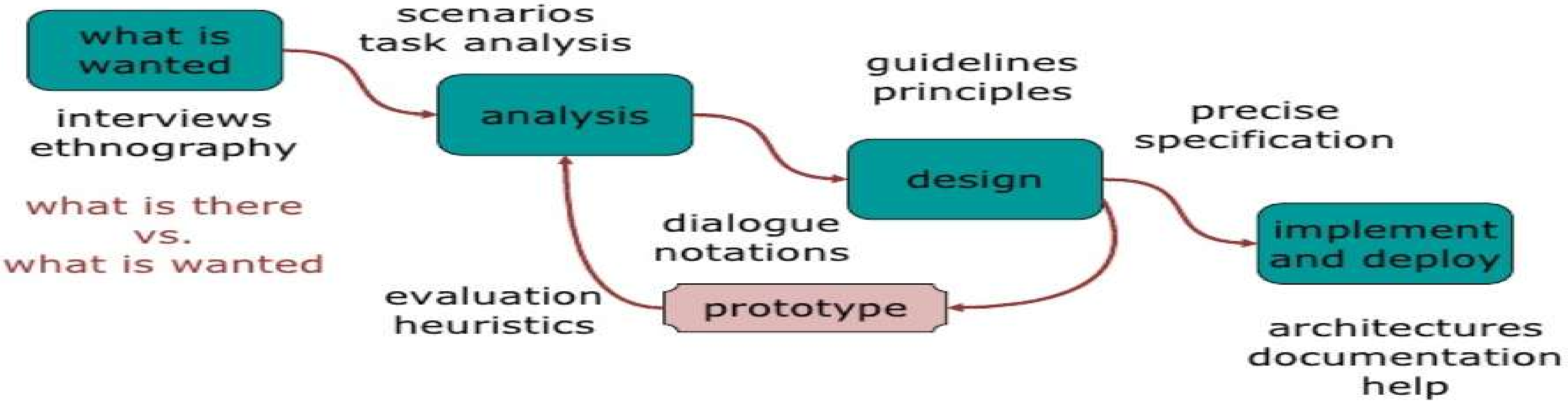
Contextual Theories

- User actions are situated by time and place
  - You may not have time to deal with shortcuts or device dependent syntax, such as on mobile devices, when hurried
  - Physical space is important in ubiquitous, pervasive and embedded devices, e.g. a museum guide stating information about a nearby painting
- A taxonomy for mobile device application development could include:
  - Monitor and provide alerts, e.g. patient monitoring systems
  - Gather information
  - Participate in group collaboration
  - Locate and identify nearby object or site
  - Capture information about the object and share that information

HCI – MODULE 2

LECTURE 5

The process of design



The process of design:

- **Requirements** – what is wanted – the first stage is establishing what exactly is needed.
- There are number of techniques used for this HCI – Interviewing people, looking at the documents and objects that they work with, observing them directly.
- Ethnography is a form of observation which helps in this process which became very influential.

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.

- There are various task modules, which are a means to capture how people carryout the various tasks that are part of their work and life.
- Analysis is done on scenario, rich stories of interaction which can be used in conjunction with a method like task analysis or on own to record and make various actual interaction.
- These techniques can be used both to represent the situation as it is and also the desired situation.

Design – there are numeration rules, guidelines and design principles that can be used to help with this.

- We need to record our design choices in some way and there are various notations and methods to do this, including those used to record the existing situation.
- It is at this stage where input from theoretical work is most helpful, including cognitive models, organizational issues and understanding communication.

Interaction and prototyping – humans are complex and we cannot expect to get designs right first time.

- We therefore need to evaluate a design to see how well it is working and where there can be improvements.
- Some forms of evaluation can be done using the design on paper, but it is hard to get real feedback without trying it out.
- Most user interface therefore involves some form of prototyping, producing early versions of systems to try out with real users.

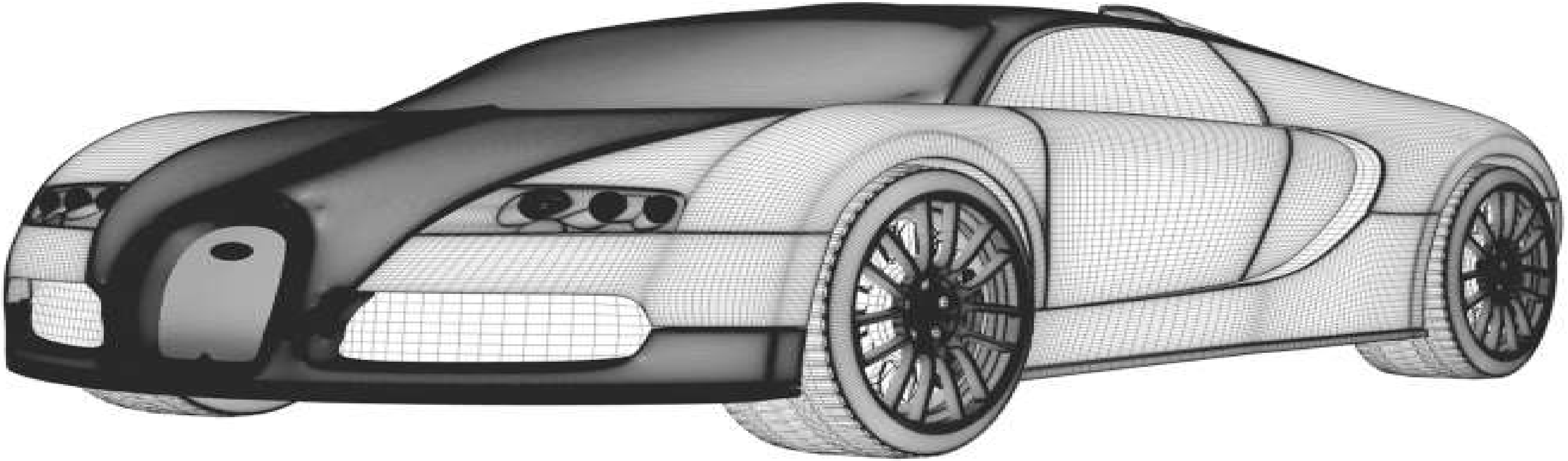
Implementation and deployment:

- Finally when we are happy with the design, we need to create and deploy it.
- This will involve writing code, perhaps making hardware, writing documentation and manuals – everything that goes into a real system that can be given to others.
- For this there are many software architectures for user interfaces and there are the processes for the implementation based on the type of interface.

Prototyping and construction:

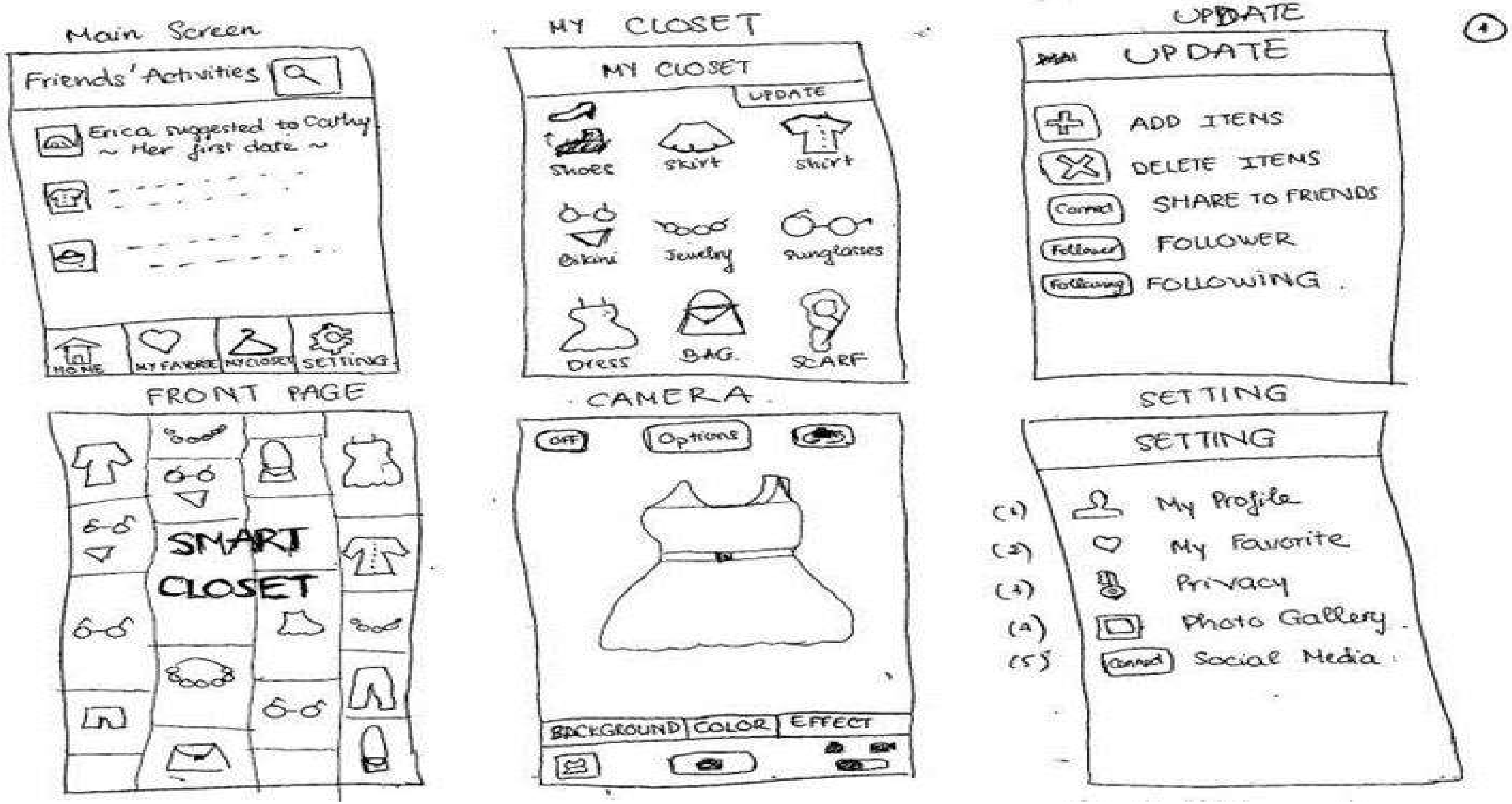
- Users cant tell the designers exactly what they want, but when they see something and get to use it, they soon know what they don't want.
- Having collected information about work and everyday practices, and views about what a system should and should not do, then designers need to try out design ideas by building prototypes and interacting through several versions.

- Prototype – A prototype is one manifestation of a document that allows stakeholders to interact with it and to explore its suitability.



- A prototype can be anything from a paper based storyboard through to a complex piece of software, and form a cardboard mockup to molded or pressed piece of metal.
- Prototypes are a useful and when discussing ideas with stakeholders, they are a communication device among team members and are effective way for designers to explore design ideas.
- The activity of building prototypes encourages reflection in design and is recognized by designers from many disciplines as an important aspect of the design process.
- Prototyping answer questions and support designers in choosing between alternatives.
- They serve a variety of purposes such as, to test out the technical feasibility of an idea, to clarify some requirements, to do some user testing and evaluation, or to check that a certain design direction is compatible with the rest of the product development.

- **Low-fidelity prototyping** – is one that does not look very much like the final product.
- It uses materials that a very different from the intended final version, such as paper and cardboard rather than electronic screens and metal.
- Low fidelity prototypes are useful because they tend to simple, cheap and quick to produce.
- This is particularly important in early stages of development, because prototypes that are used for exploring ideas should be flexible and encourage rather than discourage explor5ation and modification.
- Low fidelity prototyping are never intended to be kept and integrated into the final product.
- They are for exploration only.

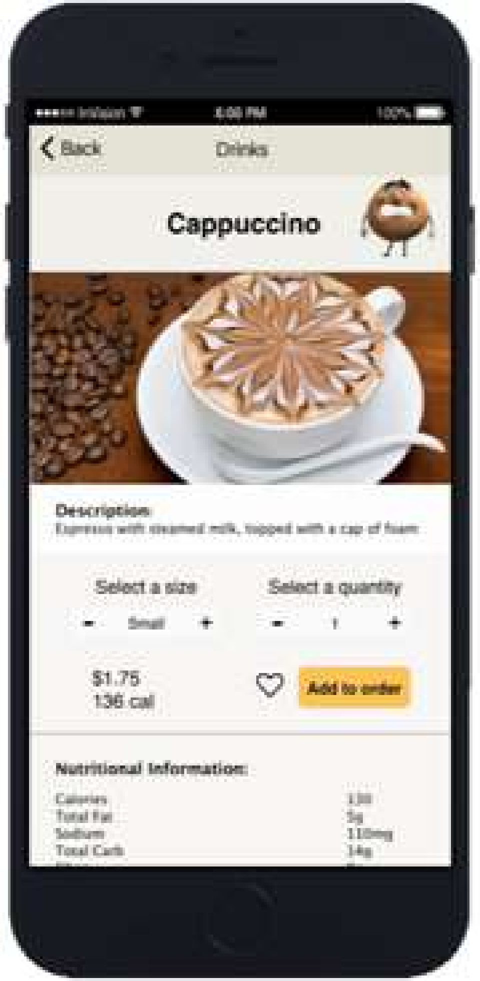

Main Screen
Friends' Activities
Erica suggested to Cathy
~ Her first date ~
HOME
MY FAVORITE
MY CLOSET
SETTING
MY CLOSET
MY CLOSET
UPDATE
Shoes
Skirt
Shirt
Bikini
Jewelry
Sunglasses
Dress
BAG
SCARF
UPDATE
UPDATE
ADD ITEMS
DELETE ITEMS
SHARE TO FRIENDS
FOLLOWER
FOLLOWING
FRONT PAGE
SMART
CLOSET
CAMERA
OFF
Options
BACKGROUND
COLOR
EFFECT
SETTING
SETTING
(1) My Profile
(2) My Favorite
(3) Privacy
(4) Photo Gallery
(5) Social Media

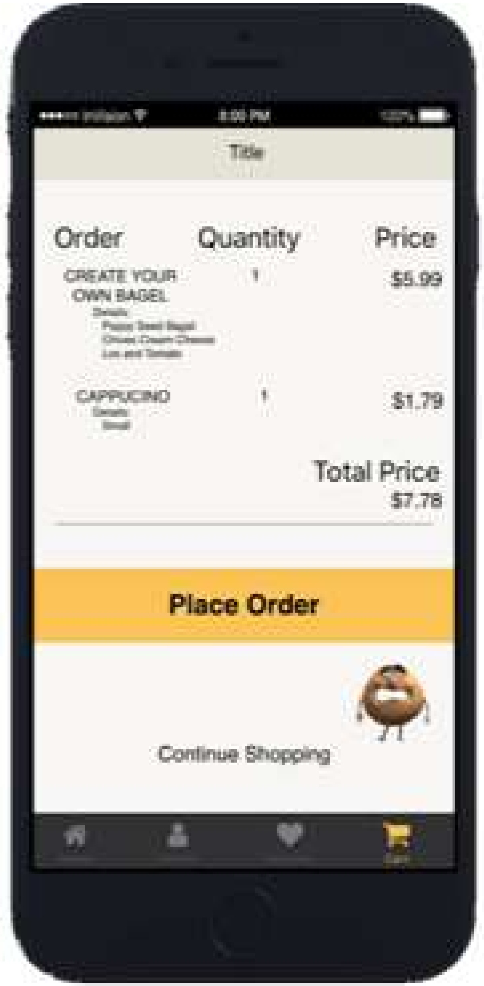
- **High fidelity** – uses materials that you would expect to be in the final product and produces a prototype that looks much more like the final thing.
- There is growing interest in producing high fidelity prototypes by modifying and integrating existing components – both hardware and software.
- Many designers argues that more projects should use low-fidelity prototyping because of the inherent problems with high fidelity prototyping.

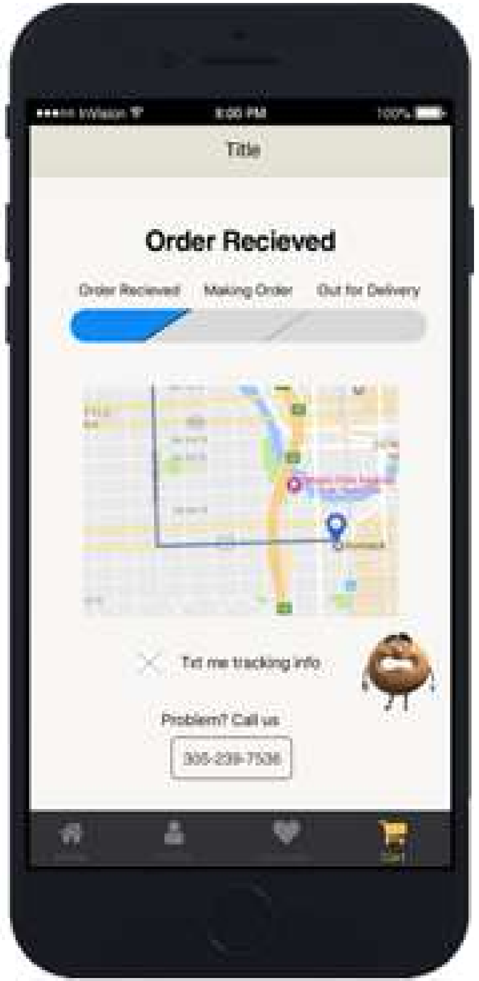
Some problems identified are:

- They take too long to build.
- Reviewers and testers tend to comment superficial aspects rather than content.
- Developers are reluctant to change something they have crafted for hours.
- A software prototype can set expectations high.
- Just one bug in a high fidelity prototype can bring the testing to a halt.


Back
Bagels
Spreads
On the side
Serving Size
Regular
Plain Cream Cheese
Chives Cream Cheese
Smoked Salmon Cream Cheese


Back
Drinks
Cappuccino
Description:
Espresso with steamed milk, topped with a cap of foam
Select a size
Select a quantity
Small
1
$1.75
136 cal
Add to order
Nutritional Information:
Calories 130
Total Fat 5g
Sodium 110mg
Total Carb 14g

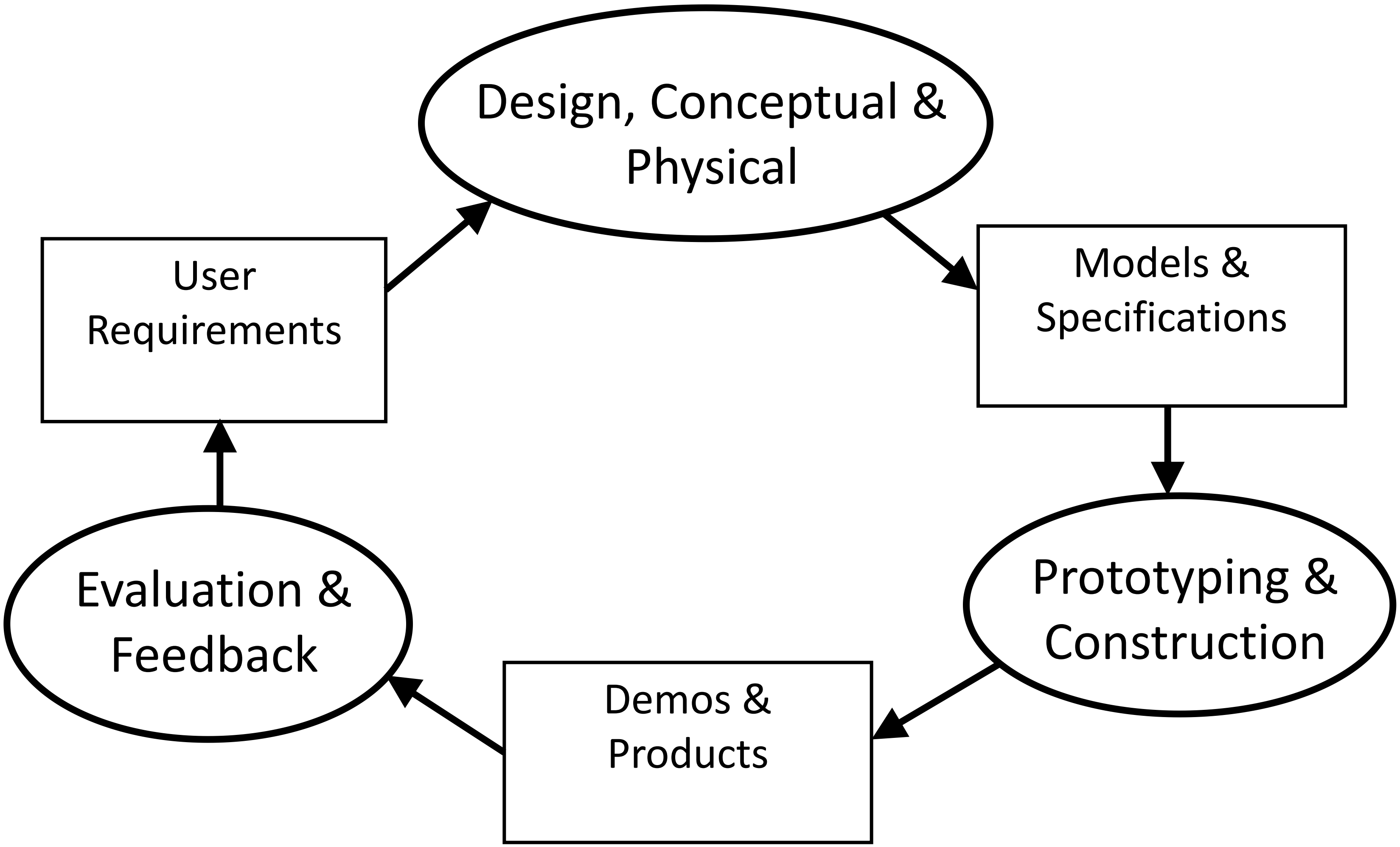

Title
Order
Quantity
Price
CREATE YOUR OWN BAGEL
1
$5.99
CAPPUCINO
1
$1.79
Total Price
$7.78
Place Order
Continue Shopping


Title
Order Recieved
Order Recieved
Making Order
Out for Delivery
Txt me tracking info
Problem? Call us

HCI MODULE 2

LECTURE 6

Iterative Design Overview



Conceptual Design:

- Conceptual design is concerned with transforming requirements into a conceptual model.
- Conceptual model is an outline of what people can do with a product and what concepts are needed to understand how to interact with it.

- The first step in getting a concrete view of conceptual model is to steep yourself in the data you gathered about your users and their goals.
- From this, a picture of what you want the users experience to be when using the new product will emerge and become more concrete.
- There are different ways to achieve empathy with users.
- One is to holding review meetings within the team to get different peoples perspectives on the data and what they observed.
- This helps to deeper understanding and to expose the whole team to different aspects.

Conceptual Design

- User Requirements => Conceptual Model
- “a description of the proposed system in terms of a set of integrated ideas and concepts about what it should do, behave, and look like, that will be understandable by the users in the manner intended”
- High-level compared to physical design

Key guiding principles of conceptual design are:

- Keep an open mind but never forget the users and their context.
- Discuss ideas with other stakeholders as much as possible.
- Use low fidelity prototyping to get rapid feedback.
- Iterate, iterate and iterate.

- Discuss and get different perspectives
- Prototyping
- Iterate, iterate, iterate!
- Consider many alternatives
- "To get a good idea, get lots of ideas"
- Empathize with the user

Developing initial conceptual model:

- Some useful perspectives to help develop a conceptual model.
- Some approaches which help in pulling together an initial conceptual model.

- Which interface metaphors would be suitable to help users understand the product?
- Which iteration type would best support user activities?
- Do different interface types suggest alternative design options?

Developing a Conceptual Model

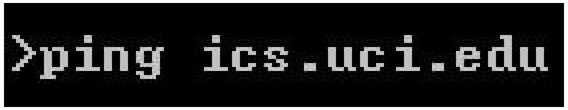
- Three perspectives
  - Interaction Mode
    - How the user invokes actions when interacting with the device
  - Interface Metaphor
    - Combining familiar knowledge with new knowledge in a way that helps the user understand the system
  - Interaction Paradigm
    - Particular way of thinking about interaction design

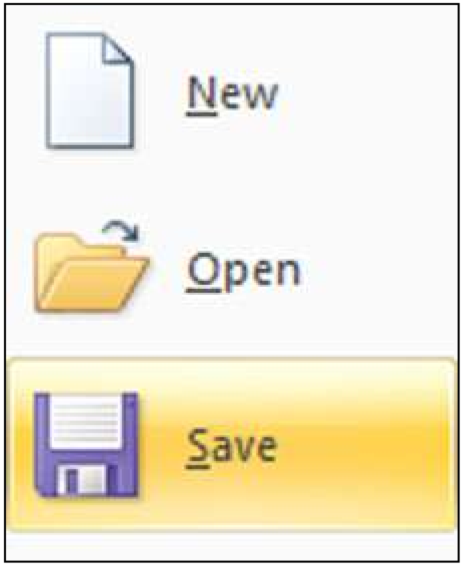
Interaction Modes

- Activity-based
  - Instructing
  - Conversing
  - Manipulating & Navigating
  - Exploring & Browsing
- Object-based
- Which is best suited to your design depends on the application domain and the kind of product being developed.

Interaction Modes

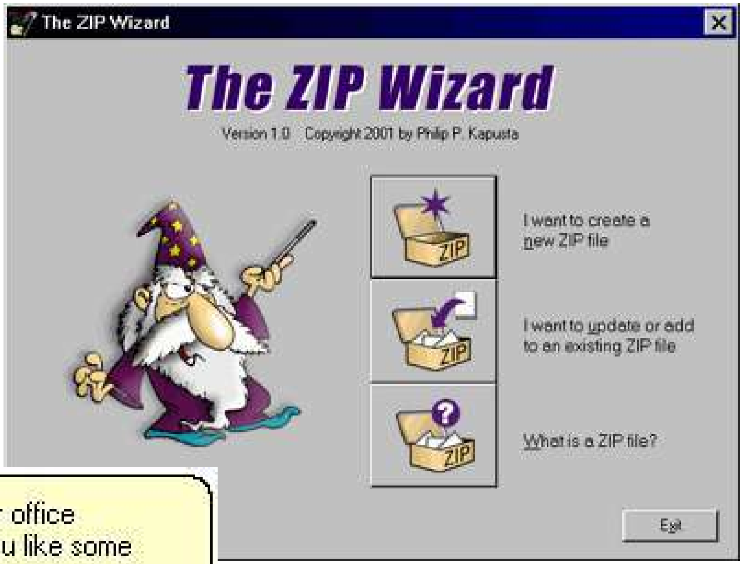
- Activity-based
  - Instructing
  - Conversing
  - Manipulating & Navigating
  - Exploring & Browsing
- Object-based





Interaction Modes

- Activity-based
  - Instructing
  - Conversing
  - Manipulating & Navigating
  - Exploring & Browsing
- Object-based



Press 1 for customer service.
Press 3 for store hours.

Interaction Modes

- Activity-based
  - Instructing
  - Conversing
  - Manipulating & Navigating
  - Exploring & Browsing
- Object-based

Interaction Modes

- Activity-based
  - Instructing
  - Conversing
  - Manipulating & Navigating
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Interaction Modes

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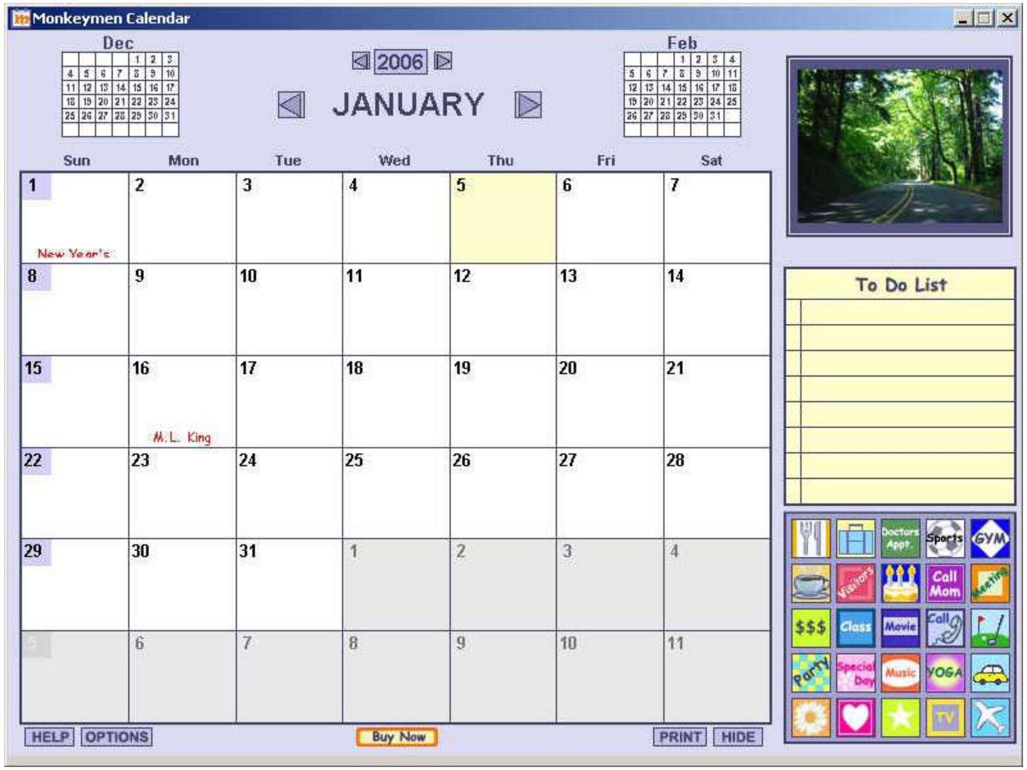


Interface metaphors:

- Interface metaphors combine familiar knowledge with new knowledge in a way that will help the user understand the product.
- Erickson suggests a three step process for choosing a good interface metaphor.

-first step is to understand what the system will do.

-second step understanding areas in which users are likely to have difficulties means that the metaphor can be chosen to support that aspects.

-generate metaphors. Looking for metaphors in users description of tasks is good starting point.

Interface Metaphors

- Conceptual model similar to some aspects of a physical entity
- Need to be evaluated
  - Structure
  - Relevance
  - Representation
  - Clarity
  - Extensibility

Interface Paradigms

- Desktop
- Ubiquitous
- Pervasive
- Wearable
- …

- Consider user tasks & environmental requirements

Expanding the Conceptual Model

- What functions will the product perform?
  – (how will tasks be divided up?)
- How are the functions related to each other?
  – Temporal (sequential or parallel)
  – Categorization
- What information needs to be available?
  – What data is required to perform the task?
  – How is this data to be transformed by the system?

Techniques used in Conceptual Design

- Scenarios
  - Basis for the overall design
  - Basis for technical implementation
  - Means of cooperation within design teams
  - Means of cooperation across professional boundaries (multidisciplinary teams)
- Prototyping

Prototyping & Construction

- What is a prototype?
- Why prototype?
- Low vs. high fidelity prototyping
- Compromises in prototyping
    - Vertical vs. horizontal
- Construction
    - Evolutionary vs. throwaway prototype

What is a prototype?

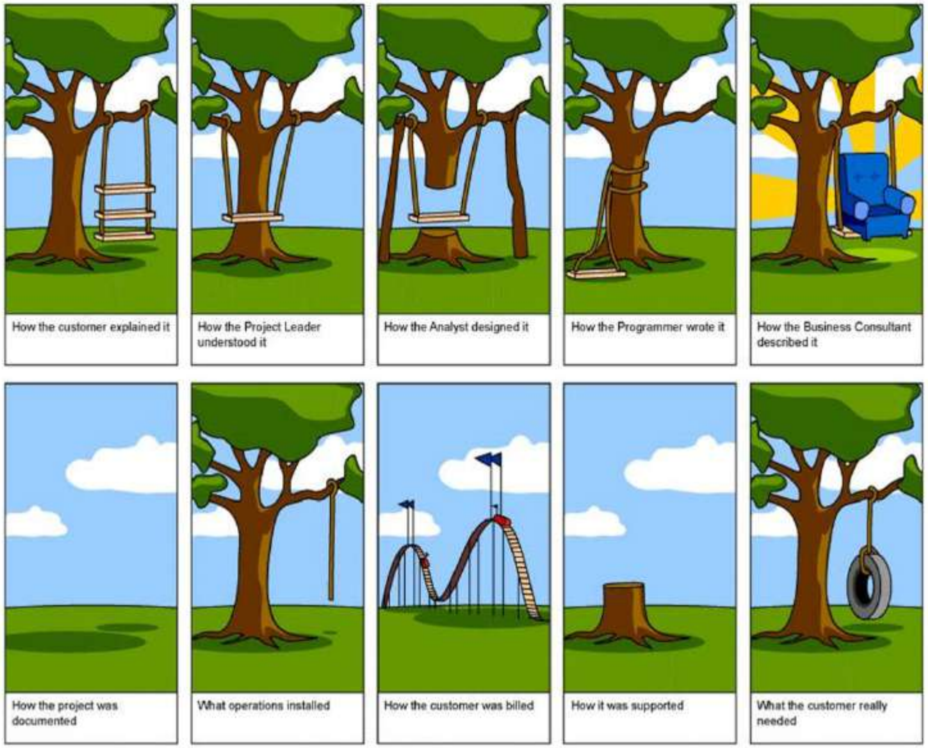
Limited representation of a product design

- Scale models, etc.
- In interaction design it can be (among other things):
  - a series of screen sketches
  - a storyboard, i.e. a cartoon-like series of scenes
  - a piece of software with limited functionality

Why prototype?

- Interactive exploration with envisioned product
- <u>*Clarifies vague requirements*</u> with concrete communication between stakeholders
- <u>*Answers questions*</u> and supports design decisions with *forced reflection*
- Tests feasibility & compatibility
- Sells product ideas
- *Inspires innovation* in "prototyping cultures"

People cannot describe what they want, but they are quick to *recognize* what they do not like!



Low vs. High Fidelity Prototypes

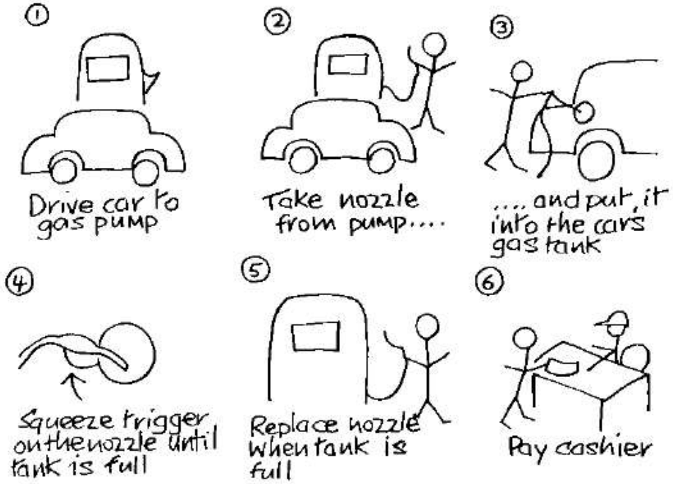
- Low-Fi: Cheap to produce, does not realistically simulate the final product

  Conceptual Design

- Hi-Fi: Increased similarity to final product, possibly even using the same “parts”

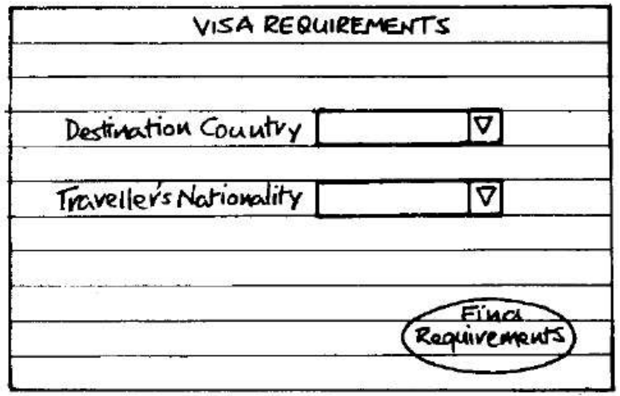
  Physical Design

- Prototypes should shift from Low-Fi to Hi-Fi as project progresses



Low-Fidelity Prototyping

- Uses medium unlike the final product (e.g. paper, cardboard)
- Quick, cheap and *easy to modify*
- Important early on to encourage creative flexibility and exploration of ideas during *conceptual design*



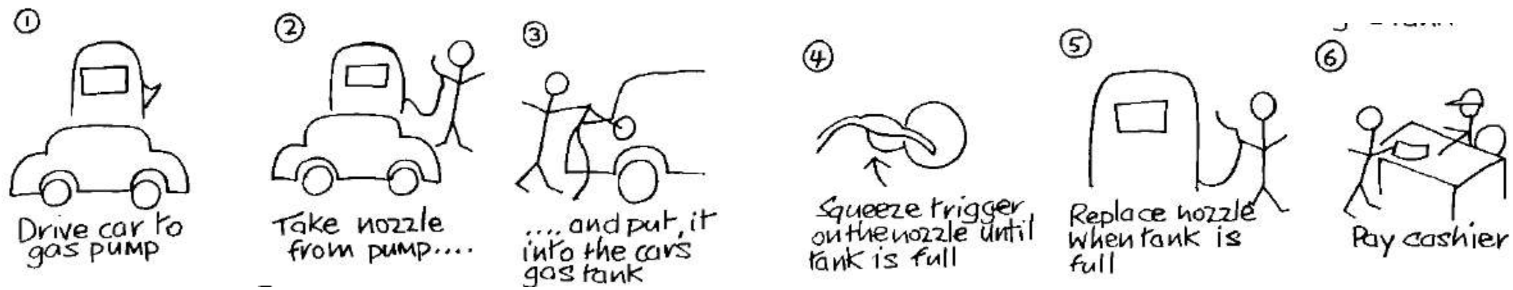
Sketching

- Core skill for most low-fidelity prototyping
- *Not about drawing ability!* Simple symbols
- Cruder sketch will emphasize <u>*conceptual*</u> design over superficial, <u>*physical*</u> design

Storyboards

- Storyboards often used with scenarios, bringing detail and a chance to role play

  - Series of scene sketches showing user progression through a *task flow*

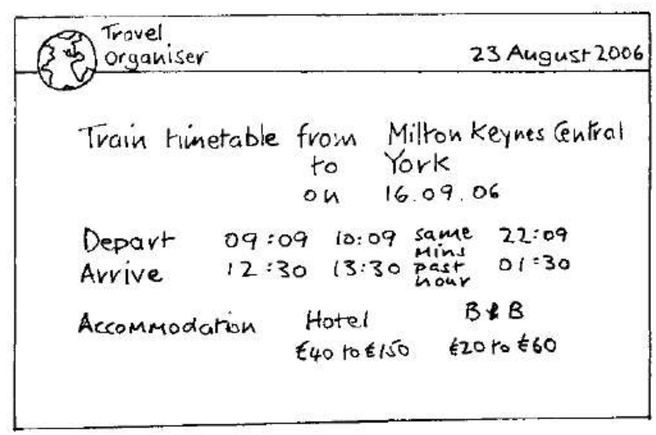


  - Series of screenshots illustrating *use case*

    Checkout: Product List, Shipping, Payment, Confirmation

Card-Based Prototypes

- Index cards, post-it notes, etc.
- Each represents one screen or section
- Often used in website development
- Facilitates stepping through elements
- Convenient to dynamically reorder work flow



High-Fidelity Prototyping

- Uses similar materials as and “looks like” final product
- Common high-fidelity software prototype environments include Macromedia Director and Visual Basic with WYSIWYG layout editors
- May include “real” code to demonstrate functions

Simulation or demo of final product to address feasibility and physical design issues, but costlier to develop and can confuse boundary between prototype and real product

Hi-Fi Compromises & Dangers

- Software prototypes may have slow response, sketchy icons, test halting bugs, etc.
- Long time to build → Developer resistance to criticism and change
- Demos good for selling product ideas, but sets high expectations →
- Users confuse demo promise with real product
- *“Invisible” compromises*: Hacked code, sloppy engineering. Time to reengineer quality product → developer pressured into recycling sloppy code

Construction

- Creating whole product given prototype results
  - ‘Throw-away’ prototyping vs.
  - Evolutionary prototyping

- **Evolutionary prototyping is appealing, but planning and quality must be attended to from the start!**

  Usability, reliability, robustness, maintainability, integrity, portability, efficiency, etc.

