CIS 421
INTERACTION DESIGN

ABDULLAH BIN KASEM BHUIYAN

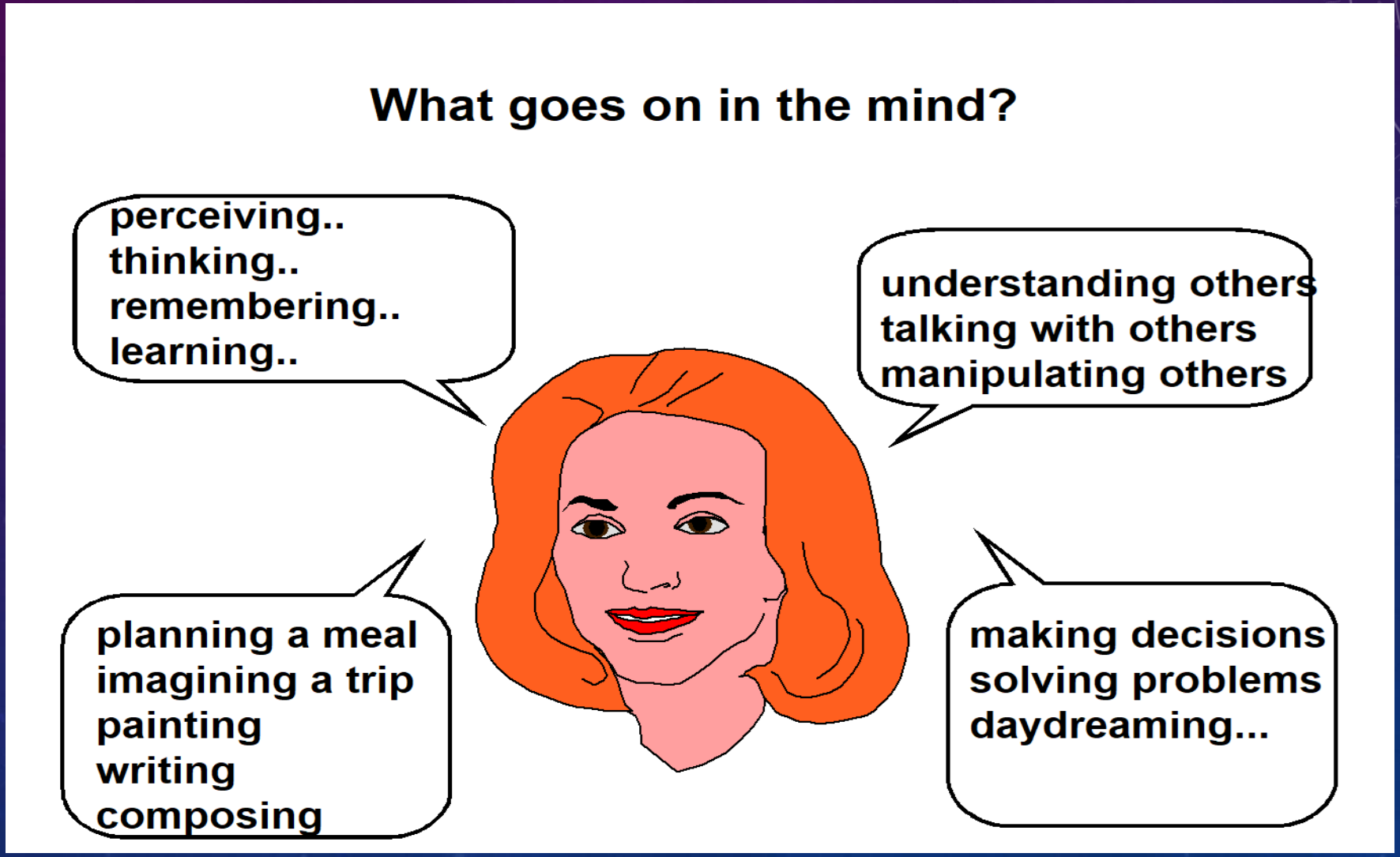
CHAPTER 3

UNDERSTANDING USERS, COGNITIVE ASPECTS & COGNITIVE MODELS

OVERVIEW

- What is cognition?
- Cognitive psychology
- Cognitive psychology processes
- Cognitive models
- Internal cognition
- External cognition

WHY DO WE NEED TO UNDERSTAND USERS?



