

Today's Agenda

- Human abilities – Cognition
- IRB instructions

Some Visual Guidelines

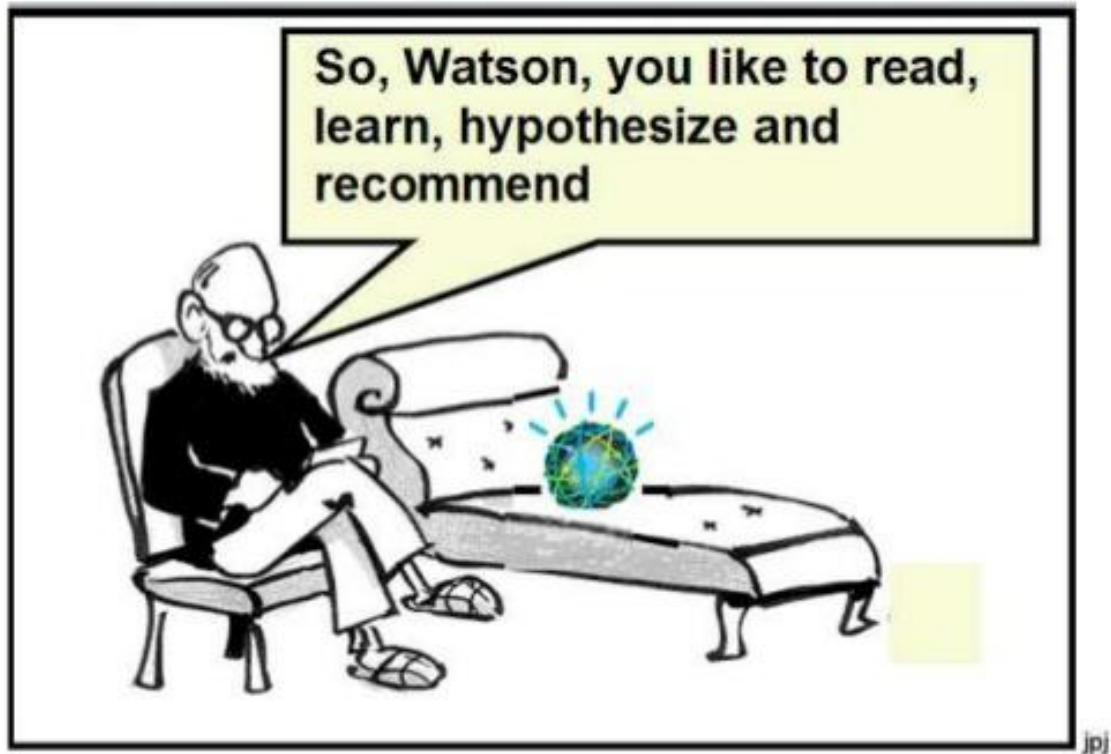
Finally, I will leave you with some general design guidelines on human visual capabilities...

Some Visual Guidelines

1. Large font is good, so is contrast
2. Don't use too many graphics
 - distracting and bad for screen readers
3. Something is important?
 - make it “pop” (bottom up processing) to reduce visual search
4. Simple text – easier to read and understand
5. “Color match” when you can (consistency)

Some Visual Guidelines

6. Never blur pictures
 - bad for low vision
7. Blue is hard to read
 - less blue cones in fovea
8. Group similar items
9. Use logical visual order – helps with read flow
10. Think about foreground and ground



Cartoon courtesy of Jean Paul Jacob, IBM Research Emeritus & IBMer on Campus, UC Berkeley

9/12/2014

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COGNITION

Cognition

Norman's two general modes: (ID 3.2)

- **Experiential cognition**
 - Perceive, act, and react
 - Effortless
 - Requires a certain level of expertise and engagement
 - E.g., driving, reading, conversation
- Reflective cognition and slow thinking

