Lecture Notes

Understanding the Memory Process, Retention Problems, and Memory Enhancement Techniques

1. Introduction

Memory is a fundamental cognitive process that enables us to store, retain, and recall information. In the context of **Design Thinking**, memory helps us retain user insights, recall design principles, and apply creative problem-solving strategies.

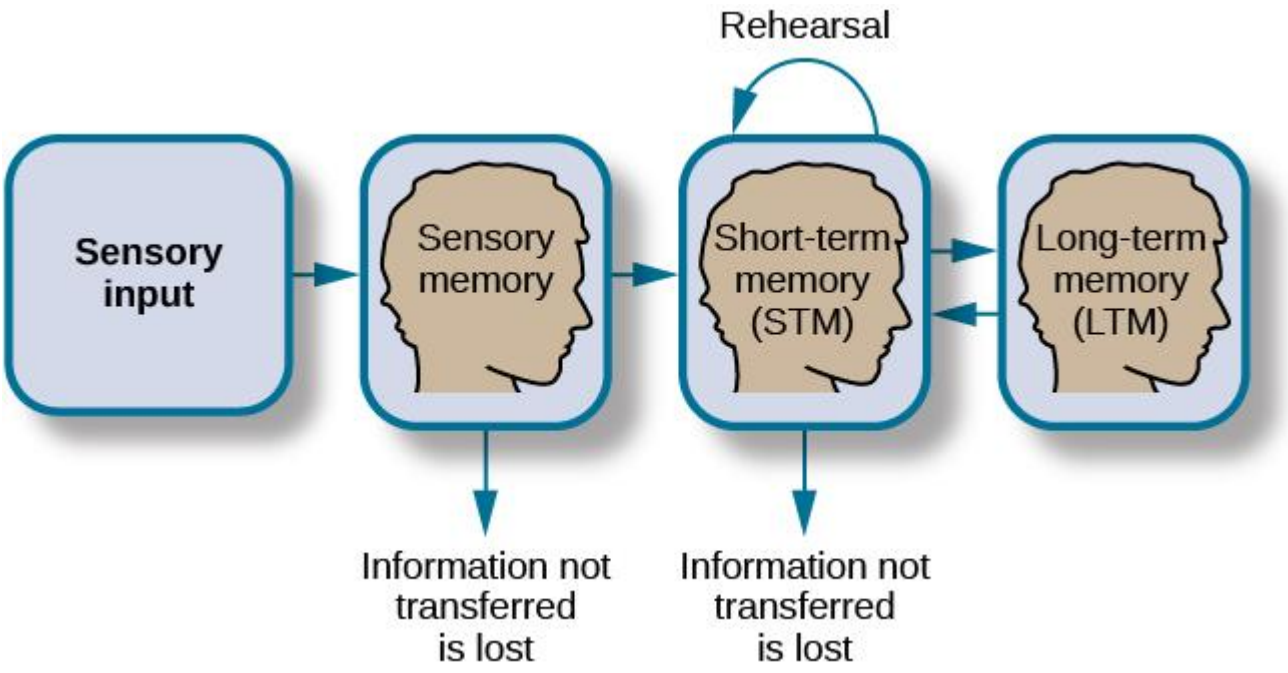

Fig: An Information Processing Model

2. The Memory Process

a) Encoding

- The process of converting sensory input into a form that the brain can store.
- Example: Listening to a user's feedback and mentally connecting it with an empathy map.

b) Storage

- Maintaining information over time.
- Two main forms:
    - **Short-Term Memory (STM):** Holds small amounts of info briefly (7±2 items).
    - **Long-Term Memory (LTM):** Stores vast information for longer durations.

c) Retrieval

- The process of bringing stored information back into conscious awareness.
- Example: Recalling case studies during ideation sessions.

3. Types of Memory

1. **Sensory Memory** – Initial, brief storage of sensory impressions.
2. **Short-Term Memory (STM)** – Temporary, limited-capacity memory.
3. **Working Memory** – Actively processes current information.
4. **Long-Term Memory (LTM)** – Stores knowledge, skills, and experiences for extended periods.