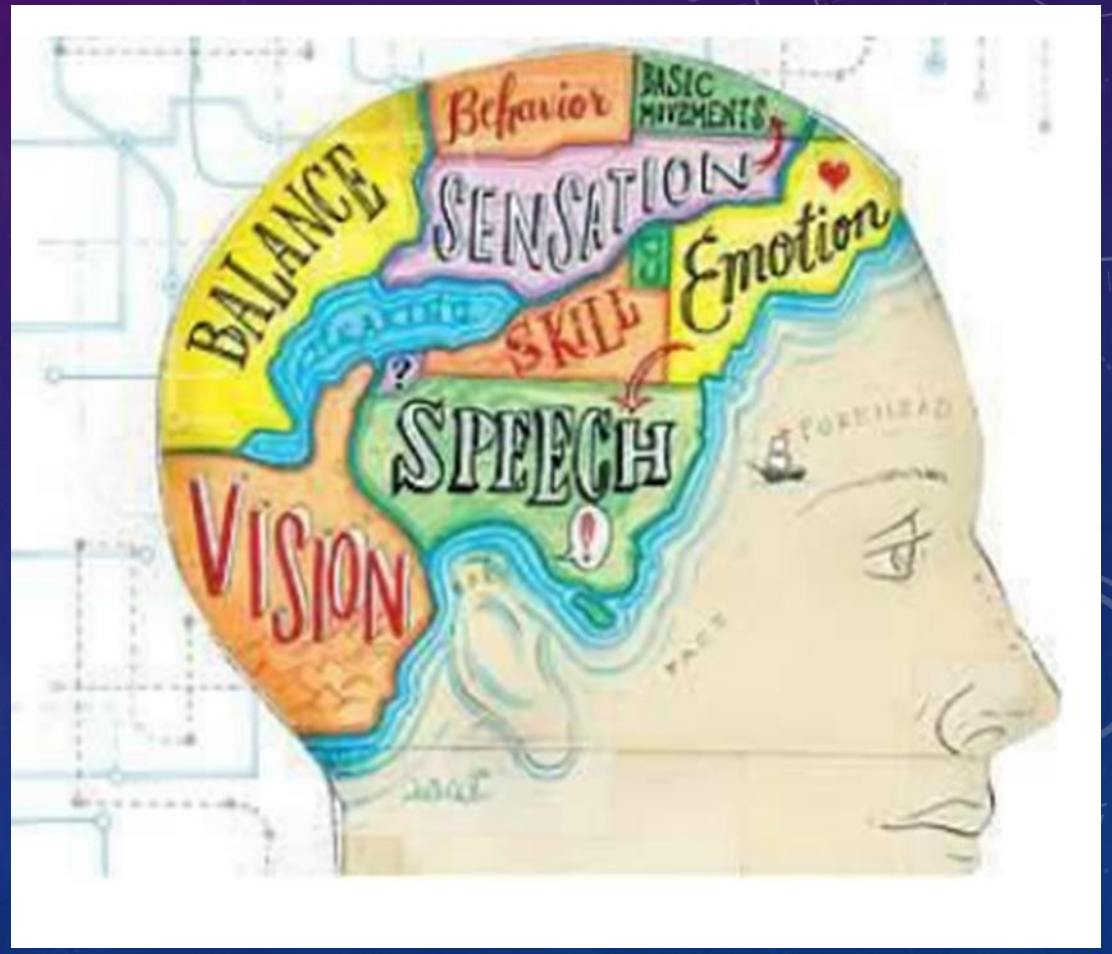
COGNITION

Cognition is "the mental action or process of acquiring knowledge and understanding through thought, experience, and the senses.“

- Its mainly a mental process that helps to retrieve, manipulate and store information.
- Cognitions are depended on different culture and society.
- As an example all the Asian people has some common behavior or reaction but will differ from European.

COGNITIVE PHYCOLOGY:

- Cognitive psychology is the scientific study of mental processes such as "attention, language use, memory, perception, problem solving, creativity, and thinking“
- Cognitive psychology usually helps us to identify human mental behavior.



COGNITIVE PSYCHOLOGY TEST

Cognitive phycology helps us to identify that why people think differently and how to deal with it.

CORE COGNITIVE ASPECTS (COGNITIVE PSYCHOLOGY PROCESSES)

- Attention
- Perception & recognition
- Memory
- Learning
- Reading, speaking and listening
- Planning, reasoning, problem-solving, and decision-making

ATTENTION

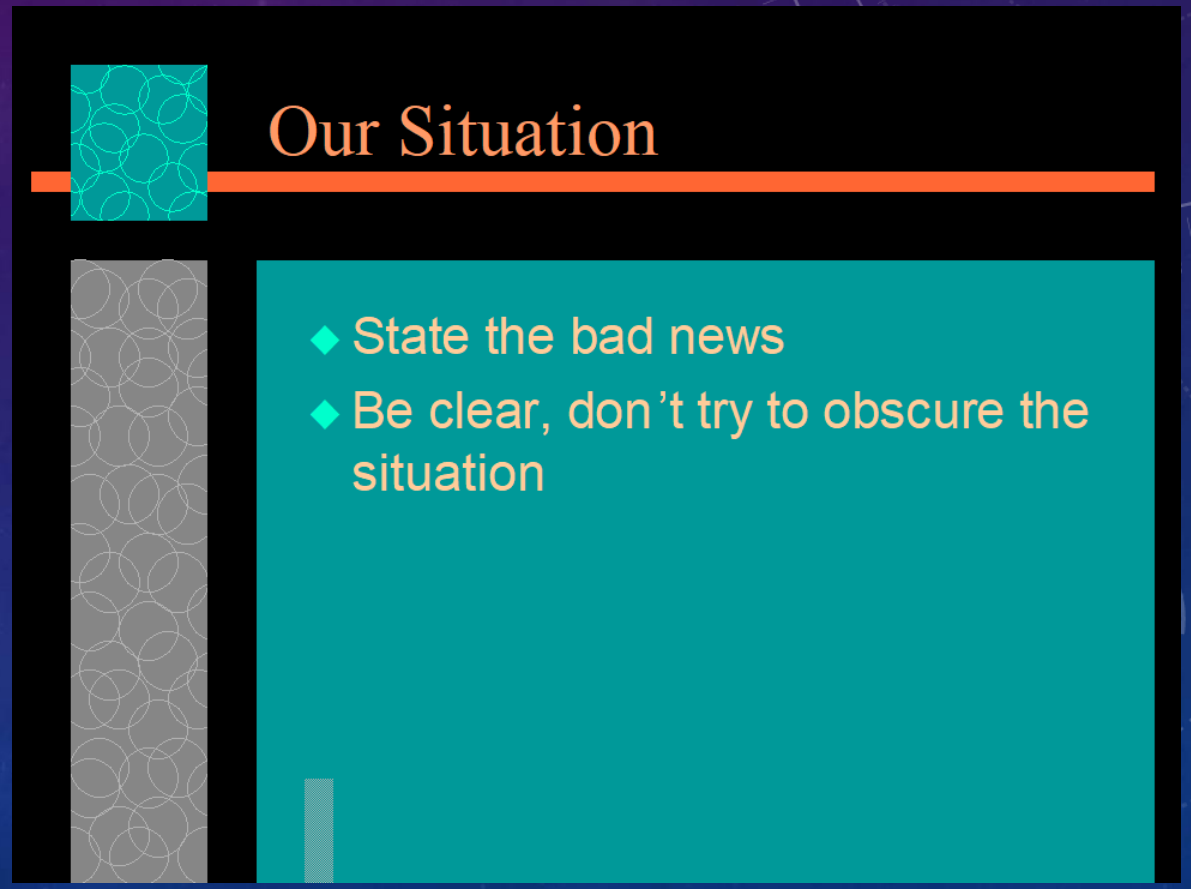
- Attention is one of the most important processes of cognitive phycology.
- Attention mainly is human mind's ability of focus and concentrate on a task.
- Attention is a popular term in interaction design. To get concentration on something specific, to reach a target, to present information, attention process is very useful.