Human Information Processing - General

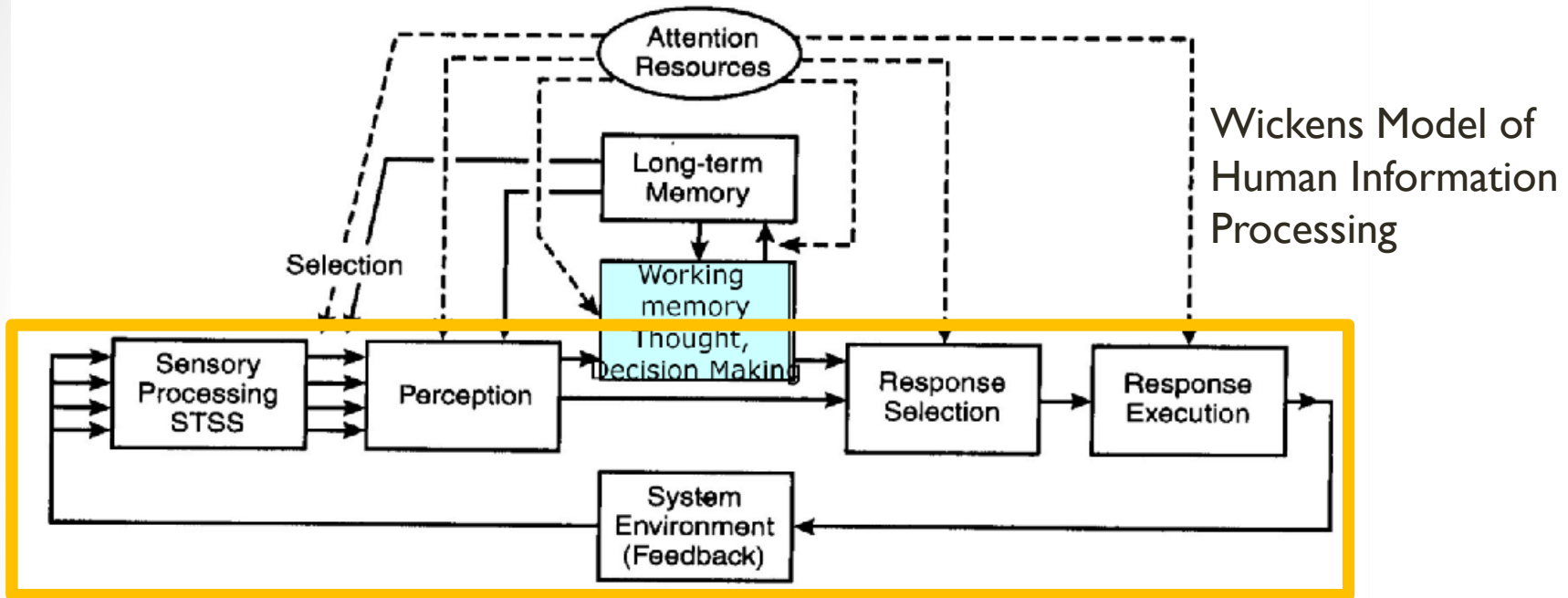


Figure 1.3 A model of human information processing stages.

1. Information from sensory system is perceived
2. Information is processed and transformed
3. Information is responded to

Cognition

Norman's two general modes: (ID 3.2)

- Experiential cognition
- Reflective cognition and slow thinking involving
 - Mental effort
 - Attention
 - Judgement
 - Decision making
 - New ideas and creativity, e.g., designing, learning, and writing a paper/book

Human Information Processing - Attention

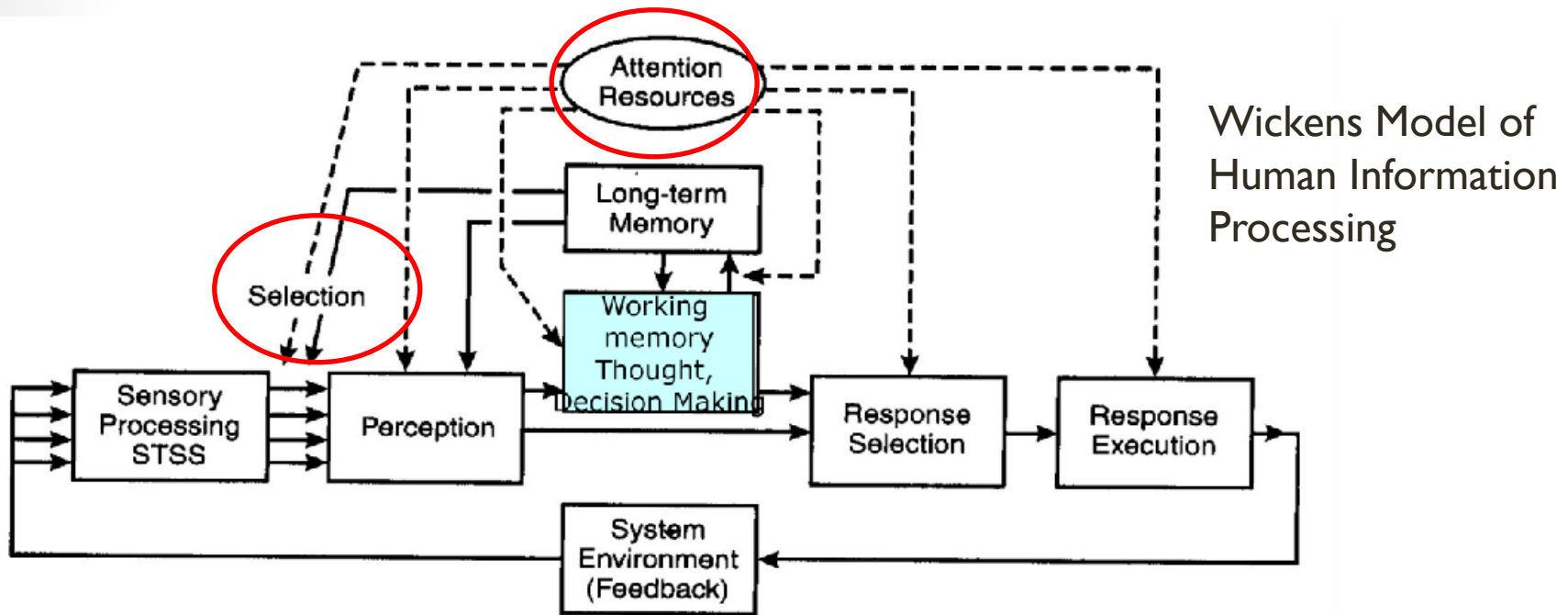


Figure 1.3 A model of human information processing stages.