Physical Design

- Conceptual design abstractly describes system's intended behavior
  - ATM should authenticate user ID and allow user to withdraw cash on command
- Physical design addresses specific, concrete layout and design issues
  - ATM should have a card reader slot, a 10 digit keypad for users to enter a PIN number, a touch screen monitor with a menu of command options and a mechanical reel for dispensing increments of $20 bills

Physical Design Guidelines

- Principles
  - Abstract statements open to interpretation
  - e.g., Maintain consistency, keep designs simple, support user recognition vs. recall, etc.
  - Mostly same principles reviewed in first half of the quarter
- Rules
  - Specific statements, with no interpretations
  - e.g., Menus should have no more than 8 options
- Style Guides and Standards
  - Collections of principles and rules to achieve consistency across applications. Good for corporate identity and consistency.
  - e.g., Windows or Mac style guides: File menu first, Help menu last, etc. Standard icon for save, cut, copy, paste, etc.
  - Useful to adopt *ad hoc* standards to meet user expectations

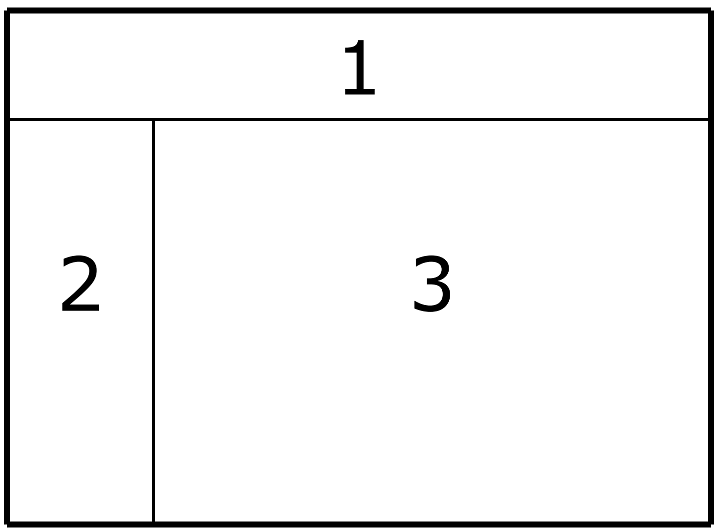
Specific Widget Guidelines

- Menu Design
  - Common functions should be easiest to reach
  - >8 options is too much, grouping to organize
  - Opposite and dangerous operators should be physically separated to avoid accidents

- Icon Design
  - Takes time to develop a good one
  - Immediately recognizable (small and simple)
  - Easily distinguishable from others
  - More important than being very descriptive

Specific Widget Guidelines

- Web Design Specifics
  - Unique with *hyperlink nature, short user attention span, download lag time*
  - Key questions web pages should answer within 3 seconds of scanning
    1. Where am I?
    2. Where can I go?
    3. What’s here?



Specific Widget Guidelines

- Multi-Screen Designs
  - Task flow with multiple steps
  - Start with one page per “atomic” step, but balance against too many trivial pages
  - Consider frames or overlapping windows to easily move between non-linear task flow
  - Pertinent info should be available across all steps

What are good design and prototyping methods for these?

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The only way to place an order at Amazon.com is via our Web site. (Sorry--no phone orders. However, if you prefer, you may phone in your credit card number, after filling out the order form online.)
Redeeming a gift card or gift certificate? We'll ask for your claim code when it's time to pay.
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SHIPPING & PAYMENT
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PLACE ORDER
Choose a shipping address
Is the address you'd like to use displayed below? If so, click the corresponding "Ship to this address" button. Or you can enter a new shipping address.
Address Book
Ship to this address
Jonathan Chen
Orange, CA 92868-3458
United States
Phone: 6268404491
Edit
Delete
Ship to this address
Jonathan Chen
Costa Mesa, CA 92626
United States
Phone: 6268404491
Edit
Delete
Ship to this address
Jonathan Chen
Irvine, CA 92617-5138
United States
Phone: 626-840-4491
Edit
Delete
Or enter a new shipping address
Be sure to click "Ship to this address" when done.

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Make your gift festive with gift-wrap and a printed gift card! Even if you decide not to wrap your gift, you can still write a free gift note to be included in the package.

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Item 1 shipping to Jonathan Chen, [illegible], Orange, CA, 92868-3458 United States

Amazon.com gift options (Learn more)

Super Mario Galaxy
$49.99 - Quantity: 1 - In Stock
Condition: new
Sold by: Amazon.com

- Don't gift-wrap this item.
  (You can still write a gift note--it's free!)
- Gift-wrap this item with "Amazon gift-wrap" paper ($0.99) **Note:** Large or irregular-shaped items may be placed in a blue gift bag. (Learn more)

Enter your free gift note for this item here:

Max. 240 characters--about 10 line (s) of text. Be sure to include "to" and "from."

Don't print prices on packing slips regardless of what I enter above.

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SIGN IN SHIPPING & PAYMENT GIFT-WRAP **PLACE ORDER**

Please review and submit your order

By placing your order, you agree to Amazon.com's privacy notice and conditions of use.

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Important Message

Want free shipping? Make sure to select FREE Super Saver Shipping as your shipping speed under "Shipping options" below. (Note that your order will take an additional 3-5 days to ship.)

Review the information below, then click "Place your order."

Place your order

Shipping Details

Shipping to: Change

Jonathan Chen
[redacted]
Orange, CA 92868-3458
United States
Phone: [redacted]

Shipping Options: (Learn more)

Save $4.49: To get this order with FREE Two-Day Shipping, start an Amazon Prime membership.

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Choose a shipping speed:

- ○ FREE Super Saver Shipping (5-9 business days)
- ◉ Standard Shipping (3-5 business days)
- ○ Two-Day Shipping **--get it Monday, November 19!**
- ○ One-Day Shipping **--get it Friday, November 16!**

Order Summary

Items:	$49.99
Shipping & Handling:	$4.49
Total Before Tax:	$54.48
Estimated Tax:	$0.00

Order Total: $54.48

Save on shipping! Select FREE Super Saver Shipping as your shipping speed, and we'll remove the shipping fees on the eligible items in your order.

Have any gift cards, gift certificates or promotional claim codes?

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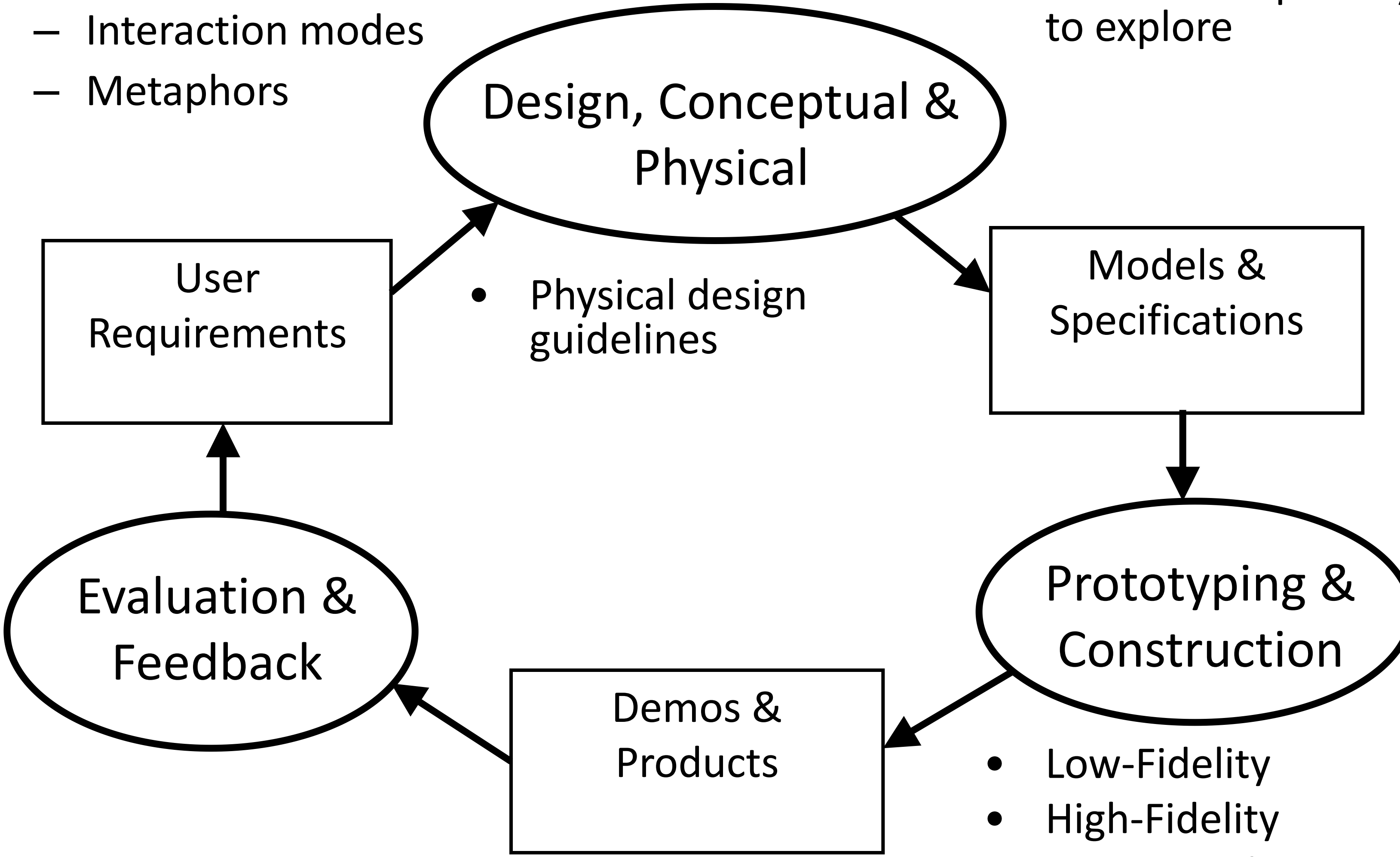
Review

- Perspectives
  - Interaction paradigms
  - Interaction modes
  - Metaphors

- Scenarios & prototypes to explore



- Physical design guidelines

- Low-Fidelity
- High-Fidelity
  - Vertical
  - Horizontal

Summary

- There two aspects to the design activity: conceptual design and physical design
- Conceptual design develops model of what the product will do and how it will behave while physical design specifies the details of the design such as screen layout and menu structure
- We have explored three perspectives to help you develop conceptual models: an interaction paradigm point of view, an interaction mode point of view, and a metaphor point of view
- Scenarios and prototypes can be used effectively in conceptual design to explore ideas
- Prototyping may be low fidelity (such as paper-based) or high fidelity (such as software based)
- High-fidelity prototypes may be vertical or horizontal
- Low-fidelity prototypes are quick and easy to produce and modify and are used in early stages of design
- We have discussed four areas of physical design: menu design, icon design, screen design, and information display

MODULE 2

LECTURE 7

The Four Pillars of Design:

- The four pillars described can help user interface architects to turn good ideas into successful systems.
- They are not guaranteed to work flawlessly, but experience has shown that each pillar can produce an order-of-magnitude speed-up in the process and can facilitate the creation of excellent systems.

1. User interface requirements:

- Soliciting and clearly specifying user requirements is a major key to success in any development activity.
- Methods to elicit and reach agreement upon user interface requirements differ across organizations and industries, but the end result is the same: a clear specification of the user community and the tasks the user perform.
- Laying out the user interface requirements is part of the overall requirements development and management process must be specified and agreed upon.
- The success or failure of software projects often depends on the precision and completeness of the understanding among all the users and implementers
- What happens without adequate requirements definition? You are not sure what problem you are solving, and you do not know when you are done.

- Be careful not to impose human operator actions onto the user-interface requirements.
- For example, do not specify a requirement like this: “The user shall decide how much to withdraw from the ATM within five seconds.”
- Rather, allocate the same requirement to the computer system: “The ATM shall permit a user five seconds to select a withdrawal amount... Before prompting for a response.
- One successful method for determining user-interface requirements is to use ethnographic observation , monitoring the context and environment of real users in action.
- Trade-offs between what functions are done best by computers versus humans in human-computer interaction.

2. Guidelines documents and processes

- Early in the design processes, the user-interface architect should generate, or require other people to generate, a set of working guidelines.
- Two people might work for one week to produce 10-page document, or a dozen people might work for two years to produce a 300-page document.
- One component of Apple’s success with the Macintosh was the machine’s early and readable guidelines document, which provided a clear set of principles for many application developers to follow and thus ensured harmony in design across products.
- Each project has different needs, but guidelines should be considered for:
- Words, icons, and graphics
  - Terminology, abbreviations, and capitalization.
  - Character set, fonts, font sizes, and styles.
  - Icons, buttons, graphics, and line thickness.
  - Use of color, backgrounds, highlighting, and blinking

- Screen-layout issues
  - Menu selection, form fill-in, and dialog-box formats
  - Wording of prompts, feedback, and error messages
  - Justification, white space, and margins
  - Data entry and display formats for items and lists
  - Use and contents for headers and footers
  - Strategies for adapting to small and large displays
- Input and output devices
  - Keyboard, display, cursor control and pointing devices
  - Audible sounds, voice feedback, speech I/O, touch input and other special input modes or devices.
  - Response times for a variety of tasks
  - Alternative for users with disabilities.

- Action sequences
  - Direct-manipulation clicking, dragging, dropping and gestures
  - Command syntax, semantics and sequences
- Shortcuts and programmed function keys
  - Touch screen navigation for devices such as the Apple iPhone and table top systems such as Microsoft surface
  - Error handling and recovery procedures
- Training
  - Online help, tutorials, and support groups
  - Training and reference materials

- Guidelines creation should be a social process within an organization to help it gain visibility and build support.
- Controversial guidelines should be reviewed by colleagues or tested empirically.
- The creation of guidelines document at the beginning of an implementation project focuses attention on the interface design and provides an opportunity for discussion of controversial issues.

- When the development team adopts the guidelines, the implementation proceeds quickly and with few design changes.
- The “four Es” provide a basis for creating a living document and a lively process:
  - **Education.** Users need training and a change to discuss the guidelines. Developers must be trained in the resultant guidelines.
  - **Enforcement**. A timely and clear process is necessary to verify that an interface adheres to the guidelines.
  - **Exemption**. When creative ideas or new technologies are used , a rapid process for gaining exemption is needed.
  - **Enhancement**. A predictable process for review , possibly annually, will help keep the guidelines up-to-date.

3. User Interface Software Tools:

- One difficulty in designing interactive systems is that customers and users may not have a clear idea of what the system will look like when it is done.
- Since interactive systems are novel in many situations, users may not realize the implications of design decisions.
- Unfortunately, it is difficult , costly, and time consuming to make major changes to systems once those systems have been implemented.
- Although, this problem has no complete solution, some of the more serious difficulties can be avoided if , at an early stage the customers and users can be given a realistic impression of what the final system will look like.
- A printed version of the proposed displays is helpful for pilot tests but an on screen display with an active keyboard and mouse is more realistic.
- The prototype of a menu system may have only one or two paths active , instead of the thousands of paths envisioned for the final system.
- For a form-fill-in system, the prototype may simply show the fields but not actually process them.

- Prototypes have been developed with simple drawing or word-processing tools or even power point presentations of screen drawings manipulated with power point slides shows and other animation.

4. Expert review and usability testing:

- Theatrical producers know that extensive rehearsals and previews for critics are necessary to ensure a successful opening night.
- Early rehearsals may involve only the key performercers wearing street clothes, but as opening night approaches , dress rehearsals with the full cast , props , and lighting are required.
- Aircraft designers carry out wind-tunnel tests , build plywood mock-ups of the cabin layout , construct complete simulations of the cock pit and thoroughly and flight-test the first prototype.
- Similarly, website designers now recognize that they must carry out many small and some large pilot tests of components before release to customers.

- In addition to a variety of expert review methods , tests with the intended users , surveys, and automated analysis tools are providing to be valuable.
- Procedures vary greatly depending on the goals of the usability study , the number of expected users , the danger of errors , and the level of investment.

Development Methodologies:

- Many software development projects fail to achieve their goals.
- Some estimates of the failure rate put it as high as 50%(Jones, 2005).
- Much of this problem can be traced to poor communication between developers and their business clients or between developers and their users.
- Successful developers work carefully to understand the business's needs it and refine their skills in eliciting accurate requirements from non technical business managers.
- In addition, since business managers may lack the technical knowledge to understand proposals made by the developers, dialog is necessary to reduce confusion about the organizational implications of design decisions.

- Successful developers also know that careful attention to user-centered design issues during the early stages of software development dramatically reduces both development time and cost.
- User-centered design leads to systems that generate fewer problems during development and have lower maintenance costs over their life times.
- They are easier to learn, result in faster performance, reduce user errors substantially, and encourage users to explore features that go beyond the minimum required to get by.
- In addition, user-centered design practices help organizations align system functionality with their business needs and priorities.
- Small consulting forms that specialize in user-centered design have created innovative design methodologies to guide developers, such as rapid contextual design which is based on the approach of contextual inquiry.
- Some large corporations have also integrated user-centered design into their practices.
- These business-oriented approaches specify detailed deliverables for the various stages of design and incorporate cost or benefit and return-on-investment analysis to facilitate decision making.

- They may also offer management strategies to keep projects on track and to facilitate effective collaboration among teams that include both business and technical participants.
- Since user-centered design is only a part of the overall development process, these methodologies must also mesh with the various software-engineering methodologies that are used in the industry today.
- The **rapid contextual design** method involves the following steps:

1. Contextual inquiry. Plan for, prepare, and then conduct field interviews to observe and understand the work tasks being performed. Review business practices.
2. Interpretation sessions and work modelling. Hold team discussions to draw conclusions based on the contextual inquiry, including gaining an understanding of the work flow processes in the organization as well as cultural and policy impacts on work performed. Capture key points.
3. Model consolidation and affinity diagram building. Present the data gathered to date from users and the interpretation and work modelling to a larger, targeted population to gain insight and concurrence. Consolidate the work models to illustrate common work patterns and processes and create affinity diagrams(hierarchical representation of the issues to address user needs).

4.Persona development. Develop personas(fictitious characters) to represent the different user types within a targeted demo graphic that might use a site or product(Cooper,2014).This aids the team in communicating the needs of the users and bringing those user needs to fruition.

5.Visioning. Review and “walk” the consolidated data , sharing the personas created. The visioning session helps define how the system will streamline and transform the work of the users. Capture key issues and ideas using flip charts or any media that will facilitate expressing the vision of the revised business processes.

6.Storyboarding. The vision guides the detailed redesign of user tasks using pictures and graphs to describe the initial user-interface concepts, business rules and automation assumptions. Storyboarding defines and illustrates the “to be built” assumptions.

7.User environment design. The single, coherent representation of the users and the work to be performed is expressed in the user environment design (UED). The UED is built from the storyboards.

8.Interviews and evaluations with paper prototypes and mock-ups. Conduct interviews and tests with actual users, beginning with paper prototypes and then moving on to higher-fidelity prototypes. Capturing the results of the interviews aids in ensuring that the system will meet end-user requirements.

Module-3

Evaluating interface Designs

Addison Wesley
is an imprint of

PEARSON

Introduction

- Designers can become so entranced with their creations that they may fail to evaluate them adequately.
- Experienced designers have attained the wisdom and humility to know that extensive testing is a necessity.
- The determinants of the evaluation plan include:
  – stage of design (early, middle, late)
  – novelty of project (well defined vs. exploratory)
  – number of expected users
  – criticality of the interface (life-critical medical system vs. museum exhibit support)
  – costs of product and finances allocated for testing
  – time available
  – experience of the design and evaluation team

Introduction (cont.)

- Usability evaluators must broaden their methods and be open to non-empirical methods, such as user sketches, consideration of design alternatives, and ethnographic studies.
- Recommendations needs to be based on observational findings
- The design team needs to be involved with research on the current system design drawbacks
- Tools and techniques are evolving
- The range of evaluation plans might be anywhere from an ambitious two-year test with multiple phases for a new national air-traffic–control system to a three-day test with six users for a small internal web site
- The range of costs might be from 20% of a project down to 5%.
- Usability testing has become an established and accepted part of the design process

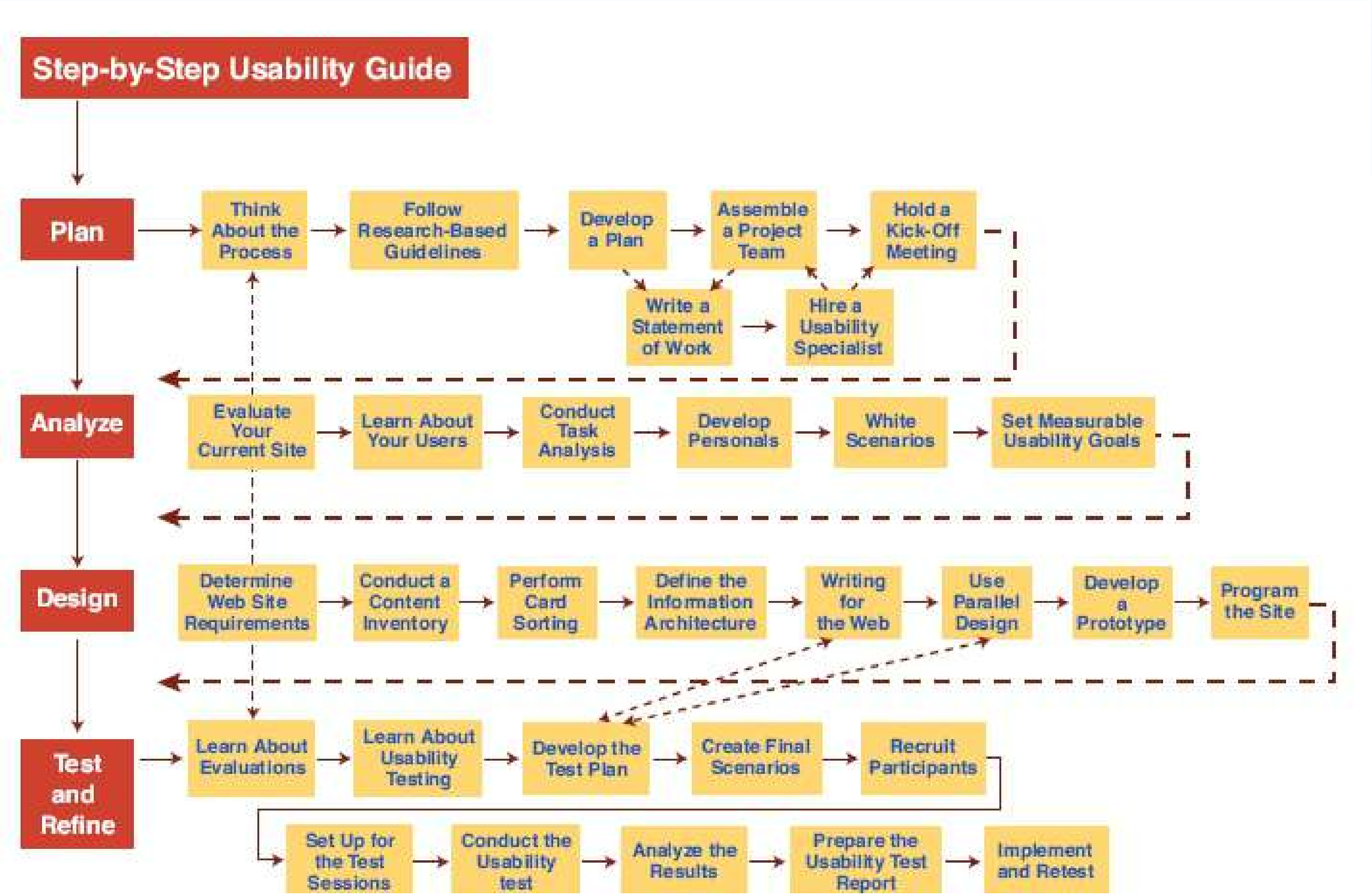
Expert Reviews

- While informal demos to colleagues or customers can provide some useful feedback, more formal expert reviews have proven to be effective
- Expert reviews entail one-half day to one week effort, although a lengthy training period may sometimes be required to explain the task domain or operational procedures
- There are a variety of expert review methods to chose from:
  - Heuristic evaluation
  - Guidelines review
  - Consistency inspection
  - Cognitive walkthrough
  - Metaphors of human thinking
  - Formal usability inspection

Expert Reviews (cont.)

- Expert reviews can be scheduled at several points in the development process when experts are available and when the design team is ready for feedback.
- Different experts tend to find different problems in an interface, so 3-5 expert reviewers can be highly productive, as can complementary usability testing.
- The dangers with expert reviews are that the experts may not have an adequate understanding of the task domain or user communities.
- Even experienced expert reviewers have great difficulty knowing how typical users, especially first-time users will really behave.

Step-by-Step Usability Guide from http://usability.gov/



Usability Testing and Laboratories

Usability Testing and Laboratories (cont.)

- The emergence of usability testing and laboratories since the early 1980s
- Usability testing not only sped up many projects but that it produced dramatic cost savings.
- The movement towards usability testing stimulated the construction of usability laboratories.
- A typical modest usability lab would have two 10 by 10 foot areas, one for the participants to do their work and another, separated by a half-silvered mirror, for the testers and observers
- Participants should be chosen to represent the intended user communities, with attention to
  - background in computing, experience with the task, motivation, education, and ability with the natural language used in the interface.

Usability Testing and Laboratories (cont.)

- Participation should always be voluntary, and informed consent should be obtained.
- Professional practice is to ask all subjects to read and sign a statement like this one:
  - I have freely volunteered to participate in this experiment.
  - I have been informed in advance what my task(s) will be and what procedures will be followed.
  - I have been given the opportunity to ask questions, and have had my questions answered to my satisfaction.
  - I am aware that I have the right to withdraw consent and to discontinue participation at any time, without prejudice to my future treatment.
  - My signature below may be taken as affirmation of all the above statements; it was given prior to my participation in this study.
- Institutional Review Boards (IRB) often governs human subject test process

Usability Testing and Laboratories (cont.)

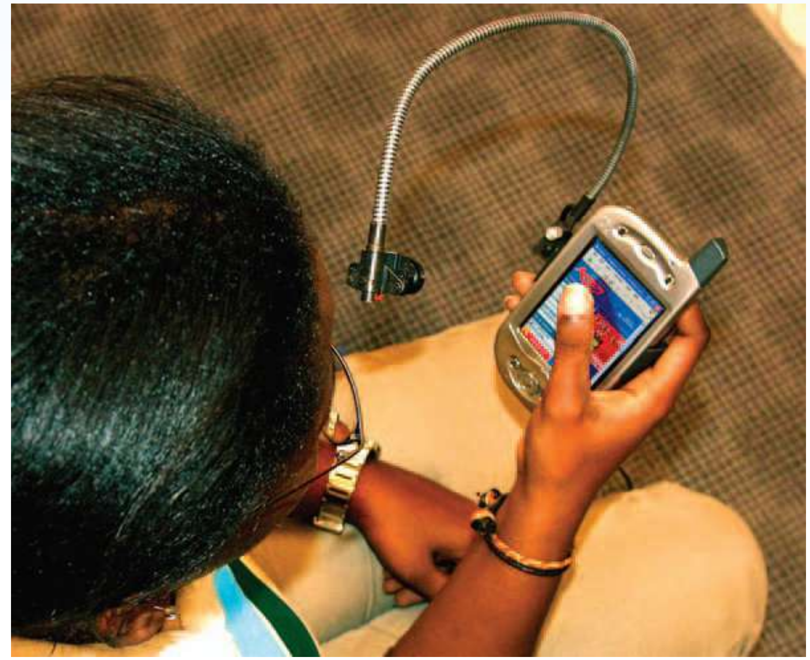
- Videotaping participants performing tasks is often valuable for later review and for showing designers or managers the problems that users encounter.
  - Use caution in order to not interfere with participants
  - Invite users to think aloud (sometimes referred to as concurrent think aloud) about what they are doing as they are performing the task.

- Many variant forms of usability testing have been tried:
  - Paper mockups
  - Discount usability testing
  - Competitive usability testing
  - Universal usability testing
  - Field test and portable labs
  - Remote usability testing
  - Can-you-break-this tests

Usability Testing and Laboratories (cont.)

In this eye-tracking setup, the participant wears a helmet that monitors and records where on the screen the participant is looking

Usability Testing and Laboratories (cont.)



More portable eye-tracking devices

Survey Instruments

- Written user surveys are a familiar, inexpensive and generally acceptable companion for usability tests and expert reviews.
- Keys to successful surveys
  - Clear goals in advance
  - Development of focused items that help attain the goals.
- Survey goals can be tied to the components of the Objects and Action Interface model of interface design.
- Users could be asked for their subjective impressions about specific aspects of the interface such as the representation of:
  - task domain objects and actions
  - syntax of inputs and design of displays.

Survey Instruments (cont.)

- Other goals would be to ascertain
  - users background (age, gender, origins, education, income)
  - experience with computers (specific applications or software packages, length of time, depth of knowledge)
  - job responsibilities (decision-making influence, managerial roles, motivation)
  - personality style (introvert vs. extrovert, risk taking vs. risk aversive, early vs. late adopter, systematic vs. opportunistic)
  - reasons for not using an interface (inadequate services, too complex, too slow)
  - familiarity with features (printing, macros, shortcuts, tutorials)
  - their feeling state after using an interface (confused vs. clear, frustrated vs. in-control, bored vs. excited).

Surveys (cont.)

- Online surveys avoid the cost of printing and the extra effort needed for distribution and collection of paper forms.
- Many people prefer to answer a brief survey displayed on a screen, instead of filling in and returning a printed form,
  - although there is a potential bias in the sample.
- A survey example is the Questionnaire for User Interaction Satisfaction (QUIS).
  - http://lap.umd.edu/quis/

Acceptance Test

- For large implementation projects, the customer or manager usually sets objective and measurable goals for hardware and software performance.

- If the completed product fails to meet these acceptance criteria, the system must be reworked until success is demonstrated.

- Rather than the vague and misleading criterion of "user friendly," measurable criteria for the user interface can be established for the following:
  - Time to learn specific functions
  - Speed of task performance
  - Rate of errors by users
  - Human retention of commands over time
  - Subjective user satisfaction

Acceptance Test (cont.)

- In a large system, there may be eight or 10 such tests to carry out on different components of the interface and with different user communities.
- Once acceptance testing has been successful, there may be a period of field testing before national or international distribution..

Evaluation During Active Use

- Successful active use requires constant attention from dedicated managers, user-services personnel, and maintenance staff.
- Perfection is not attainable, but percentage improvements are possible.
- Interviews and focus group discussions
  - Interviews with individual users can be productive because the interviewer can pursue specific issues of concern.
  - Group discussions are valuable to ascertain the universality of comments.

Evaluation During Active Use (cont.)

- Continuous user-performance data logging
  - The software architecture should make it easy for system managers to collect data about
    - The patterns of system usage
    - Speed of user performance
    - Rate of errors
    - Frequency of request for online assistance
  - A major benefit is guidance to system maintainers in optimizing performance and reducing costs for all participants.

- Online or telephone consultants, e-mail, and online suggestion boxes
  - Many users feel reassured if they know there is a human assistance available
  - On some network systems, the consultants can monitor the user's computer and see the same displays that the user sees

Evaluation During Active Use (cont.)

- Online suggestion box or e-mail trouble reporting
  - Electronic mail to the maintainers or designers.
  - For some users, writing a letter may be seen as requiring too much effort.

- Discussion groups, wiki's and newsgroups
  - Permit postings of open messages and questions
  - Some are independent, e.g. America Online and Yahoo!
  - Topic list
  - Sometimes moderators
  - Social systems
  - Comments and suggestions should be encouraged.

Evaluation During Active Use (cont.)

Bug report using Google’s Chrome browser (http://www.google.com/chrome/)

Controlled Psychologically-oriented Experiments

- Scientific and engineering progress is often stimulated by improved techniques for precise measurement.
- Rapid progress in the designs of interfaces will be stimulated as researchers and practitioners evolve suitable human-performance measures and techniques.

Controlled Psychologically-oriented Experiments (cont.)

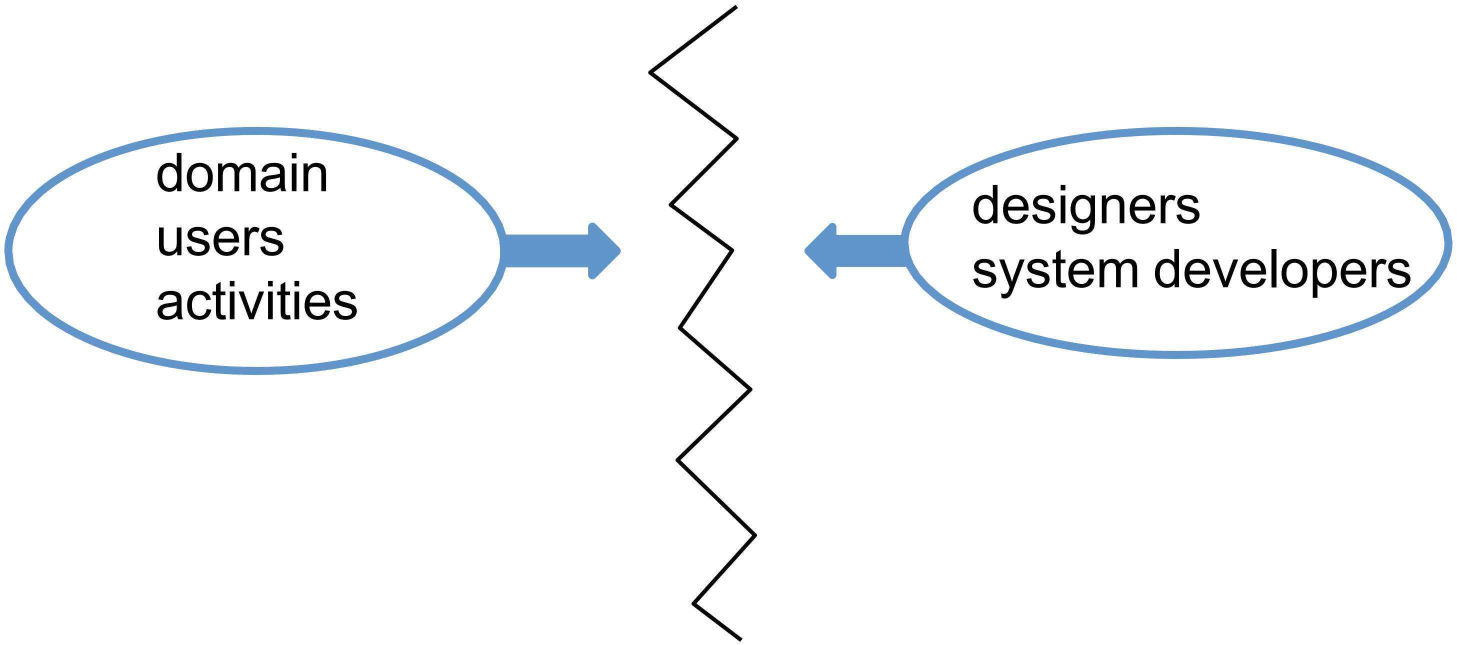
- The outline of the scientific method as applied to human-computer interaction might comprise these tasks:
  - Deal with a practical problem and consider the theoretical framework
  - State a lucid and testable hypothesis
  - Identify a small number of independent variables that are to be manipulated
  - Carefully choose the dependent variables that will be measured
  - Judiciously select subjects and carefully or randomly assign subjects to groups
  - Control for biasing factors (non-representative sample of subjects or selection of tasks, inconsistent testing procedures)
  - Apply statistical methods to data analysis
  - Resolve the practical problem, refine the theory, and give advice to future researchers

Controlled Psychologically-oriented Experiments (cont.)

- Controlled experiments can help fine tuning the human-computer interface of actively used systems.
- Performance could be compared with the control group.
- Dependent measures could include performance times, user-subjective satisfaction, error rates, and user retention over time.

HCI,
Participatory Design

Background



How are users viewed?

- flexible?
- lazy?
- ungrateful?
- stupid?

or are they:

- knowledgeable?
- experts?
- professionals?

Goals for PD

- Designers and users narrowed
- Mutual learning
- Users highly involved in design process
- Handle conflicting goals between workers/users and management

Participatory Design

- Emerged from strong labor movement in Scandinavia in the early 70s
  - political aspect, distribution of power
- From top-down, management-driven, to a bottom-up, democratic, humanistic perspective
- Articulating problems and co-creating solutions in cooperation with users
- Other names for PD include *Cooperative Design* and *Collective Resource Approach*

Landmark PD Projects

- UTOPIA - 1981
  - Nordic Graphic Workers Union (NGU)
  - Ehn, Kyng, Sundblad, Bødker
- Florence - 1983
  - Nurses
  - Nygaard, Bjerknes, Bratteteig

PD and Applications

- Enhance workplace skills, rather then degrade them
- Applications should support work activities, not make them more rigid
- Organizational issues - a specific focus of the design
- In addition to improving productivity, improve the quality of work and results

Source: Bødker, Grønbæk and Kyng; “Cooperative design: techniques and experiences from the Scandinavian scene”

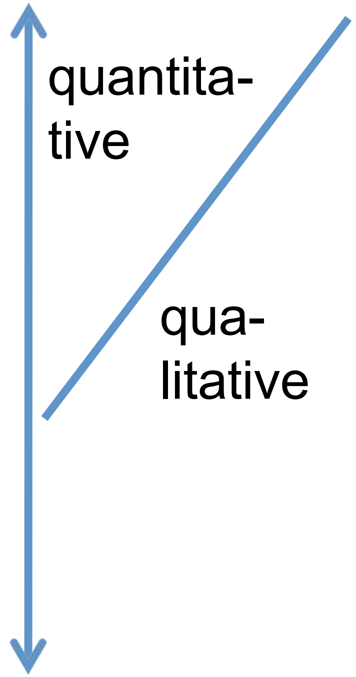
Why involve users?

- Improve the knowledge upon which systems are built
- Enable workers to develop realistic expectations
- Reduce resistance to change
- Increase workplace democracy – members participate in decisions that affect their work

Source: Bjerknes & Bratteteig, 1991; Bjørn-Andersen & Hedberg, 1977

Levels of users' involvement

- documented studies
- source for data gathering
  - questionnaires
  - observations
  - interviews
- ethnography
- part of design team



All levels might be relevant

Participatory Design Process

- Recognize conflict
- Guided by designers
- Situated within user's work
- Encourage creativity and draw out tacit knowledge
- Simulate the future to aid in prediction and evaluation of design

Adapted from Patrick Williams

Role of Designers

- Coordinate activities
- Facilitate discussion
- Prepare materials
- Advocate solutions

Adapted from Patrick Williams

Stages of the project

- *Workplace visits* - understand current situation and work practices
- *Future workshop* - compile current problems and brainstorm potential solutions
- *Organizational game* - Envision possibilities by presenting new scenarios using mock-ups and prototypes
- *Embodying ideas* - Continue development by co-creating mock-ups and prototypes and by trying out new / modified work situations

Future Workshops

- shed light on a common problematic situation
- generate visions about the future
- discuss how visions can be realized
- Participants should share a set of problems, a desire to change the work situation, and the means to achieve that change
- Usually involves two facilitators, and no more then 20 participants

Stages of a Future Workshop

- Preparation
- Critique - draw out specific issues and problems
- Fantasy - imagine how things could be different
- Implementation - figuring out how to make it happen
- Follow-up

Critique

- Structured brainstorming about current problems at work
- Everyone gets a chance to speak
  - Time can be restricted, for example, to 30 secs.
- Statements are recorded, and then grouped into a number of themes

Fantasy

- Problem themes are inverted to generate positive ideas for the future
- “No statement about the future is considered too extreme - if somebody wants it, it’s OK”
- Positive visions are grouped under a number of themes
- Themes are selected to develop “utopian outlines” - idealistic visions of how things might work in the future

Implementation

- Use utopian outlines as a starting point
- Envision the resources, systems and organizational changes required to make the vision a reality
- Plan how to access those resources, build the systems and gain consensus around the required organizational changes

Organizational Games

- "Act out" alternate work organizations and confront problems that arise
- Use mock-ups and prototypes
- Metaphor of acting in a play
  - Playground - where the action occurs
  - Roles - that various actors play
  - Situation cards - introduce particular breakdowns
  - Commitments - actions taken by actors in response to specific situations
  - Conditions - requirements for taking these actions
  - Action plan - how to propose the idea to the rest of the organization and make it happen

Cooperative Prototyping

- Learning for the designer, as well as for the user
- Users can understand the potential of technology to impact work, and envision realistic future scenarios
- Users and designers cooperatively envision new designs, and inform each other's perception of their practicality and utility
- The final result is not a surprise!