MULTITASKING AND ATTENTION

- Multi-tasking is doing more than one tasks at a same time that divides user's attention.
- Divided attention is something we do focus on more than one thing at a same time. It's a type of simultaneous attention what allow us to process different information successfully

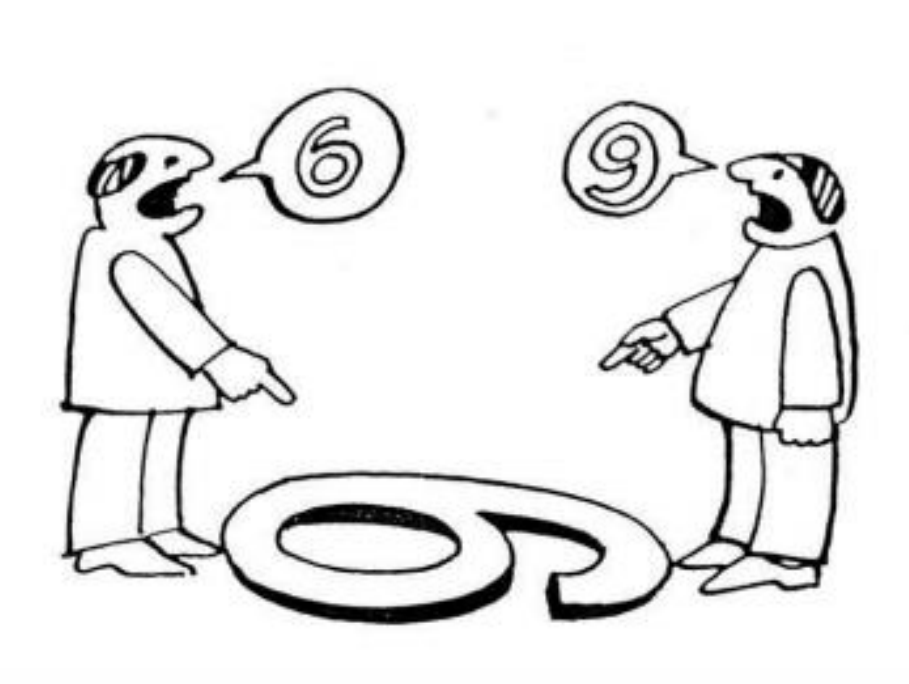
DESIGN IMPLICATIONS FOR ATTENTION

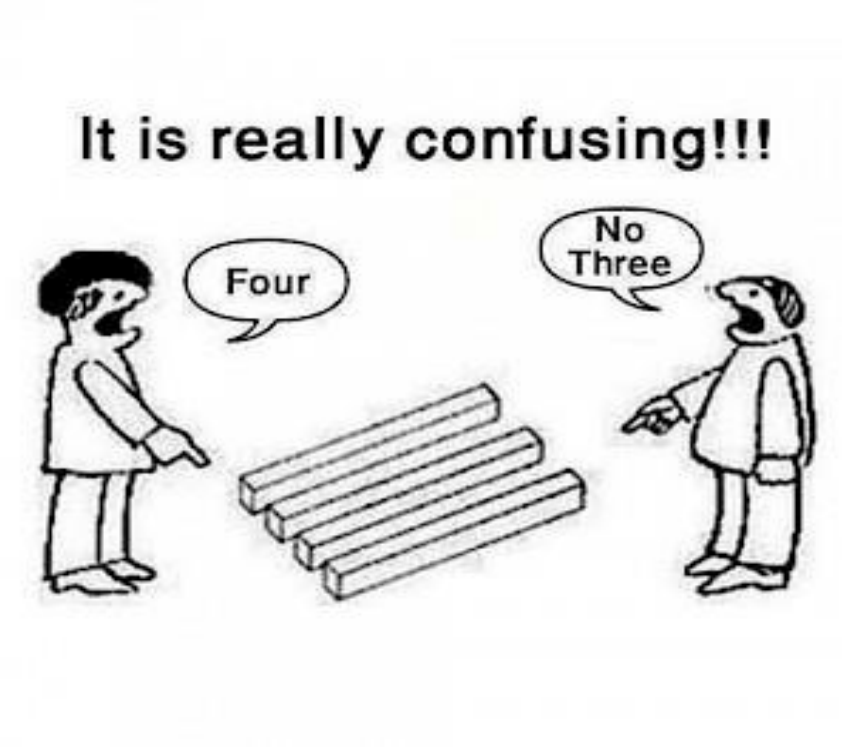
- Using suitable colors, fonts, beeps and meaningful icons to capture user's attention.
- Providing opportunities to get the job done for less work.
- Avoiding unnecessary information and components in this application.



PERCEPTION AND RECOGNITION

- Process of sensory information such as seeing, hearing, smelling taking shape into meaningful something is signified as perception.





DESIGN IMPLICATIONS FOR PERCEPTION & RECOGNITION

- Texts should be clear, big enough to read and distinguish from background.
- Font family should not be illegible, a common or familiar font family is always more acceptable.
- The icons and symbols should be clean, meaningful and distinguish from each other. For example, Map icon is meaningful for address information.
- Using border for different content is a good practice. People used to see border to separate things.
- Multimedia is a powerful interaction design tool. People like to listen fancy or high bit music while motivating or successful stories shows