- Mental effort
- Selecting sensory channels for further processing

Selective Attention

- Awareness test
- <http://www.youtube.com/watch?v=Ahg6qcgoy4>
- <https://www.youtube.com/watch?v=ubNF9QNEQLA>
- The “Door” study (“change blindness”)
- <http://www.youtube.com/watch?v=FWsXSQsspiQ>

Does NOT guarantee perception

Selective Attention

Driven by four factors:

1. Saliency
2. Expectancy
3. Value
4. Effort



Selective Attention

Saliency

- Bottom-up process
- Attentional capture
- Examples: Car horn, alarms, pop-out, movement...



Selective Attention

Expectancy

- Top-down process
- We look where we expect to see information
- E.g., where information changes rapidly, where it usually appears...



Selective Attention

- Value
 - Top-down process
 - How valuable is it to attend to (or how costly to miss)
 - E.g., Professor's voice? Scan outside car for pedestrians? Email?
- Effort
 - Inhibited if effortful
 - Scan short distances over longer ones



Design Guidelines - Attention

- Make information salient
- Use techniques like animation, color, underline, ordering, sequencing, and spacing of items to achieve attention
- Avoid cluttering the interface with too much information
- Search engines and forms should use simple and clean interfaces

Human Information Processing - Memory

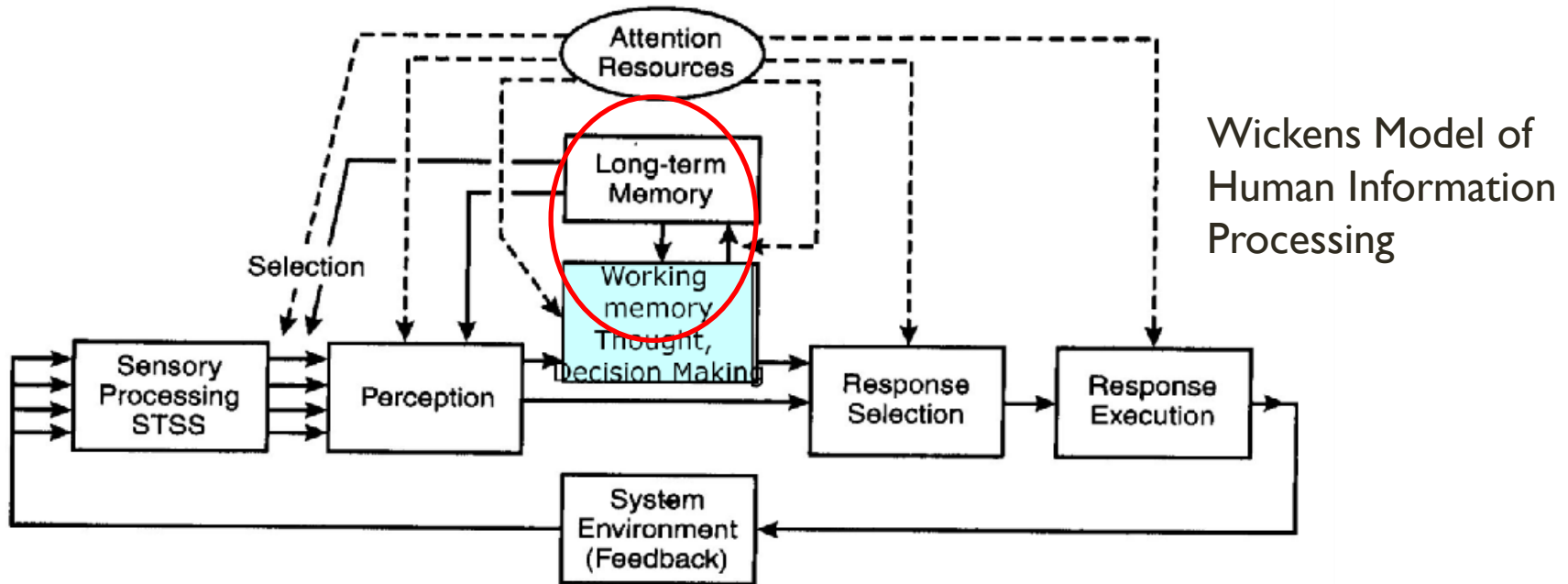


Figure 1.3 A model of human information processing stages.