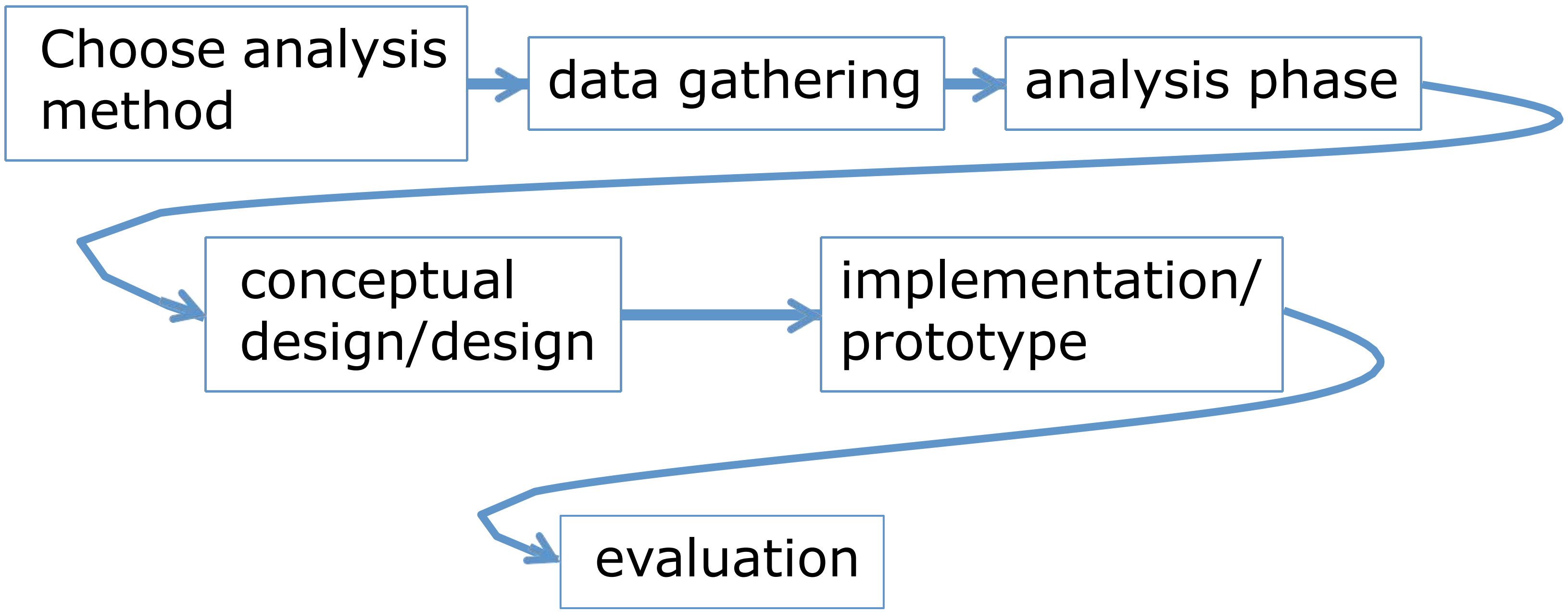
Mock-up Design

- Mock-ups and lo-fidelity prototypes provide hands-on experience with new situations
- Everyone has the knowledge and tools (pens, scissors, etc.) to make modifications
- Everyone understands their limitations
- They can be made cheaply
- They are fun to use and modify

Limitations of PD

- Close collaboration between users and developers
  - Physical proximity
  - Resources and time to support collaboration
  - Does not address Internet-based systems
- Strong organization of labour helps
  - Unions a possible support for involving users
  - To access the “right” users
  - Users not comfortable with articulating desires
  - Users disappointed when visions are not realized
- Not all systems are workplace-based
  - What about consumer technologies?
  - What about systems for fun, or communication?
- PD ideology must be adapted for dealing with variations

The design process



People

- Gro Bjerknes
- Jeanette Blomberg
- Tone Bratteteig
- Susanne Bødker
- Pelle Ehn
- Joan Greenbaum

Summary

- Users represented in design team
- No single set of methods and technologies
- Appropriate for workplace systems development
- Designers as coordinators and usability experts

USABILITY TESTING

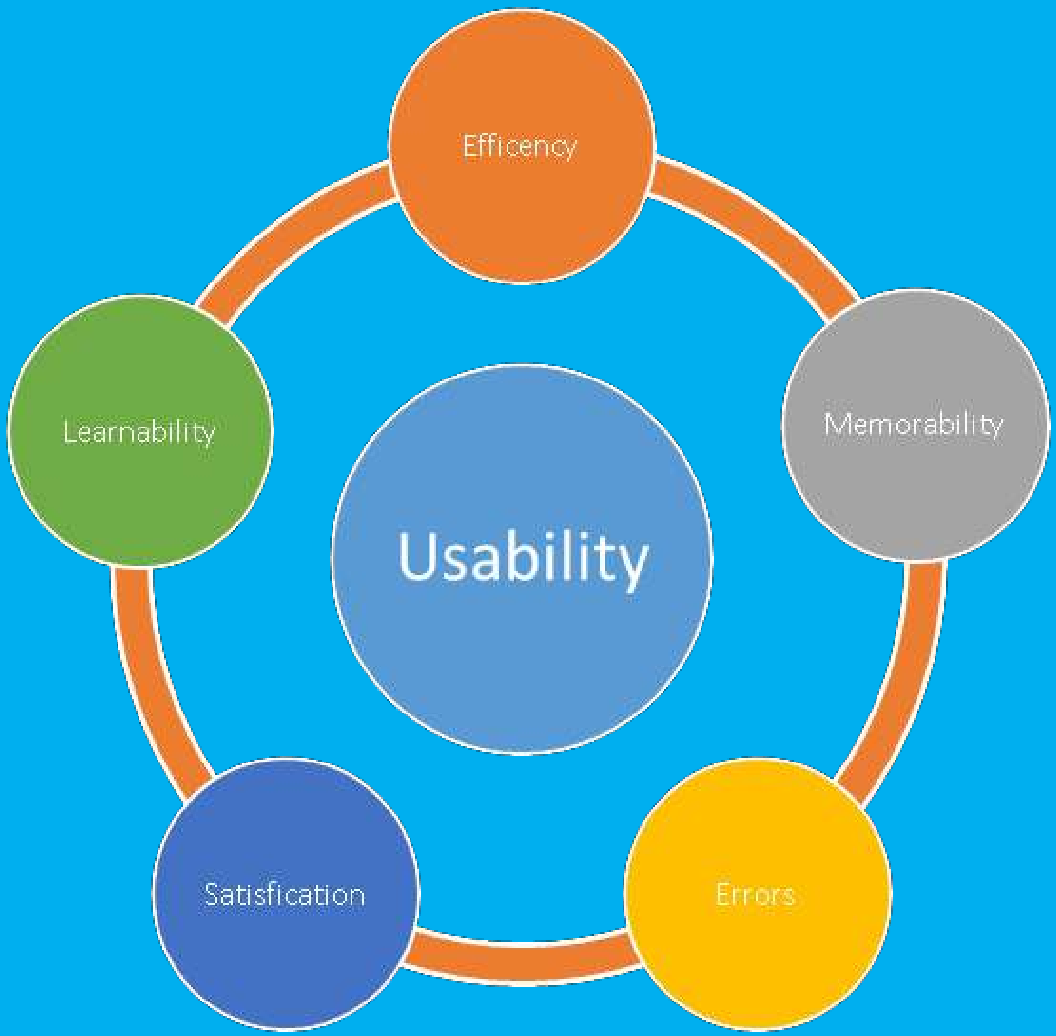
Topic Agenda:

- Introduction of Usability
- Usability Components
- Benefits of usability
- Usability testing
- Usability testing Methods
- Usability Tools And On-line Services
- Usability Principles
- Testing Process
- Conclusion

Introduction of Usability:

- The extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency and satisfaction in a specified context of use
- Usability=Usable + Usefulness
- Usefulness= Usability Components

Usability Components



Usability Components

- **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 re establish 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?

Why Usability is important?

- It will help to know Customer expectations to company
- Reduce the Possibilities to Lose the Customer
- Reduced development time and costs;
- Reduced support costs;
- Reduced user errors;
- Reduced training time and costs;
- Return on Investment

Benefits from usability for users

- User will be satisfied, not frustrated, with the web site or product;
- User will enjoy interacting with the web site or product;
- User will achieve their goals effectively and efficiently;
- User will cultivate confidence and trust in the product or web site.

Usability Testing:

What is Usability Testing?

- Usability testing is an effort to ascertain the deg software has met t needs of its intended userbase
- Usability is difficult to evaluate and measure
- Usability testing is the best way to understand how real users experience your website or application.
- The process of learning about users from users, but observing them using a product to accomplish specific goals of interest to them

Usability Testing Methods:

- Hallway testing
- Remote usability testing
- Expert review(Cognitive Walkthrough)

Formal Method:

- Formal testing might entail building a usability testing lab, equipping it with an array of computers, audio-video equipment, then staffing it with psychologists, technicians, and human-computer interaction specialists.

Informal Method:

- No Lab Required
- Asimple test plan and task list are prepared, notepad and pencil
- The advantage is that informal testing looks at what people actually do when they are doing real work in an ordinary setting

Usability Testing Tools:

- Silverback
- Morae
- Userzoom
- Camtasia

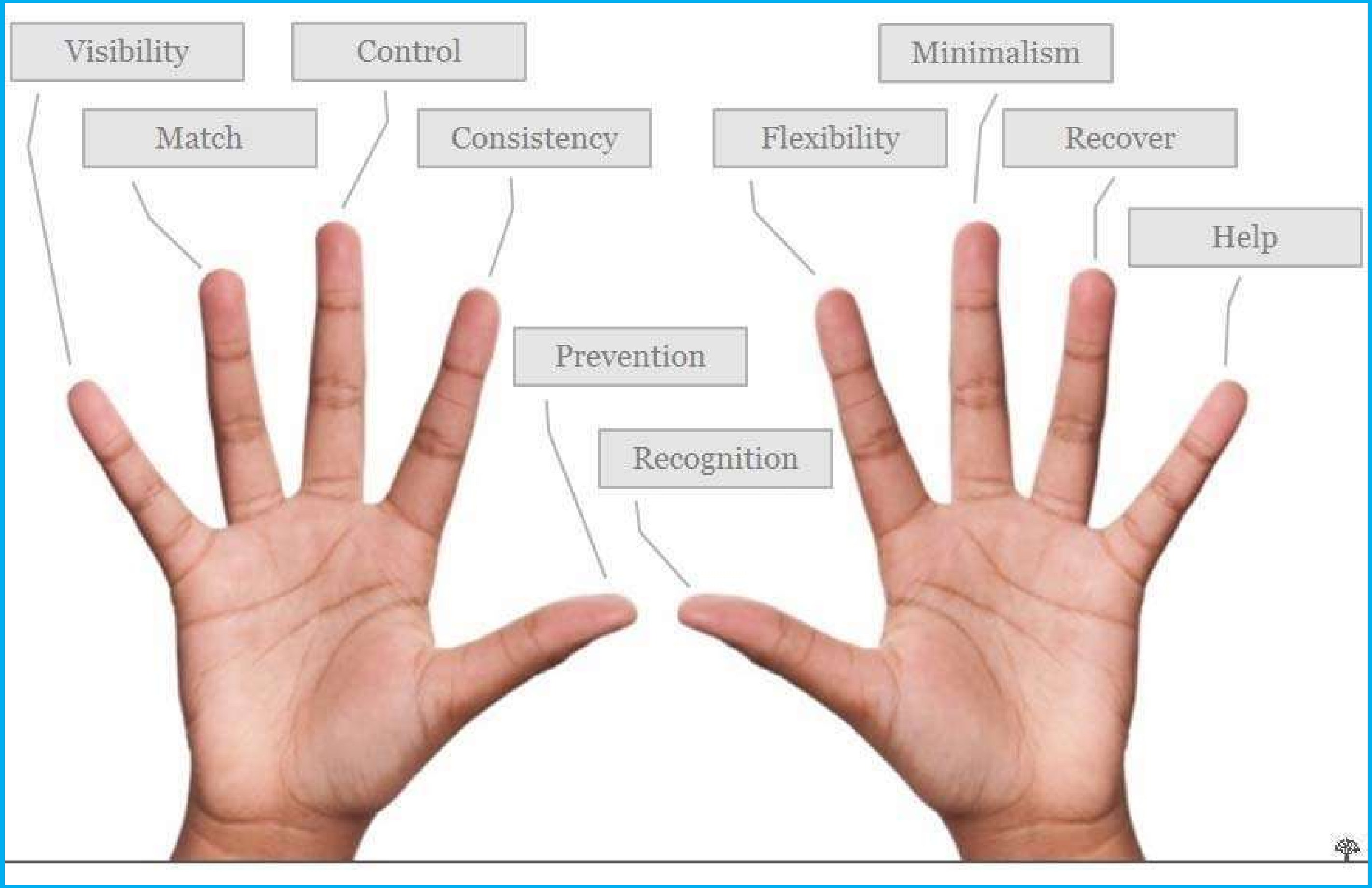
Website Usability Tracking and Analytics:

- Crazy Egg
- Clicktale
- Usabilia
- Ghostrec
- GTMetrix

Online Usability Testing Services:

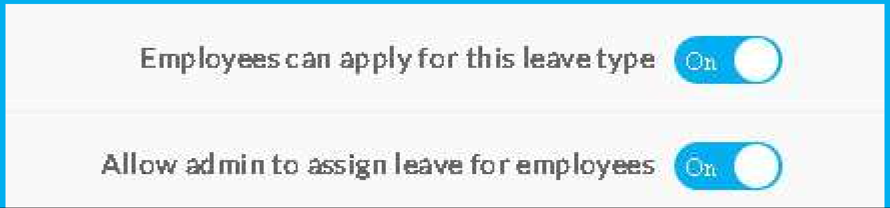
- Usertesting.com
- Feedbackarmy
- Utest
- Loop11
- Trymyui

Usability Principles:



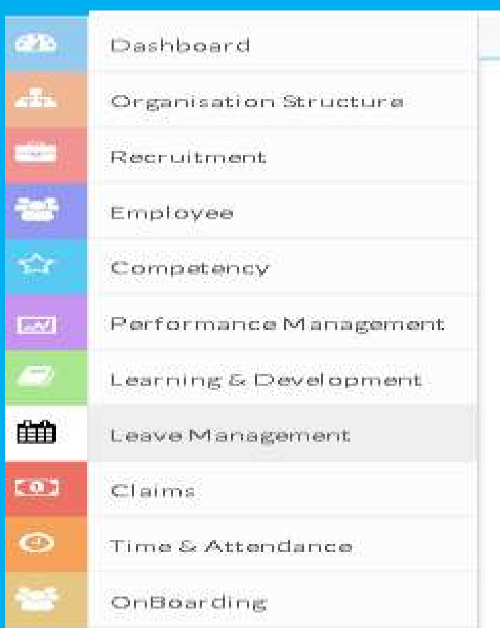
Visibility of system status(Feedback):

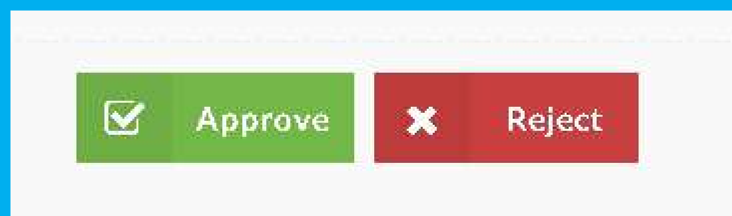
- The system should always keep the user informed about what is going on through appropriate feedback within reasonable time; communicate clearly with the user
- **Examples:** Progress bars (either in line format or in a “step 1 out of 3” format), hour glass, breadcrumbs, confirmation messages

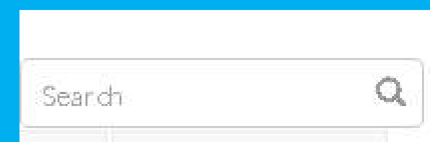


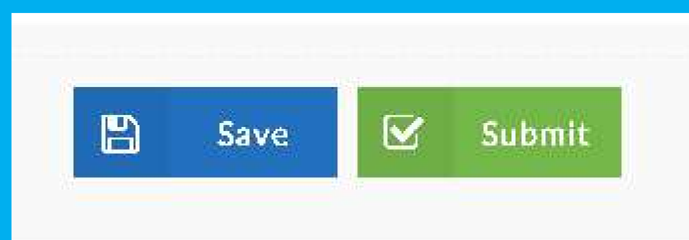
Match between system and the real world(Metaphor):

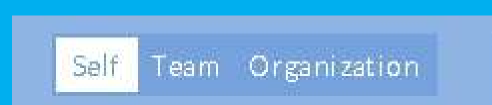
- The system should speak the users language, with words and concepts that are familiar to the user make sure the user understands what you are talking about.
- **Examples:** File-folder tabs for navigation, correct labels for buttons or text boxes associated with the industry / target audience.





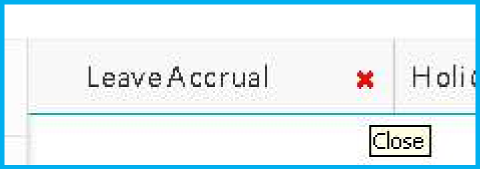


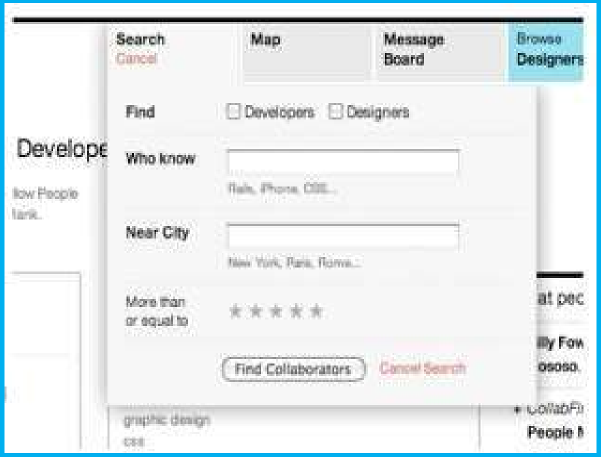




User control and freedom(Navigation):

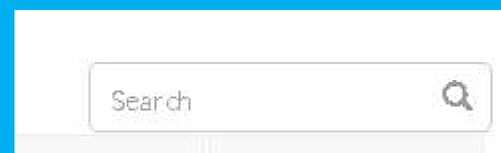
- users make mistakes and need an "emergency exit" to get back to where they want to be, as fast as possible.
- **Examples:** “Go back” button, “Undo” button, “Remove from Cart” button, “Close Window” button

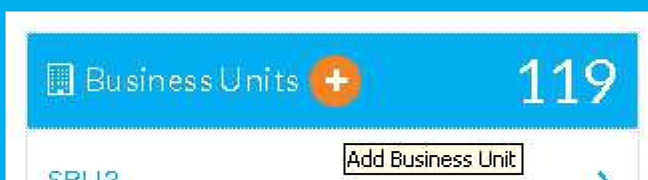


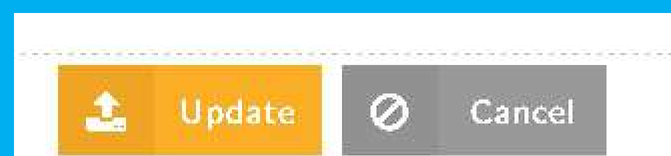


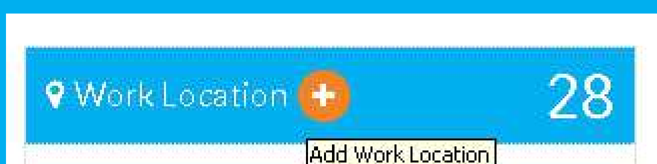
Consistency and standars(Consistency):

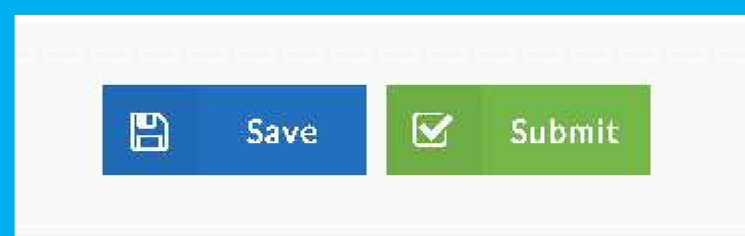
- Always make sure that your system has continuity across your platform.
- **Examples:** differently coloured links (to some extent), links indistinguishable from copy, unconventional navigation, buttons called “find this” instead of “search”, instead of Delete “Remove”.

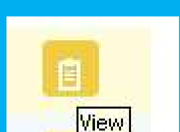


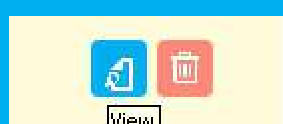






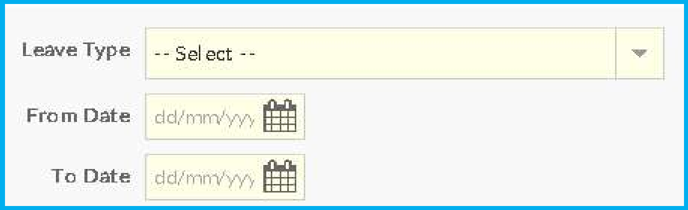


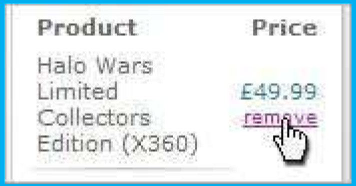


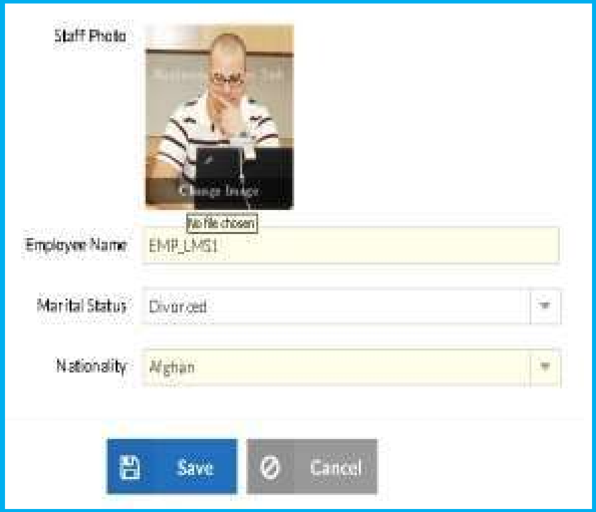


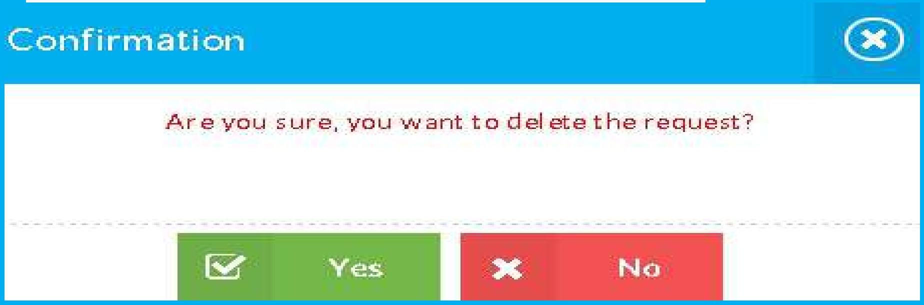
Error prevention(Prevention):

- The best designs don't only have great error recovery, but prevent users from making those errors.
- **Examples:** displaying which fields are mandatory, form validation, giving clear instructions during checkout, “Are you sure?” messages, clear labels (i.e. “Checkout”)



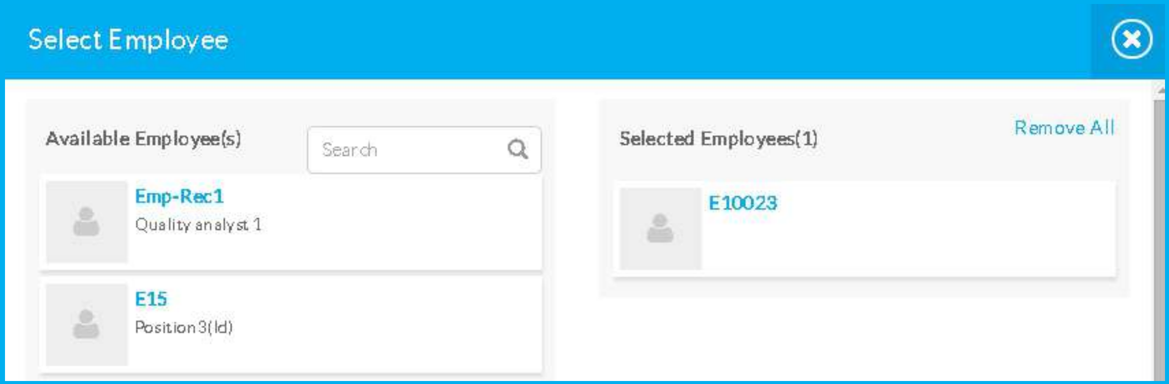






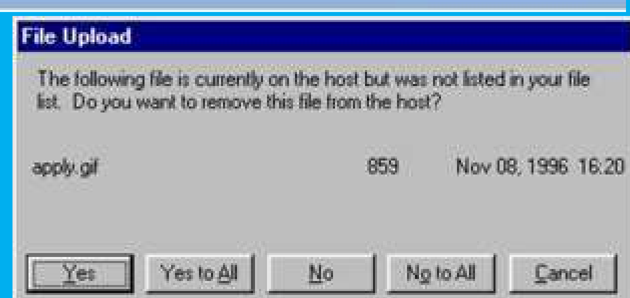
Recognition or recall(Memory):

- systems should minimize the user's memory load by making objects, actions and options more visible.
- **Examples:** “please select from a list of options” drop-down, “Did you mean…” in search results, tool-tips or help icons



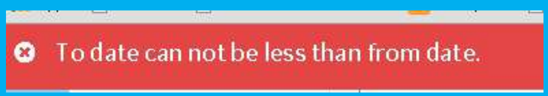
Flexibility and Efficiency of use(Efficiency):

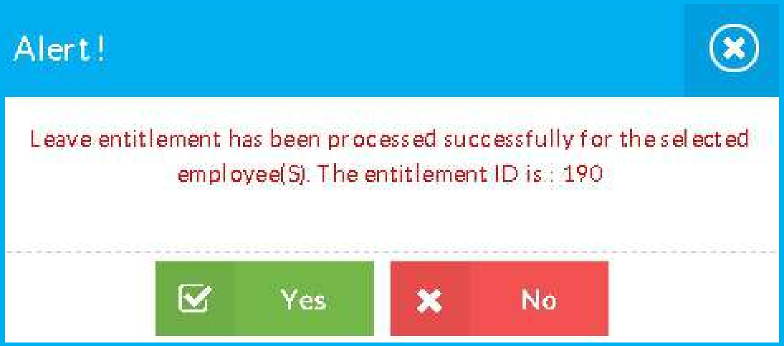
- systems should incorporate accelerators, which are unseen to the novice user, but that allow the expert user to navigate faster with frequent actions.
- **Examples:** quick-links, “saved searches”, “items you recently looked at”, “save query for later”



Aesthetic and minimalist design(Design):

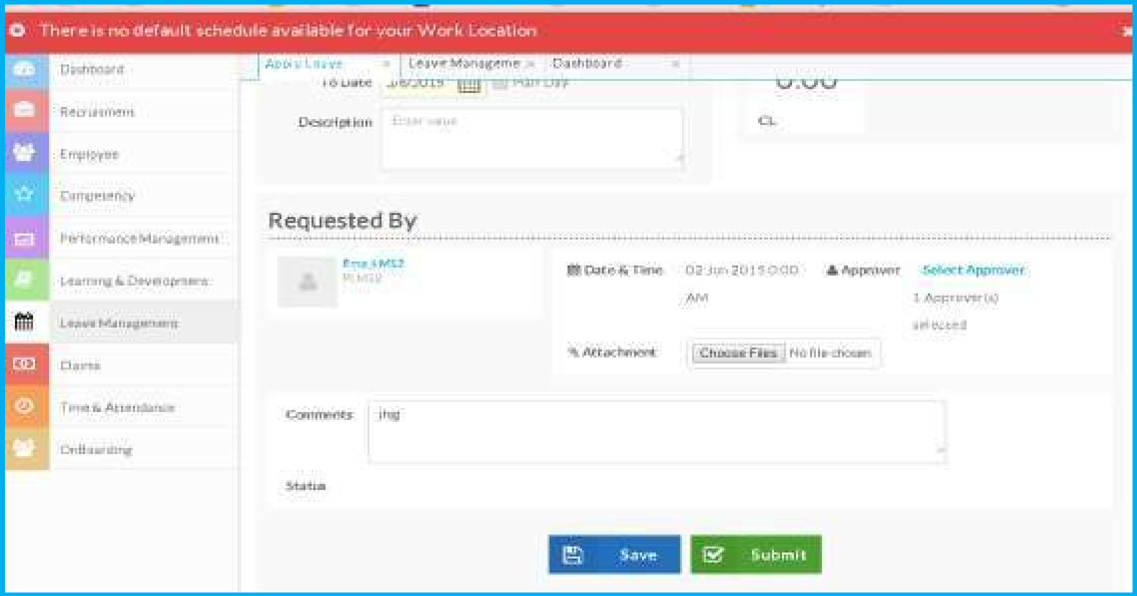
- Dialogues should not contain irrelevant information; always make sure your system is aesthetically pleasant and efficiently composed.
- **Examples:** reducing clutter, clear call to actions, no annoying flashing eye-candy





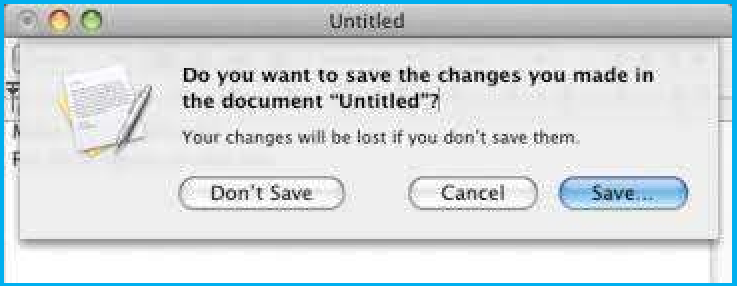
Help users recognize, diagnose and recover from errors(Recovery):

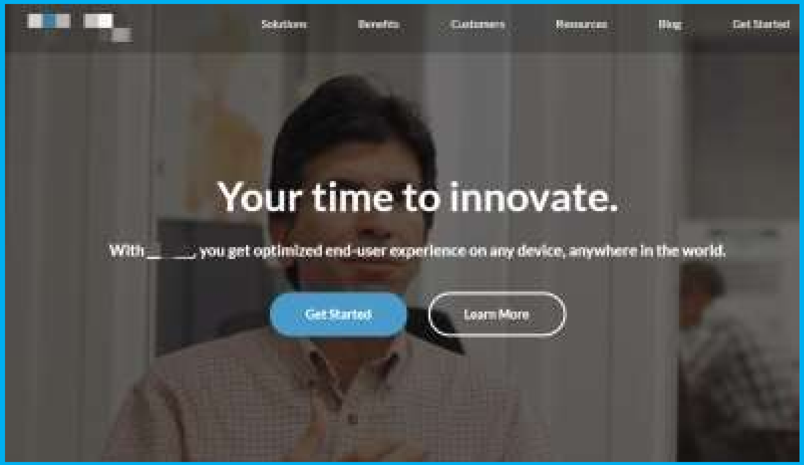
- Error messages should be expressed in plain language, and precisely indicate the problem.
- **Examples:** Useful error messages ("Your password is incorrect, please ensure your CAPSLOCK key is off"), Form validation highlighting the error field, related links ("Did you mean…")

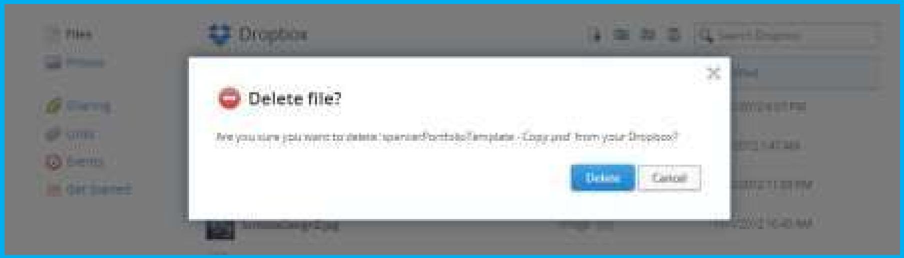


Help and documentation(Help):

- Even though the system can be used without documentation, it may be necessary to provide it.
- **Examples:** FAQs, "?" icons, advanced search, clear labels on form fields and sections, pop-up help, online / live chat







Usability Test Scenarios:

- Web page content should be correct without any spelling or grammatical errors
- All fonts should be same as per the requirements.
- All the text should be properly aligned.
- All the error messages should be correct without any spelling or grammatical errors and the error message should match with the field label.
- Tool tip text should be there for every field.
- All the fields should be properly aligned.
- Enough space should be provided between field labels, columns, rows, and error messages.
- All the buttons should be in a standard format and size.
- Home link should be there on every single page.
- Disabled fields should be grayed out.
- Check for broken links and images.
- Confirmation message should be displayed for any kind of update and delete operation.
- Check the site on different resolutions (640 x 480, 600x800 etc.?)
- Check the end user can run the system without frustration.
- Check the tab should work properly.
- Scroll bar should appear only if required.
- If there is an error message on submit, the information filled by the user should be there.
- Title should display on each web page
- All fields (Textbox, dropdown, radio button etc.) and buttons should be accessible by keyboard shortcuts and the user should be able to perform all operations by using keyboard.
- Check if the dropdown data is not truncated due to the field size and also check whether the data is hardcoded or managed via administrator.

Testing Process:

- Plan And Prepare
- Find Participants
- Conduct Session
- Analyze Results
- Make Recommendations

Conclusion

- In general, Usability is difficult to evaluate and measure
- Usability often may not explicitly be identified as part of the user requirements, nor form part of a product specification.
- To Satisfy Customer ,usability Testing is important

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Thank You!

Social Impact Statements:

Engaging Public Participation in Information Technology Design

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"The real question before us lies here: do these instruments further life and enhance its values, or not?" - Mumford (1934) p. 318

ABSTRACT

Computers have become an integral part of our everyday lives. Banks, airlines, motor vehicle administrations, police departments, Social Security, and the Internal Revenue Service all depend on computers. From their introduction, people have questioned the impact computers will have on society. We believe it is our responsibility as system designers to achieve organizational goals while serving human needs and protecting individual rights. The proposed Social Impact Statements (Shneiderman, 1990) would identify the impacts of information systems on direct and indirect users, who may be employees or the public. This paper proposes a framework for implementing Social Impact Statements for federal and local government agencies and regulated industries, with optional participation by the other privately held corporations. A Social Impact Statement should describe the new system and its benefits, acknowledge concerns and potential barriers, outline the development process, and address fundamental principles. Examples from our work with the Maryland Department of Juvenile Justice are offered.

KEYWORDS: Social impact, Public participation, Design

INTRODUCTION

From its inception, people have been pondering the impact computers will have on society and on the image individuals have of themselves (Wiener, 1954; Sterling, 1974). Many analysts believe the social repercussions of computers may be as potent as those of the automobile and the telephone (Kling, 1980; Dunlop & Kling, 1991; Huff & Finholt, 1994).

Information systems are increasingly required to manage the government, utilities, and public services that citizens in modern societies have come to expect. But many critics have pointed out the negative effects of modern technologies: "technological evolution is leading to something new: a worldwide interlocked monolithic, technical-political web of unprecedented negative implications. And it is surely creating terrible and possibly catastrophic impacts on the earth" (Mander, 1991).

This negative view does not help in shaping more effective technology or preventing damage from technology failures. Constructive criticism and guidelines for design could be helpful in reversing the long history of disruptions in telephone, banking, or charge card systems, dissatisfaction with privacy protection or incorrect credit histories, dislocation through deskilling or layoffs, and deaths from flawed medical instruments. While guarantees of perfection are not possible, we believe that policies and processes can be developed that will more often lead to satisfying outcomes.

This hopeful stance was part of a larger argument about taking responsibility for shaping the future (Shneiderman, 1990). The Declaration of Responsibility stated that: "We, the researchers, designers, managers, implementers, testers, and trainers of user interfaces and information systems, recognize the powerful influence of our science and technology. Therefore we commit ourselves to studying ways to enable users to accomplish their personal and organizational goals while pursuing higher societal goals and serving human needs."

The second part of the Declaration proposed writing a Social Impact Statement (SIS), similar to an Environmental Impact Statement (Battle, Fischman, & Squillace, 1994). The goal is a high quality system whose design is discussed early and widely, thereby uncovering concerns and enabling stakeholders to openly state their positions. Such open discussions might improve quality which should lead to increased system acceptance. Of course there is the danger that these discussions will elevate fears or force designers to make unreasonable compromises, but these risks seem reasonable in a well-managed organization. The practicality of writing SISs was addressed by Huff (1995) who used them as a teaching tool.

This paper focuses on SISs as a tool to engage public participation in information technology design. First, we outline a framework for implementing a SIS:

1. Preparation

2. Evaluation

3. Enforcement

and then present a list of Social Impact Issues:

1. Describe the new system and its benefits.

1.1 Convey the high level goals of the new system.

1.2 Define the stakeholders.

1.3 Identify specific benefits.

2. Acknowledge concerns and potential barriers.

2.1 Anticipate changes in job functions and potential layoffs.

2.2 Address security and privacy issues.

2.3 Avoid potential biases.

2.4 Recognize needs for more staff, training, and hardware.

2.5 Propose plan for backups of data and equipment.

3. Outline the development process.

3.1 Present an estimated project schedule.

3.2 Propose process for making decisions.

3.3 Discuss expectations of how stakeholders will be involved.

3.4 Outline plan for migrating to the new system.

3.5 Describe plan for measuring the success of the new system.

4. Address fundamental principles.

4.1 Weigh individual rights vs. societal benefits.

4.2 Assess trade-offs between centralization and decentralization.

4.3 Preserve democratic principles.

4.4 Ensure diverse access.

4.5 Promote simplicity and preserve what works.

FRAMEWORK

We propose a three stage framework for implementing a SIS. First, the SIS is prepared by system designers within the organization (or contracted by the organization), then presented to the stakeholders and the appropriate review panel for evaluation. Once approved, it must be enforced. Our goals are to encourage maximum participation in the review process by structuring the document, limiting its size, and controlling its complexity.

1. Preparation

The SIS should be produced early enough in the development process to influence the project schedule, system requirements, and the budget. It should be developed by the system design team which may include end users, managers, internal or external software developers, and possibly clients. Even for complex systems, the SIS should be of a size and complexity that it is understandable by users with relevant background. Some practical alternatives are to focus on those issues that seem the most dangerous or those that seem key to the system's success.

