Users

- Understanding users
    - Interacting with technology is cognitive, need to account for cognitive processes and limitations of users
    - Will be able to explain nature and causes of problems users encounter
    - Use understanding of users to guide design
- **Cognition**
    - **Attention** - selecting things to concentrate on from mass of stimuli, selective information, audio visual senses, cannot track all info at once, direct user's attention
        - Multitasking - Is it possible to perform multiple tasks without detrimental effect to them?
        - Heavy multitaskers are easily distracted
            - users need to know where they are in the system and what info is being displayed, minimal effort on the users side
        - **Design implications:** make important information prominent (colour, ordering, spacing), avoid clutter

    - **Perception and Recognition** - How we acquire information, implication is to design representations that are readily perceivable (legible text, iconography, speech output)
        - Layout is very important - consistent, grouped, sufficient whitespace (easier to pick out info)
        - **Laws of Gestalt:**
            - Proximity, Similarity, Good Continuation, Closure/Good Form (perception - straight lines appear to continue as straight), Membership Character
        - **Colour** - Hue, Intensity, Saturation
            - 8% of men have colour vision deficiency
        - **Vision** - visual system compensates for: movement, change in luminance
            - Context resolves ambiguity
            - **Over compensation can cause optical illusions**
        - **Reading** - see patterns, decode using internal language representation, interpreted using domain knowledge
            - Word shape and negative contrast are important
        - **Audio** - get attention(message noise), status information(alarm), confirmation(message send), navigation(windows dud click)
        - **Touch** - provides feedback, crucial for visually impaired - Haptics
        - **Movement** - time taken to respond to stimulus = reaction time + movement time
            - Movement time is age dependent, Reaction time is stimulus dependent
            - Targets as large as possible, distances as small as possible
        - **Design implications for representation**
            - Information must be perceptible, and recognisable

        - Iconography is only useful if instantly distinguishable
        - Bordering and spacing are most effective in grouping
        - Sounds should be audible and distinguishable
        - Speech and text should be distinguishable

- **Memory** - Involves first encoding then retrieving knowledge
    - Don't remember everything - filtering, contextual memory (where, when etc)
    - Recognise better than recall (image recall >textual recall)
    - **Processing**
        - Encoding - first stage, interprets info
            - The more attention something gets, the more likely we are to remember it
    - **Three memories:**
        - Sensory
        - Short-term/working memory (STM)
        - Long-term memory (LTM) - two types: episodic (serial memory of events), semantic (structured memory of facts/concepts/skills)
    - **STM->LTM: Rehearsal** (moving information)
    - **LTM Interference: retroactive interference (new replaces old e.g. phone number), proactive inhibition (old interferes with new)**
    - Context is important - affects extent to which information can be retrieved, sometimes hard to recall information that you had encoded in a different context
    - **Recognition vs Recall**
        - Command interface - Recall (requires retrieval from memory based off no prompt other than thought)
        - GUIs - Recognition (includes web browsers)
    - Consistency reduces memory load - know where to find info, or what to do in a situation
    - **George Miller '7±2'** - memory capacity is limited, no more than 7 options in a block - wrong though, people scan lists until they see the option they want, don't need to recall them
        - Small lists can be a good design, but depends on screen estate
    - **Personal Information Management (PIM)**
        - People now have a huge number of docs, images, etc deciding where/how to save them and then being able to find them is an issue
        - This memory process is **recall-directed and recognition-based scanning** - system should support this
            - Search box and history list
    - **Design implications**
        - Don't overload memory with complicated procedures, interfaces promote recognition over recall

        - Give a variety of ways to encode information
- **Learning**
    - Mental Models - means of understanding through use
        - **Craik (1943) - mental models are internal constructions of some aspect of the external world enabling predictions to be made**
    - Knowledge is a mental model - how to use a system, how it works
    - Interfaces should be a mapping of the assumed mental model
    - Many mental models are wrong
    - **Levels of experience**
        - Novice: main concern is ease of learning
        - Expert: main concern is ease of use
        - Depending on frequency of use, priority in system design changes: infrequent use = more novice users, so system should be easily learned
    - **External Cognition**
        - Explaining how we interact with external representations (maps, notes…)
        - What are the cognitive benefits, and processes involved
        - How do they extend our cognition
        - **Helps to reduce memory load**
            - diaries , reminders etc remind us of what to do
            - Post-it notes etc location indicates priority of what to do
    - **Annotation and cognitive tracing**
        - **Annotation** involves modifying existing representations e.g. tick
        - **Cognitive tracing** involves modifying externally manipulating items into orders/structures e.g. playing scrabble
        - **Computational offloading**: using a tool/device to help carry out a computation e.g. pen and paper for a maths problem
    - **Design implications**
        - Provide external representations at the interface reducing memory load and facilitating offloading
- **Reading, speaking and Listening, Problem-solving, planning, reasoning and decision making**
    - **Distributed Cognition**
        - Nature of cognitive phenomena across individuals, artifacts and internal and external representations
            - Information is transformed through different media
        - Distributed model - books, phones, computers, people, paper all act as nodes in a distributed information manipulation system
        - **Enables distributed problem solving**
            - Verbal and non-verbal behaviour
            - Coordinating mechanisms that are used

- E.g. verbal instruction - mental, physical response - visual observation - mental and physical response

Key Points

- Cognition: attention, memory, perception, learning
- Interface design influences perception, attention, learning and memory
- Theoretical frameworks (mental models, external cognition) facilitate greater understanding of interactions - better designed products
- Sensory impairments affect increasingly large segments of the population - should be considered.