Working Memory (WM)

Short-term Memory (STM)

Long-term Memory (LTM)

Human Information Processing - Memory

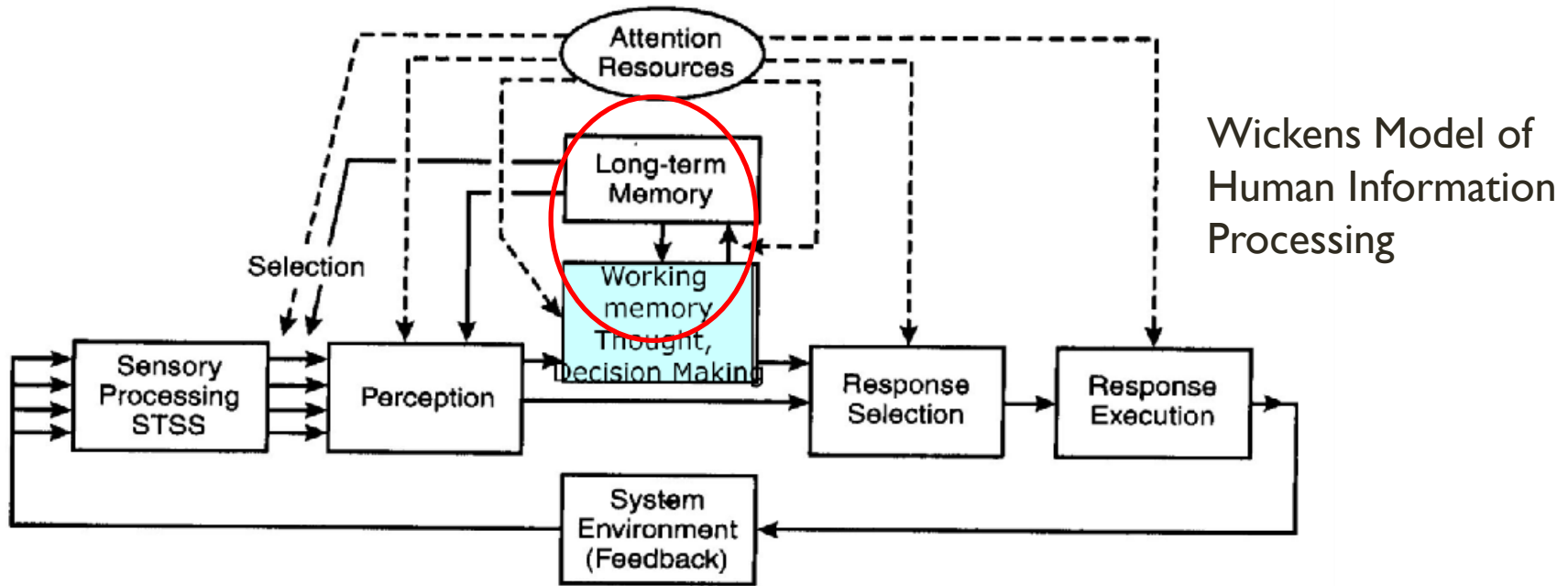


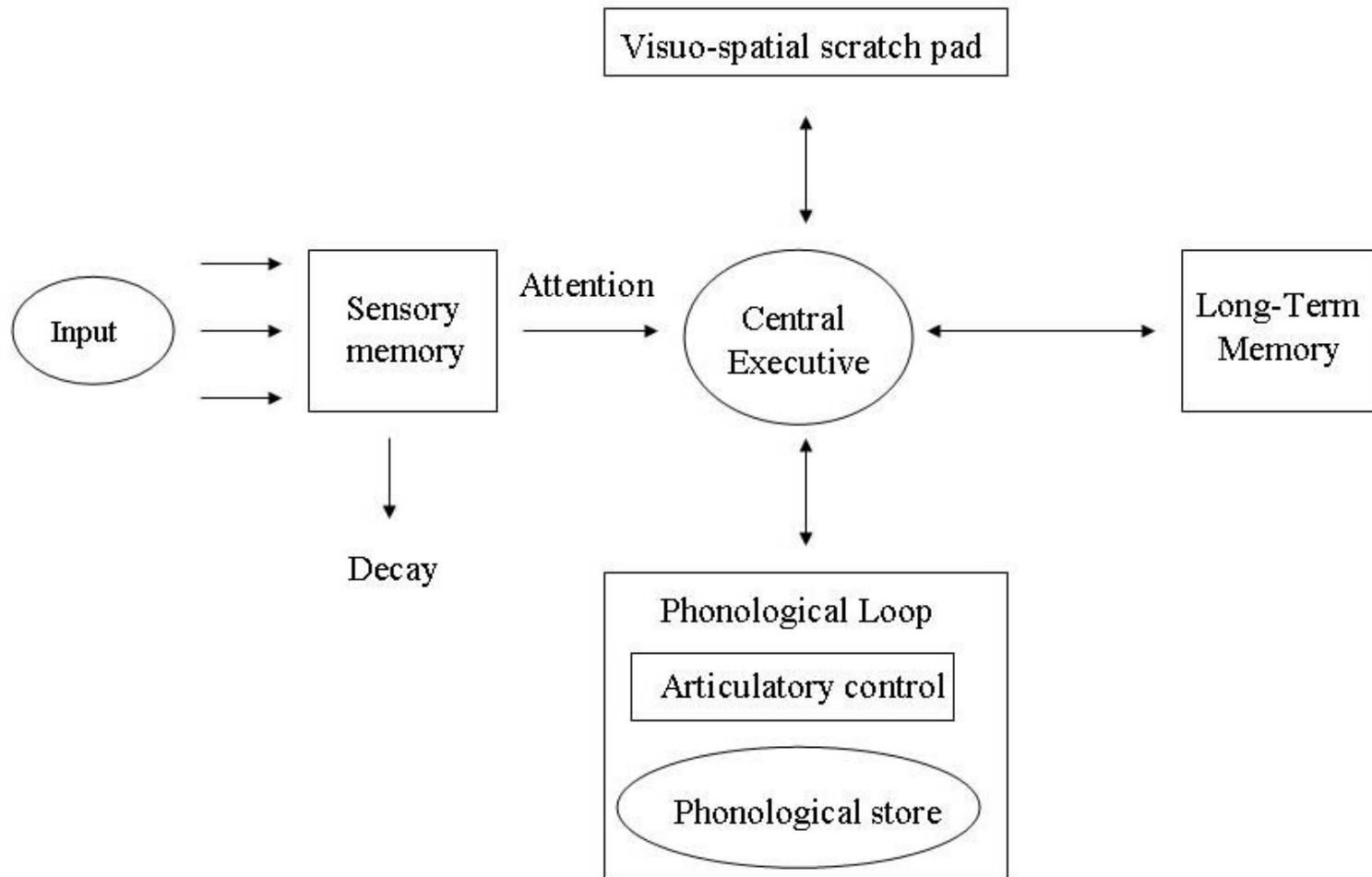
Figure 1.3 A model of human information processing stages.