2. Evaluation

After the SIS is written, it is evaluated by the appropriate review panel plus management, other designers, end users, and anyone else who will be impacted by the proposed system. Potential review panels include federal government units (e.g. General Accounting Organization, Office Personnel Management), state legislatures, regulatory agencies (e.g. SEC, FAA, FCC), professional societies, and labor unions (Table 1).

Organization	Review Panel
Government agencies (e.g. IRS, Social Security)	Inspector general, GAO, OPM
State government agencies (e.g. motor vehicles, courts)	State legislative bodies
Public utilities (e.g. phone, electricity)	Review boards
Regulated industries (e.g. banking, airlines)	Regulatory agencies (e.g. SEC, FAA, FCC)
Commercial industry (optional) (e.g. Microsoft, IBM)	Board of directors, management
Research groups (optional) (e.g. universities, R&D labs)	Professional organizations (e.g. ACM, IEEE)

Table 1. Organizations and appropriate Review Panels

The review panel would receive the written report, hold public hearings, and request modifications. A group of knowledgeable authorities might be assembled for consultation. Private citizen groups would also be given the opportunity to present their concerns and suggest alternatives (Wurth, 1992).

3. Enforcement

Once the SIS is adopted, it must be enforced. A SIS serves to document the "intentions" of the new system and the stakeholders need to see those "intentions" backed up by actions. Typically, the review panel is the proper authority for enforcement. There needs to be a recognized cost to the organization for not adhering to the SIS.

DEPARTMENT OF JUVENILE JUSTICE

We are working with the Maryland Department of Juvenile Justice (DJJ) on redesigning their information system, ISYS (Information System for Youth Services). ISYS is a terminal-based system used by approximately 600 workers to support the processing of 50,000 juvenile case referrals per year. The next generation system, NISYS, will run on PCs in a windows environment.

The NISYS redesign effort has raised several social impact issues. Who should be allowed to see a juvenile's case history? How will the handling of the youths be effected? How will jobs be changed? As the user interface designers, it has been our responsibility to consider the impact of our designs on DJJ, the citizens of Maryland, and the youthÕs served. The executive staff of DJJ will be responsible for reviewing and accepting our designs, and finally for enforcing them. By offering examples related to our work, we hope to inspire others to consider the impacts of their designs.

SOCIAL IMPACT ISSUES

A SIS should discuss the effects a new system will have both within the organization and on society at large:

describe the new system and its benefits,

acknowledge concerns and potential barriers,

outline the development process, and

address fundamental principles.

We recognize that the issues discussed are not complete, rather they are meant to prompt insightful dialogue about the contents. It is difficult, if not impossible, to enumerate all of the potential impacts a new system. To help in this effort, Markus (1984) defines a framework that identifies the potential impacts that different kinds of systems are likely to have.

1. Describe the new system and its benefits.

A SIS should begin by describing the proposed system and its goals. This includes identifying who will be impacted and specifying the benefits they will receive.

1.1 Convey the high level goals of the new system.

In order to be effective evaluators, stakeholders need to understand the purpose of the new system. A brief system description should be provided and the goals should be enumerated. The goals may range from reducing costs to improving worker morale to meeting new legislative requirements.

DJJ: The next generation ISYS, NISYS, will be an integrated software system designed to support juvenile case tracking for DJJ operations. The primary goal is to increase the availability of staff to serve the youths and their families by reducing the time that front-line workers spend on administrative tasks, improving the quality of decisions, and the timeliness and accuracy of the data. A secondary goal is to improve the communication of DJJ personnel across divisions.

1.2 Define the stakeholders.

A stakeholder is anyone who will be affected, directly or indirectly, by the new system like the end users, the software staff, and the organization's clients. Those interacting directly with the system are considered primary stakeholders; secondary stakeholders interact indirectly. A motor vehicle licensing officer using a computer system is considered a primary stakeholder while the driver applicant is a secondary stakeholder. This classification does not reflect the degree to which the stakeholder is impacted. For example, incorrect information might cause the applicant's license request to be rejected. Explicitly defining the stakeholders alerts designers to unanticipated impacts which may be biased towards certain stakeholders (Friedman & Nissenbaum, 1995).

DJJ: For NISYS, the primary stakeholders include the DJJ personnel who will use the system, such as the case managers and supervisors, and the MIS staff that will support the new system. The secondary stakeholders include the youths and their families, the victims, other state agencies, and the citizens of Maryland. The information contained in NISYS will directly influence how DJJ interacts with the youths.

1.3 Identify specific benefits.

"A critical factor for successful implementation of any innovation is that its benefits be construed as benefits by the potential adopters (Kaplan, 1994)." The benefits may include reduced costs, faster performance, shorter learning times, reduced errors, and increased user satisfaction and they differ by stakeholder. For example, an organization may be interested in reducing costs while employees may be more interested in reducing the workload. In order to motivate all stakeholders, the potential benefits for each must be described. The "benefits to the organization as a whole may not be sufficient motivation (Kaplan, 1994)."

DJJ: As an organization, DJJ will benefit from NISYS's ability to gather the data needed to obtain funding from the state and federal legislation in a timely fashion. NISYS will reduce the time front-line workers spend on administrative tasks by automatically generating required letters and reports. Most importantly NISYS will allow workers to focus more of their time and attention to working with the youths and their families in an attempt to reduce the rate of recidivism in Maryland.

2. Acknowledge concerns and potential barriers.

Identifying potential problems and concerns early in the development process allows an organization to manage them more effectively and minimize harmful rumors. Open and honest discussion about these problems benefits all stakeholders.

2.1 Anticipate changes in job functions and potential layoffs.

Change is a major cause of stress because it causes uncertainty. Using the SIS to describe anticipated changes can help reduce speculation and fear plus it allows an organization to manage them proactively (Kaplan, 1994). Stakeholders are most concerned with negative impacts such as layoffs, demotions, decreased skill requirements, and potential health problems. However, not all change is bad. Some positive changes may include enlarged job roles, new employment opportunities, increased wages, and flexible working arrangements (Ralls, 1994). It is hard to guess how some changes will impact an organization. Marcus (1984) discusses how changes in work flow can affect communication, socialization (involvement vs. isolation), and loyalties.

Today, job security is a major concern. When considering layoffs, organizations should weigh the consequences both to society and to individuals. Sterling (1974) points out that the cost of finding employment for those laid off is met by society not the organization and there is no way to measure the loss to individuals who are forced into less satisfactory employment. Iacono and Kling (1991) illustrates this point with the example of long distance operators whose jobs became less satisfying because their jobs became more automated and required less skill.

DJJ: In several offices, case referrals are being entered into ISYS by clerical staff. The NISYS design team is investigating techniques for facilitating electronic data entry. Some possibilities include scanning in the case referrals or having the police departments transfer them electronically. Both these techniques would drastically reduce the role of the clerical staff, who might be trained as case workers or as administrative assistants.

2.2 Address security and privacy issues.

Before computers, it was easier to physically lock away and secure information. Today, information can be collected and misused without ever violating physical barriers (Ladd, 1991). There are several measures that can be taken to secure electronic data including isolating computers (no network access), isolating networks (no internet access), requiring passwords, encryption protection, and monitoring logins. The method chosen should be appropriate to the criticality and confidentiality of the data.

Information systems should only collect the data needed. To apply for a driver's license, an applicant should not have to provide their annual income. Storage space has become increasingly affordable so more organizations are maintaining huge databases, often containing irrelevant information. An organization's desire to collect data about its clients or employees may be in conflict with an individual's right to privacy. One compromise is to store aggregate data (e.g. average number of logins per day for all employees) rather than individual data (e.g. number of times John logged into system).

A conflicting issue is accountability. Users should be responsible for their actions. The question is how to do this without violating their privacy. One approach is to keep a log of changes and when they were made so authorship is not as important. A user's identity would only be recorded for critical functions, like deleting a record.

DJJ: Since the juvenile data, especially the medical information, is confidential, there is an ongoing discussion of whether or not NISYS should be connected to outside networks. DJJ is trying to decide whether or not the benefits of network access outweigh the potential security risk. Another discussion is about what information should be recorded for each youth. The information necessary depends primarily on how the case is handled. If a youth is never placed in a DJJ facility, does medical information need to be collected?

2.3 Avoid potential biases.

Most system designs contain biases, both intentional and unintentional, but well-designed systems can limit these biases (Friedman and Nissenbaum, 1995). Functionality may be biased toward select groups of stakeholders, certain data may foster biased judgments, and some display techniques may encourage hasty decisions. For instance, an airlines reservations systems showed clear bias by always putting one airline's flights first. Unfortunately, it is not possible to avoid all biases, but thoughtful designs can minimize them.

DJJ: There are several sources of potential bias with respect to how a youth is treated. For example, who should know if a youth is HIV positive? The medical staff needs to know to treat the youth but do the cases workers need to know? Should the victim that was attacked be told? Also, what should happen to cases that are found not guilty? Should they still appear on the youth's record? If so, aren't they a source of bias? Also, the youth records naturally focus on negative behavior, but shouldn't equal attention be given to positive behavior (e.g., getting a job or staying drug free)?

2.4 Recognize needs for more staff, training, and hardware.

A successful system requires more than functioning software. Additional software staff may be needed, users may require formal training, and more hardware may be required to provide adequate access. Inadequate training and education are typical reasons new systems do not achieve their potential. ÒManagers in too many organizations still perceive people and technology as substitutes, rather than complements. They invest in technology, but too often neglect to invest in the people who operate and use the technology (Ralls, 1994)."

DJJ: The failure of ISYS is due in large part to the lack of machines and inadequate training. For NISYS, DJJ is planning on significantly increasing the number of machines. Additional MIS staff may be required to handle the increase maintenance responsibilities. Formal training is another key especially since NISYS is expected to run in a windows environment and most DJJ employees have little experience, if any, in a windows environment.

2.5 Propose plan for backups of data and equipment.

Unfortunately, all systems have the potential to fail. These failures can cause loss of business and productivity or possibly catastrophes resulting in loss of life. Organizations have the moral responsibility to take the steps necessary to minimize the impact these failures have on individuals and on society in general. A standard practice to protect data is to back it up periodically. For critical systems, like air traffic control systems, a backup system should be in place.

DJJ: Procedures to perform routine backups to protect against data loss will be needed. In case of a long term failure, DJJ should also have a backup paper system in place so case processing can continue. A youth's processing should continue even when the system fails.

3. Outline the development process.

The development process can have a significant impact on an organization. Work routines are disturbed, critical decisions need to be made, and training may be required. Outlining the process allows everyone involved to anticipate disruptions and plan accordingly.

3.1 Present an estimated project schedule.

The project schedule should outline the basic development stages, such as requirements generation, design, and implementation, and estimate how long each will take. The idea is to provide the stakeholders with a rough idea of what to expect and when. Keeping the stakeholders abreast of what is happening enhances their satisfaction with the entire process.

DJJ: The NISYS project is currently in the requirements generation and early design phase. The Request for Proposals (RFP) is scheduled to be ready by July 1, 1996. Once a contract is awarded, it is anticipated that it will be two years until initial product roll out.

3.2 Propose process for making decisions.

A component of any development process is making decisions. Hardware needs to be chosen, functionality needs to be decided on, and the user interface needs to be designed. A SIS should outline the process for obtaining input and making decisions. Assuming a democratic process, each stakeholder would be given a vote. In some cases, an executive review committee might be a more practical alternative. In any case, the process should include informing the stakeholders about the resulting decisions including the motivation behind these decisions and the reason for rejecting proposed alternatives.

DJJ: Final decisions about the NISYS design will be made by upper management with input from their staff. It will the University of Maryland's responsibility to present alternative designs and perform usability tests where appropriate.

3.3 Discuss expectations of how stakeholders will be involved.

Each stakeholder is interested in what is expected of them personally. Their involvement might consist of filling out questionnaires, participating in usability studies, and receiving training. Or, it might consist of procuring hardware, writing contracts, and analyzing user feedback. The SIS should explain what is expected and whether participation is voluntary or mandatory. If participation is voluntary, explain how volunteers will be chosen. All stakeholders should be given the opportunity to participate in the development process. Active participants will probably be more satisfied with the resulting system than those who are not.

DJJ: Users will be encouraged to be active participants in the design process. Specifically, users will be asked to fill out questionnaires, participate in interviews, review user interface designs, and produce process maps.

3.4 Outline plan for migrating to the new system.

Migrating to the new system requires careful planning. Users may require training, the software staff may need to perform backups, and hardware may need to be installed. An evolutionary approach of smaller more manageable steps is preferable to the "flip the switch" approach (Kaplan, 1994). A backup plan should be in place in case the new system fails during migration or the transition takes longer than anticipated. Another issue to consider is how long the old system and the new system will overlap because the work load during this period will be increased.

DJJ: In order to familiarize their employees with graphical window environments, DJJ plans to provide courses in PC applications, such as word processors and spreadsheets. A training lab is currently under development. Formal training for NISYS will also be provided. Ideally, some PCs would be deployed early so users could begin integrating them into their work life. Unfortunately, state procurement practices may make this difficult.

3.5 Describe plan for measuring the success of the new system.

Often times, stakeholders are left wondering if the system goals were ever achieved. The success or failure of the system to meet specific goals should be conveyed to the stakeholders along with the plan for correcting any shortcomings. Specific goals, like reduce the amount of paper used by ten percent, can be measured over time. More subjective goals like, improve user satisfaction, can be evaluated by administering questionnaires.

DJJ: The Questionnaire for User Interaction Satisfaction (QUIS) (Chin, Diehl, & Norman, 1988), was administered to 332 employees to measure user satisfaction with ISYS. Using this as a benchmark, the QUIS could be readministered to measure the success of NISYS.

4. Address fundamental principles.

As we continue to develop systems on the forefront of technology, we must strive to serve human needs by addressing fundamental principles.

4.1 Weigh individual rights vs. societal benefits.

There are times during system design when individual rights conflict with societal benefits. When developing new technologies, it is the obligation of the SIS authors to weigh alternatives, for example, it was recently decided that tax records could be searched to locate individuals who refused to pay child support.

DJJ: While a youth's record is confidential, case workers are entitled to know if the youth they are dealing with has a violent history, but should future school teachers, neighbors, or employers be entitled to this information?

4.2 Assess trade-offs between centralization and decentralization.

Centralization vs. decentralization is a long running debate about whether computer systems will result in decisions being made by a few select people (centralization) or by broader more diverse groups (decentralization) (George & King, 1991). For example, a decentralized system gives more control to the end users, while a centralized system ensures consistent policies. However, with control also comes responsibility which needs to be delegated. For example, will end users be responsible for backing up their personal data or will additional software staff be hired to do this? A SIS should assess the trade-offs and choose the approach that best suits the needs of the organization and society.

DJJ: Internally, DJJ is wrestling with the desire to empower their workers by giving them more control (e.g., letting them create their own customized reports, etc.) without burdening them with additional responsibility (e.g. data backups). Another question is if NISYS automatically generates reports who should be responsible for requesting that function. Should workers continue to generate the reports and forward them to their supervisors or should the supervisors simply generate the reports themselves?

4.3 Preserve democratic principles.

Successful system design depends, in part, on active user participation and unless users are given a vote, it can be difficult to motivate them to participate. Giving users a "vote" requires management to relinquish some control. This does not mean that users should be given full control over the system design. For example, management may give users control over certain system aspects but within a budget they define. While the ideal may be a democracy, the hierarchical nature of many organizations makes this difficult.

4.4 Ensure diverse access.

It is very common to see the phrase "Equal Opportunity Employer" on job announcements. Unfortunately, very few systems provide equal access. Ideally, systems should be designed to meet everyone's needs: young, old, handicapped, rural, foreign, etc. While it may not be practical to design systems that accommodate everyone, this should not excuse designers from considering alternative designs that satisfy wider audiences. A SIS should outline an organization's policy on ensuring equal opportunity and define the intended users of the system. In some cases, an organization may choose to provide alternative systems to ensure diverse access.

DJJ: Within DJJ there is an employee with impaired vision and another with impaired motor coordination. While NISYS will not directly incorporate functionality to accommodate these individuals, different input devices will be investigated, time permitting.

4.5 Promote simplicity and preserve what works.

Designers should be careful not to overlook simple solutions. Today, with technology advancing rapidly, we often get carried away with integrating the latest breakthroughs into our system designs. It is important recognize when certain technology works and when it does not. If organizations have devised good ways of handling their needs, then incorporate them into the new system. Designers should acknowledge and preserve what works, not reinvent solutions.

DJJ: One of the design goals of NISYS is that it is not so complex that users have to constantly refer to technical manuals and look up obscure codes. The basic functionality of ISYS is a good starting point for NISYS (e.g., add a case, add a placement, add a review, etc.). Currently, many factors, such as the user interface and accessibility problems, make it difficult to perform these functions, but these functions still reflect DJJÕs needs.

CONCLUSION

In 1974, Sterling recognized that "systems will not become humanized on their own without the conscious effort of concerned citizens.Ó Incorporating SISs into the development process would be one step toward achieving that goal. In our society, success is too often measured in terms of immediate costs: ÒThe utility of humanizing procedures is not apparent from cost/benefit calculations but arises from the point of view of quality of life - not only of our own but also of future generations who will be saddled with the systems which are designed and implemented today (Sterling, 1974)."

This paper takes a step in clarifying what a Social Impact Statement might contain and how it might be integrated into a realistic development process. We recognize the need to keep the effort, cost, and time appropriate to the project, while facilitating a thoughtful review. We believe that there can be large improvements from such a process by preventing costly problems which may be expensive to repair, improving privacy protection, minimizing legal challenges, and creating more satisfying work environments. Well designed systems will be valued by users and appreciated by colleagues. Information system designers have no Hippocratic Oath, but excellence in design can win respect and inspire others to higher performance.

ACKNOWLEDGMENTS

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THEORIES

one goal of the discipline of HCI is to go beyond the specific of guidelines and build on breadth of principles to develop tested, reliable and broadly usefully theories.

Some theories are :

1: **DESCRIPTIVE THEORIES** : these are help full in developing consistence tech for objects and actions there by supportive collaboration and training

2: **EXPLANATORY THEORIES**: describing sequences of events and possible cause and effect are mentioned and making interventions (modification) possible

3 : **PRESCRIPTIVE THEORIES** : giving designers clear guides. for their choices

4 :**PREDICTIVE THEORIES** : enabling designers to compare purposed designed for execution time error rates trust levels. The development of HCI improves when practitioners rapid development software tools , design guideline and theories.

Two challenges of theories are :

1 . it should be more central toward central research and practice:-

(a good theory should guide in understanding relationship between concepts and generalizing result it should also guide practitioners when making design trade of products.

2. Theories should lead rather than lake behind practice :- a robust theory (perfect) should predict or at least guide practitioners in designing new products effective theories should suggest novel product and help refine existing ones.

Design by Levels :-

one approach for developing descriptive theories ids to separate concepts accounting to levels . such theory have been help full software engineering and network design

one of the best models for interfaces 4 level model:-

1**: conceptual level** : it is the users mental model of interactive system

2. **semantic level** : describes the meaning conveyed by users input and buy the computer's output display

3. **the syntactic level** : defines how the us users action the convey semantic are assembled complete sentence that structure the computer to perform certain tasks

4 .**the lexical level** : deals with device dependence and precise mechanism by which user specifies the syntax

HCI-1

Participatory design..

*) It is the direct involvement of people in the collaborative design of things and technologies they use.

*) The arguments in favor of this design suggests that more user involvement brings more accurate information about tasks and opportunity for users to influence design decisions

*) Extensive user involvement maybe costly and may lengthen the implementation period

*) It may also generate problems from people who are not involved or whose suggestions are rejected

Careful selection of users help to build successful participatory design experience.

Competitive selection increases participants sense of importance and increases the seriousness of the project

*) participants maybe asked to attend repeated meetings and should be told what to expect about their roles and their influence

*) they may have to learn about the technology and business plans of the organization and be asked to act as communication channel to larger group of users that they represent.

The sensitive project leader must judge each case on its merits and must decide what is right level of user involvement.

*) participatory design team members are such critical experts in group dynamics and social psychology and maybe useful as consultants

*) many studies to be examined and questioned such as whether homogeneous or diverse groups are more successful? , how could prepare process for small or large groups, how to balance decision making control between typical users and professional designers.

*) socio technical system developers who work on complex systems such as transportation security, voting, online auctions, e-learning and health care are aware of the value of participatory design.

*)User input from stake holders at every state should understand sensitive issues

*) the experienced user interface architect knows that organizational politics and the preferences of individuals maybe more important technical issues in governing the success of interactive system

*) the participatory design is expanding its type by involving the user in various roles from testers, informants and has partners.

HCI-2

Social impact statement for early design review..

A social impact statement help to promote high quality systems in government related applications.

*) early and wide spread discussion can uncover concerns and enable stake holders to state their positions openly.

*) there is a danger that these discussions will elevate fears or force designers to make unreasonable compromises but these risks

seem reasonable in a well managed project.

Outline of social impact statement include these sections

SECTION-1 (DESCRIBE THE NEW SYSTEM AND IT'S BENEFITS)

*) Covey the high level goals of the new system

*) identify the stake holders

*) identify specific benefits

SECTION -2(ADDRESS CONCERNS AND POTENTIAL BARRIERS)

*) anticipate changes in job functions and potential layoffs

*) address security at privacy issues

*) discuss accountability and responsibility for system misuse and failure

*) avoid potential biases

*)weight individual rights versus social benefits

*) assess trade offs between centralization and decentralization.

*) preserve democratic principles

*) ensure diverse access

*) promote simplicity and preserve what works

SECTION-3 (OUTLINE THE DEVELOPMENT PROCESS)

*) present an estimated project schedule

*) propose a process for making decisions

*) discuss expectations of how stake holders will be involved

*) recognize needs for more staff, training and hardware

*) propose a plan for backup of data and equipment

*) outline a plan for migrating to the new system

*) describe a plan to measure the success of the new system.

Module -3

EXPERT REVIEW..

They can occur early or late in the design phase. The outcome maybe a formal report with problems identified or recommendations for change. The expert review may involve in a discussion or a presentation to design team.

The reviews can present the problems to the designers but development of solutions should not be suggested. Expert reviews usually take time from half a day to one week. Sometimes a training period may require to explain task domain and procedures.

They are variety of expert reviews methods.

Few prominent ones are :-

1) HEURISTIC EVALUATION:-

The reviewers compare the interface with a design heuristics such as 8 golden rules, principles etc.. The experts should be familiar with the rules and should be able to apply the.

2) GUIDELINES REVIEW:-

the interface is checked with the organizational guidelines document. Sometimes it takes more time for this review method as the organizational review document might contain more items and it makes the reviewers take more time for evaluating

3) CONSISTENCY INSPECTION:-

the experts verified consistency across the interfaces by checking the terminology, fonts, color, layout and input output formats. Experts even inspect the documentation of the interface and online help.

4) COGNITIVE WALK THROUGH:-

the experts explore through the interface to carry out typical tasks. High frequency tasks are the starting point but rare critical tasks such as error recovery should also be covered. An expert reviewer can explore the system privately but it's more suggestible to conduct the walk through in the presence of designers.

5) META FORCE OF HUMAN THINKING:-

the experts conduct an inspection that focuses on how users think when interacting with an interface. They consider meta force for 5 aspects of human thinking such as

*) HABIT

*) STREAM OF THOUGHT

*) AWARENESS AND ASSOCIATIONS

*) RELATIONSHIP BETWEEN PRESENTATION AND THOUGHT

*) KNOWLEDGE OF USER. in experimental setting this technique seems to perform better than cognitive walk through and heuristic evaluation.

6) FORMAL USABILITY INSPECTION:-

the experts conduct court room style meeting with a judge to present the interface and to discuss it's merits and weakness.

Design team members can oppose about the problems.

Formal usability inspections can be educational experiences for new designers but they may take longer to carry out than the other types.

According to the decades-old formula, you write a business plan, pitch it to investors, assemble a team, introduce a product, and start selling as hard as you can.

According to conventional wisdom, the first thing every founder must do is create a business plan—a static document that describes the size of an opportunity, the problem to be solved, and the solution that the new venture will provide. Typically it includes a five-year forecast for income, profits, and cash

flow. The assumption is that it’s possible to figure out most of the unknowns of a business in advance, before you raise money and actually execute the idea.

USABILITY TESTING!

There are various types of usability testing important among them are the following :-

1) PAPER MOCKUPS AND PROTOTYPING:

Early usability studies can be conducted using paper representations of screen displays to evaluate user reactions to the working experience, layout and sequencing. This informal testing is inexpensive, rapid and productive. The test administrator will the play the role of flipping the pages while asking the user to perform his desired task.

2) COMPETITIVE USABILITY TESTING:

This compares a new interface to previous versions or to similar products for testing type of pattern but each participant is needed for longer time period.

3) UNIVERSAL USABILITY TESTING:

this approach test interfaces with highly diverse users and on various hardware and software platforms and networks.This type of evaluation where wide range of participants are included are for application such as web based services and e-government services, where it helps to ensure success. Testing with small large displays, slow and fast networks and range of operating systems, browsers will do much to raise the rate of customer success.

4) FIELD TEST AND PORTABLE LABS:

This testing puts new interfaces to work in realistic environment or in the real field for a fixed time period. Field test can be made more fruitful if login software is used to capture errors occurring, help frequencies and productivity measures. Portable usability laboratories with recording and logging facilities have been developed support more field testing.

4) REMOTE USABILITY TESTING:

Since web based applications are available internationally these advantages conduct usability test online by avoiding complexity and cost of bringing participants with more diverse backgrounds to perform the test in their own environment. We can use any one approach of synchronous or asynchronous approaches. Some studies have found remote usability testing can find more problems than traditional testing.

5) CAN-YOU-BREAK-THIS-TEST:-

This approach is mainly used in evaluation of gaming interfaces. Game designers have developed this approach of usability testing by providing energetic participants with the challenge of trying to beat the new game. This destructive testing approach in which the user's motive is to find errors in the system or otherwise destroy.

EVALUATION DURING ACTIVE USE :-

A carefully designed and tested interface is a wonderful asset but successful active use requires constant attention for managers, user service team and maintenance team. Everyone involved in supporting user community can contribute to interface refinements that provide higher level of service.

It is not easy to satisfy all the users at all the times but the effort will be rewarded by the success.

Perfection in the interfaces is not attainable but percentage improvements are possible and are worth pursuing.

There are various methods :-

INTERVIEWS AND FOCUS GROUP DISCUSSIONS:-

*)Interviews with individual users can be productive because the interviewer can pursue specific issues of concern.

*) after a series of individual discussions focused group discussions are valuable to maintain the universality of user comments.

*) Interviewing can be costly and time consuming so only a small fraction of user community is involved.

*) Professional led focused groups can detect real problems which can be quickly explored and confirmed by participants.

*) interviews and focus groups can be arranged to target specific sets of users such as experienced long term users generating different sets of issues that would be raised with new users.

2) CONTINUOUS USER PERFORMANCE DATA LOGIN.

*)A software architecture should make it easy for system managers to collect data about the patterns of interface usage, speed of user performance, rate of errors and mostly frequency of request for online assistance. If the frequency error message is recorded, then the highest frequency error is the one we need to pay attention.

*) the message could Re-written, training materials could be revised, software could be changed to provide more specific information.

*) without specific login data the system maintenance team has no way of knowing which of the error message creation is the biggest problem for the user. Similarly staff should examine messages that never appear to see weather there is an error in the code or weather users are avoiding use of some facility. If login data are available for each command, each help screen and each database record then the changes to the interface can be made to simply access to frequently used features.

3) ONLINE OE TELEPHONE CONSULTANT:-

This process can provide extremely effective and personal assistance to users who are experiencing difficulties. Many users feel reassured they know that there is someone whom they can contact when problems arise. Those consultants are an excellent source of information for knowing about problems users are having and can suggest improvements. Many organizations offer toll free numbers through which the users can reach consultants. On some network systems the consultants can monitor the users and can see the same display that of the users while maintaining voice contact and can give instructions.

4) DISCUSSIONS GROUPS AND NEWS GROUPS:-

These act as a common platform for users and support team to communicate openly. The users in the discussion group can raise discussions in any problem that are faced. Support team provides the suggestions and discussions to recover from the problem so that any other users facing the same problem can use the suggested suggestions.

News groups are similar types of source where users can post different queries regarding the interface and they will be answered by the maintenance team.

8/11/19

SURVEY INSTRUMENTS:

User surveys are familiar, inexpensive and are acceptable companion for usability test and expert reviews.

Managers and users can easily understand notation of surveys and large number of users can sence authority of evaluation of interfaces through survey instruments. The key to successfull surveys are clear goals in advance and development of focused items that help to attain these goals.

Experience surveys know that care is to be taken during design, administration and data analysis.

A survey form should be prepared, should be reviewed by the other teammates and tested with small sample of users before a large scale survey is conducted.

Methods of statistical analysis and presentation should also be developed before the final survey is distributed.

Since biased samples of respondence can produce wrong results, survey planners need to build methods to verify that respondence represent the population in terms of age, gender, experience and so on.

It is important to pre- test any survey instrument prior to actual use. Users can be asked for their subjective impression about specific aspects of the interface such as the representation of 1)task domain objects and actions

2) interface domain models and action

3) syntax of inputs and design of displays

It may also be useful to collect characteristics about the users including

*) Background demographics (age, gender, language, education.. Etc)

*) experienced with interfaces

*) Job responsibilities

*) personality style (Extrovert vs Introvert, Risk taking vs risk evers, early vs late adapter, systematic vs opportunistic)

*) reasons for not using an interface

*) familiarity with features

*) feeling after using the interface

online and web based surveys avoid the cost and effort of printing, distributing and collecting paper forms.

Many people prefer to answer a brief survey displayed on a screen instead of filling and opening a printed form. Some online surveys include more than 50000 respondents.

They are various Survivor scales which can be used in survey forms to get the user response, one of such scales is LIKErt scale. The categories included in such scales are

*) strongly agree

*) agree

*) neutral

*) disagree

*) strongly disagree

These type of surveys using above scales will demonstrate improvements to the interface as changes are made in training online assistance, command structures and so on.

Progress is demonstrated by improved scores on subsequent surveys.

CHAPTER 14:
Information Visualization

Designing the User Interface:
Strategies for Effective Human-Computer Interaction

Fifth Edition

Ben Shneiderman & Catherine Plaisant

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is an imprint of

PEARSON

Information Visualization

- Introduction
- Data Type by Task Taxonomy
- Challenges for Information Visualization

Introduction

- "A Picture is worth a thousand words"
- *Information visualization* can be defined as the use of interactive visual representations of abstract data to amplify cognition (Ware, 2008; Card et al., 1999).
- The abstract characteristic of the data is what distinguishes information visualization from *scientific visualization*.
  - Information visualization: categorical variables and the discovery of patterns, trends, clusters, outliers, and gaps
  - Scientific visualization: continuous variables, volumes and surfaces
- Information visualization provides compact graphical presentations and user interfaces for interactively manipulating large numbers of items, possibly extracted from far larger datasets.

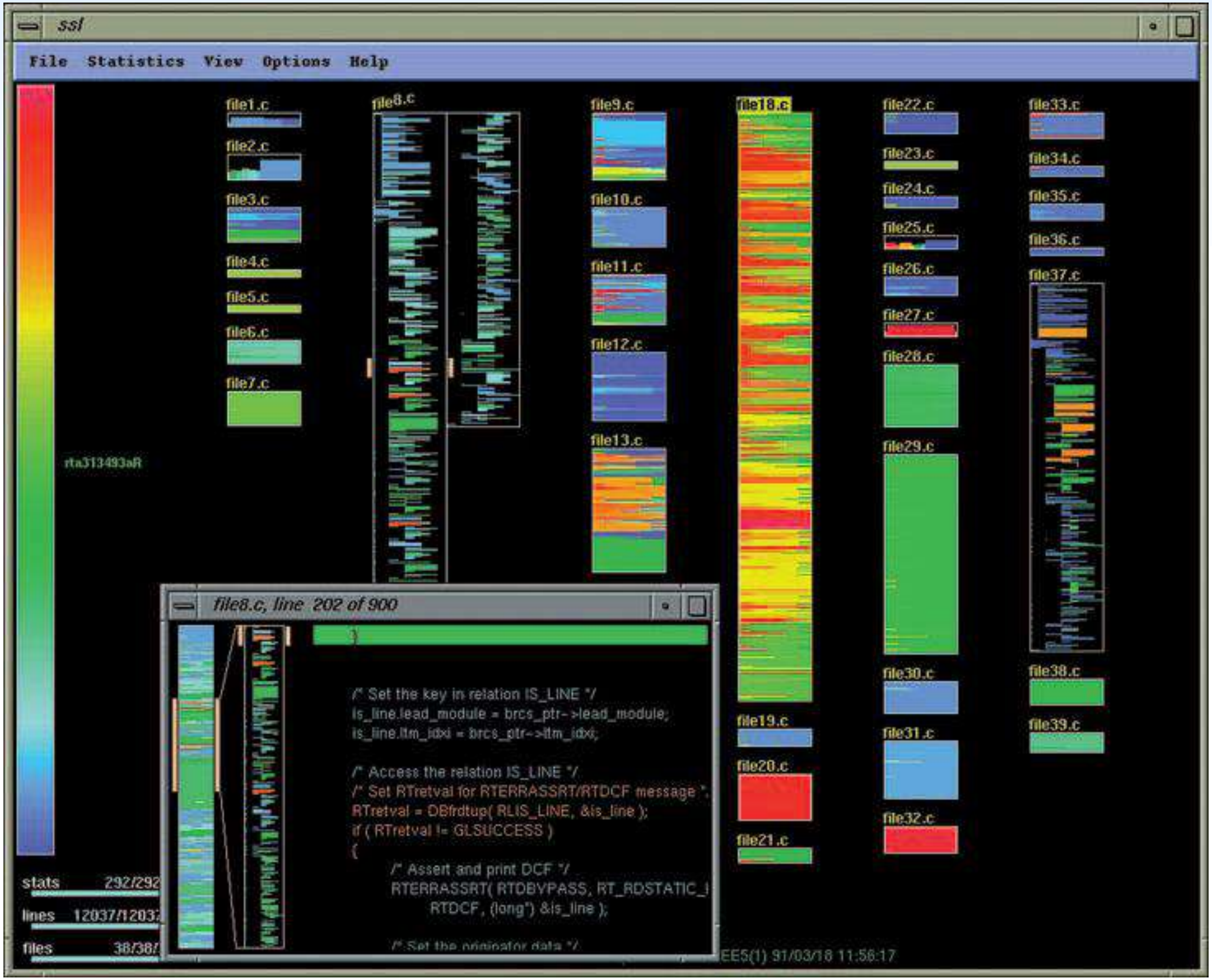
Introduction (cont.)

- Sometimes called *visual data mining*, it uses the enormous *visual bandwidth* and the remarkable *human perceptual system* to enable users to make discoveries, take decisions, or propose explanations about patterns, groups of items, or individual items.
- Visual-information-seeking mantra:
  - Overview first, zoom and filter, then details on demand.
  - Overview first, zoom and filter, then details on demand.
  - Overview first, zoom and filter, then details on demand.
  - Overview first, zoom and filter, then details on demand.
  - Overview first, zoom and filter, then details on demand.

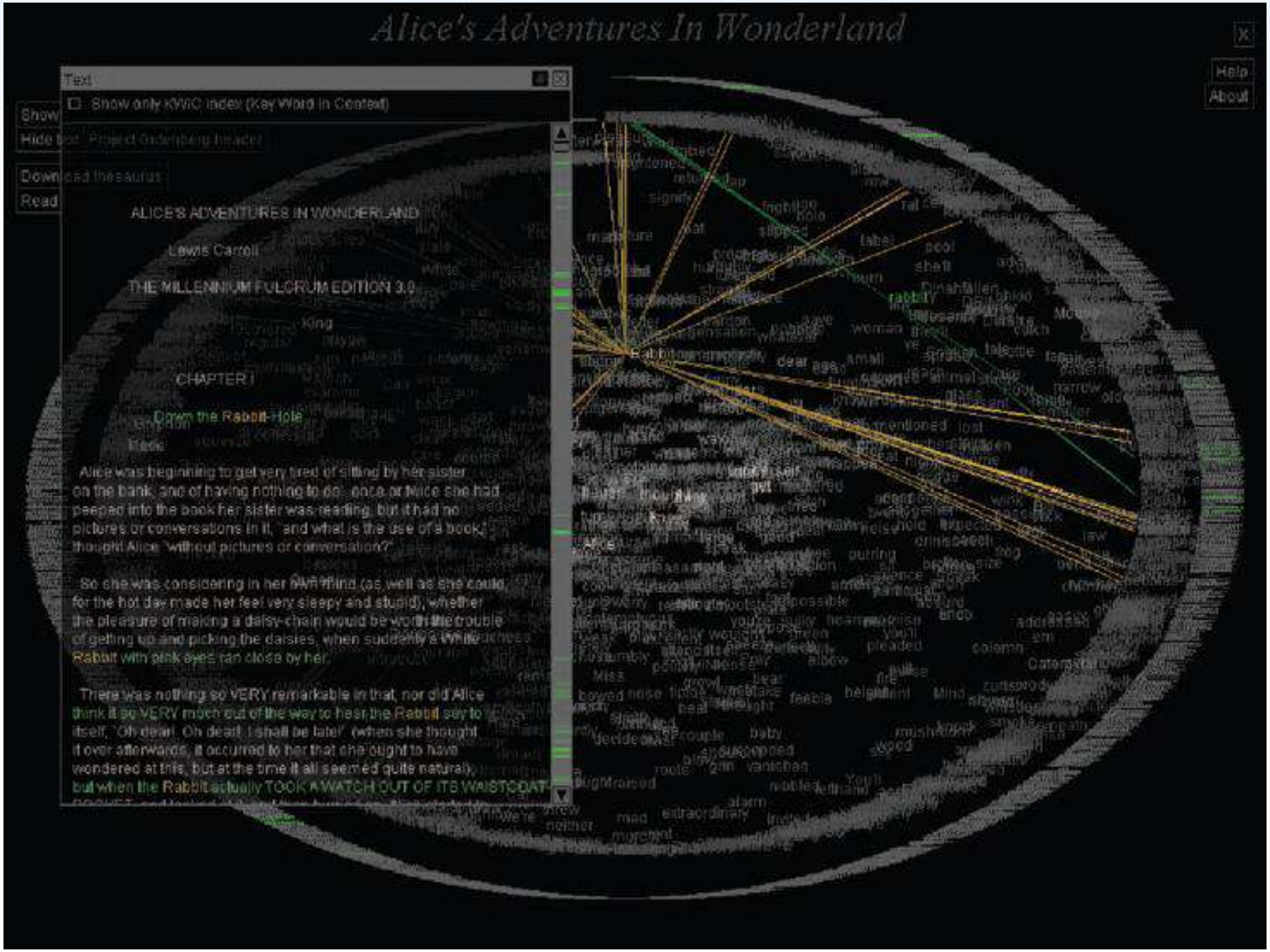
Data Type by Task Taxonomy

Data Types	
1D Linear	Document Lens, Seesoft™, Information Mural, TextArc
2D Map	Geographic information systems, ESRI ArcInfo™, ThemeView™, newspaper layout, self-organizing maps
3D World	Desktops, WebBook™, VRML™, Web3D™, architecture, computer-assisted design, medicine, molecules
Multidimensional	Parallel coordinates, scattergram matrices, hierarchical clustering, Spotfire®, Tableau®, GGobi®, DataDesk®, TableLens®, InfoZoom®
Temporal	DataMontage, Palantir, Project Managers, LifeLines, TimeSearcher
Tree	Outliners, degree-of-interest trees, cone/cam trees, hyperbolic trees, SpaceTree, treemaps
Network	NetMap™, netViz™, Pajek, JUNG, UCINet, NetDraw, TouchGraph, SocialAction, NodeXL
Tasks	
Overview	Gain an overview of the entire collection
Zoom	Zoom in on items of interest
Filter	Filter out uninteresting items
Details-on-demand	Select an item or group and get details when needed
Relate	View relationships among items
History	Keep a history of actions to support undo, replay, and progressive refinement
Extract	Allow extraction of subcollections and of the query parameters

Data Type by Task Taxonomy: 1D Linear Data

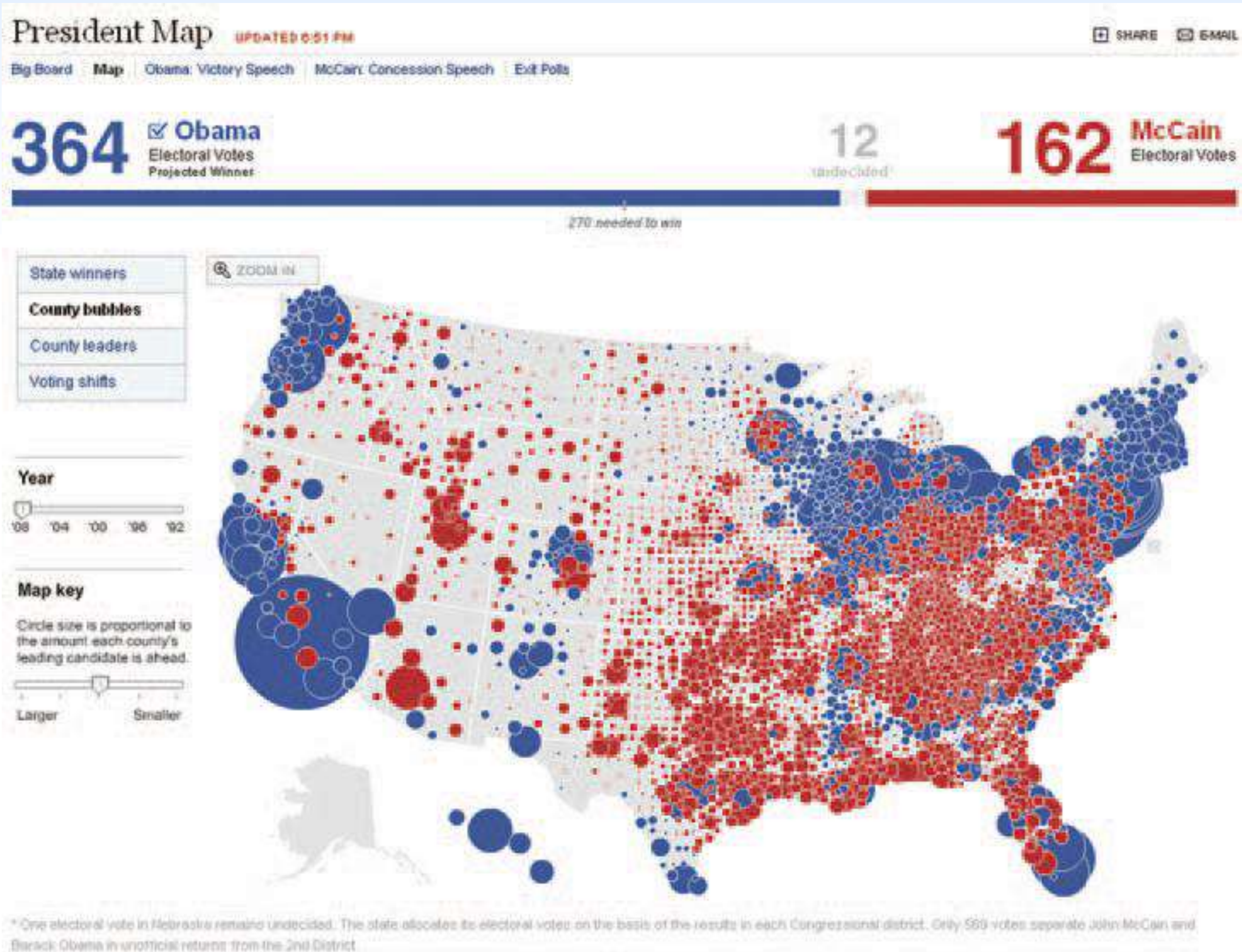


Data Type by Task Taxonomy: 1D Linear Data (cont.)