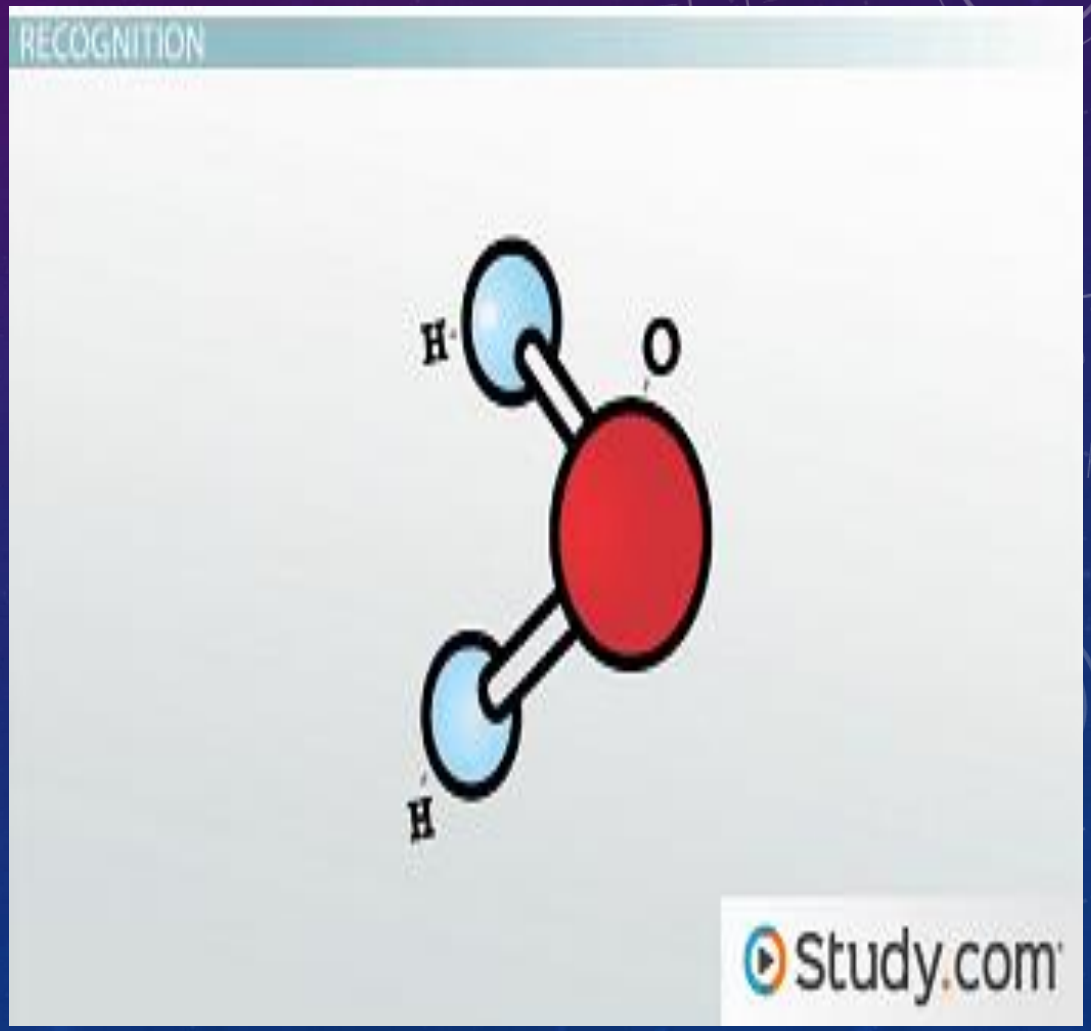
MEMORY

- Memory is also one important process which is able to store, encode and retrieve information.
- When we make attention of a topic than memory encode this information and store this.
- When we need to retrieve information it helps us by recall or recognize.
- Recognize is something can be remembered from previous knowledge or experience.
- Recall is a short of information what was experienced or learned in pervious.

❑Memory involves 2 processes

- recall-directed and recognition-based scanning

RECOGNITION VS. RECALL



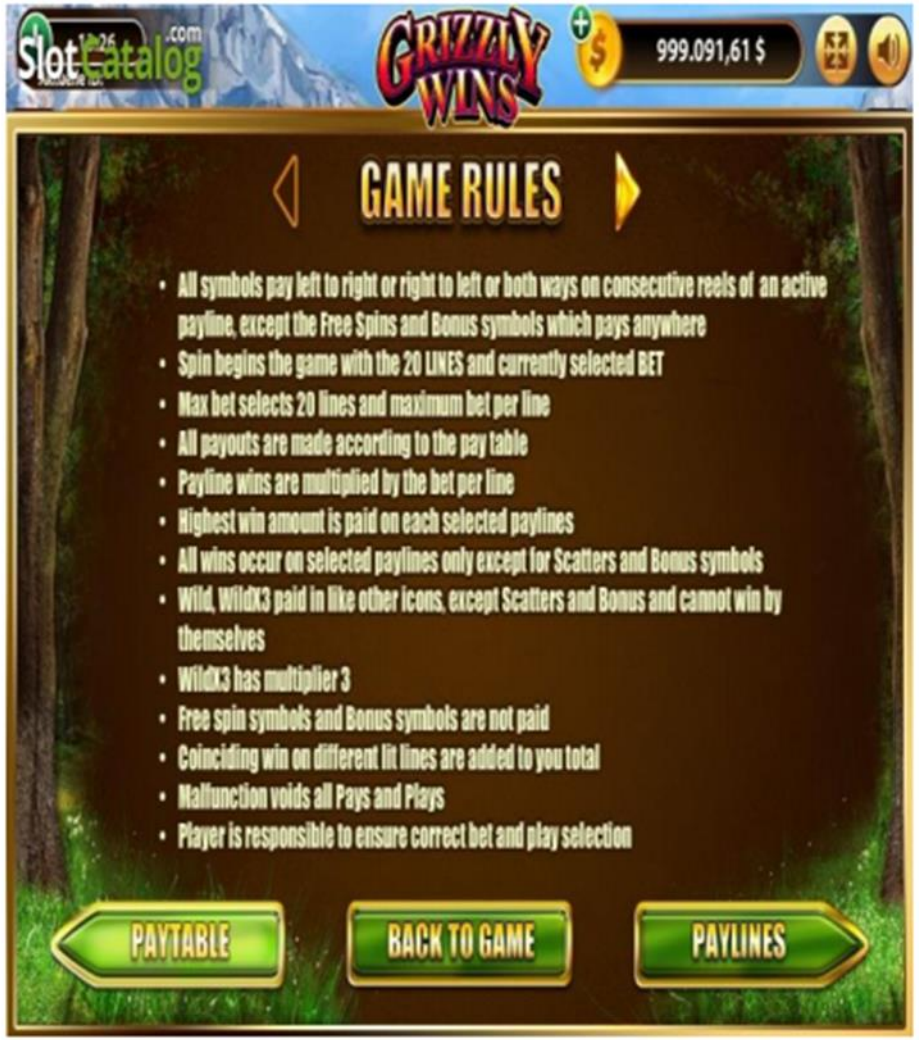
DESIGN IMPLICATIONS FOR MEMORY

- Try to reduce user input instead of give them option
- Providing alerts for the user to remind anything in the application.
- Providing App related information so that user need not to remember anything.
- Using colors, flags and buttons to recognize the things easily

LEARNING

- Learning is the process of storing knowledge through various experiences. Attention is required to learn something.
- Generally users like to learn something by doing rather than reading or watching anything while using the system.
- Small tips and interactive or video tutorial are more efficient than intolerably long manual and videos

WHICH ONE IS MORE EASIER ?