Working Memory (WM)

- “Think about” or manipulate information
- Temporary storage

Working Memory

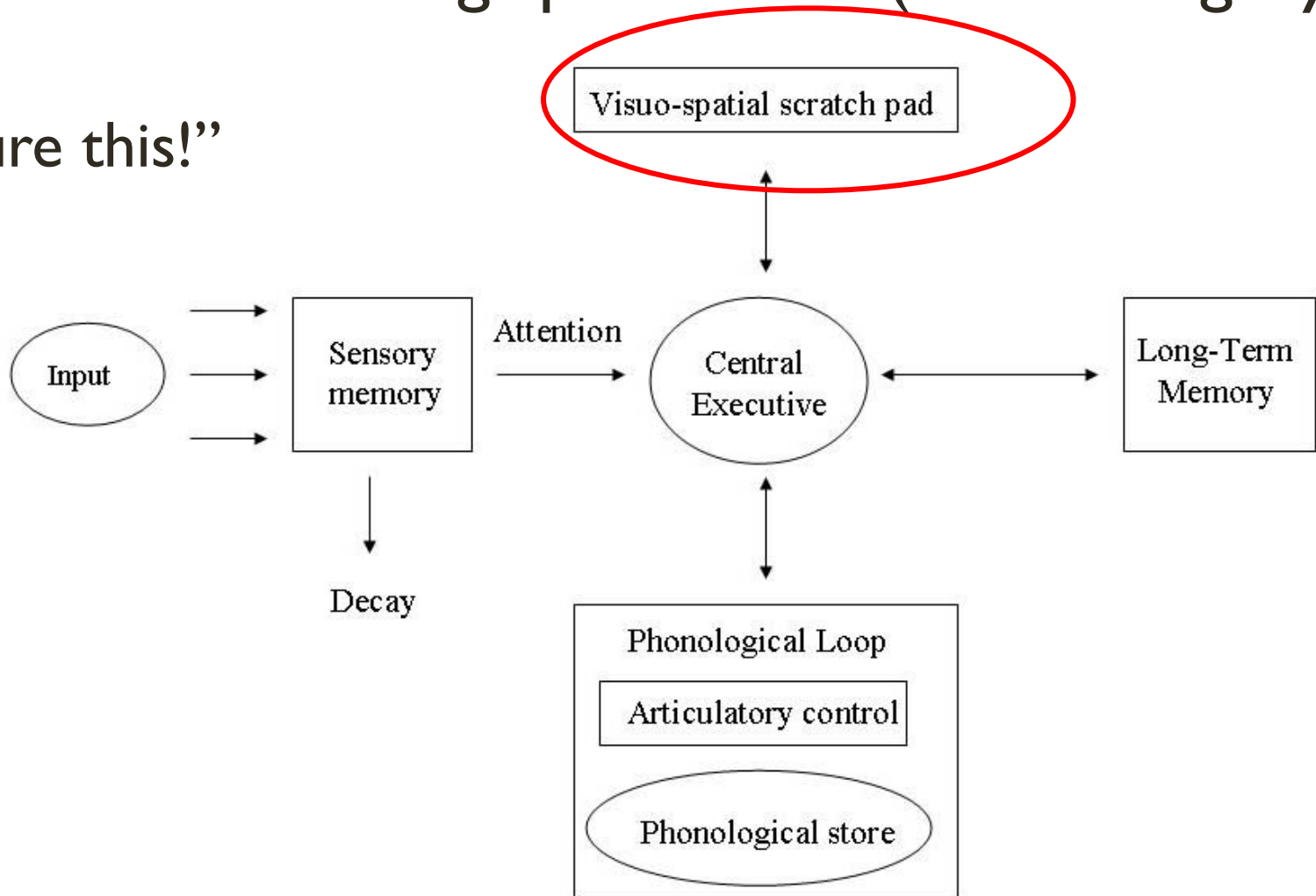
Working Memory Model (Baddeley and Hitch, 1974)