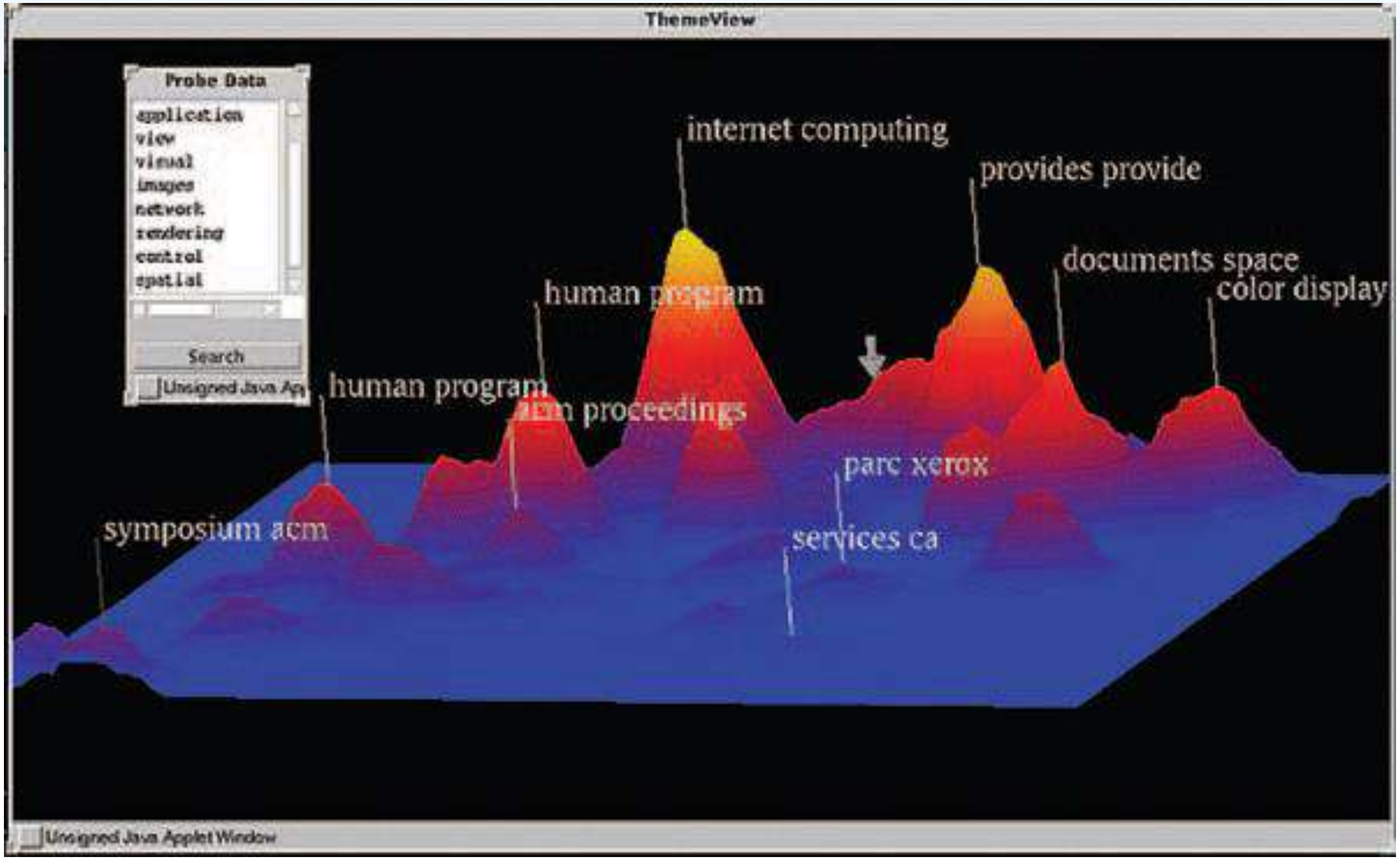


Data Type by Task Taxonomy: 1D Linear Data (cont.)

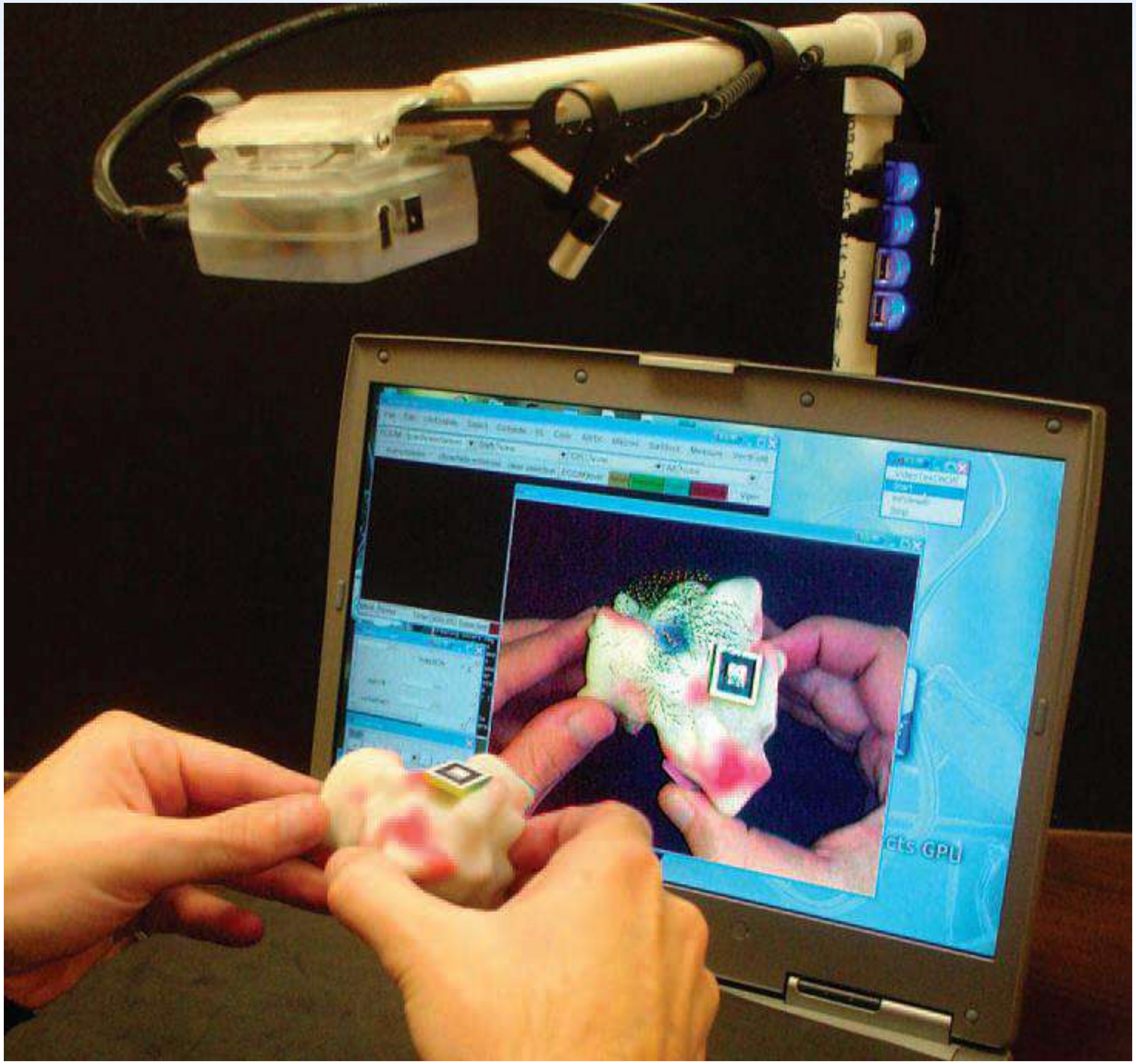
Data Type by Task Taxonomy: 2D Map Data



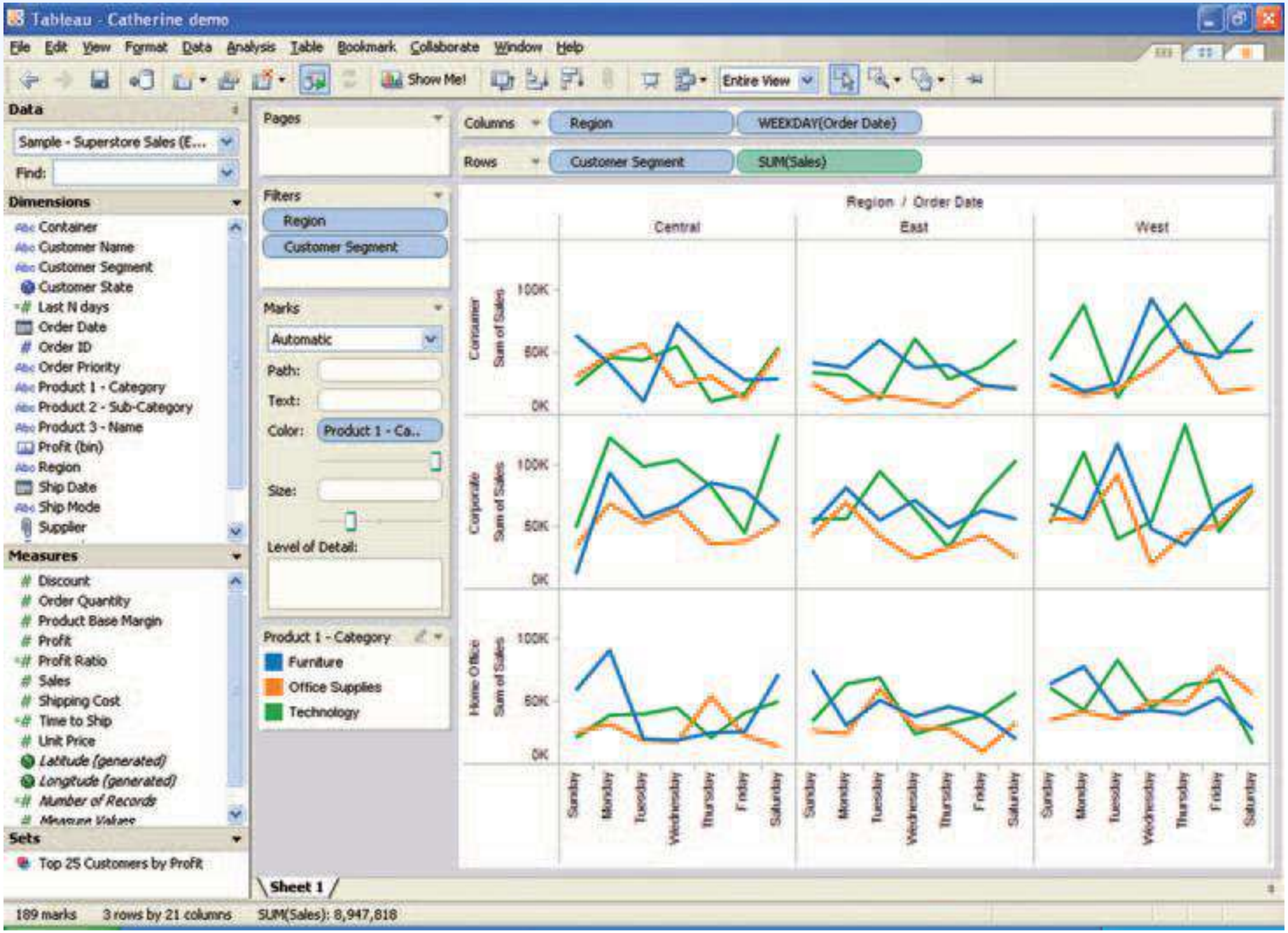
Data Type by Task Taxonomy: 2D Map Data (cont.)



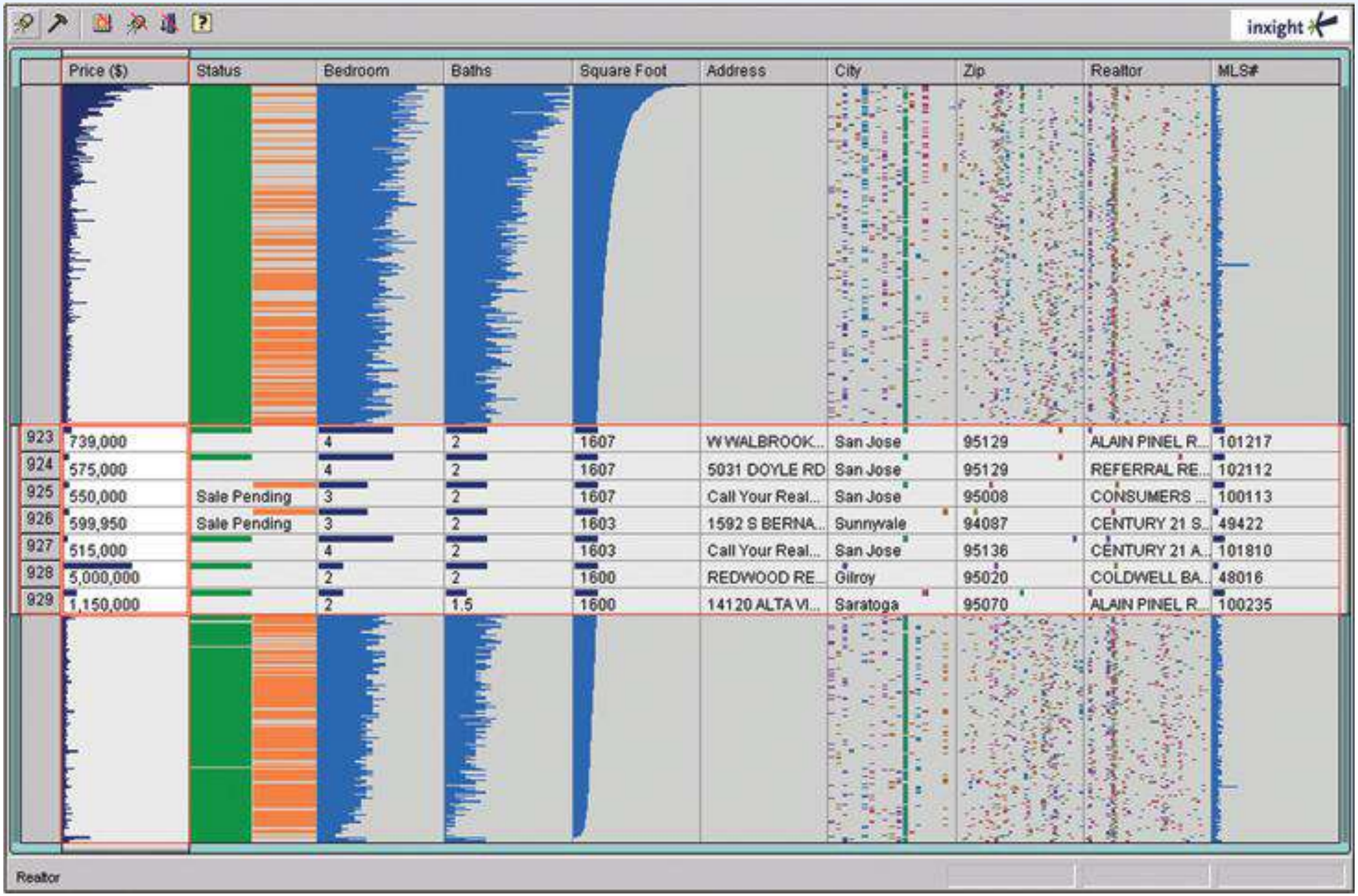
Data Type by Task Taxonomy: 3D World Data



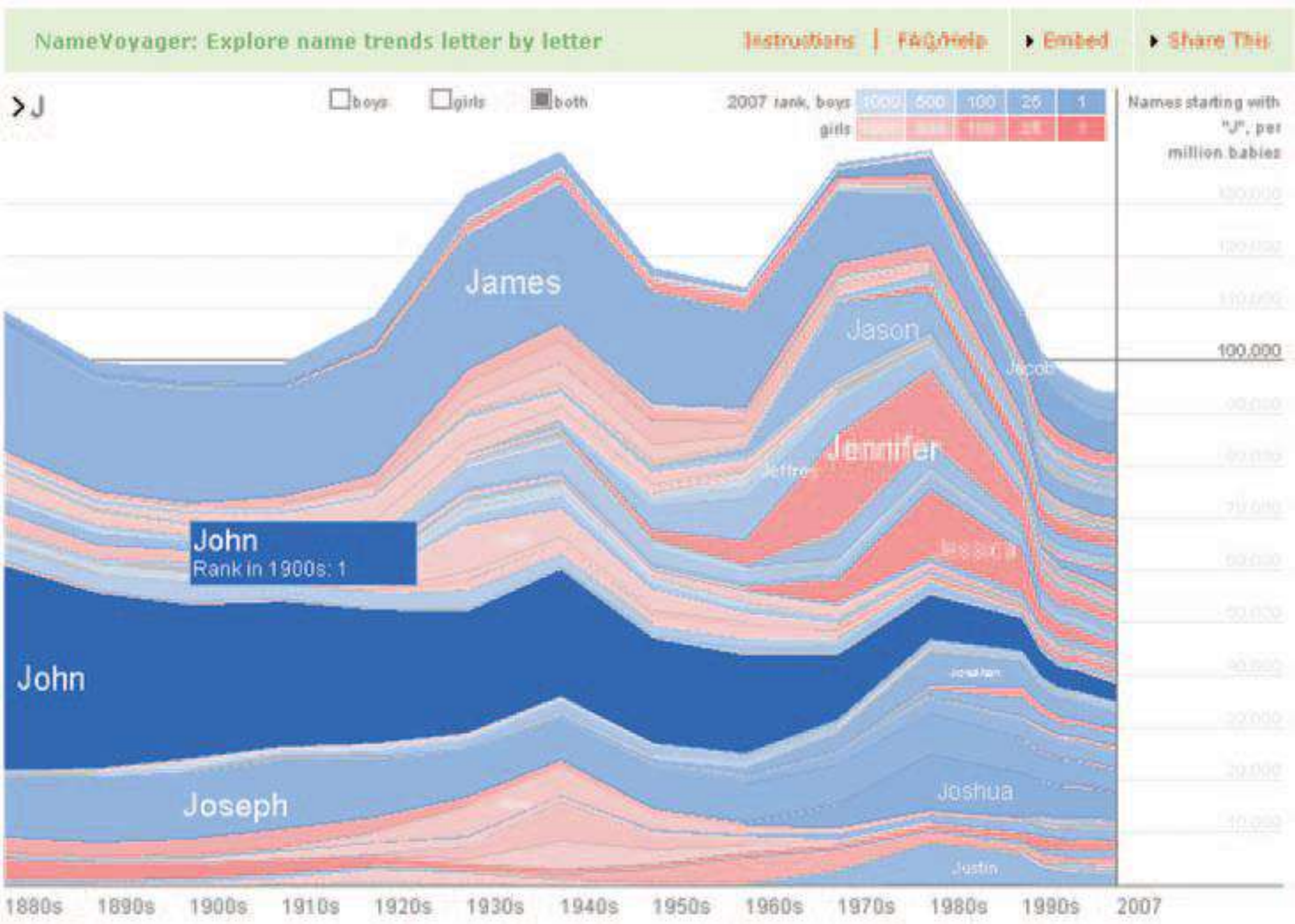
Data Type by Task Taxonomy: Multidimensional Data



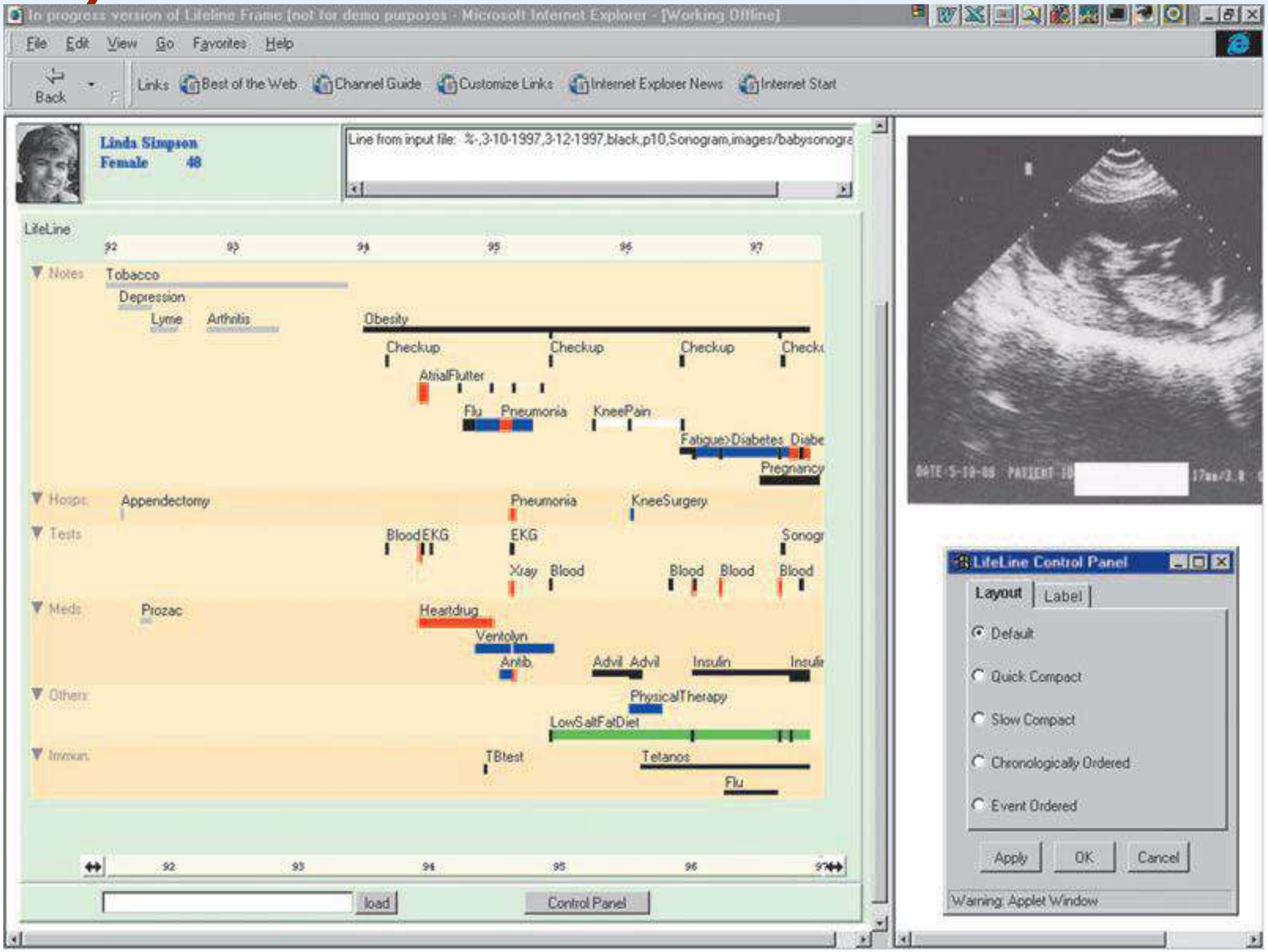
Data Type by Task Taxonomy: Multidimensional Data (cont.)



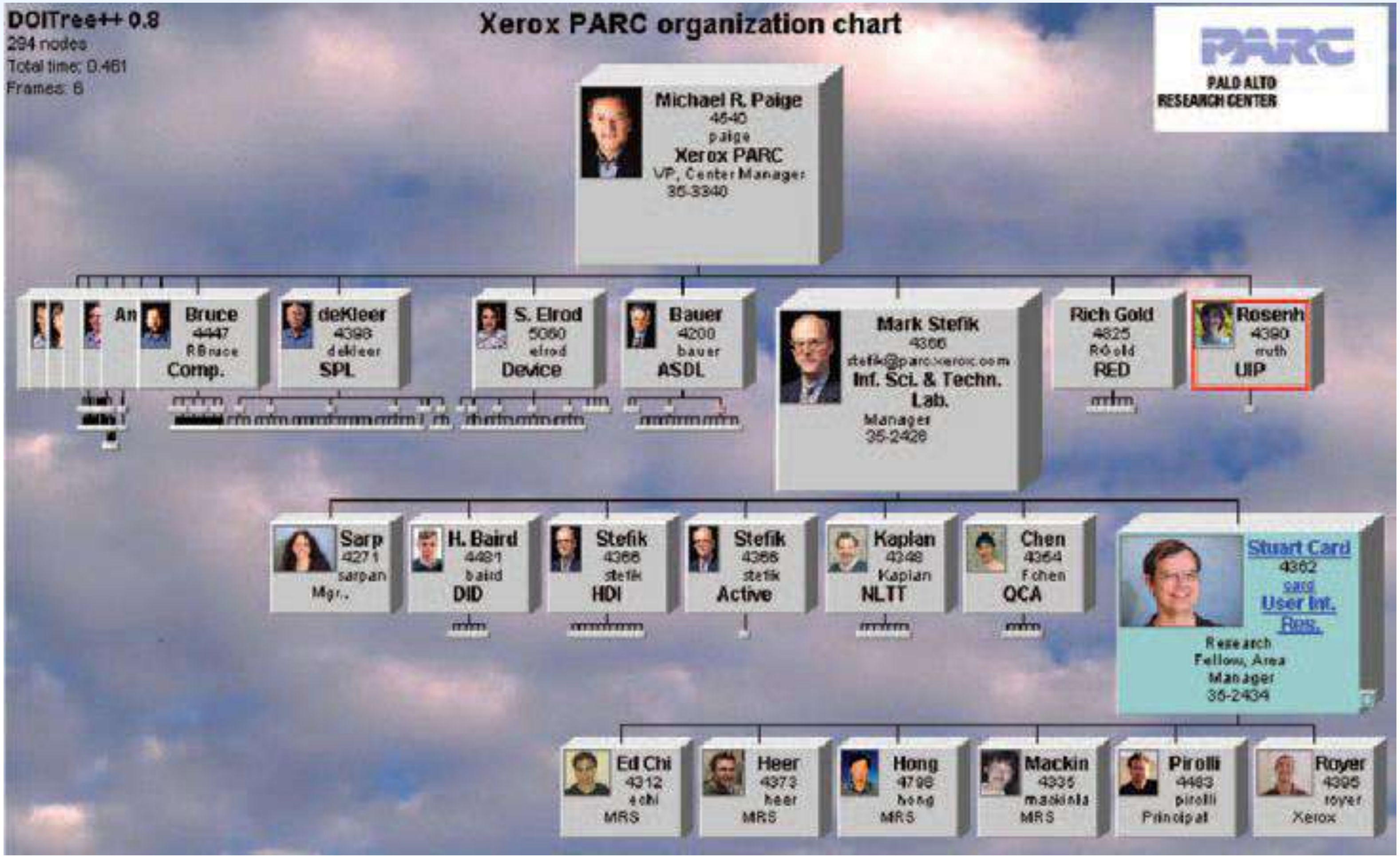
Data Type by Task Taxonomy: Temporal Data



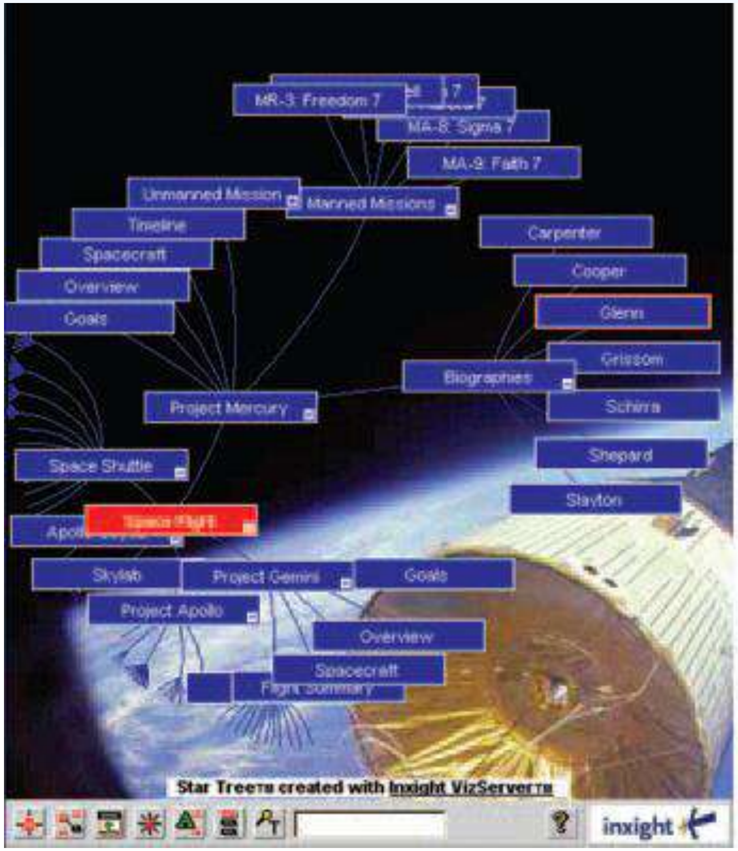
Data Type by Task Taxonomy: Temporal Data (cont.)

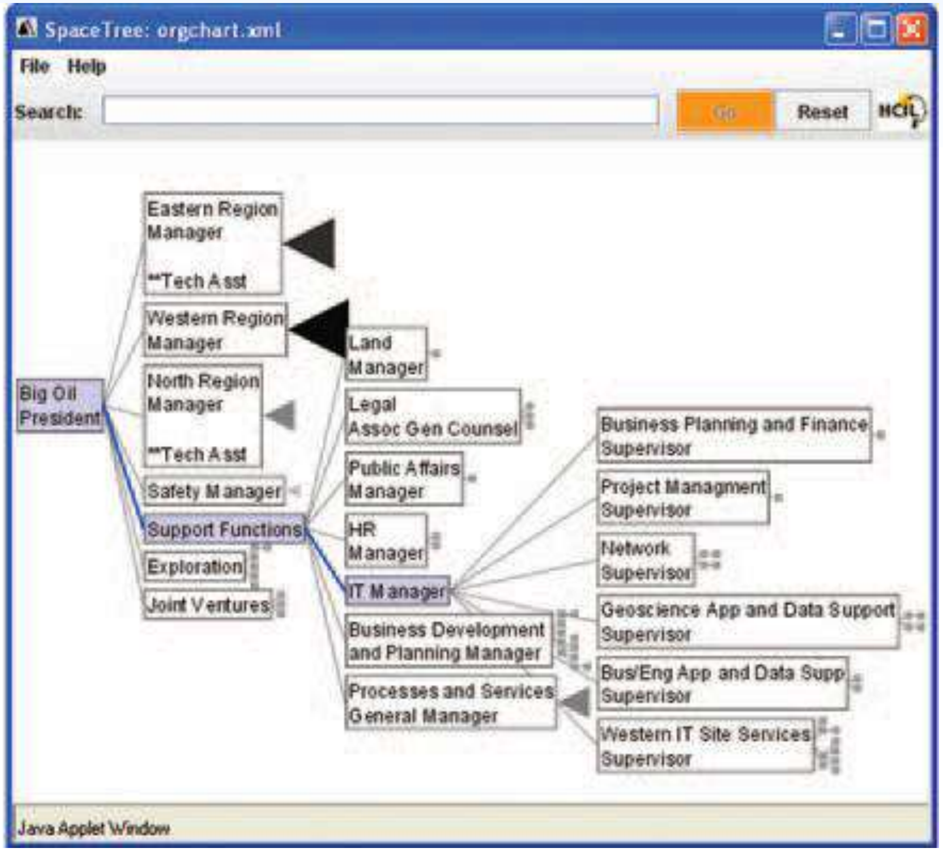


Data Type by Task Taxonomy: Tree Data

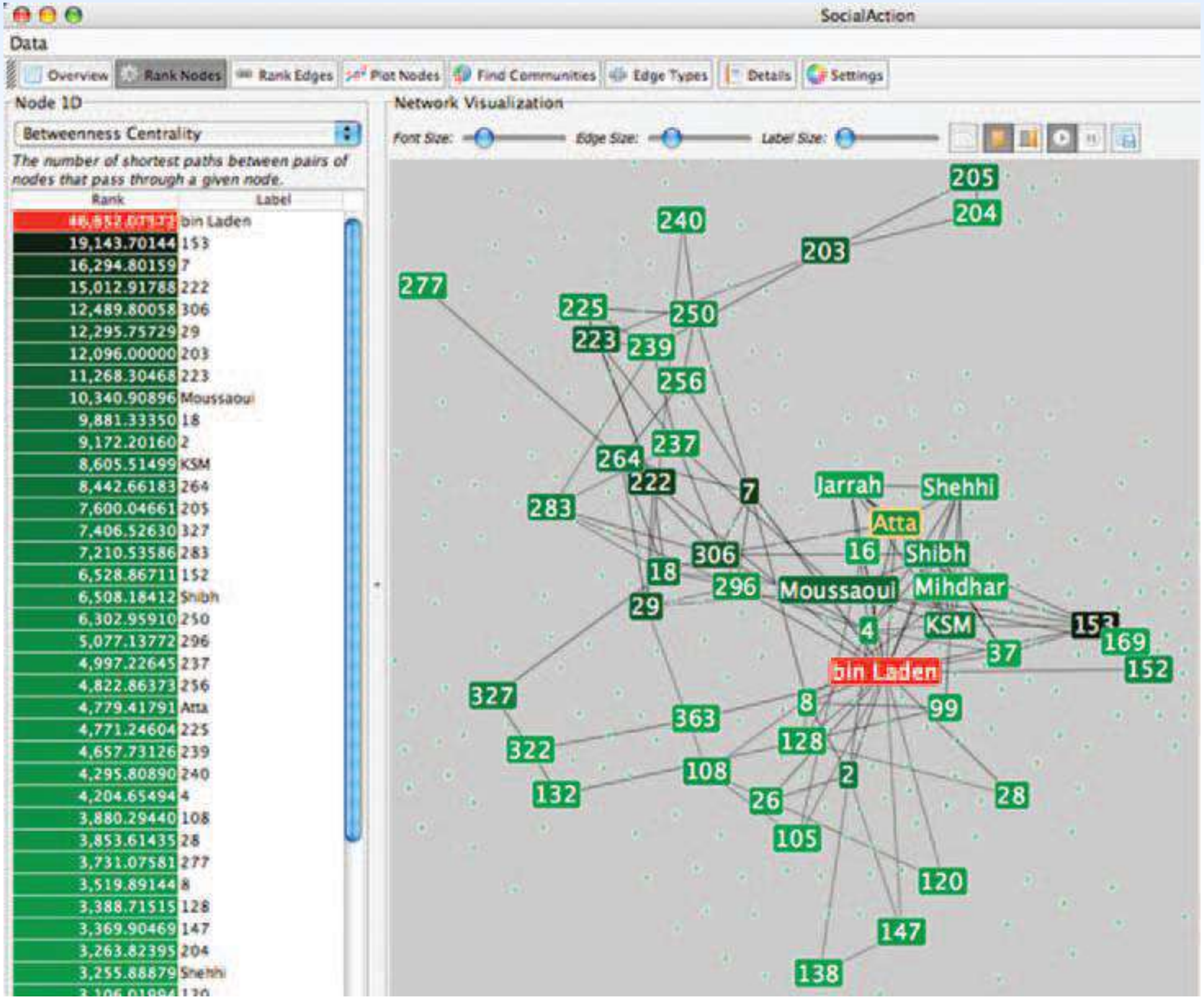


Data Type by Task Taxonomy: Tree Data (cont.)