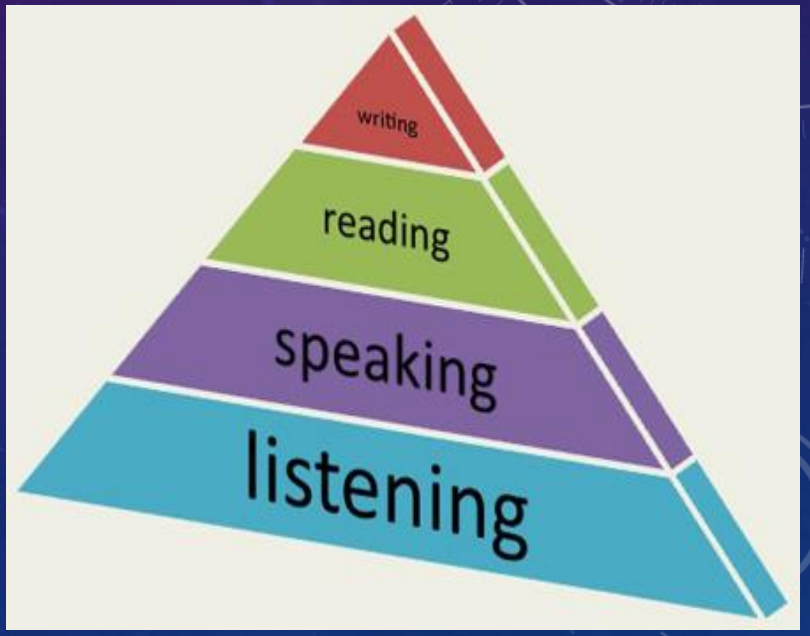


DESIGN IMPLICATIONS FOR LEARNING

- Users may use the app through learning by doing.
- Using appropriate icons may help the user learn the actions quickly.
- Providing useful guidelines which help to remember the activities.
- Representing dynamic linking for removing learning complexity.

READING, SPEAKING AND LISTENING

- Written language is permanent while listening is temporary.
- Reading can be quicker than speaking or listening depends on person to person.
- Listening requires less cognitive effort than reading or speaking. That's why video tutorials are more acceptable than books.



DESIGN IMPLICATIONS FOR READING, SPEAKING & LISTENING

- The menu of an application should be written. *Research has shown, spoken menu is hard to capture if there are many.*
- Set of instructions are preferred to be in written format rather than spoken format.
- For disabled users, different options should available. For example, text-to-speech system will allow a blind user to use an application.
- Offering text size control feature will help user to make text large in small screens

PLANNING, REASONING, PROBLEM-SOLVING, AND DECISION-MAKING

- These are some core reflective subjects of cognitive psychology. All these come alive from the previous experiences of a person. Thousands layers of knowledge or experiences are checked for planning, reasoning, problem solving and decision making

DESIGN IMPLICATIONS FOR PLANNING, REASONING, PROBLEM-SOLVING, AND DECISION-MAKING

- Providing additional services for the users who need to know more about the system.
- Including computational assist to support decision making.
- Providing additional information that help the user to clear the concept of actions.

COGNITIVE (COGNITIVE PSYCHOLOGY) FRAMEWORKS

- There are several cognitive framework developed to identify users behavior based on cognition. Cognitive frameworks has been categorized by internal and external frameworks which has been listed below:
- Internal
  - Mental Model
  - Gulfs of Execution and Evaluation
  - Information Processing
- External
  - Distributed Cognition
  - External Cognition

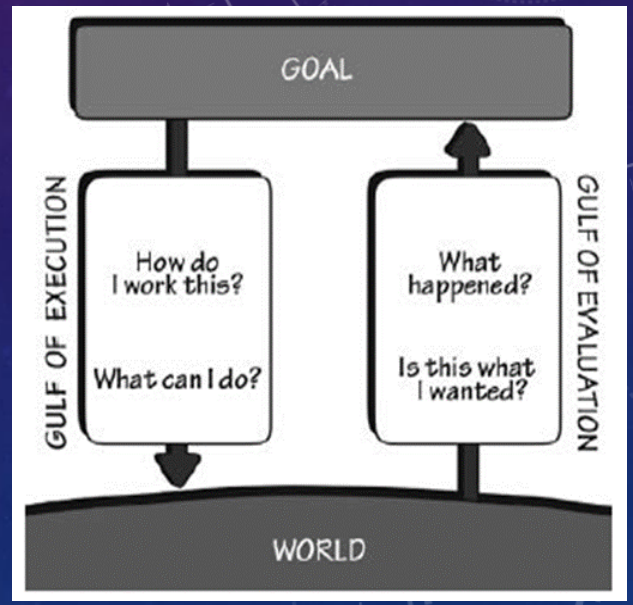
MENTAL MODEL

- Mental model is the most important concept for developing a HCI (Human-Computer Interaction).
- What user knows about the system and how they interact with that system or product, such as web site or application.
- It does actually try to predict user thinking too closely.
- Every user has their own mental model. It can be differ from other users.

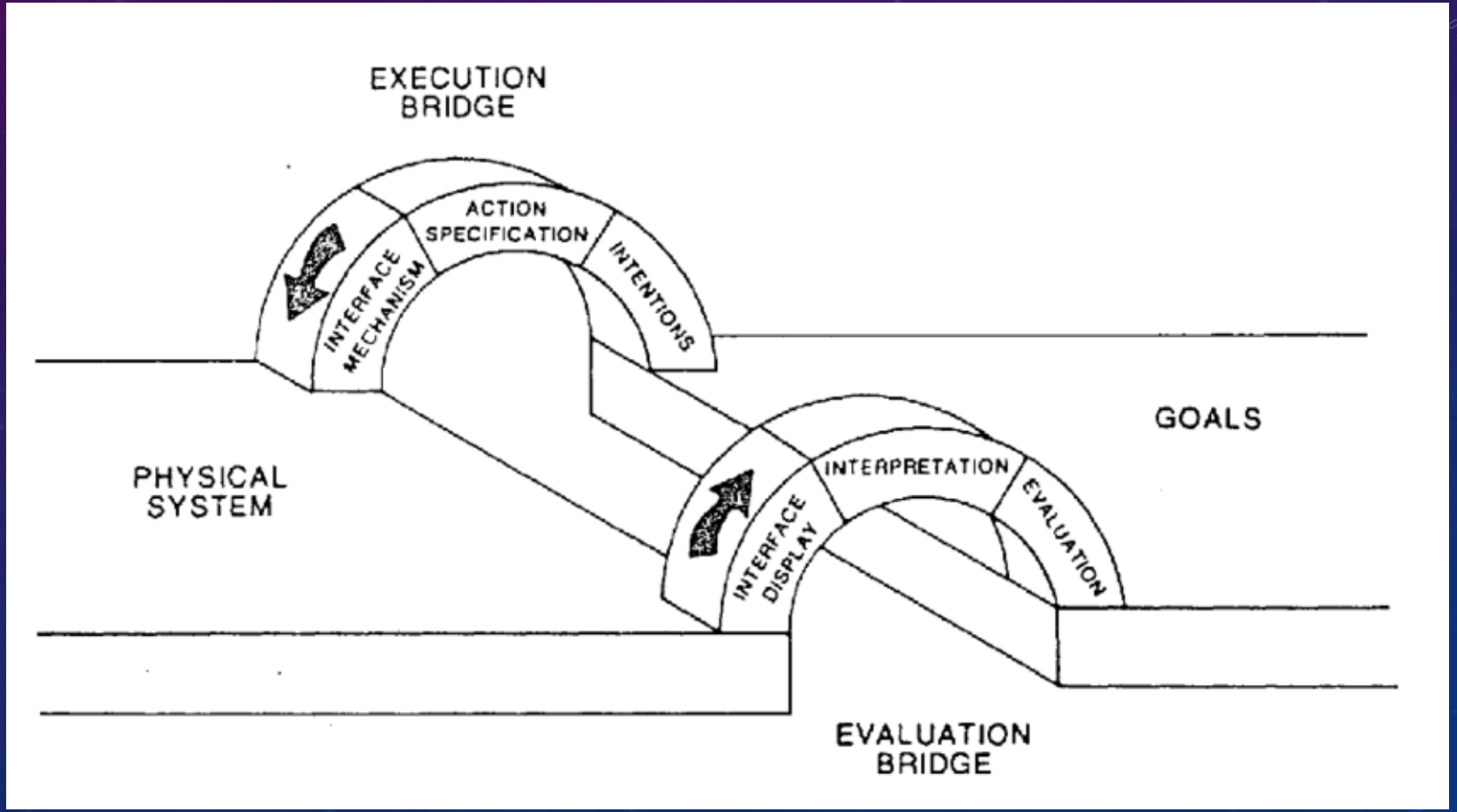
Mental model always try to retrieve design form real world object.