Working Memory

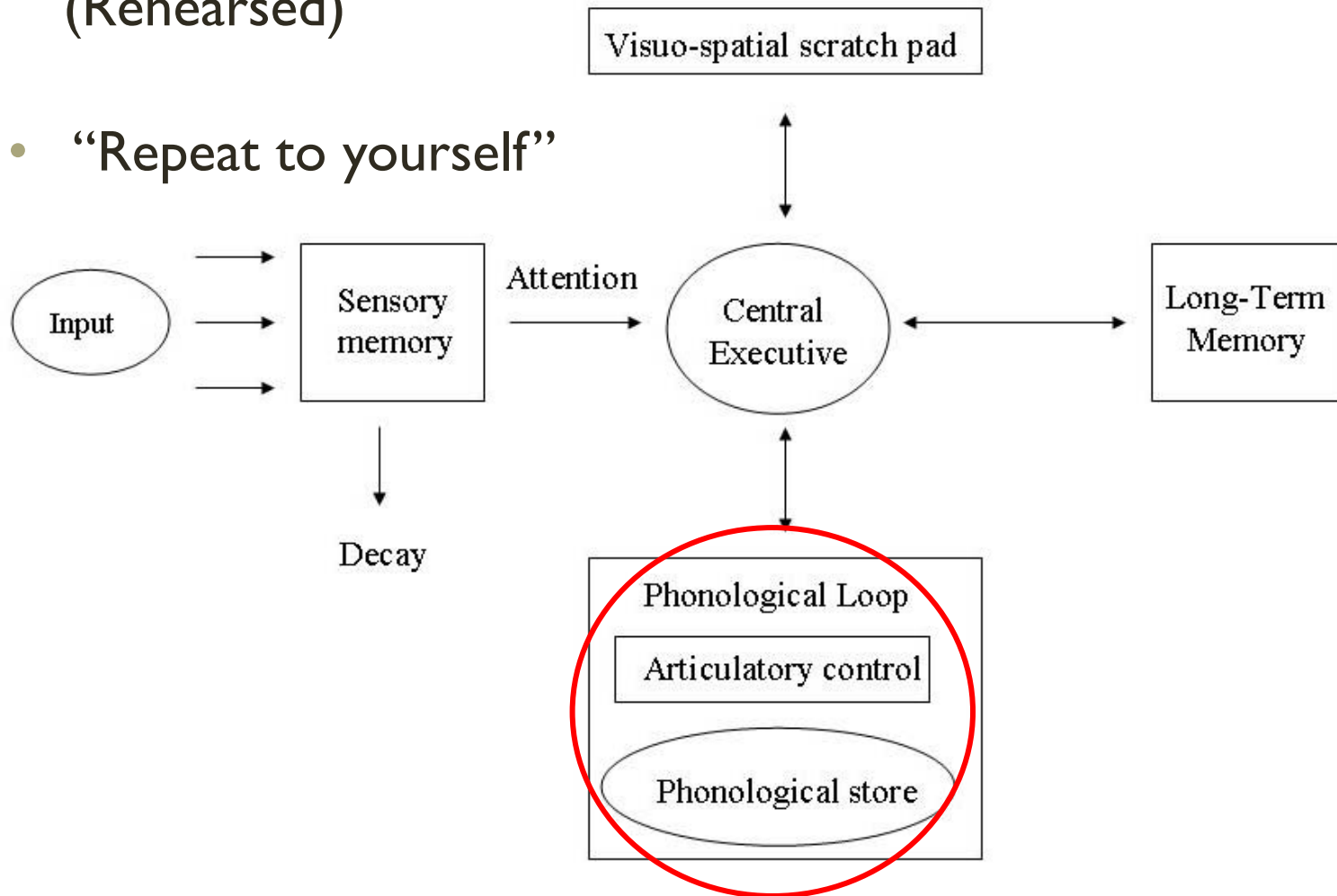
Information in analog spatial form (visual imagery)

“Picture this!”