Data Type by Task Taxonomy: Network Data



The seven basic tasks

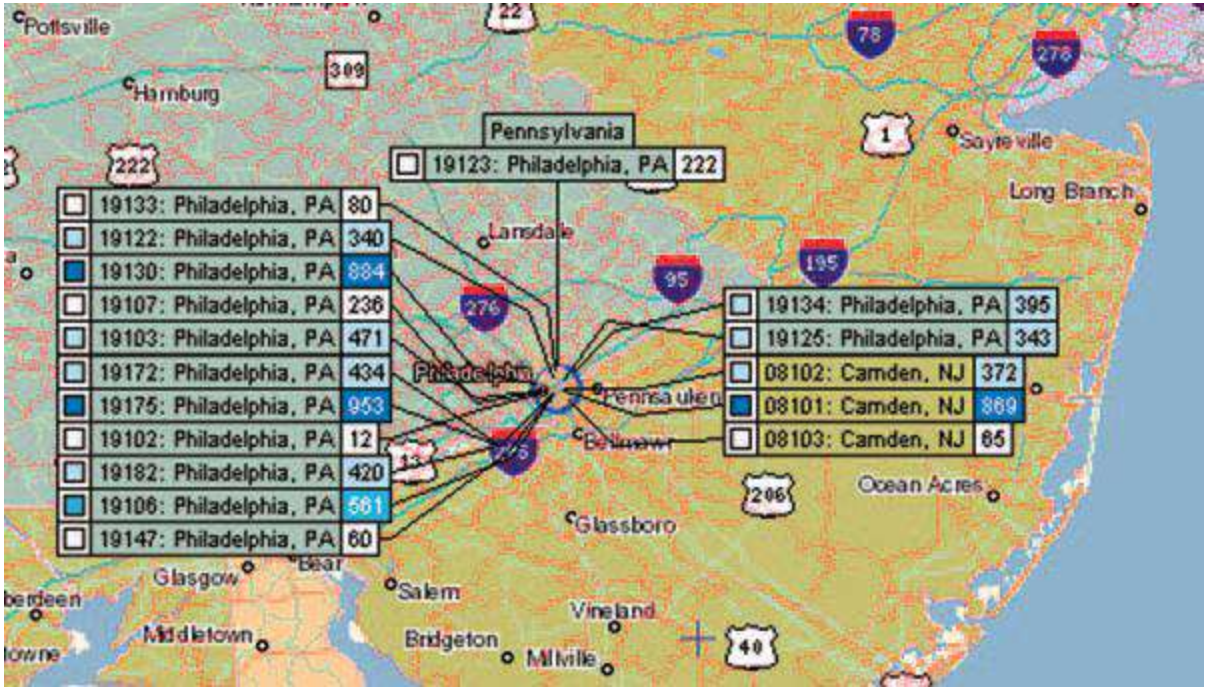
1. <u>Overview task</u> - users can gain an overview of the entire collection
2. <u>Zoom task</u> - users can zoom in on items of interest
3. <u>Filter task</u> - users can filter out uninteresting items
4. <u>Details-on-demand task</u> - users can select an item or group to get details
5. <u>Relate task</u> - users can relate items or groups within the collection
6. <u>History task</u> - users can keep a history of actions to support undo, replay, and progressive refinement
7. <u>Extract task</u> - users can allow extraction of sub-collections and of the query parameters

Challenges for Information Visualization

- Importing and cleaning data
- Combining visual representations with textual labels
- Finding related information
- Viewing large volumes of data
- Integrating data mining
- Integrating with analytical reasoning techniques
- Collaborating with others
- Achieving universal usability
- Evaluation

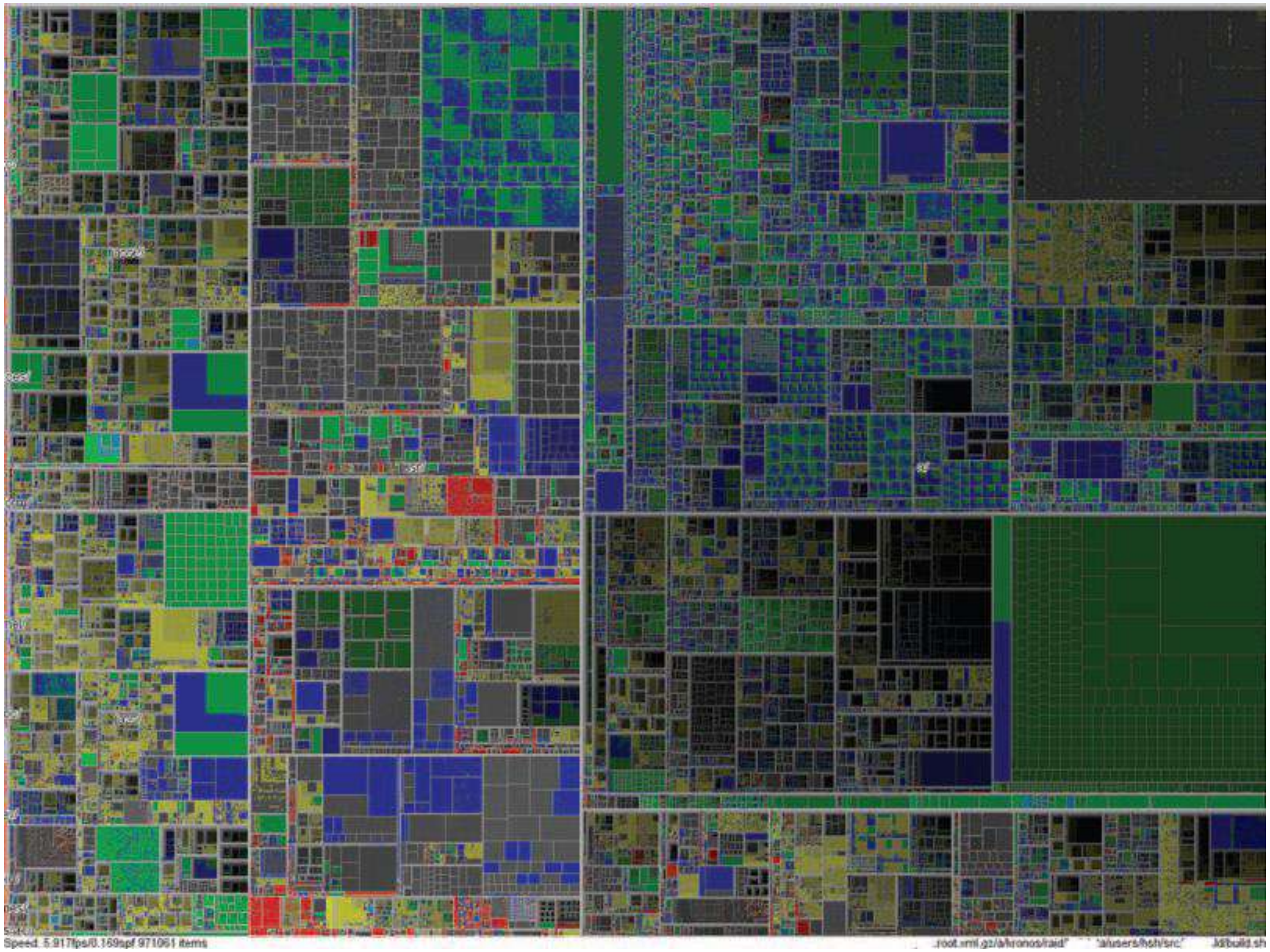
Challenges for Information Visualization (cont.)

- **Combining visual representations with textual labels**



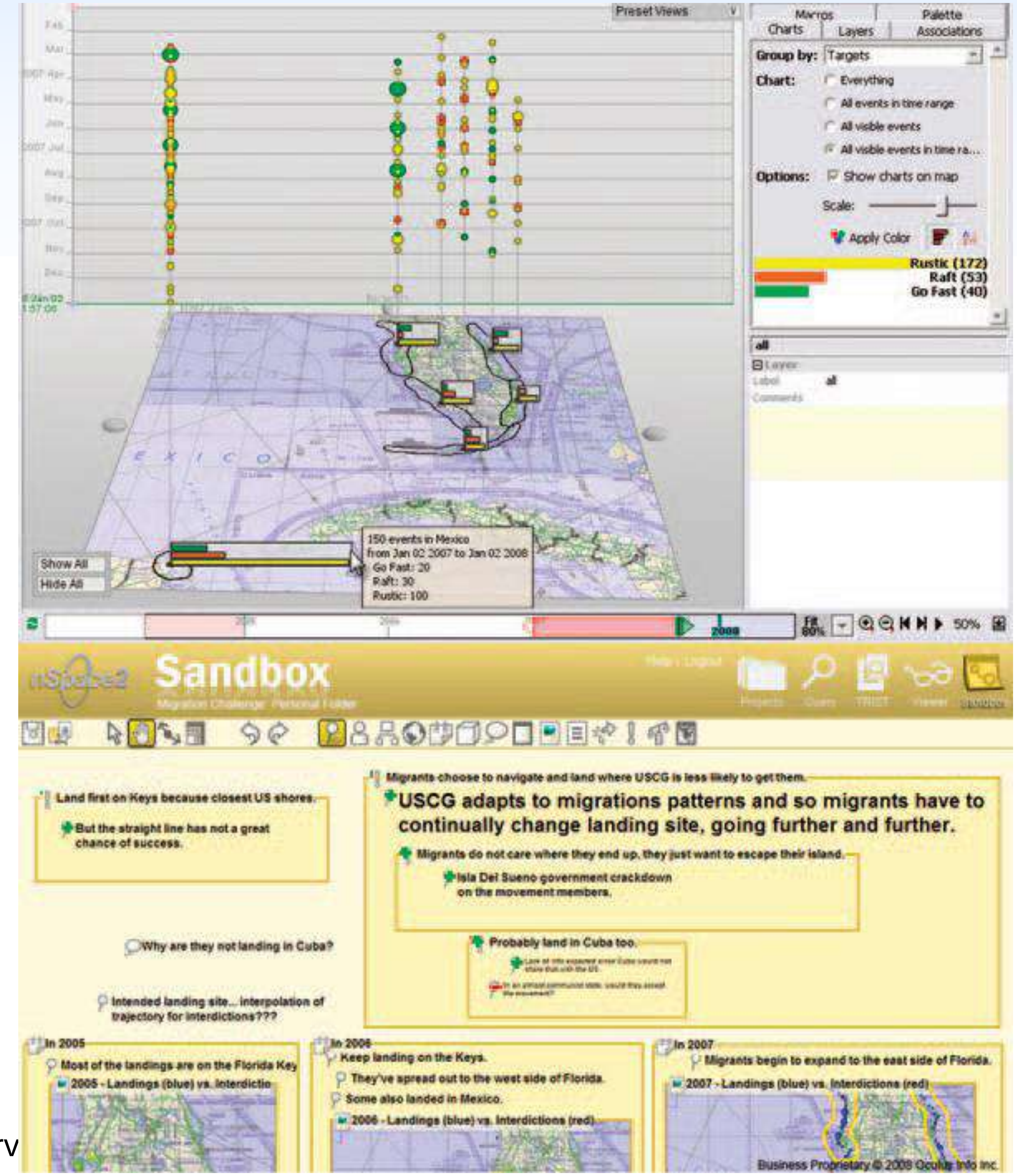
Challenges for Information Visualization (cont.)

- Viewing large volumes of data



Challenges for Information Visualization (cont.)

- Integrating with analytical reasoning techniques



CHAPTER 6:
Collaboration and Social Media Participation

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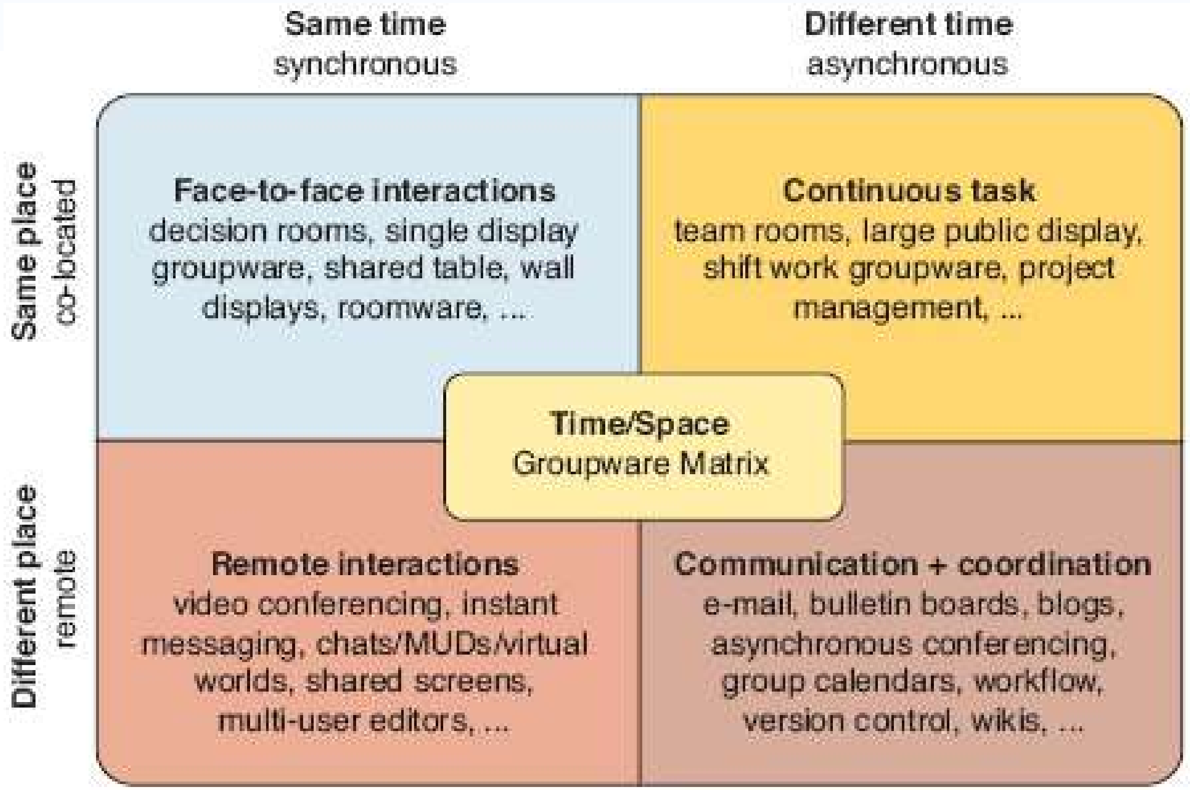
Characteristics and examples of collaboration and social media participation

Collaboration	Crossover	Social Media Participation
E-mail, phone calls, audio- and videoconferences, shared documents, collaboratories	Wikis, blogs, chat rooms, instant messages, short messages, listservers, Yahoo!/Google groups	Chat rooms, blogs, user-generated content sites, tagging, rating, reviewing
GoToMeeting®, LiveMeeting®, WebEx®, Skype®, Google Docs™, GeneBank™	Wikipedia, Wikia™, LinkedIn, Second Life, Blogger®	YouTube, Flickr, Picasa, Netflix, Technorati™, MySpace, Facebook, Digg, del.icio.us™
	Want recognition for contributions **May Aspire to Leadership**	
Typically 2 to 2000 people		Typically 20 to 200,000,000 people
Work-related, goal-directed		Playful, process-oriented
Time-limited, milestones		Open-ended
Selected identified partners		Open unknown partners
Assign tasks and review each other's work		Act independently

Collaboration

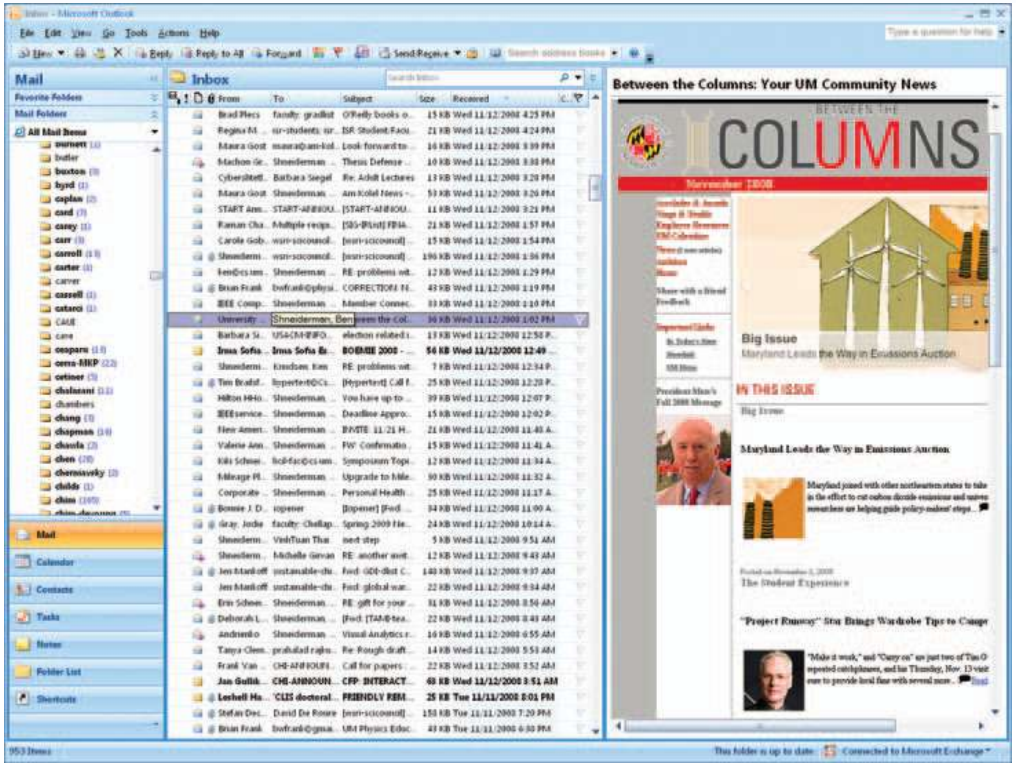
- **Goals of Cooperation**
  - Focused partnerships
  - Lecture or demo
  - Conference
  - Structured work processes
  - Meeting and decision support
  - Electronic commerce
  - Tele-democracy
  - On-line communities
  - Collaboratories
  - Telepresence

Time/space matrix model of group-supported work



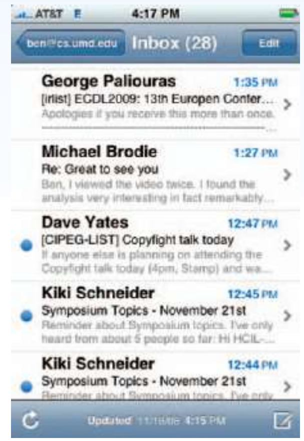
Asynchronous distributed interfaces: Different place, different time

- **Electronic mail:**
  - can be too loosely structured
  - sometimes overwhelming
  - transient
  - tools
    - filtering
    - archiving
    - mailing lists
    - discussion groups
  - typically text-only, but increasingly includes other structured objects
    - graphics
    - sounds
    - animations
    - web pointers
    - video

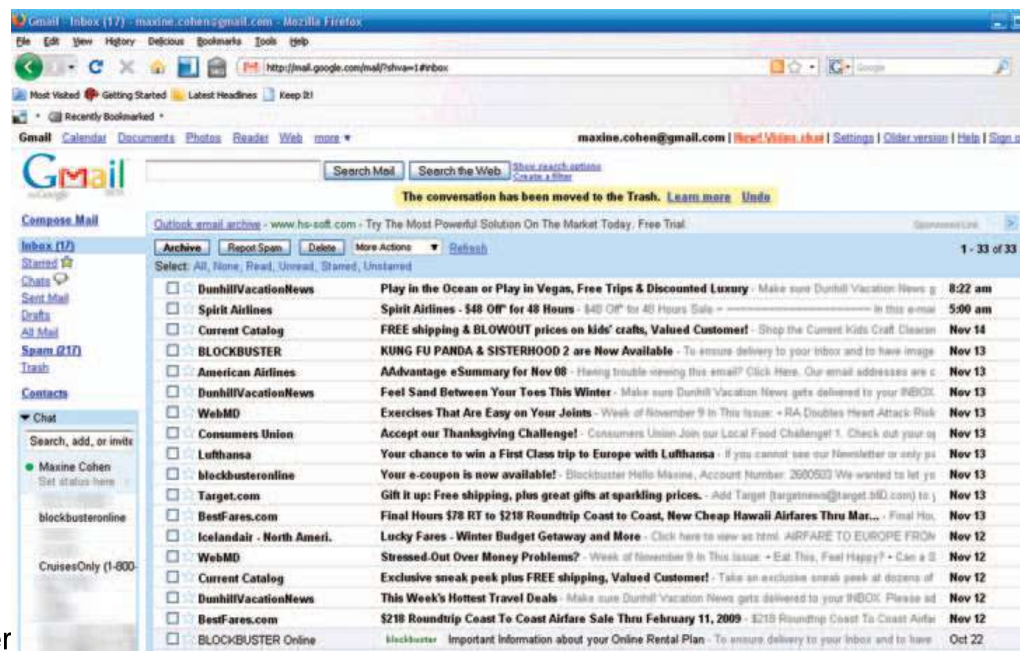


Asynchronous distributed interfaces: Different place, different time (cont.)

- **Electronic mail (cont.):**
  - Email on mobile devices
  - Online directories
  - Web services with E-mail
    - E.g. Hotmail, and Yahoo! Mail



E-mail message on an iPhone

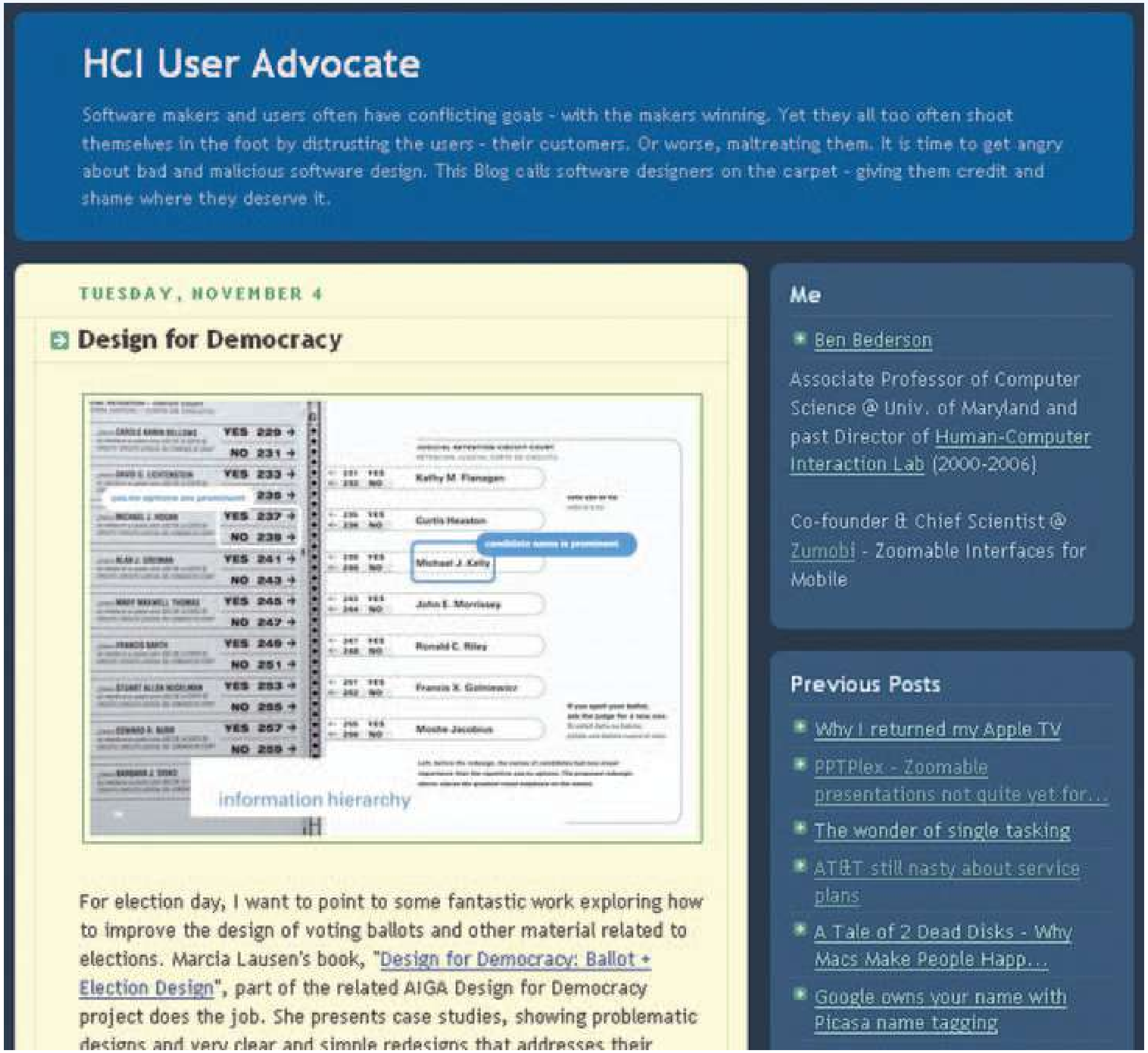


Google's web-based email (Gmail)

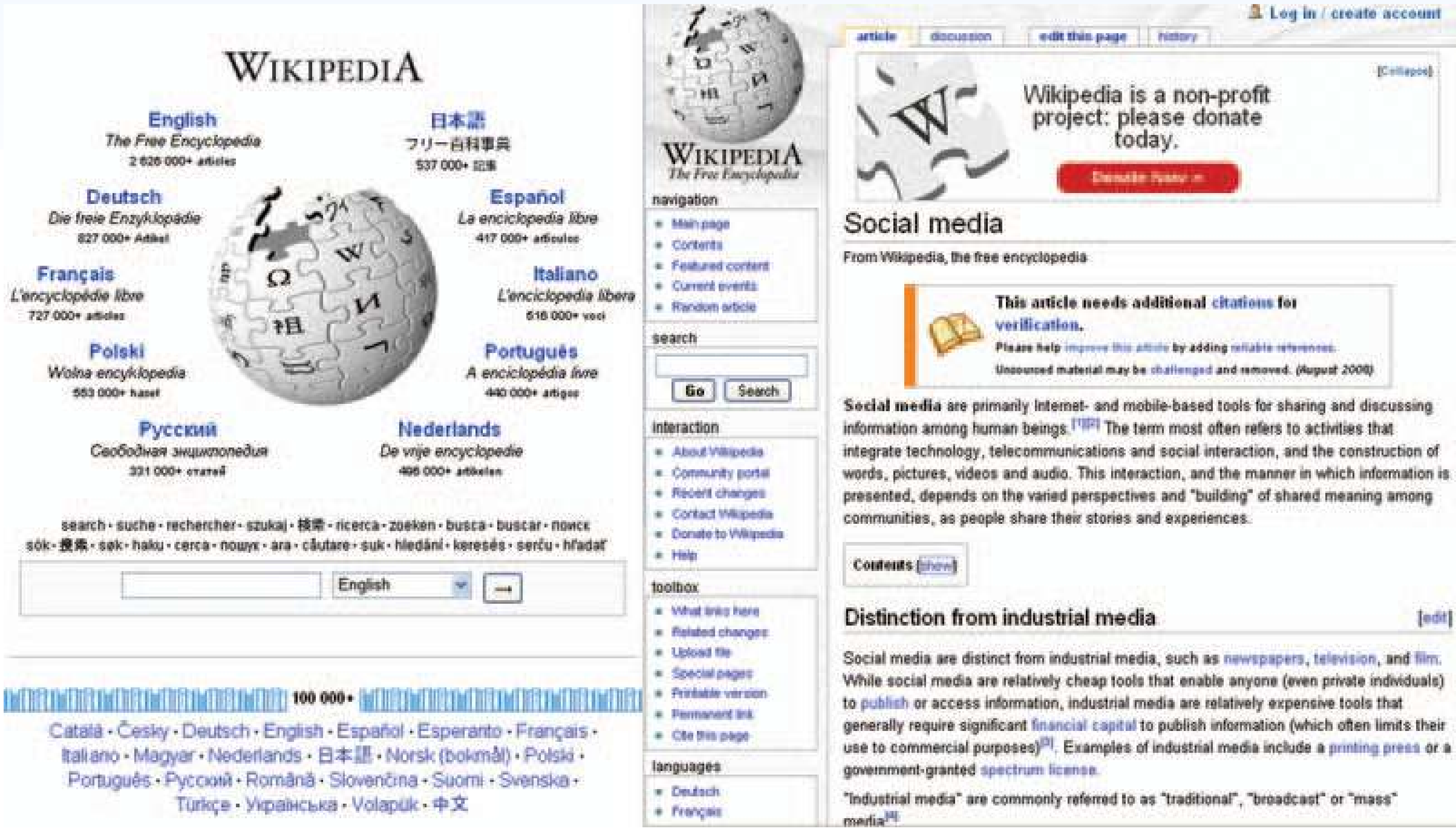
Asynchronous distributed interfaces: Different place, different time (cont.)

- **Newsgroups, listservers, discussion boards, conferences, social media participation web sites, blogs, and wikis**
  - focused electronic discussions by group of people
  - USENET newsgroups
    - each group dedicated (more or less) to one topic
    - like ordered posting on bulletin board
    - users read as many previous notes and related comments as they wish
    - open to all
  - listserv
    - individual must subscribe to receive e-mail notices
    - may be moderated by a leader
    - may be mail reflector
    - users can get flooded with listserv e-mails
    - server machine keeps searchable archive or past notes and subscriber list
  - online conference
    - in addition to listserv tools, may also include additional facilities
      - voting
      - online directories of users
      - online directories of documents
  - online magazines and newsletters
  - Web-logs/blogs and wikis

Asynchronous distributed interfaces: Different place, different time (cont.)



Asynchronous distributed interfaces: Different place, different time (cont.)



Asynchronous distributed interfaces: Different place, different time (cont.)

- Online and networked communities
  - Group identity
  - Patient support groups
  - Impact on offline communities
  - Community policies & freedom of speech
  - Network communities can be controversial
    - hackers
    - hate groups
    - para-military groups
  - Distance education courses
  - Reputation managers for online stores

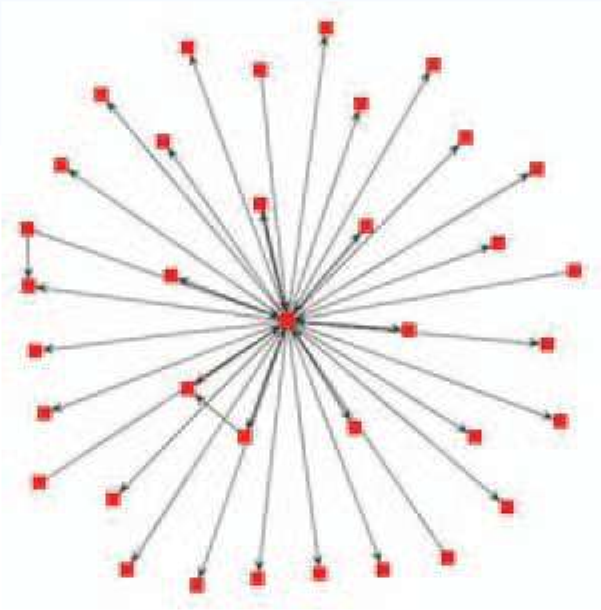
Asynchronous distributed interfaces: Different place, different time (cont.)

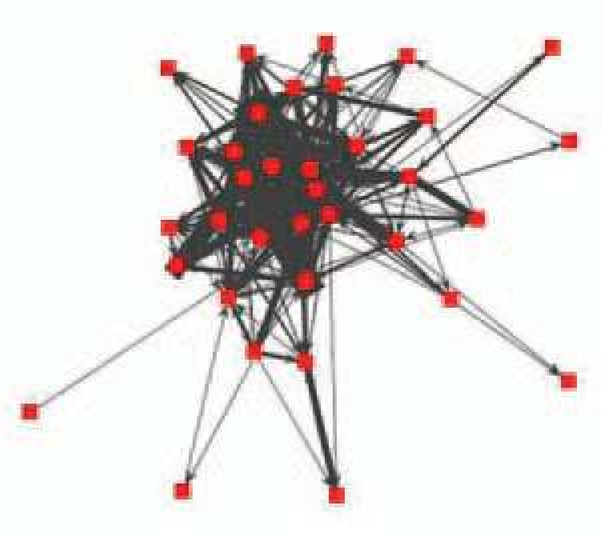
Bob’s ACL Kneeboard, a threaded discussion board for people who have suffered tears of the anterior cruciate ligaments in their knees. (http://factotem.org/cgi-bin/kneebbs.pl)

Asynchronous distributed interfaces: Different place, different time (cont.)

Starting screen for a virtual classroom example from the Los Angeles County Office of Education

Asynchronous distributed interfaces: Different place, different time (cont.)





Visualization of the communication pattern of an “answer person” on the left, and a “discussion person” on the right (Welser et al).

Synchronous distributed interfaces: Different place, same time

- Synchronous distributed applications
  - group editing
  - shared screens for customer assistance
  - give demonstrations simultaneously at multiple sites
  - allow sharing of information for various applications
  - interactive games

Synchronous distributed interfaces: Different place, same time (cont.)

- **Chat, instant messaging, and texting**
  - CHAT, Internet Relay Chat (IRC), and TALK
  - Flamers
  - MUDs

  Instant Messaging
  - LOL etc.
  - Twitter
  - Texting and cell phones

Synchronous distributed interfaces: Different place, same time (cont.)

Parental control system to oversee children’s online activities (http://www.sentryparentalcontrols.com/)

Synchronous distributed interfaces: Different place, same time (cont.)

- **Audio and video conferencing**
  - videoconferencing
    - slow response times for entering and leaving session
    - distracting background audio
    - difficulty in determining who is speaking
    - inadequate lighting
    - difficulty in making eye contact
    - changed social status
    - small image size
    - potential invasion of privacy
    - need for convenient turn taking
    - need for document sharing

Synchronous distributed interfaces: Different place, same time (cont.)

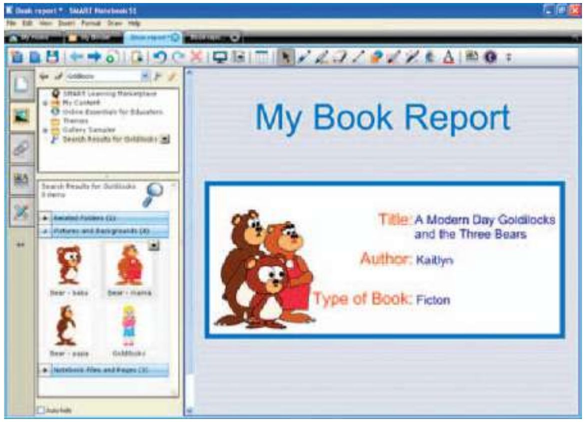
- **Audio and video conferencing (cont.)**
  - issues of ownership and control
    - private and public workspaces
    - identity of participants
    - location of actions
    - care with updating
  - Whether audio or video conferencing is more appealing than chat, IM, and texting, or more effective than asynchronous text, depends on the goals and the task environment

Face-to-face interfaces: Same place, same time

- Innovative approaches to work and learning include:
  - Shared display from lecturer workstation
  - Audience response units
  - Text-submission workstations
  - Brainstorming, voting, and ranking. Benefits of electronic meeting systems:
    - Parallel communication promotes broader input into the meeting process and reduces the chance that a few people dominate the meeting.
    - Anonymity mitigates evaluation apprehension and conformance pressure, so that issues are discussed more candidly.
    - The group memory constructed by participants enables them to pause and reflect on information and opinions of others during the meeting and serves as a permanent record of what occurred.
    - Process structure helps focus the group on key issues and discourages irrelevant digressions and unproductive behaviors.
    - Task support and structure provides information and approaches to analyze it.

Face-to-face interfaces: Same place, same time (cont.)

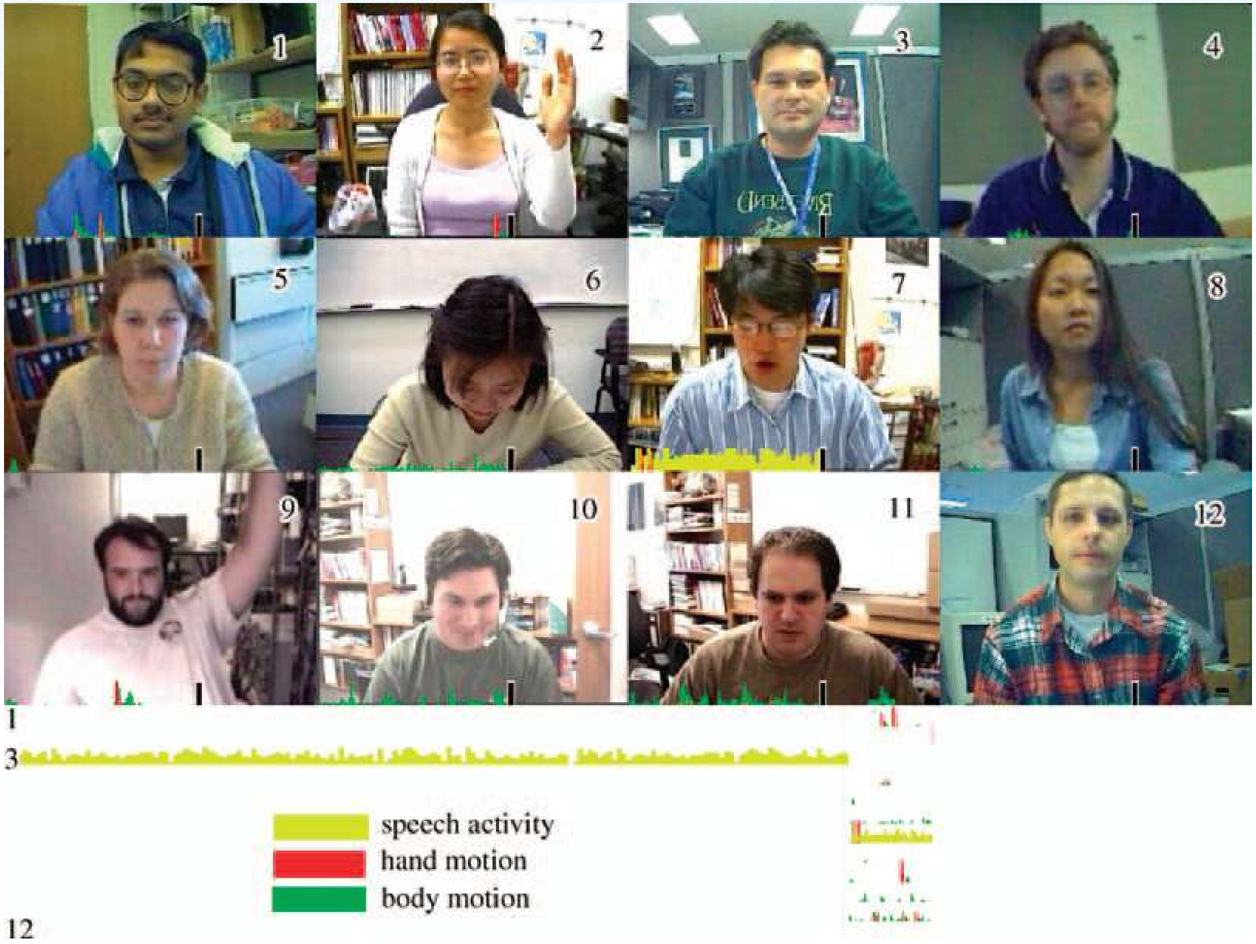
- File sharing
- Shared workspace
- Group activities
- Colab and Liveboard
- SMART Board
- Public spaces facilitate sharing
- Sharing photos is very popular
- Notification systems



Face-to-face interfaces: Same place, same time (cont.)