GULFS OF EXECUTION AND EVALUATION

- The ‘gulfs’ explicate the gaps that exist between the user and the interface .
- The gulf of execution
  - the distance from the user to the physical system
- The gulf of evaluation
  - the distance from the physical system to the user
- Bridging the gulfs can reduce cognitive effort required to perform tasks.



GULFS OF EXECUTION AND EVALUATION



INFORMATION PROCESSING

- Information processing framework processes based on human mental activities.
- When something comes to human mind, it has been processed inside head, there may need input something which comes from memory or surrounding environment,
- after process brain decide something and memorize the output. This process is called information processing approach which is sometimes compared with computer processing system.

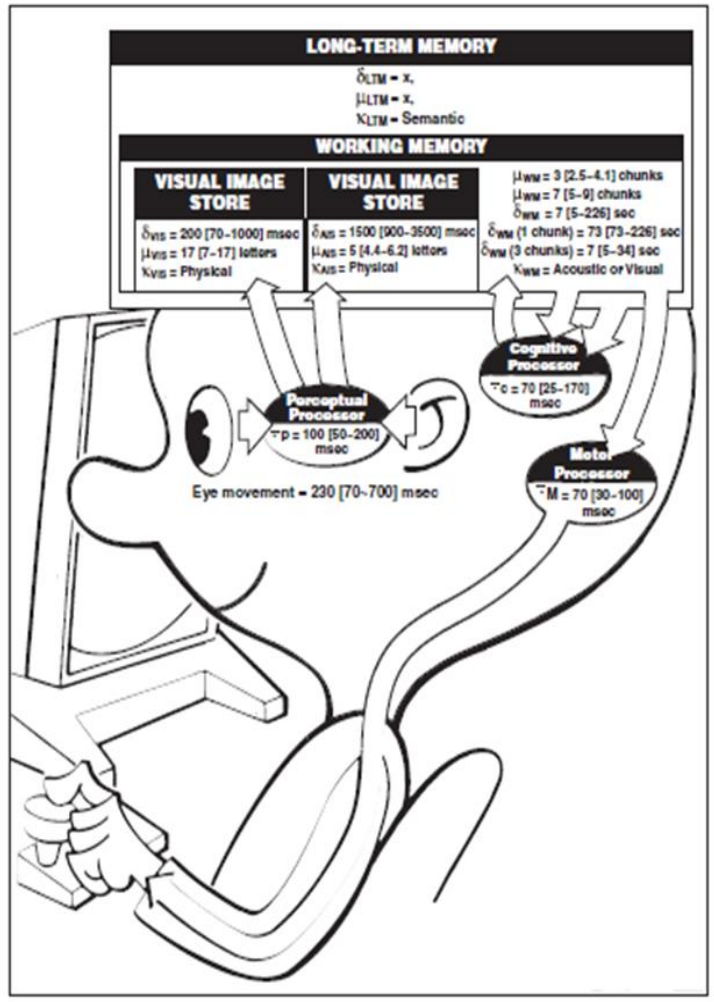


Figure 3.9 The human processor model

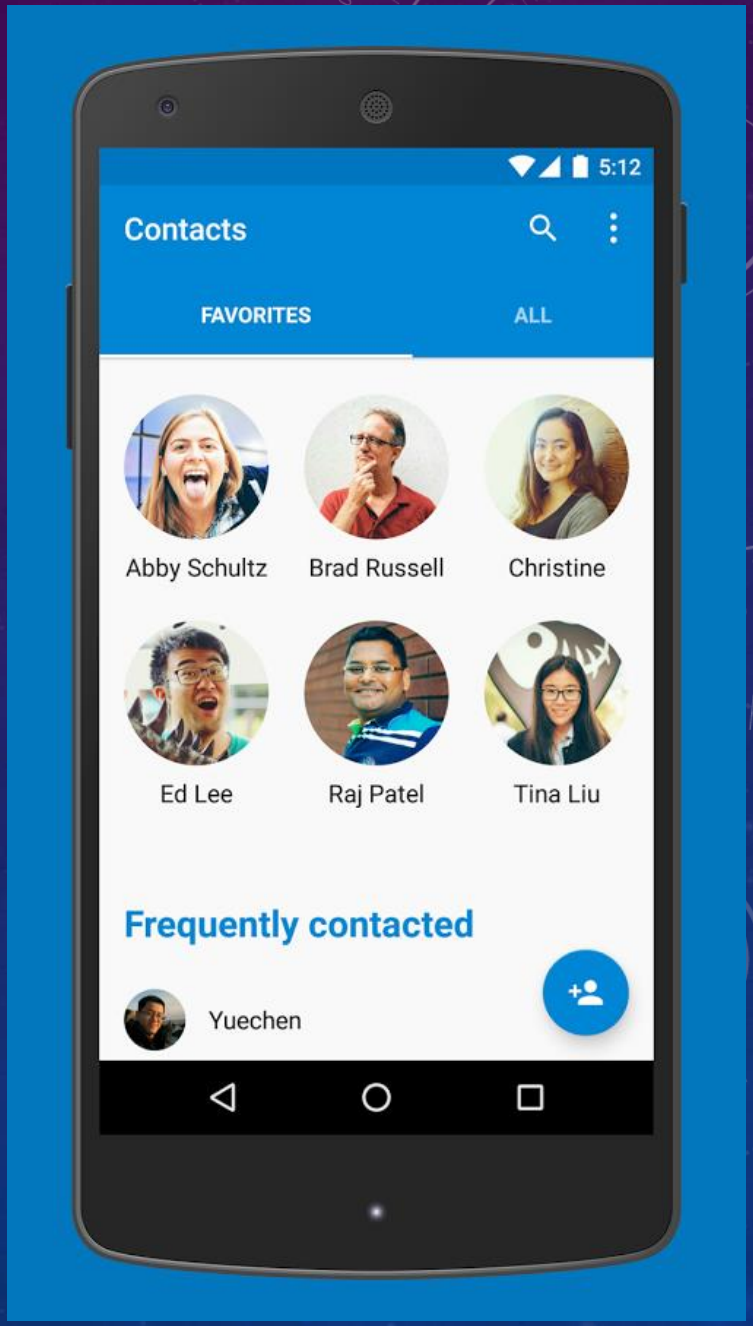
Source: The psychology of human-computer interaction by S. Card, T. Moran and A. Newell. Copyright 1983 by Taylor & Francis Group LLC - Books. Reproduced with permission of Taylor & Francis Group LLC.