Working Memory

- Verbal information in acoustical form (Rehearsed)
- “Repeat to yourself”



Example of Working Memory

$$\begin{array}{r} 23 \\ \times 38 \\ \hline 874 \end{array}$$

$$\begin{array}{r} 2345 \\ \times 3867 \\ \hline 9068115 \end{array}$$

Working Memory Limitations

Limited capacity

Length of Time & Amount of Information



15-20seconds



items

source: Driscoll, Marcy (2005), *Psychology of Learning for Instruction*, 86

Working Memory Limitations

Chunking is based on

- Familiarity with links between items
- Past experience (LTM)

• **Advantageous** because

- Increases the amount of information stored in WM
- Aids retention by making use of LTM associations
- Easier to rehearse (and transfer to LTM)

Social Security #
123 45 6789

FBICIAUSA
vs.
FBI CIA USA

What was that number again?

$$\begin{array}{r} 23 \\ \times 38 \\ \hline 874 \end{array}$$

Working Memory Limitations

Similarity & Confusability

Similarity between items in WM increase confusability

- E G B D V C
- E N W R U J
- Decay and time more disruptive for similar material

WM: Design Guidelines

Important for group project

1. Minimize working memory load (avoid the user having to remember)
2. Provide placeholders for sequential tasks (what steps have been completed? e.g., automated check out)
3. Exploit chunking (meaningful sequences – e.g., I-800-438-4357 ; I-800-GET-HELP)
4. Avoid “0”s (regal member number: 0000000100290978)
5. Consider WM limits in instructions (Before doing X and Y, do A) (Do A. Then do X and Y)

DECISION MAKING



Human Information Processing – Decision Making

Influenced by:

- WM
- LTM
- Sensation & perception
- Attention

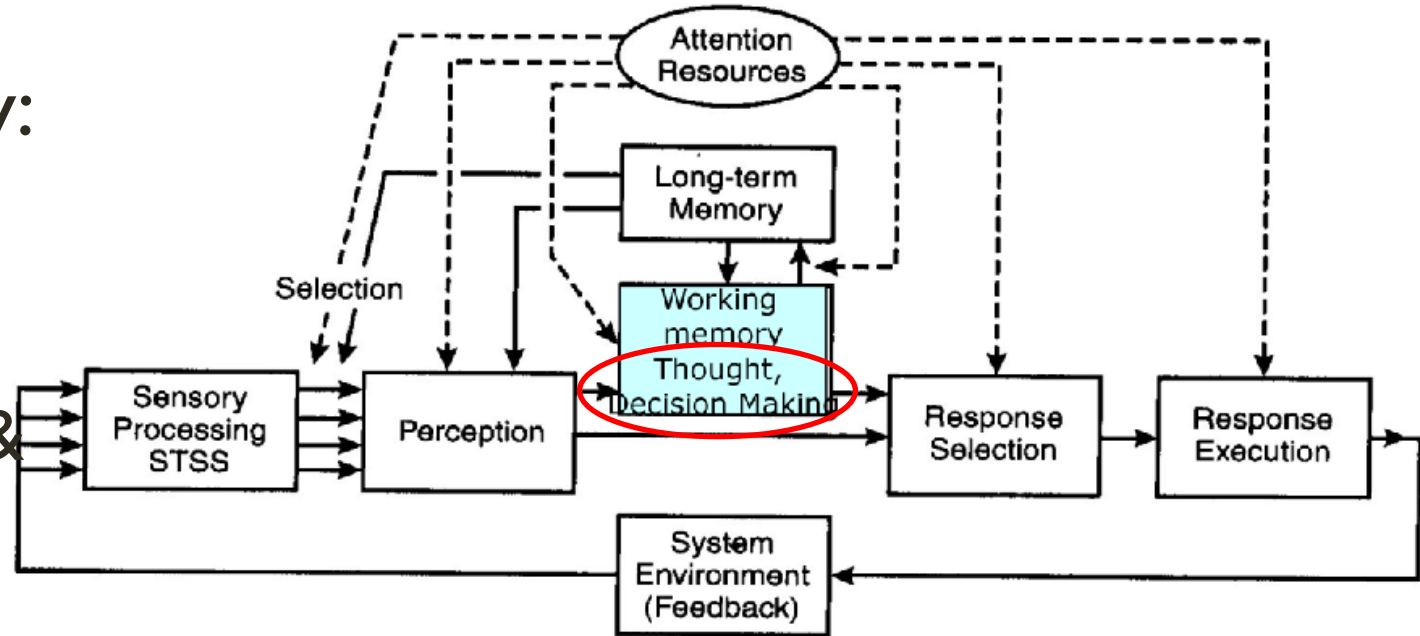
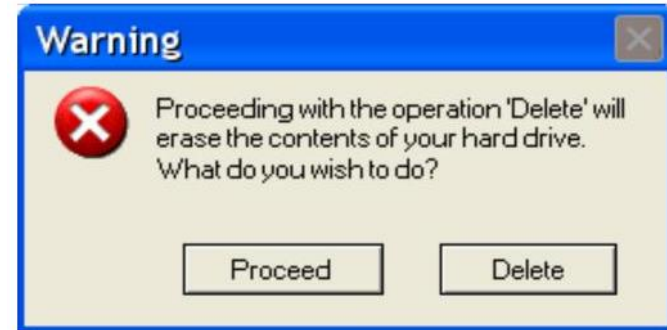


Figure 1.3 A model of human information processing stages.