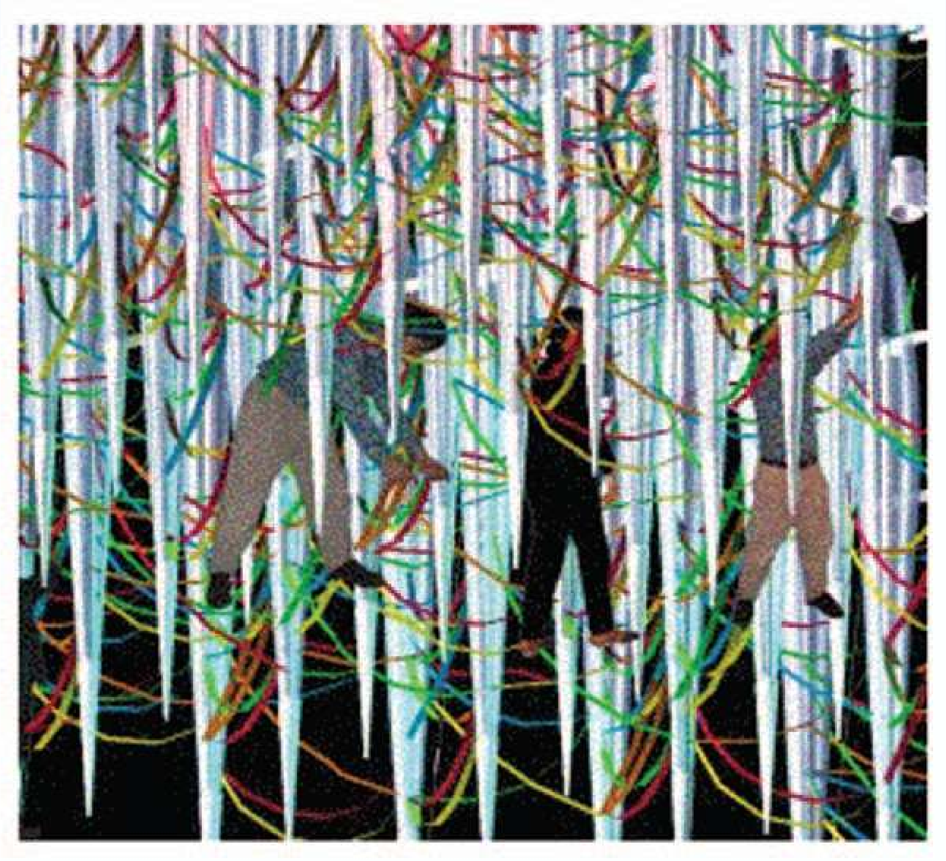
- **Electronic classrooms**
  - **Active individual learning experiences include using software during class time to:**
  - **Write essays in English or poems in a foreign language**
  - **Find antecedents of Impressionism in an art history library of 9000 images**
  - **Run business simulations to increase product quality**
  - **Perform psychological statistical analyses**
  - **Do landscaping with computer-assisted design and graphics packages**
  - **Compose computer programs and search the Internet**
- Small teams and large teams
- Changes teaching style

Face-to-face interfaces: Same place, same time (cont.)



Students in an online classroom. Activity is monitored by color: speech in yellow, hand motion in red, body motion in green. Under each student is a timeline of their individual activity and at the bottom is an activity picture (using the colors) of the class (Chen)

Face-to-face interfaces: Same place, same time (cont.)



Modulor II is a time-dependent architectural work of art in which participants create new patterns daily by collaboratively weaving colored strings through an interactive labyrinth of luminous poles (Halkia and Local)

Questions for consideration

Computer-supported cooperative work questions

- How would facilitating communication improve or harm teamwork?
- Where does the community of users stand on centralization versus decentralization?
- What pressures exist for conformity versus individuality?
- How is privacy compromised or protected?
- What are the sources of friction among participants?
- Is there protection from hostile, aggressive, or malicious behavior?
- Will there be sufficient equipment to support convenient access for all participants?
- What network delays are expected and tolerable?
- What is the user's level of technological sophistication or resistance?
- Who is most likely to be threatened by computer-supported cooperative work?
- How will high-level management participate?
- Which jobs may have to be redefined?
- Whose status will rise or fall?
- What are the additional costs or projected savings?
- Is there an adequate phase-in plan with sufficient training?
- Will there be consultants and adequate assistance in the early phases?
- Is there enough flexibility to handle exceptional cases and special needs (users with disabilities)?
- What international, national, and organizational standards must be considered?
- How will success be evaluated?

Good Design (our goal!)

"Every designer wants to build a high-quality interactive system that is admired by colleagues, celebrated by users, circulated widely, and imitated frequently." (Shneiderman, 1992, p.7)

…and anything goes!…

What is an interface?

- An interface refers to the part of technology that people interact with
- Interactions include information transfer:
  - From user to computer
  - From computer to user

Interaction Components

- Interaction hardware include:
  - Keyboard, mouse, stylus, keypad, microphone
- Interaction software include:
  - Window, page, sound, talking voice

What is a ‘well-designed’ interface?

- Depends on your perspective……
- Examples:
  - For a programmer – *works within technical constraints of project*
  - For a usability engineer – *designed with particular user group in mind*
  - For a user – *works the way expected*

Types of Interfaces

- Character-based user interface (CHUI)
- Graphical user interface (GUI)
- Web user interface (WUI)
- Speech user interfaces (SUI)
  - Auditory user interface (AUI)
  - Graphical user interface with speech (S/GUI)
  - Voice user interface (VUI)

Speech User Interface

- A software interface that employs speech
  - Human speech
  - Simulated human speech

Auditory User Interfaces

An Auditory user interface (AUI) is an interface which relies primarily or exclusively on audio for interaction, including speech and sound. (Weinschenk & Barker 2000)

- Examples:
  - Hands-free automobile navigational system
  - Interactive voice response system (IVR) like automated payment center
  - Products for visually impaired

Auditory User Interfaces

- Natural Language/Speech User Interfaces
  - Conversation is natural
- Multimodal User Interfaces
  - Combines voice, text, graphics, gestures, keypad, stylus, etc. into one interface

Graphical User Interface with Speech (S/GUI)

- Multimodal interface that involves speech and a GUI
- Examples:
  - Voice activated calling on cell phone
  - Dictation software that allows text entered via text, speech or both

Graphical User Interface with Non-Speech Audio

- Interface that includes non-verbal audio
- Earcons – auditory icons/sounds that communicate information
- Examples:
  - System beeps when user makes an error
  - System knocks when someone wants to chat

Multimodal User Interfaces

- Simultaneous Multimodality
  - Multiple modes at the same time, voice-visual
- Sequential Multimodality
  - Uses multiple modes sequentially and seamlessly

Voice User Interface

A voice user interface (or VUI) is what a person interacts with when communicating with a spoken language application. (Cohen et al, 2004)

Why a VUI?

- Characteristics that favor VUI:
  - Hands-busy situation
  - No keyboard, mouse, stylus available
  - Disablilties
  - Context-specific, command driven application

But What Makes a Good VUI?

- Functionality
- Speed & efficiency
- Reliability, security, data integrity
- Standardization, consistency
- **USABILITY !**

Closer to Fine: A Philosophy

…The human user of any system is the focus of the design process. Planning and implementation is done with the user in mind, and the system is made to fit the user, not the other way around….

Bruce Walker

Georgia Institute of Technology

How Do You Know It's Good?!

Usability Test and Evaluation

Human Factors in Speech

Human Factors in Speech

- High Error Rates
  - Speech recognition
  - Background noise, intonation, pitch, volume
  - Grammars (missing words, size limitations)

- *"When speech recognition becomes genuinely reliable, this will cause another big change in operating systems."* (Bill Gates, The Road Ahead 1995)

Human Factors in Speech

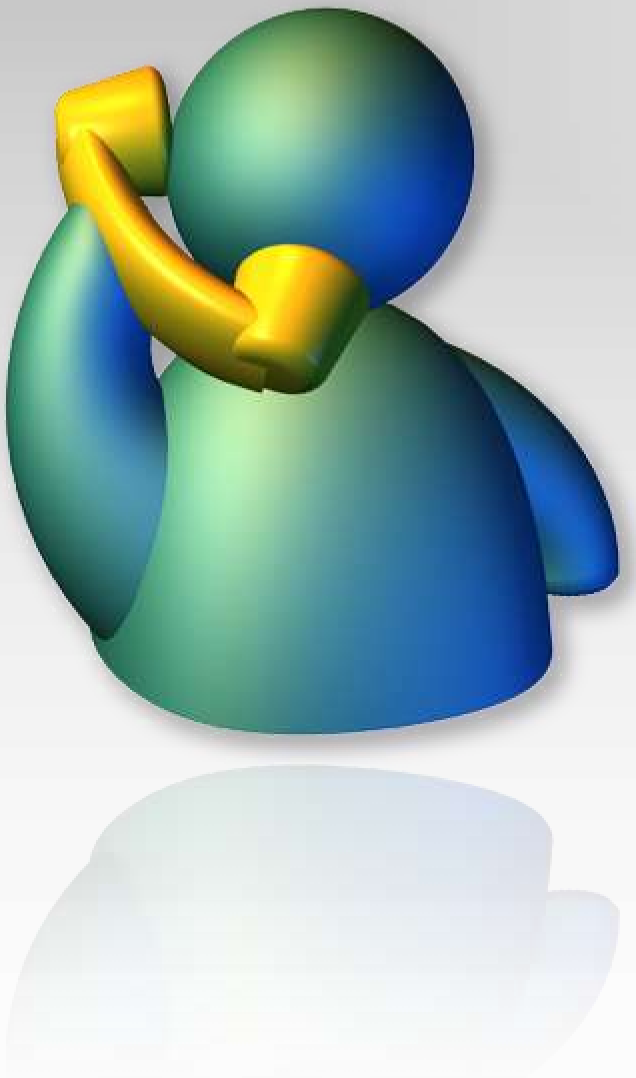
- Unpredictable Errors
  - Grammars
    - Sound alike words Austin-Boston
    - Missing words
    - Grammar size limitations
  - *Note: We do not like using unpredictable machines.*

Human Factors in Speech

- User Expectations
  - Novice users have high expectations of computers and speech
  - Natural language
    - Novices expect to say “anything” to the machine
    - i.e. Star Trek
  - Spoken language differs from written language.
    - i.e. ums or uhs appear in spoken language

Human Factors in Speech

- Memory
  - Speech only systems can be taxing on human memory, i.e. large telephone menu systems.
  - Miller - 7 plus or minus 2



Definitions and Terms

Speech Recognition

Refers to the technologies that enable computing devices to identify the sound of human voice.

Speech Recognition

- Continuous Recognition
  - Allows a user to speak to the system in an everyday manner without using specific, learned commands.
- Discrete Recognition
  - Recognizes a limited vocabulary of individual words and phrases spoken by a person.

Speech Recognition

- Word Spotting
  - Recognizes predefined words or phrases.
  - Used by discrete recognition applications.
    - “Computer I want to **surf the Web**”
    - “Hey, I would like to **surf the Web**”

Speech Recognition

- Voice Verification or Speaker Identification
  - Voice verification is the science of verifying a person's identity on the basis of their voice characteristics.
  - Unique features of a person's voice are digitized and compared with the individual's pre-recorded "voiceprint" sample stored in the database for identity verification.
  - It is different from speech recognition because the technology does not recognize the spoken word itself.

Speech Synthesis

Refers to the technologies that enable computing devices to output simulated human speech.

James, here are the U-N-C Charlotte orders.

Speech Synthesis

- Formant Synthesis
  - Uses a set of phonological rules to control an audio waveform that simulates human speech.
  - Sounds like a robot, very synthetic, but getting better.

Speech Synthesis

- Concatenated Synthesis
  - Uses computer assembly of recorded voice sounds to create meaningful speech output.
  - Sounds very human, most people can’t tell the difference.

Uses of Speech Technologies

- Interactive Voice Response Systems
  - Call centers
- Medical, Legal, Business, Commercial, Warehouse
- Handheld Devices
- Toys and Education
- Automobile Industry
- Universal Access (visual/physical impaired)

Requirements Analysis

- A E I O U (Y)
  - Artifacts
  - Environment
  - Interaction
  - Outcome
  - User
  - WhY

A
Artifacts

- What are the artifacts?
  - Things
  - Places

E
Environments

- What are the environments?
  - Physical Places of Operation
  - Operating Environments/Systems

I
Interactions

- What are the interactions?
  - Between humans
  - Between machines
  - Between humans and machines

O
Outcomes

- What are the outcomes?
  - Tangible outcomes
  - Intangible outcomes

U
Users

- Who are the users?
  - Customers
  - Clients
  - Developers
  - Users

Y
Why?

- Why are you doing this?

- Motivation
  - Client
  - User
  - You

Human Computer Interaction

Chapter 5

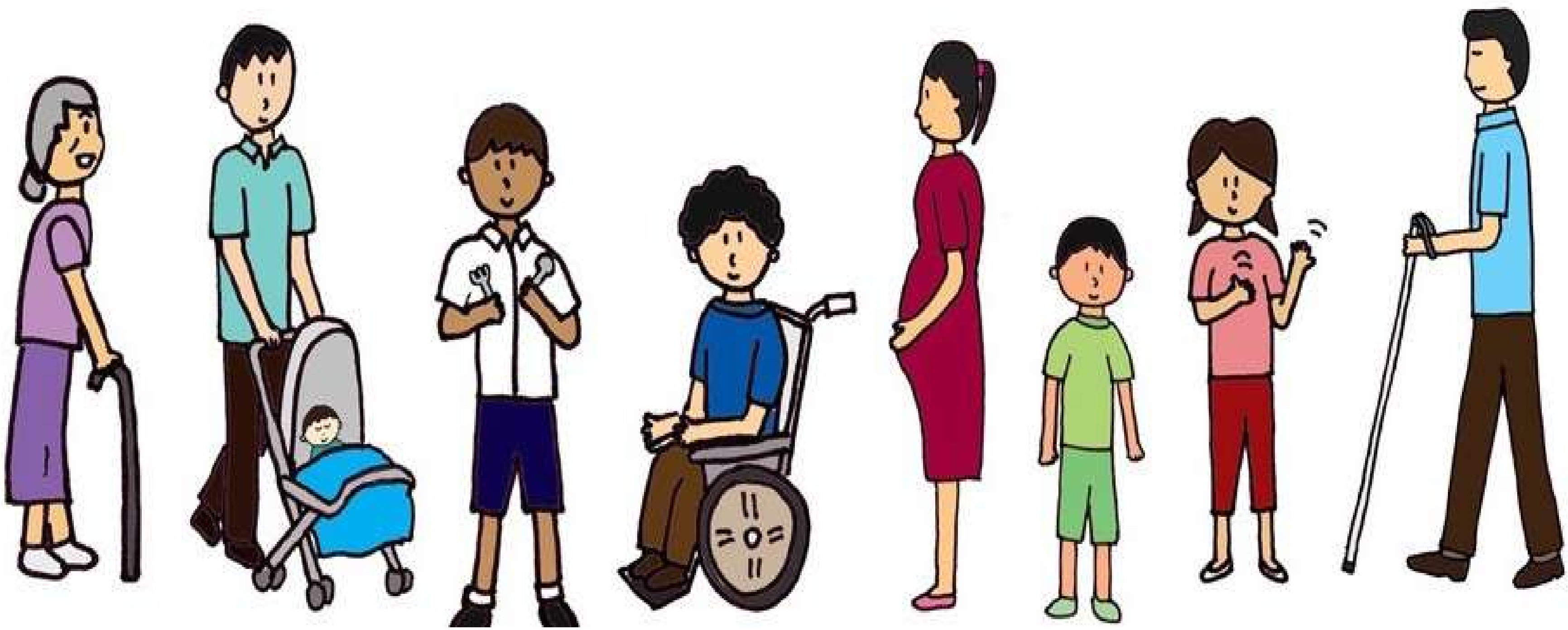
Universal Design and User Support

Presented by Dr. J. VijiPriya,
Assistant Professor, Hawassa University,
Ethiopia

May 26, 2016

Universal design

- ***the process of designing products*** that are accessible by all users in all circumstances, taking account of human diversity in disabilities, age and culture



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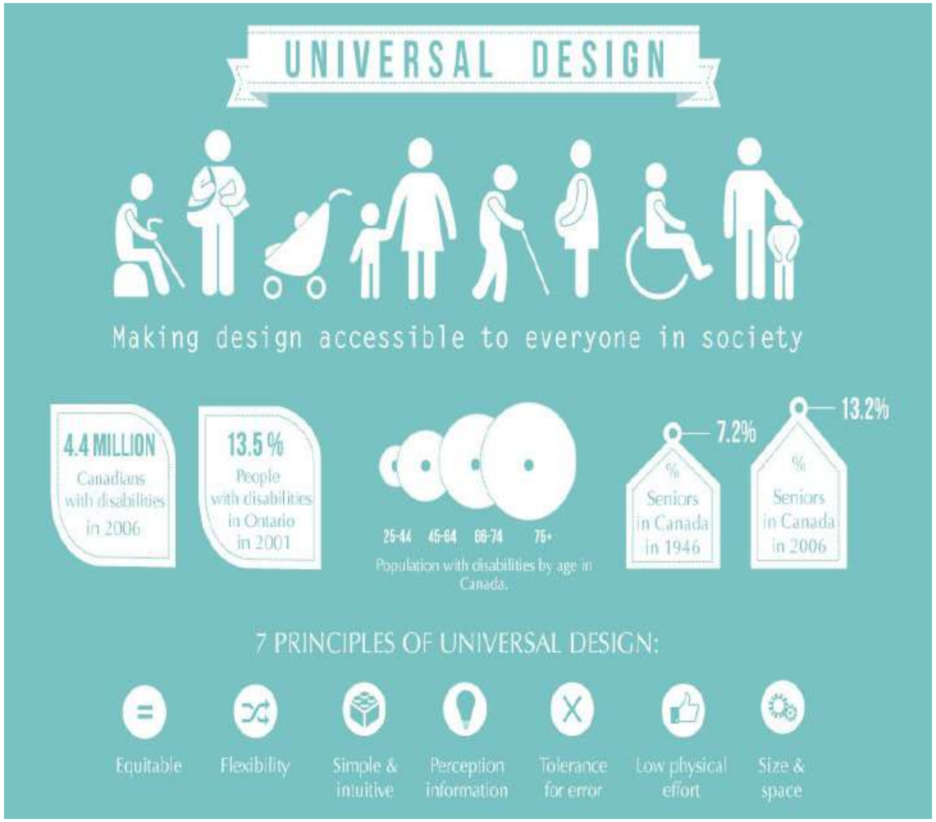
Seven Universal Design Principles

- In 1990s, ***North Carolina State University in the USA*** proposed seven universal design principles

1. *Equitable use*
2. *Flexibility in use*
3. simple and intuitive to use
4. Perceptible information
5. *Tolerance for error*
6. *Low physical effort*
7. *Size and space for approach and use*



Seven Universal Design Principles Con…

1. ***Equitable use***: the design is useful to people with a range of abilities and appealing (tempting) to all.

Seven Universal Design Principles Con…

2. ***Flexibility in use*****:** the design is adaptively to the user's pace (speed), precision (accuracy), and custom(habit)

Seven Universal Design Principles Con…

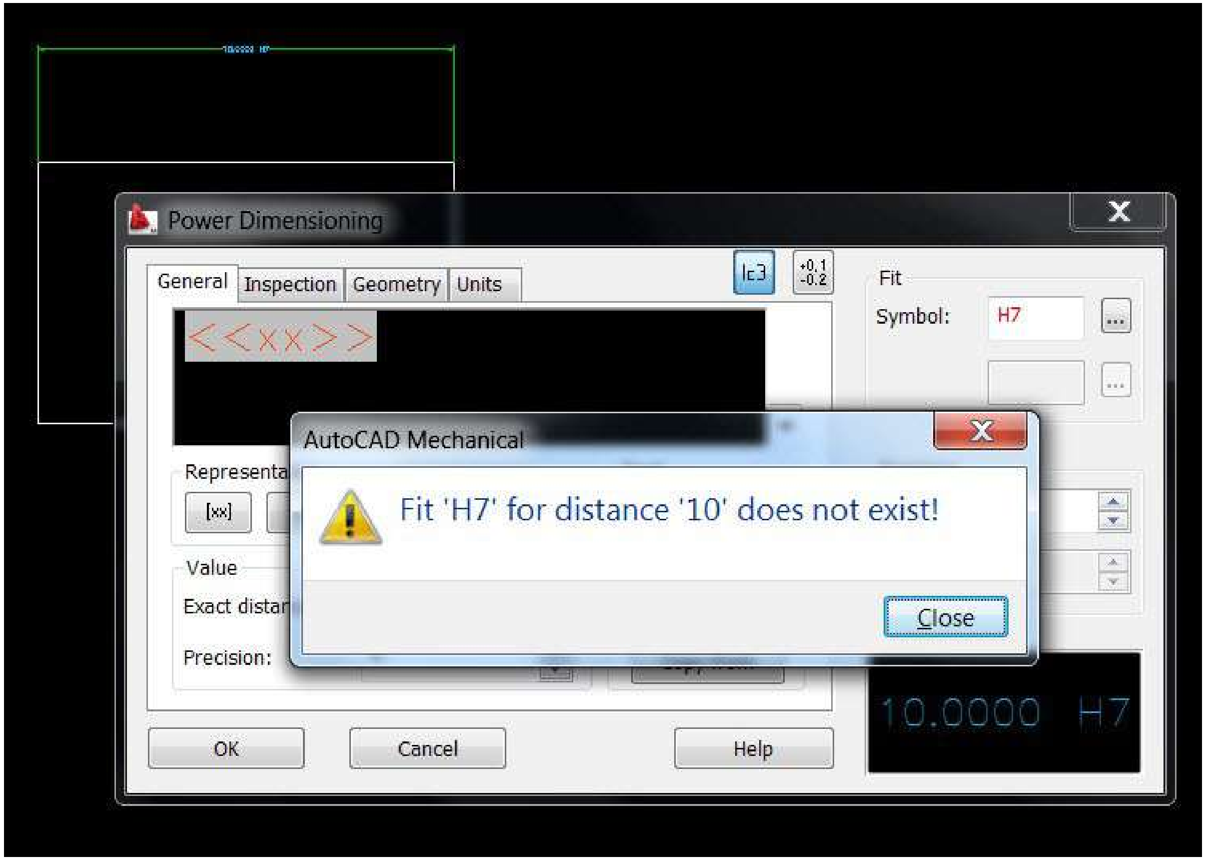
3. The system be **simple and intuitive (perceptive) to use**, regardless of the knowledge, experience, language or level of concentration of the user

Seven Universal Design Principles Con…

4. **Perceptible (observable) information:** The design should provide effective communication of information regardless of the environmental conditions or the user's abilities (e.g. graphic, verbal, text, touch).

Seven Universal Design Principles Con…

5. ***Tolerance for error*:** minimizing the impact and damage caused by mistakes or unintended behavior



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Ethiopia

Seven Universal Design Principles Con…

6. ***Low physical effort*: systems should be designed to be comfortable to use, minimizing physical effort and fatigue (tiredness)**

Seven Universal Design Principles Con…

7. ***Size and space for approach and use*:** The placement of the system should be reached and used by any user regardless of body size, posture or mobility (ie. seated or standing users)

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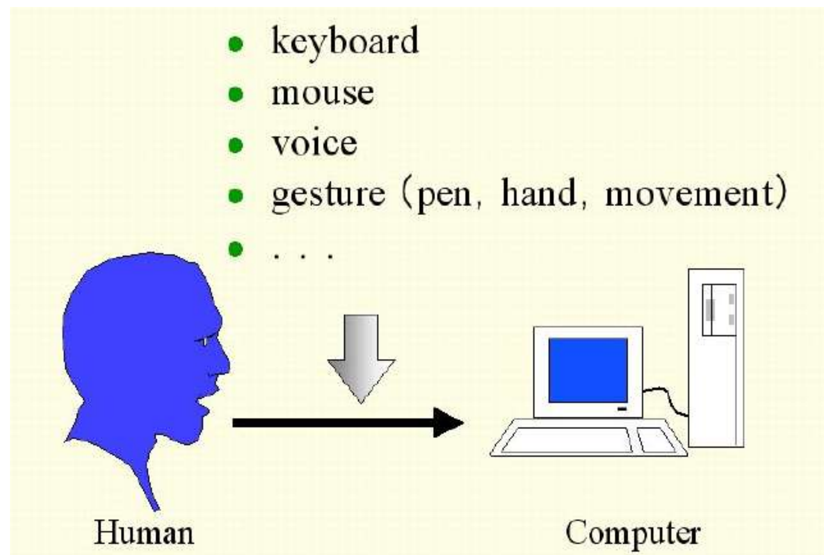
Multi-modal Interaction

- provide access to system information and functionality through a range of ***different input and output channels***
- The 5 senses (sight, sound, touch, taste and smell) are used by us every day and provide a fuller interaction with the natural world
- Computers rarely offer such a rich interaction



Designing for Diversity

The designer considers three key areas:

1. *Designing for users with disabilities*
   - visual impairment
   - hearing impairment
   - physical impairment
   - speech impairment
   - dyslexia
   - autism
1. *Designing for different age groups*
   - Old people
   - Children
1. *Designing for cultural differences*

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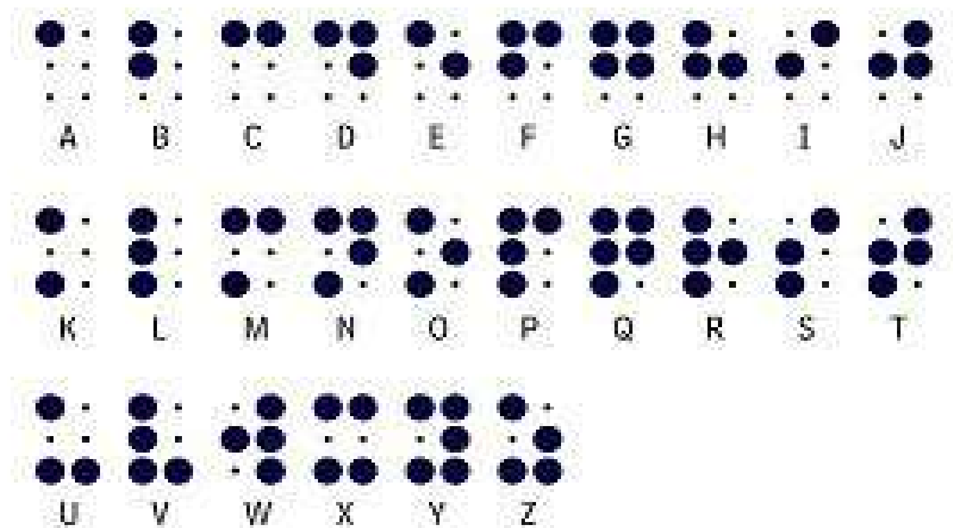
Assistant Professor, Hawassa University,
Ethiopia

Designing for Diversity Con…

visual impairment

- The rise in the use of graphical interfaces reduces the possibilities for visually impaired users



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Assistant Professor, Hawassa University, Ethiopia

Designing for Diversity Con..

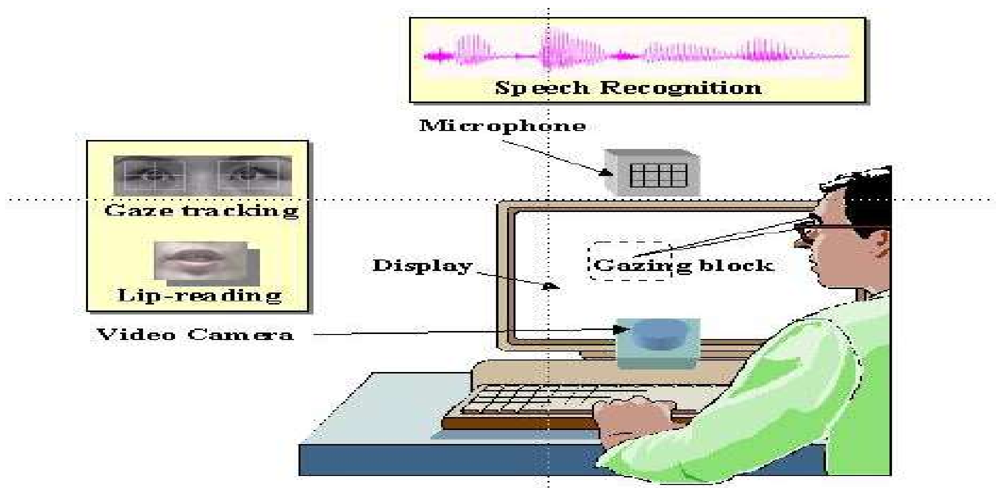
hearing impairment

- have little impact on the use of an interface
- Captioning audio content making audio files easier and more efficient to index and search

Designing for Diversity Con…

physical impairment

- Users with physical disabilities vary in the amount of control and movement over their hands ,impact in mouse control difficulty
- **eyegaze system** which tracks eye movements to control the cursor,
- keyboard driver that can be attached to the user's head.
- predictive system, such as the **Reactive keyboard**, cut the typing requirement considerably



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Designing for Diversity Con…

- **speech impairment**

  multimedia systems provide a number of tools for communication, including synthetic speech and text-based communication and conferencing systems

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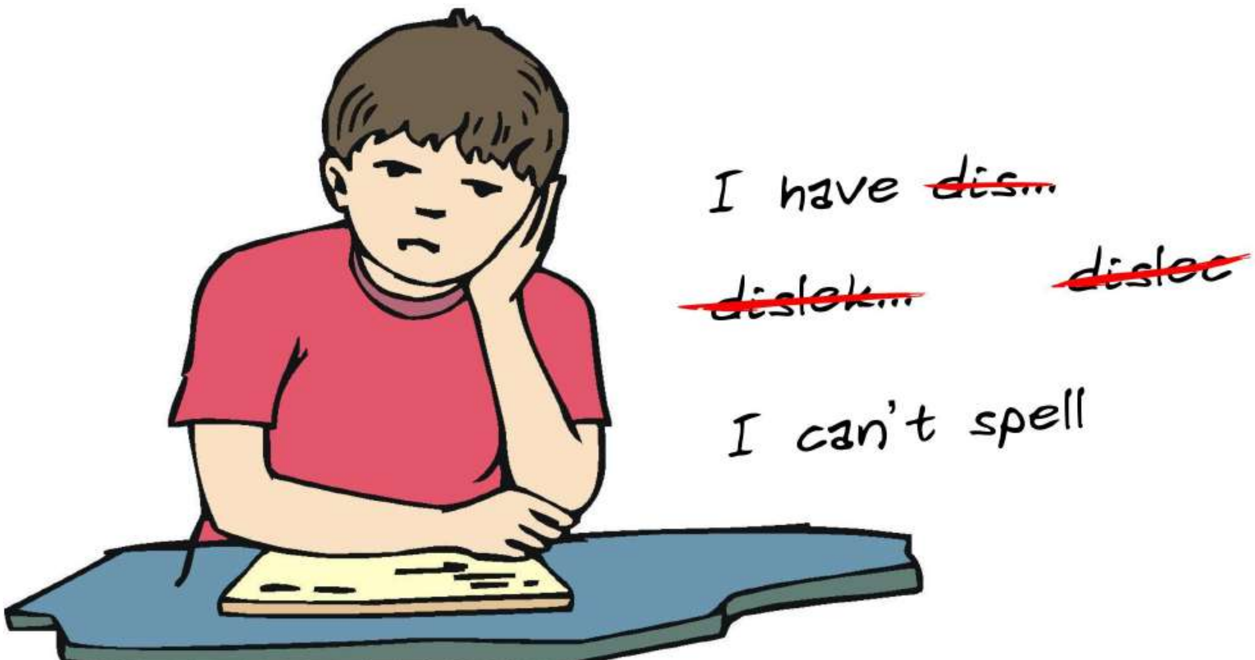
Assistant Professor, Hawassa University,
Ethiopia

Designing for Diversity Con…

Dyslexia

- Users with cognitive disabilities such as dyslexia can find textual information difficult



Designing for Diversity Con…

Autism

- affects a person's ability to communicate and interact with people around them and to make sense of their environment

1. Social interaction – problems
2. Communication – problems
3. Imagination – problems

How might universal design of technology assist people with autism?

communication and education.

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Assistant Professor, Hawassa University,
Ethiopia

Designing for Diversity Con…

Designing for different age groups

- **Older people:**

  email and instant messaging, can provide social interaction in cases where lack of mobility or speech difficulties and reduce face-to-face possibilities.

- **Children**

  Information in Graphics, sound and text, Pen-based interfaces, touch or handwriting, may be easier for children than keyboard and mouse

Designing for Diversity Con…

Designing for cultural differences

- The other factors such as age, gender, race, sexuality, class, religion and political persuasion, may all influence an individual's response to a system
- The designer practice universal design which include language, cultural symbols, gestures and use of color

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Assistant Professor, Hawassa University, Ethiopia

User Support

- Even if an interactive system is properly designed, the user will require varies assistance at various times, dependent on many factors:
  - their familiarity with the system,
  - the job they are trying to do, and so on.

There are four main types of assistance that users re

1. quick reference
2. task-specific help
3. full explanation
4. tutorial

User support is provided by different types of support system

i. Help systems are problem oriented and specific
ii. Documentation is system oriented and generic

User Support Con…

- ***Quick reference***
  - used as a reminder to the user for the details of tools
  - Example: find a particular command option and the syntax of the command
- ***Task-specific help***
  - required how to apply the tool to his particular problem
- ***Full explanation***
  - used when the more experienced or inquisitive (questioning) user may require a full explanation of a tool or command
- ***Tutorial***
  - particularly aimed at new users of a tool and provides step-by-step instruction (perhaps by working through examples) of how to use the tool

Requirements of user support

What features will the help system have? These features are:

- ***Availability***
  - access help at any time during his interaction with the system.
  - Ideally, run concurrently with main application.
- ***Accuracy and completeness***
  - provided should be accurate and complete.
  - If provided proves not to match the actual behavior of the system the user will become disillusioned (disappointed) with the help facilities.
- ***Consistency***
  - Online help should also be consistent with paper documentation in terms of content, terminology and style of presentation

Requirements of user support Con…

- ***Robustness***
  - When the system is behaving unexpectedly or has failed altogether ,the help system should be correct error handling and predictable behavior.
- ***Flexibility***
  - allow each user to interact with it in a way appropriate to his needs, experience and task.
- ***Unobtrusiveness***
  - The help system should not prevent the user from continuing with normal work.
  - The textual help system on a non-windowed interface may interrupt the user's work.
  - A possible solution to this is split-screen presentation.

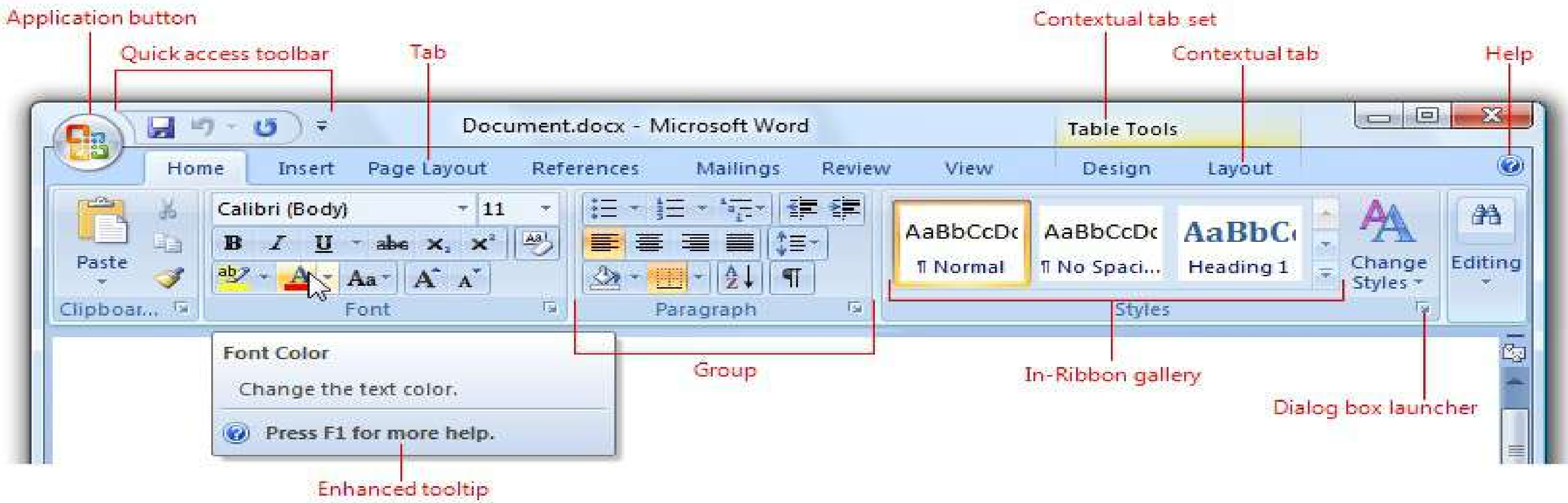
Approaches to user support

- A number of different approaches to providing help, each of which meets a particular need.
- vary from simple captions to full adaptive help and tutoring systems.

The *styles of help* are given below:

- ***Command assistance***
  - The user requests help on a particular command and is presented with a help screen or manual page describing it.
  - e.g., UNIX man, DOS help, Windows Help.
  - It is good for quick reference
- ***Command prompts***
  - In command line interfaces, command prompts provide help , usually in the form of correct usage prompts when the user encounters an error.
- ***Context sensitive help***
  - used in menu-based systems to provide help on menu options
  - Example: The Microsoft Office tool-tips , Web page rollover.

Approaches to user support Con…

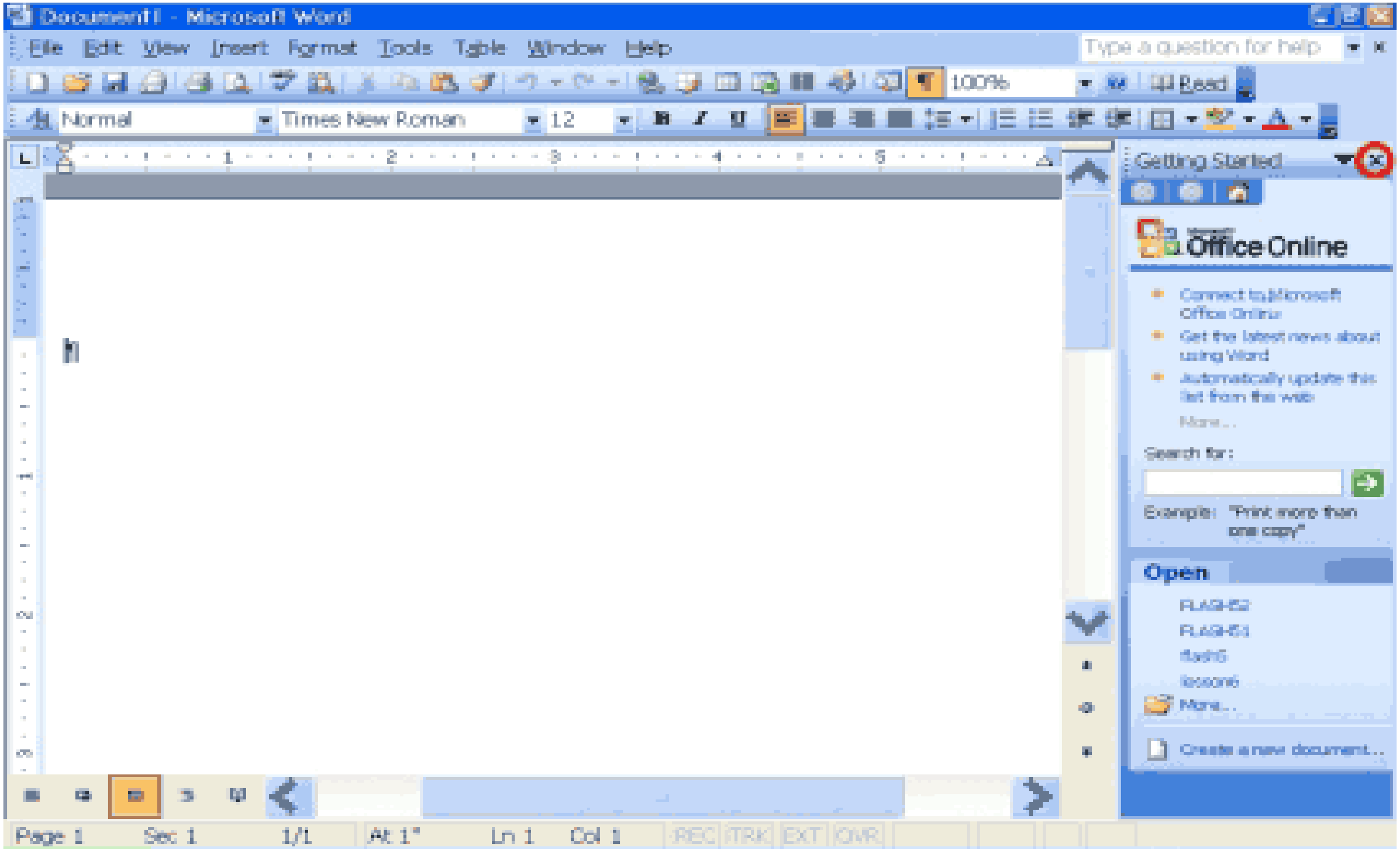


Approaches to user support Con…

- ***On-line tutorials***
  - The user get how the application works by **experimenting with examples and demonstration of how to perform a task**
  - The user can **repeat parts of the tutoria**l if needed.