EXTERNAL COGNITION

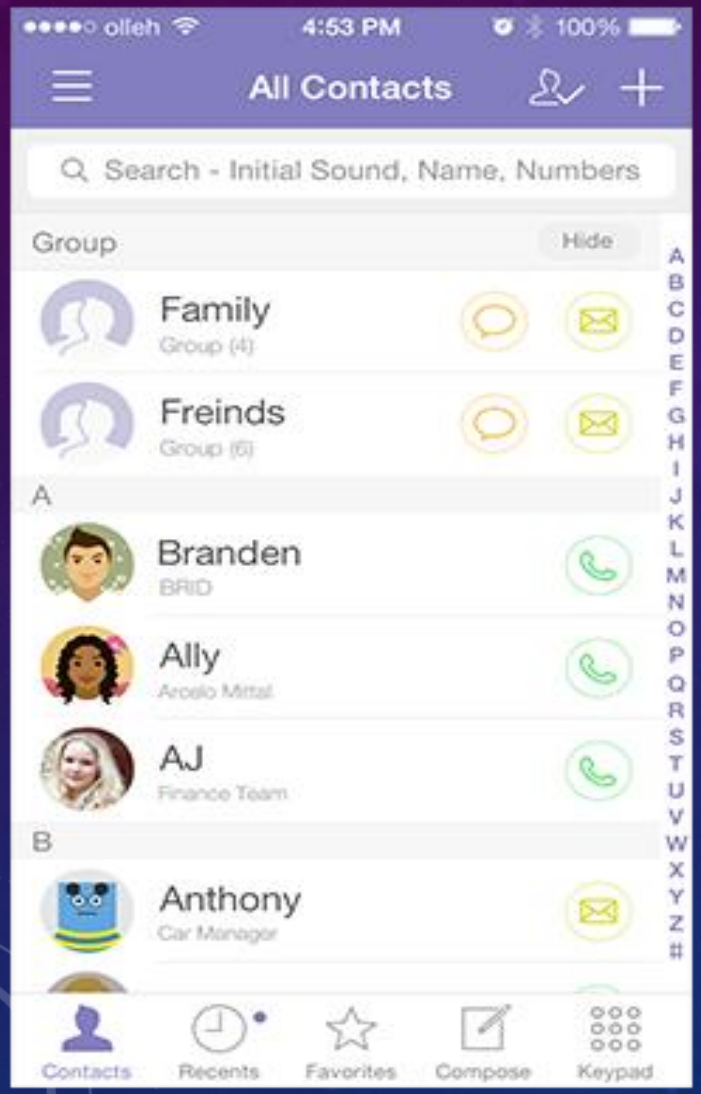
- External cognition refers the way of processing information between the internal cognition of human mind and the manipulation of them into external representation.
- In the interaction design, it greatly supports users to minimize their memory load in the design of user flows.