Wickens Model of Human Information Processing

Decision Making

What is a decision making task?



- A choice between alternatives
 - Example: Course A or Course B?
- Some information available about the choices
 - Example: Course A: MWF, Course B: TTH
- Time frame longer than a second
 - Decision making vs choice-reaction
 - Example: Drop day is in October
- Uncertainty & risks
 - Example: what type of exams are involved in A

How Do People Make Decisions?

Thoughts?

Three Processes or Steps

- Cues go into working memory
- Using cues, we generate hypotheses
- Based on cues, and hypotheses, plan and act

Normative Decision Models

- How people ideally *should* make decisions
- Mathematical assessments of probability
- Example: Purchasing a car
 - Cars have many attributes:
 - Type, stereo, navigation, MPG, maintenance, etc.
 - Determine best option summing:
 - magnitude of each attribute
 - E.g., - poor stereo, + maintenance
 - multiplied by utility (weights)
 - E.g., importance



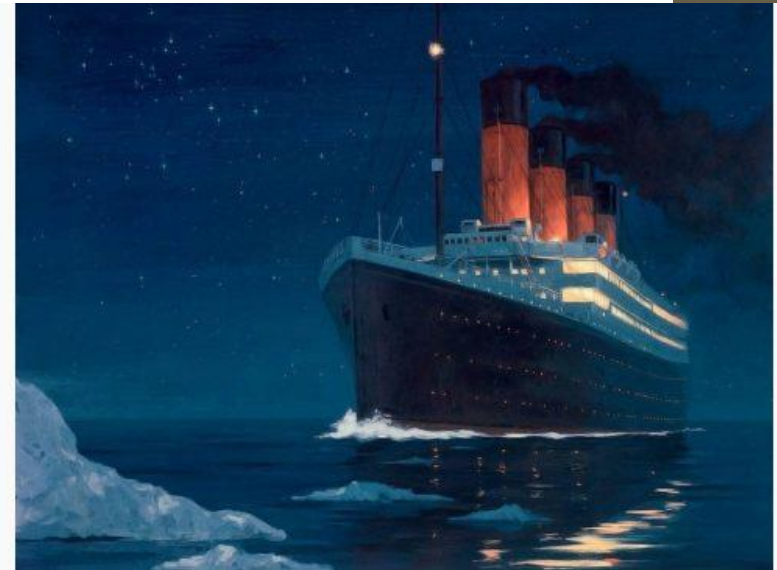
Normative Decision Models

- Do people do this?
- Not usually! It's too time consuming and effortful!
 - People rely on simpler, less-complete means of selecting among choices



Issues Pertaining to Decision Making

- Cognitive fixation
 - Stay fixated on particular hypothesis (chosen for testing)
 - Stay fixated on particular solution even when not working
- Confirmation bias
 - Seek cues that confirm; avoid those that disconfirm
 - Interpret ambiguous evidence as supportive



Improving Decision Making

- ***Redesign the task***
 - Provide information – not data
- ***Proceduralization (Training)***
 - Practice normative decision making skills as much as possible
- ***Automation (Decision support system)***
 - Computers can present many sources of data in aggregated format
 - Decision making can be informed by more sources of information
 - Computer aids can offload working memory load by displaying different hypotheses that fit data
 - Computers can also display all recommended actions based on data

Improving Decision Making

- ***Give feedback (results of decision) as soon as possible:***

clear and diagnostic

- **Challenges**

- When feedback is ambiguous
- When feedback is delayed



Case Study

Imagine UofSC asked you to build a program that helped students decide which courses to enroll

What are some considerations to design this decision aid program?

Questions?

Ethical Guidelines for HCI Researchers

All researchers must:

1. Obtain informed consent from participants
2. Minimize any discomfort and risk to participant
3. Ensure participants will not suffer any long-term negative consequences
4. Treat any information from participant as confidential
5. Debrief the participant afterward

— The Role of the IRB

IRB

- Institutional review board (IRB) or called Independent ethics committee
- An approved IRB application is commonly required when the study involves human subjects
- Documents are needed
 - Study protocols
 - Human subject protection plan
 - Consent form
- Exempt from IRB, e.g.
 - Conventional educational setting
 - Using public available data
- **Decision of exemption is made by IRB representative**

Assignment – IRB training

- Every student should pass the IRB training and get a certificate of completion
- Submit the certification to Blackboard
- Due: by 11:59pm EST, Sunday, Oct. 8, 2023



Completion Date
Expiration Date
Record ID

This is to certify that:

Has completed the following CITI Program course:

Human Research (Curriculum Group)
Social & Behavioral Researchers (Course Learner Group)
1 - Basic Course (Stage)

Under requirements set by:

University of South Carolina



Verify at

An example of Certificate of Completion