- ***On-line documentation***
  - **paper documentation available** on computer.
  - **material available continually** (assuming the machine is running!) in the same medium to a large number of users concurrently.
  - difficult to browse.
  - Documentation structured using **hypertext supports browsing**

Approaches to user support Con…



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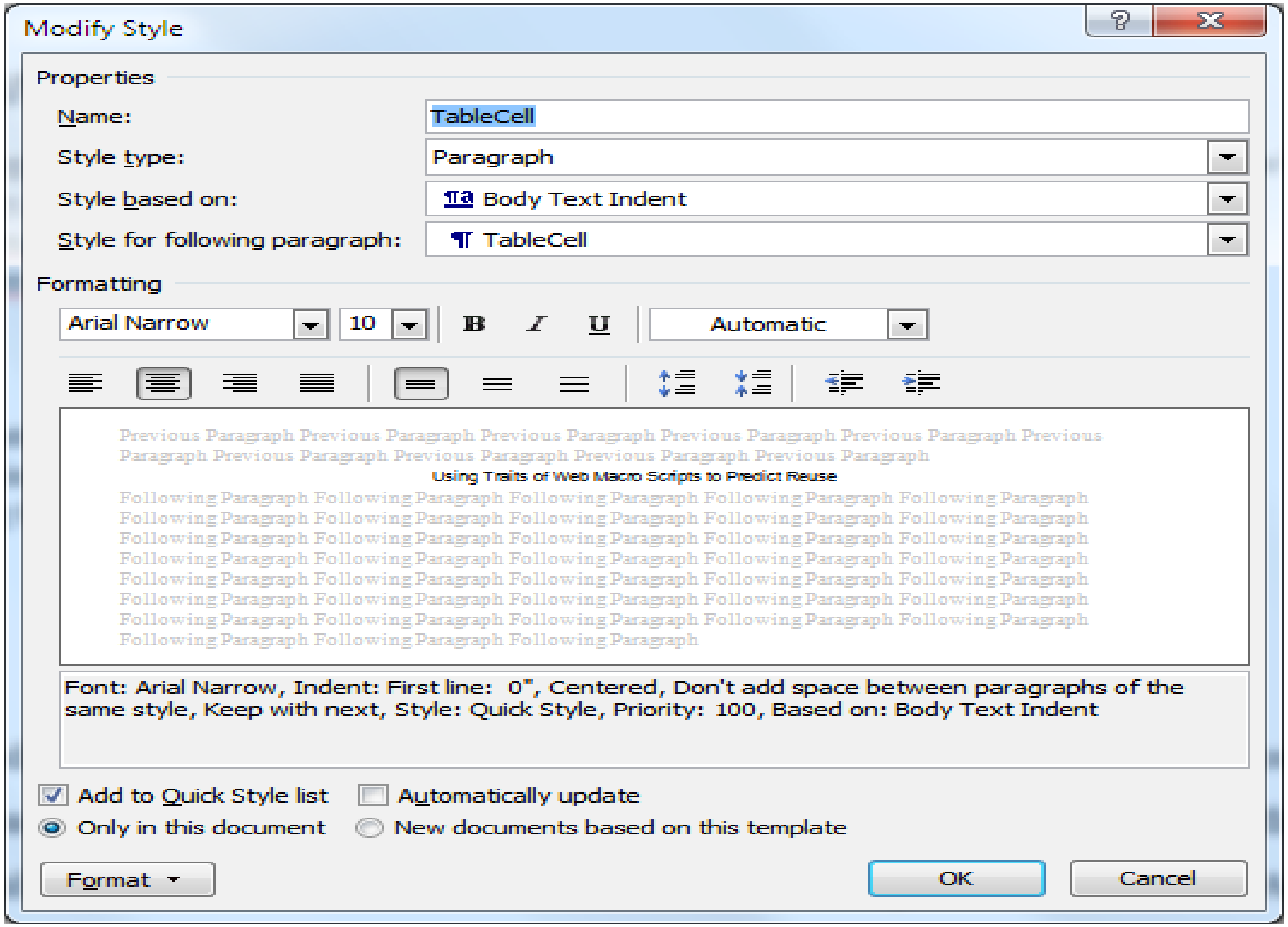
Approaches to user support Con…

- ***Wizards***
  - A *wizard* is a **task-specific tool**.
  - allow the user actually to complete the tasks safely, quickly and accurately.
  - Example, the **Microsoft Word resumé.**
  - allow the user to move back a step as well as forward, will provide a progress indicator showing how much of the task is completed and how many steps remain, and will offer sufficient information to allow the user to answer the questions
- ***Assistants***
  - software tools that **monitor user behavior** and offer suggestions or hints when they recognize familiar sequences.
  - Example : **Eager**, a software agent. When it notices the user repeating a sequence of actions, a **cat icon appears**, suggesting the next action

Approaches to user support Con…



Adaptive help systems

- In any large or complex computer system, users will be
  - familiar with a subset of the available functionality,
  - demonstrating expertise in some applications
  - having no experience with others,
  - unaware of their existence.
- attempt to address these above problems by ***adapting the help to the individual user*** and by actively ***suggesting alternative courses*** to the user may not be aware.
- ***Intelligent systems*** include domain-specific expert systems, intelligent tutoring systems and general adaptive interfaces.

Adaptive help systems

Other Resources

- **Excel Tutorials on the Internet**
  - http://www.fgcu.edu/support/office2000/excel/
  - http://www.baycongroup.com/el0.htm
  - http://www.studyfinance.com/lessons/excel/
  - http://www.usd.edu/trio/tut/excel/
- **Useful Powerpoint help**
  - http://www.actden.com/pp/print.htm
  - http://www.ellenfinkelstein.com/powerpoint_tip.html
  - http://www.masterviews.com/2001/11/15/chart_types_how_to_select_appropriate_chart_types.htm
- **Microsoft Word Tutorials**
  - http://www.tutorialbox.com/tutors/off2000/word/
  - http://www.baycongroup.com/wlesson0.htm
  - http://www.public.iastate.edu/~hschmidt/wordtutorial.html

Designing User Support Systems

There are a number of things which the designer should take into account.

1. User support is not an `add on'
   - should be designed integrally with the system.

1. Concentrate on content and context of help rather than technological issues.

2. Make decisions about how the help will be presented to the user and how this will be affected by implementation issues.

Presented by Dr. J. VijiPriya,
Assistant Professor, Hawassa University, Ethiopia

Designing User Support Systems Con…

Presentation issues

- How is help requested?
  - command, button, function (on/off), separate application
- How is help displayed?
  - new window, whole screen, split screen,
  - pop-up boxes, hint icons
- Effective presentation requires
  - clear, familiar, consistent language
  - instructional rather than descriptive language
  - avoidance of blocks of text
  - clear indication of summary and example information

Designing User Support Systems Con…

Implementation issues

1. Will help be an ***operating system command, a meta-command or an application***?
2. What ***physical constraint*** does the machine impose ***in terms of screen space, memory capacity and speed?***
3. How the help data is to be ***structured: in a single file, a file hierarchy, a database?*** any structure should be flexible and extensible
4. Will users be able to ***browse through the system*** or only request help on one topic at a time?
5. Will the user make a ***hard copy of part of the help system*** to study later (manuals and documentation).
6. The designer should ***consider the authors of help material as well as its users***. Even if the designer ***writes the initial help texts***, these ***will be extended*** by other authors at different times.

Graphical User Interface (GUI)

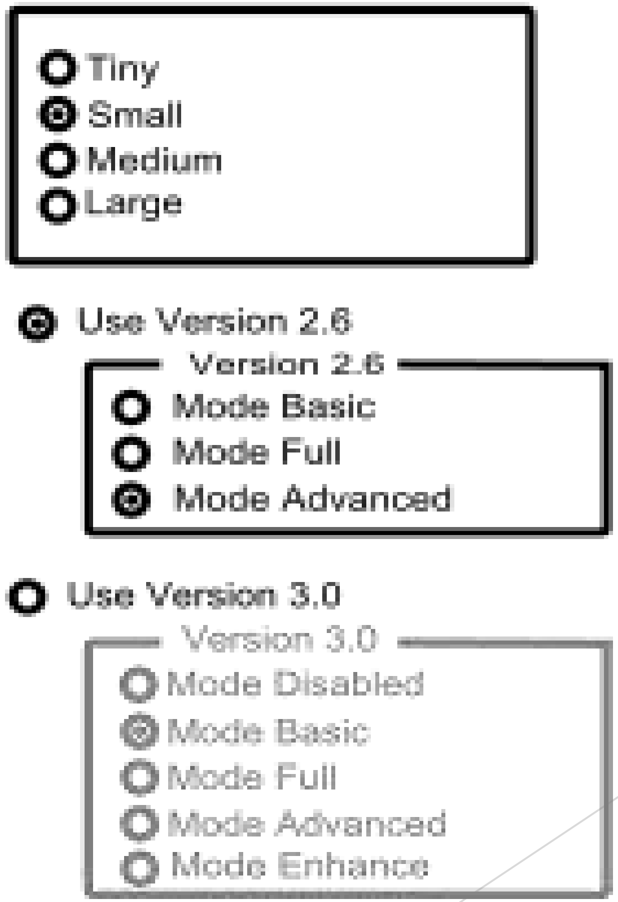
An introduction to Graphical User Interface

Graphical User Interface (GUI)

- Graphical User Interface (GUI) is a visual way of interacting with the computer using the components like windows, icons, labels, text-boxes, radio buttons, etc.
- GUI is a program interface that takes the advantage of the computer graphics capabilities to make the program easier to use.
- A well designed GUI helps the users to get rid from remembering complex commands by presenting command driven graphical layout.
- GUI uses windows, icons and menus to carry out commands such as opening files, deleting files and moving files.
- It refers to the graphical interface of a computer that allows users to click and drag objects with a mouse instead of entering text at a command line.

Frame

- In graphics and desktop publishing applications, a rectangular area in which text or graphics can appear is termed as a frame.
- Frames are rectangular areas meant for inserting graphics and text.
- They allow users to place objects wherever they want to on the page.

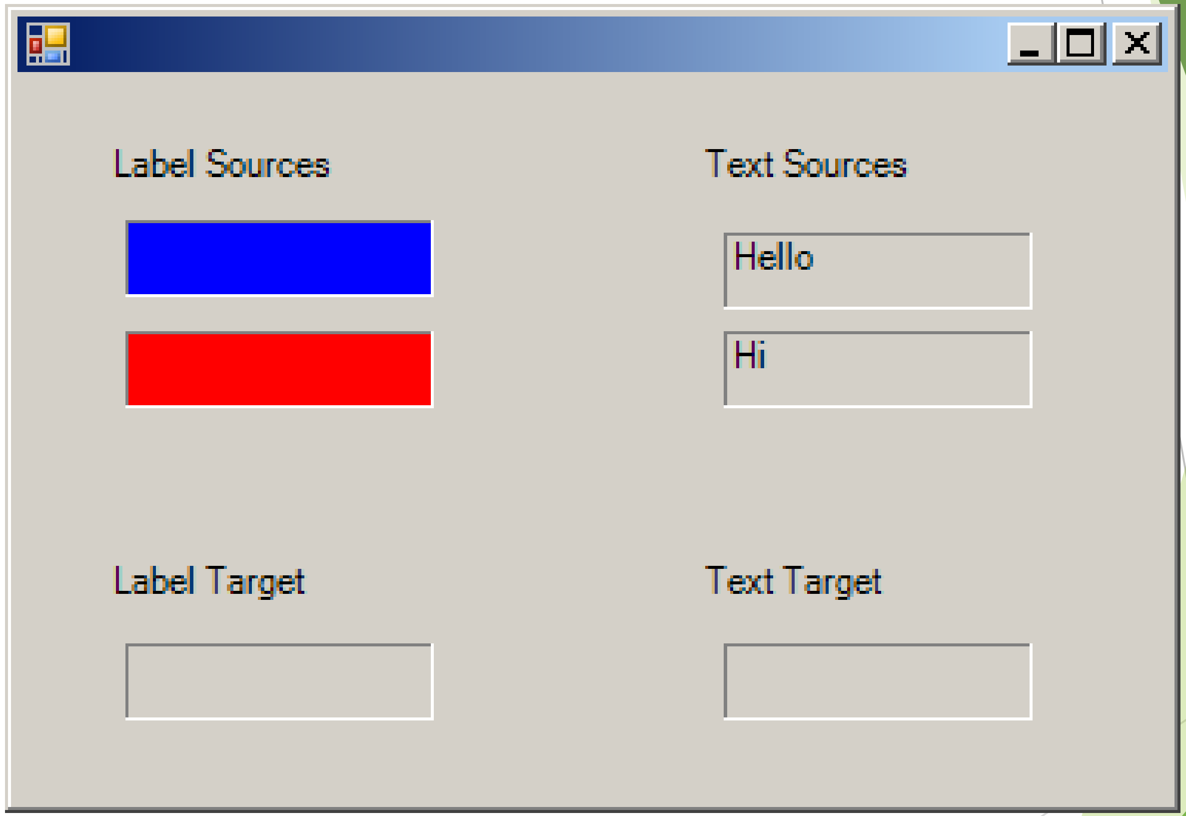


Window

- Window is the total visible screen of any application.
- It consists of a visual area that contains some of the graphical user interface of the program.
- A window is framed by a window decoration.
- It has a rectangular shape that can overlap with the area of other windows.
- It displays the output and allows input to one or more processes.

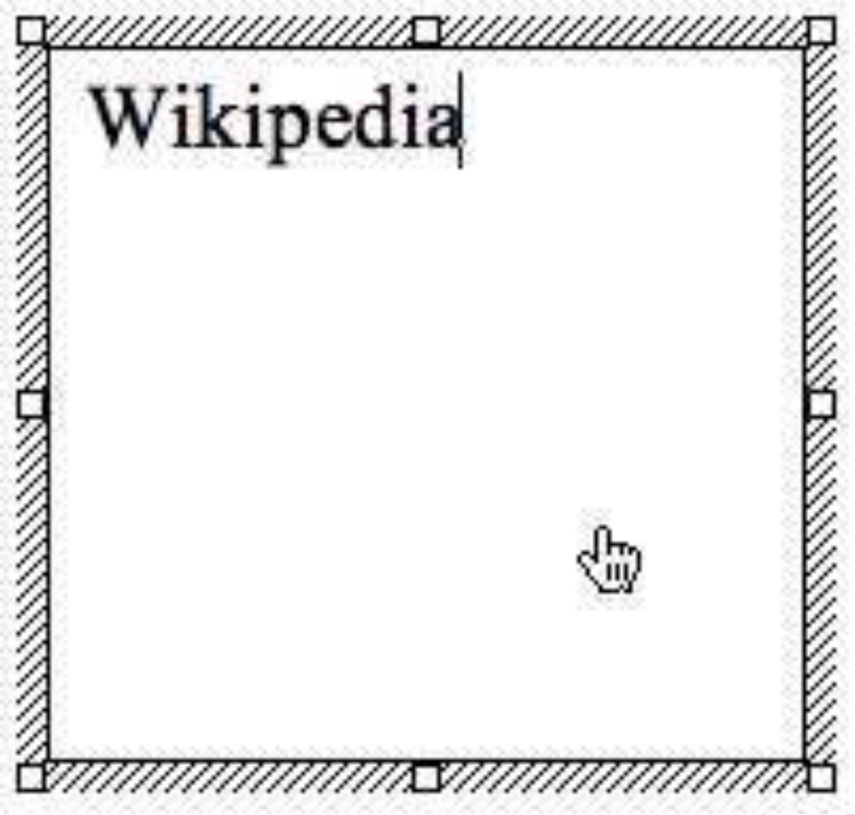
Label

- A label is a graphical control element, which displays text on a form.
- It is a static control; having no interactivity.
- A label is generally used to identify a nearby text box.
- A label in GUI is just like a piece of paper, polymer, cloth, metal, or other material on a container or product, written
or printed information about the product.
- In computing, labels are used when the texts are written for informational and naming purpose.



Text Box

- A text box is a graphical control element often appears with a label and is intended to enable the user to input text information used by the program.
- It is an area where user can input data and information.

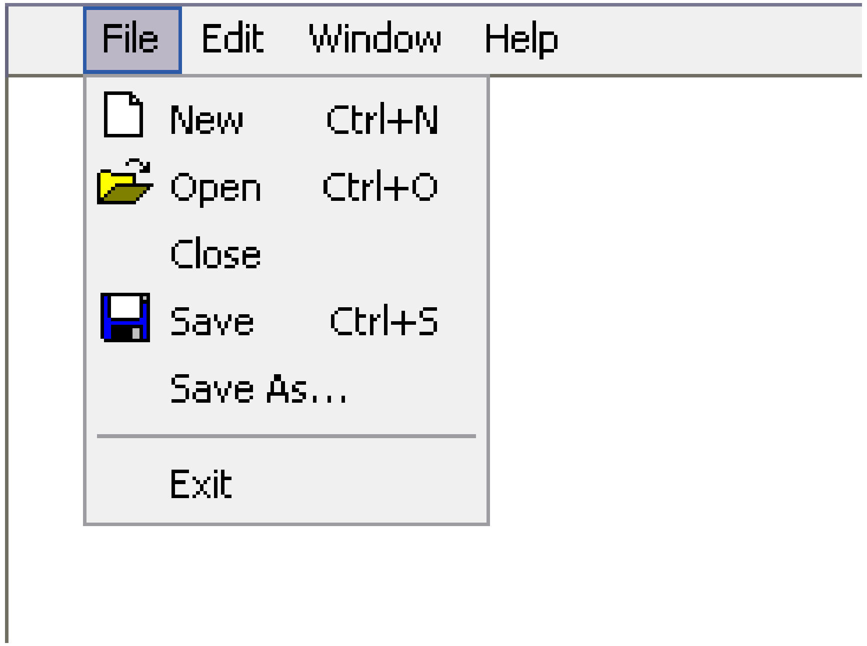


Text Field

- A text field is a text control GUI element that enables the user to type a small amount of text.
- When the user indicates that text entry is complete, the text field processes an event.

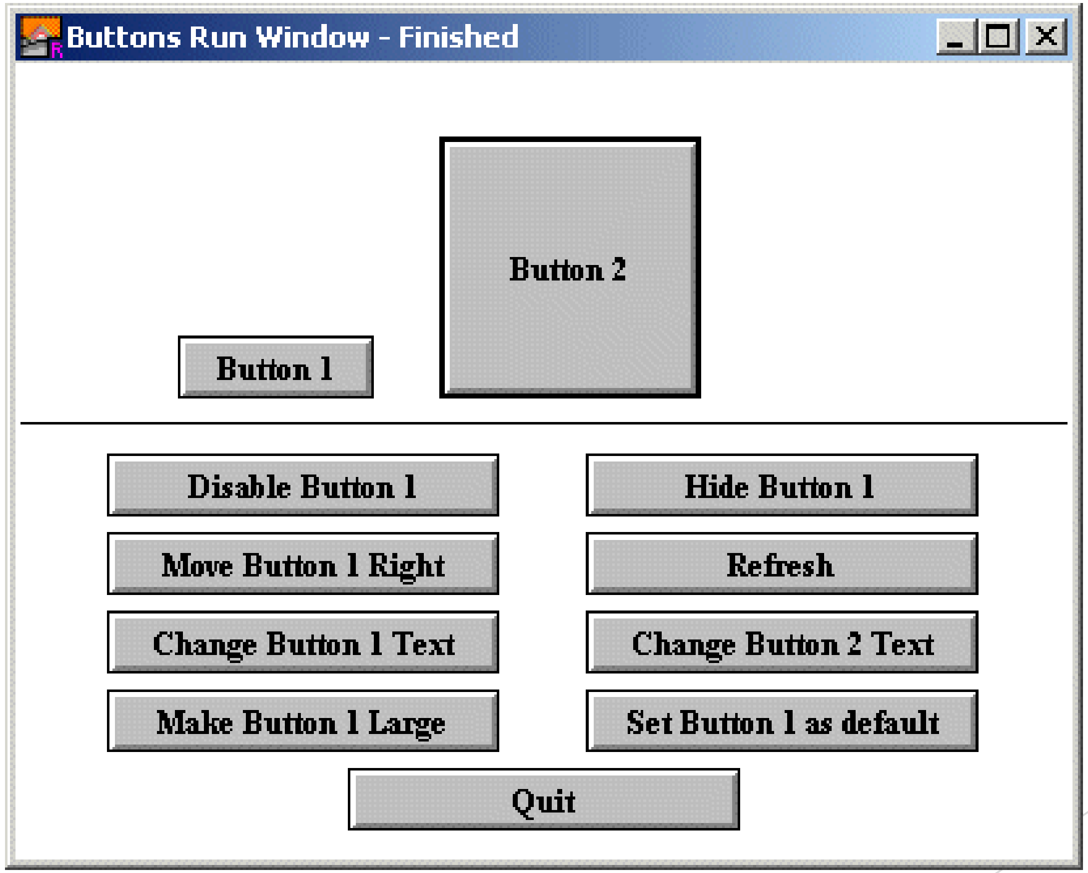
Menu

- Menu is a control that allows the user to select an option out of a list of options.
- It is a list of options or commands presented to an operator by a computer.



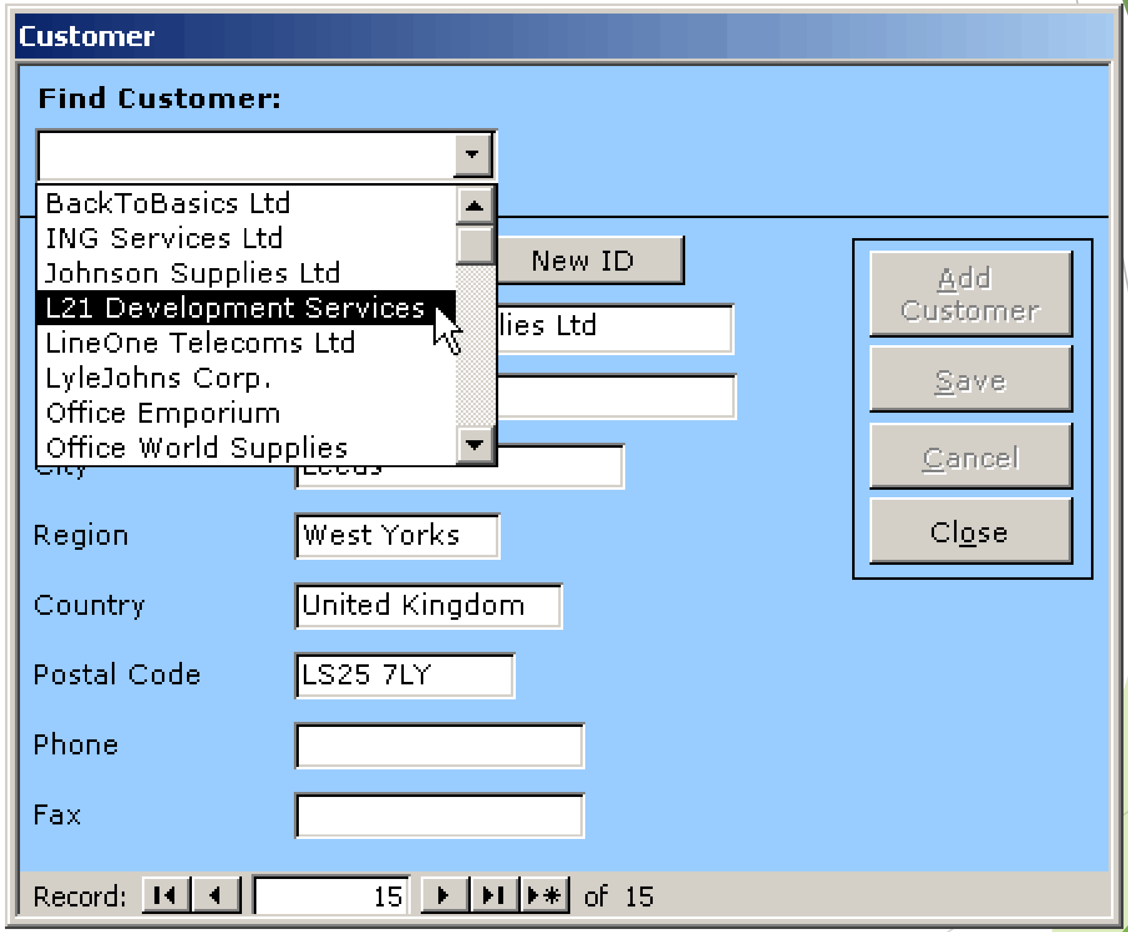
Buttons

- Buttons are control which can be clicked upon to select an option from a selection of options.
- Its name comes from the mechanical push-button group on a car radio receiver.



Combo Box

- Combo box is a combination of a single-line text box and a drop-down list or list box.
- It allows the user to either type a value directly into the control or choose from the list of existing options.
- It is very useful when a user has to select a certain option among various options.

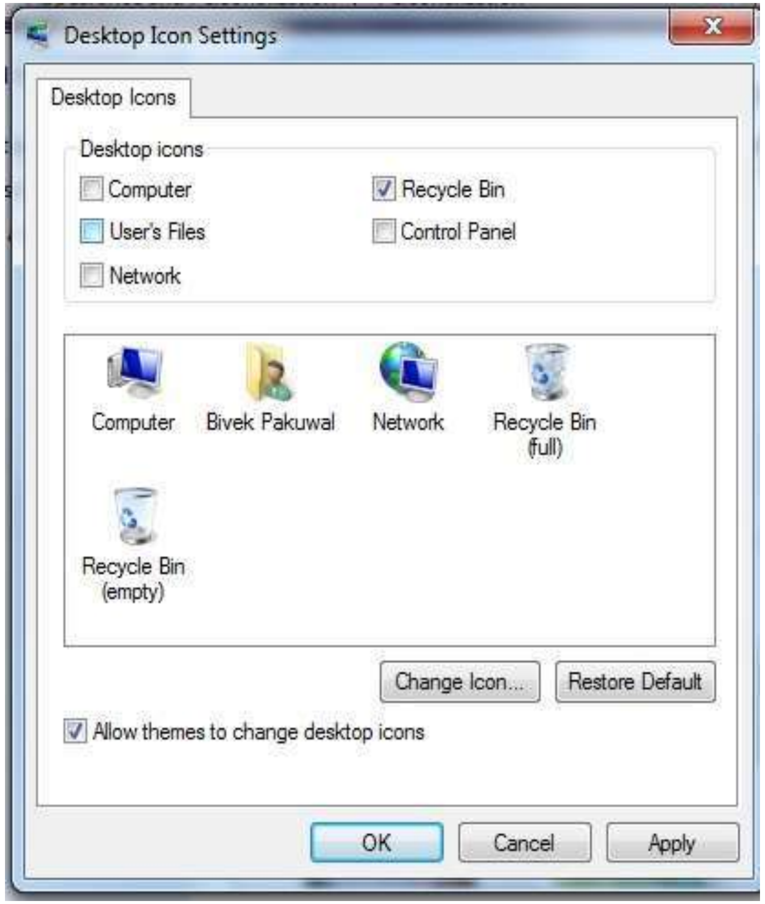


Radio Button

- Radio buttons always appear in pairs or larger groups, and only one option in the group can be selected at a time.
- Selecting a new item from the group's buttons also de-selects the previously selected button.
- Radio buttons were named after the physical buttons used on older radios to select preset stations –
- When one of the buttons was pressed, other buttons would pop out, leaving the pressed button the only button in the "pushed in" position.

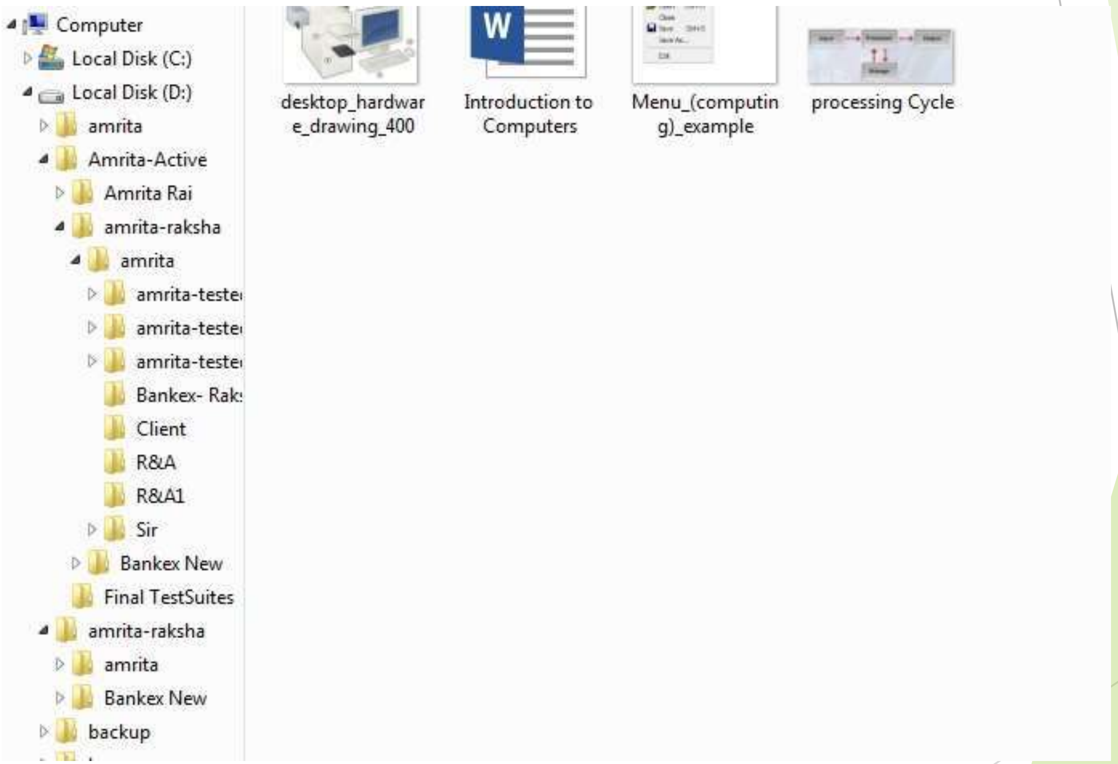
Check Box

- Check box is a graphical element that allows user to make selection among the given alternatives.
- Check box are often presented as a small box in the shape of square.
- A simple click on the check box marks the box and makes a visible selection in the computer.
- A check box is usually accompanied by a label to provide information to the user about the choices to be made.



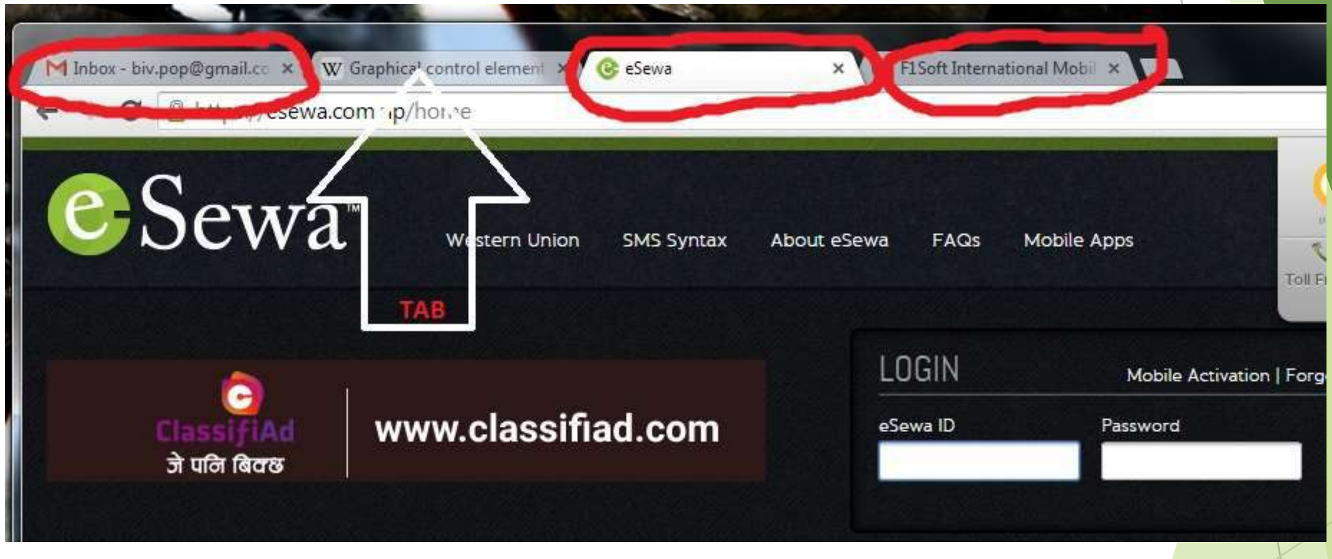
Tree view

- A tree view is a graphical control element that presents a hierarchical view of information.
- Each item (often called a branch or a node) can have a number of sub-items.
- This is often visualized by indentation in a list.
- An item can be expanded to reveal sub-items, if any exist, and collapsed to hide sub-items.
- Tree views can be seen in file manager applications, where they allow the user to navigate the file system directories.



Tab

- Tab is a graphical control element.
- A tab allows multiple documents or panels to be contained within a single window.
- It is an interface style most commonly associated with web browsers, web applications and text editors.
- Tabs are popular in use as a navigational widget for switching between sets of documents.



THE - END

UNIT-4

Information visualization: Information visualization can be defined as the use of interactive visual representations of abstract data to amplify cognition. Information visualization provides compact graphical presentations and user interfaces for interactively manipulating large number of items, extracted from larger datasets. Humans have remarkable perceptual abilities that are greatly underutilized in most current interface designs. Users can scan, recognize and recall images rapidly and can detect changes in size, color, shape and movement easily. Successful information visualization tools have to be more efficient to provide measurable benefits for realistic tasks. They must be built to satisfy universal usability principles of working on a variety of platforms while enabling access for all intended users, including users with disabilities. Information visualization researchers and commercial developers may be able to sort the numerous tools and identify new opportunities by using a data type by task taxonomy.

Data type by Task taxonomy: The data type by task taxonomy includes seven basic data types and seven basic tasks.

Seven data types

1. 1D linear data - They include program source code, textual documents, dictionaries and alphabetical lists of names, all of which can be organized in sequential manner.
2. 2D Map data - planar data include geographical maps, floor plans, and newspaper layouts. Each item in the collection covers some part of the total area and may or may not be rectangular.
3. 3D World data - Real world objects such as molecules, the human body,

Scanned by CamScanner

and buildings, have volume and complex relationships with other items. Computer assisted medical imaging, architectural drawing, mechanical design, chemical structure modeling and scientific simulation are built to handle these complex three-dimensional relationships.

4. Multidimensional data:- Most relational and statistical database contents can be conveniently manipulated as multidimensional data, in which items with n attributes becomes points in an n-dimensional space.

5. Temporal data:- Time series are very common and merit a data type that is separate from one-dimensional data. The distinctions of temporal data are that items have a start and finish time and that items may overlap.

6. Tree data:- Hierarchies or tree structures are collections of items in which each item has a link to one parent item. Items and the links

between parents and children can have multiple attributes.

7. Network data:- when relationships among items cannot be captured with a tree structure, items can be linked to an arbitrary number of other items in a network. In addition to performing the basic tasks applied to items and links, network users often want to know about the shortest paths connecting two items or traversing the entire network.

Seven basic tasks

1. overview task - users can gain an overview of the entire collection. overview strategies include zoomed-out views of each data type that allow users to see the entire collection, plus an adjoining detail view.

2. Zoom task:- users can zoom in on items of interest. users typically have an interest in some portion of a collection and they need tools to enable them to control the zoom focus & zoom factor.

3. Filter task - users can filter out uninteresting items. Dynamic queries applied to the items in the collection constitute one of the key ideas in information visualization.
4. Details on demand task - users can select an item or group to get details.
5. Relate task - users can relate items or groups within the collection. The attraction of visual displays when compared to textual displays is that they make use of human perceptual ability for processing visual information.
6. History task - users can keep a history of actions to support undo, replay and progressive refinement.
7. Extract task:- users can allow extraction of subcollections and of the query parameters. Once users have obtained that they desire, it is useful for them to be able to extract that set and to save it.

Information Visualization

Challenges of Information Visualization

* Importing and cleaning data – Deciding how to organize input data to achieve a desired result often takes more thought and work than expected. Getting data into the correct format, filtering out incorrect items, normalizing attribute values can also be burdensome tasks.

* Combining visual representations with textual labels: Visual representations and textual labels have an important role that they should be visible without confusing users. Mapmakers have long wrestled with this problem and their work offers valuable lessons. User-controlled approaches such as screen tips and excentric labels can help.

/ /

7

* Finding related information - Multiple sources of information are often needed to make meaningful judgments. The pursuit of meaning during discovery requires rapid access to rich sources of related information which requires integration of data from multiple sources.

* Viewing large volumes of data - Many innovative prototypes can deal with only a few thousand items or have difficulty maintaining real time interactivity when dealing with larger number of items. Dynamic visualization demonstrate that information visualization is not yet close to reaching the limits of human visual abilities. Larger displays can help because additional pixels enable users to see more

details while maintaining reasonable overview.

* Integrating data mining - Information visualization researchers believe in the importance of letting users visual systems lead them to form hypothesis while, data mining researcher believe that statistical algorithms and machine learning can be relied on to find interesting patterns. Some consumer purchase patterns such as stand out when properly visualized.

* Integrating with analytical reasoning Techniques - To support assessment, planning and decision making, the field of visual analytics highlights the integration information visualization with analytical reasoning tools.

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* Achieving universal usability - Making visualization tools accessible to diverse users regardless of their backgrounds, technical advantage or disabilities is necessary when the tools are to be used by public, but it remains a huge challenge for designers.

Goals of collaboration and participation

Understanding the processes and strategies of the participants facilitates analysis of ~~these~~ various situations for collaborative interfaces.

* Focused partnerships - are collaboration between two or three people who need each other to complete a task, such as joint authors of technical report, programmers debugging a program together etc.

* Lecture formats - involve one person sharing information with many users at remote sites. The start time and duration are the same for all.

* conferences - allow groups whose participants are distributed to

communicate at the same time or spread out over time: Many to many messaging may be used, and there is a record of conversations.

* Structured work processes - let people with distinct organizational roles collaborate on some task: like a scientific journal editor arranges online submission, reviewing, revisions and publication.

* Meeting and decision support - can be done in face-to-face meeting with each user working at a computer and making simultaneous contributions.

* Electronic commerce - includes customers browsing and comparing prices online, possibly followed by short term collaborations to inquire about a product before ordering.

* Teledemocracy - allows small organizations or governments to conduct online meetings to expose officials to comments from constituents.

* online communites - these people come online to discuss, share information or support, socialize or play games. these communities focus on shared interests.

* collaboratories - are novel organizational forms for groups of scientists or other professionals to work together across time and space, possibly sharing expensive equipments and platforms.

* Telepresent - enables remote participants to have experiences that are almost as good as being physically co-present

Asynchronous Distributed Interfaces :-

Different place, Different time

This communication can range from distributed loosely structured online communities to more formal e-mail.

* E-mail :-
* Google groups
* Blogs and Wikis
* online and networked communities

Synchronous distributed Interfaces: Different place, Same time

* chat, instant messaging and texting
* Audio and video conferencing