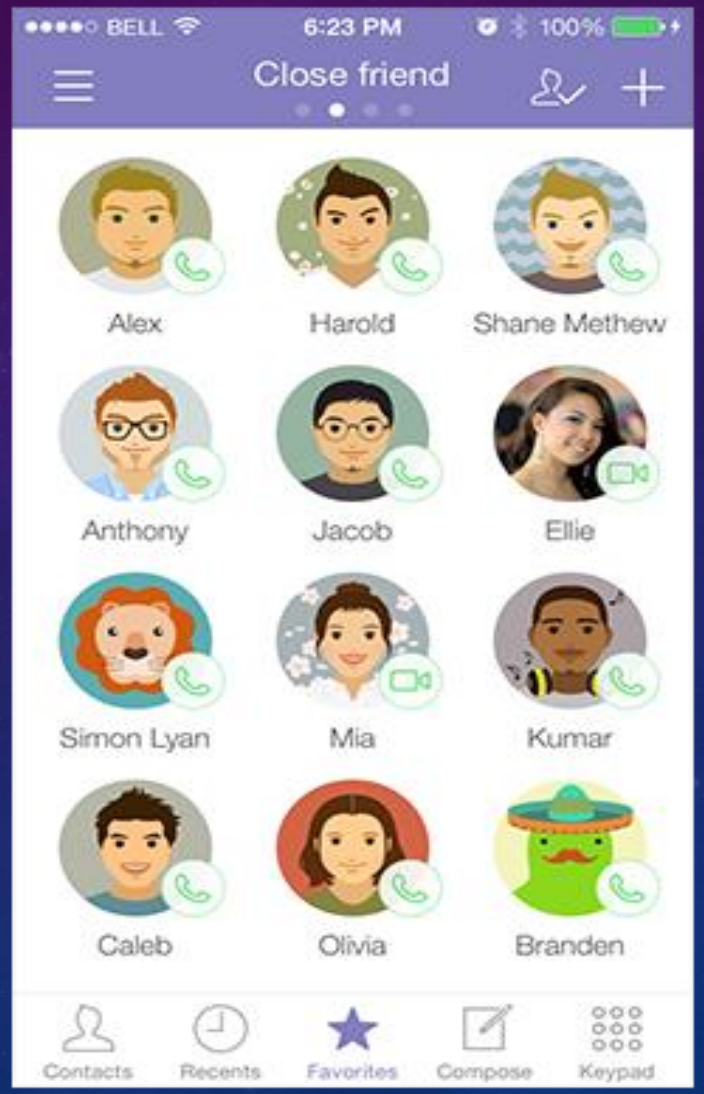
EXTERNALIZING TO REDUCE MEMORY LOAD

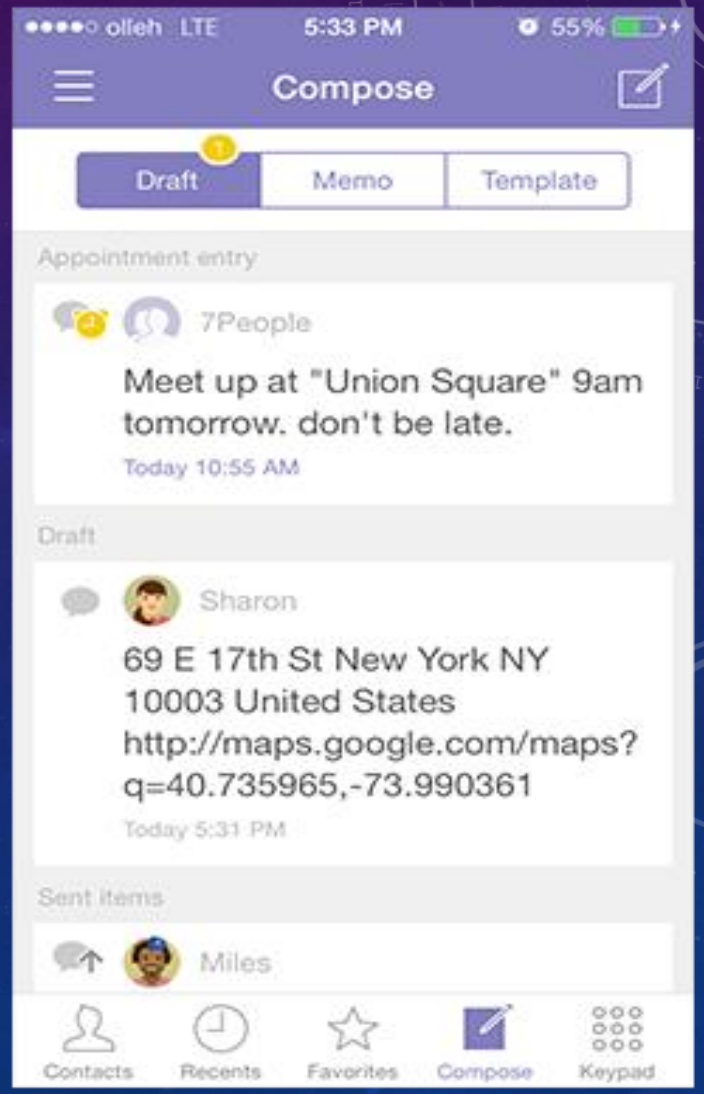
- Some software like google map, mobile contact app handle the phone numbers, birthdays, appointments can be used to reduce memory load by externalizing the information



EXTERNALIZING TO REDUCE MEMORY LOAD







COMPUTATIONAL OFFLOADING

- It defines some use of physical tools like calculators combining with external representation which allows user to solve computational problems.

Figure 17- computational offloading (interaction-design.org, 2013)

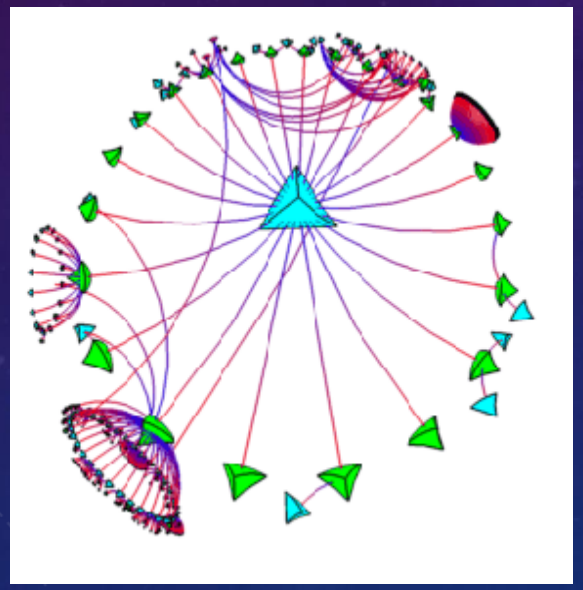
ANNOTATING AND COGNITIVE TRACING

- Annotation involves modifying existing representations through making marks
  - e.g. crossing off, ticking, underlining
- Cognitive tracing involves externally manipulating items into different orders or structures
  - e.g. playing Scrabble, playing cards

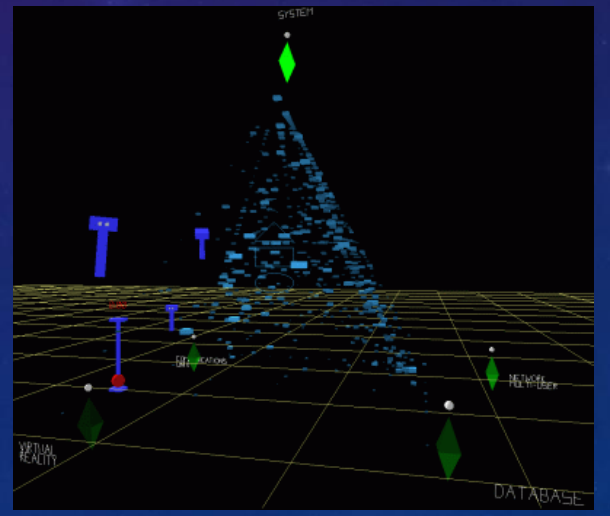
Google keep allows user to take notes and make list and help to trace where user are at in any cognitive process.

DESIGN IMPLICATION

- Provide external representations at the interface that reduce memory load and facilitate computational offloading



e.g. Information visualizations have been designed to allow people to make sense and rapid decisions about masses of data



KEY POINTS

- Cognition involves many processes including attention, memory, perception and learning

- The way an interface is designed can greatly affect how well users can perceive, attend, learn and remember how to do their tasks

- The conceptual framework of ‘mental models’ and ‘external cognition’ provide ways of understanding how and why people interact with products, which can lead to thinking about how to design better products
- This can lead to thinking about how to design better products.

END OF CHAPTER 2 ☺

Any Question?