4. Problems in Retention

Despite the brain's remarkable capacity, forgetting is common. Key causes include:

- **Interference:** New learning disrupts old memories (or vice versa).
- **Decay:** Information fades over time without rehearsal.
- **Retrieval Failure:** Stored information exists but cannot be accessed when needed.
- **Lack of Attention/Focus:** Ineffective encoding due to distractions.
- **Stress and Overload:** Emotional strain reduces memory performance.

5. Memory Enhancement Techniques

As designers and engineers, enhancing memory supports both learning and innovation. Effective techniques include:

1. **Mnemonics:** Using acronyms, rhymes, or visual imagery to remember concepts.
    - Example: Using "IDEAL" to recall the stages of problem-solving.
2. **Chunking:** Grouping related information into meaningful units.
    - Example: Remembering a phone number in sets of 3–4 digits.
3. **Elaboration:** Linking new knowledge with prior experiences.
4. **Repetition:** Frequent review strengthens memory traces.
5. **Spaced Repetition:** Reviewing information at increasing intervals.
6. **Active Recall:** Testing oneself instead of passive rereading.
7. **Mind Mapping:** Visualizing connections to organize information better.
8. **Healthy Habits:** Good sleep, exercise, and mindfulness improve retention.

Compilation of memory techniques

Type	Sample Method

Acronyms	Every discipline has its own language and acronyms are the abbreviations. Acronyms can be used to remember words in sequence or a group of words representing things or concepts. CAD can mean: Control Alt Delete, Canadian Dollar, Computer Aided Design, Coronary Artery Disease, Canadian Association of the Deaf, Crank Angle Degree, etc.
Acrostics	Acrostics are phrases where the first letter of each word represents another word. They are relatively easy to make and can be very useful for remembering groups of words. For example: King Philip Can Only Find His Green Slippers. This is the classification system of Kingdom, Phylum, Class, Order, Family, Genus, Species.
Chunking	You can capitalize on your short term memory by "chunking" information. If you need to remember this number: 178206781. The task would exhaust your seven units of storage space unless you "chunk" the digits into groups. In this case, you could divide it into three chunks, like a social insurance number: 178 206 781. By chunking the information and repeating it you can stretch the capacity of your short term memory.
Flash cards	Flash cards provide a convenient tool to test yourself frequently. You can purchase flash cards for common memory tasks such as learning multiplication tables, or you can create your own for learning facts, systems, and processes.
Images	This helps us remember by linking words to meanings through associations based on how a word sounds and creating imagery for specific words. This sort of visualization was found to be more effective when one listened to someone reading a text than when they read the text themselves.
Jingle	Jingles or short songs are great tools for memory. Remember the famous song to teach children parts of the body, "Head and shoulders, knees and toes, knees and toes, knees and toes. Head and shoulders, knees and toes. Eyes, ears, mouth and nose."
Locations and Journeys	Traditionally known as the Method of Loci, we associate each word from a list or grouping with a location. Imagine a place with which you are familiar, such as, the rooms in your house. These become the objects of information you need to memorize. Another example is to use the route to your work or school, with landmarks along the way becoming the information you need to memorize. When you do this in order of your journey through the imagined space, it makes it easier to retrieve all of the information in the future.

Maps & Diagrams	Graphic organizers help us remember by connecting new information to our existing knowledge and to let us see how concepts relate to each other and fit into a context. Mind and concept maps, Cause and Effect, Fishbone, Cycle, Flow Chart, Ladders, Story Board, Compare and Contrast, Venn Diagrams, and more.
Reciting	Saying something out loud activates more areas of our brain and helps to connect information to other activities.
Rhymes	Rhyme, rhythm, repetition, and melody make use of our brain's ability to encode audio information and use patterns to aid memory. They help recall by limiting the possible options to those items that fit the pattern you have created.
Summarizing	This traditional element of note taking is a way to physically encode materials that make it easier for our brain to store and retrieve. It can be said that if we cannot summarize, then we have not learned…yet.

6. Application in Design Thinking

- During **Empathy Phase**, memory helps retain subtle user observations.
- In **Ideation**, recalling diverse knowledge sources sparks creativity.
- **Prototyping & Testing** benefit from memory-enhanced recall of user feedback and design iterations.