Today's Agenda

- Human abilities – Cognition
- IRB instructions

Review: Cognition

Norman's two general modes: (ID 3.2)

- Experiential cognition
  - effortless
  - Perceive, act, and react
  - Requires a certain level of expertise and engagement
  - E.g., driving, reading, conversation
- Reflective cognition and slow thinking
  - Mental effort
  - Involving attention, judgement, decision making
  - New ideas and creativity, e.g., designing, learning, and writing a paper/book

Selective Attention

- Awareness test
- http://www.youtube.com/1watch?v=Ahg6qcgoay4
- 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. Salience
2. Expectancy
3. Value
4. Effort

Selective Attention

Salience

- 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

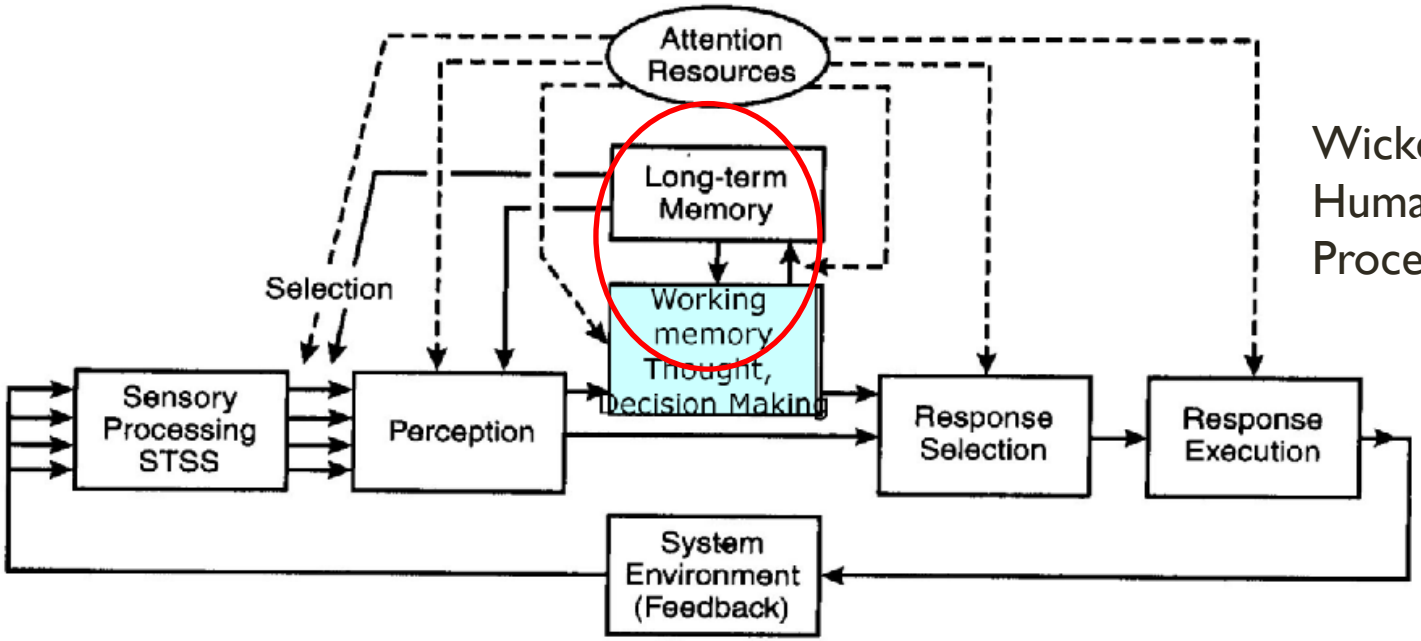


Figure 1.3 A model of human information processing stages.

Wickens Model of Human Information Processing

Working Memory (WM)

Short-term Memory (STM)

Long-term Memory (LTM)

Human Information Processing - Memory

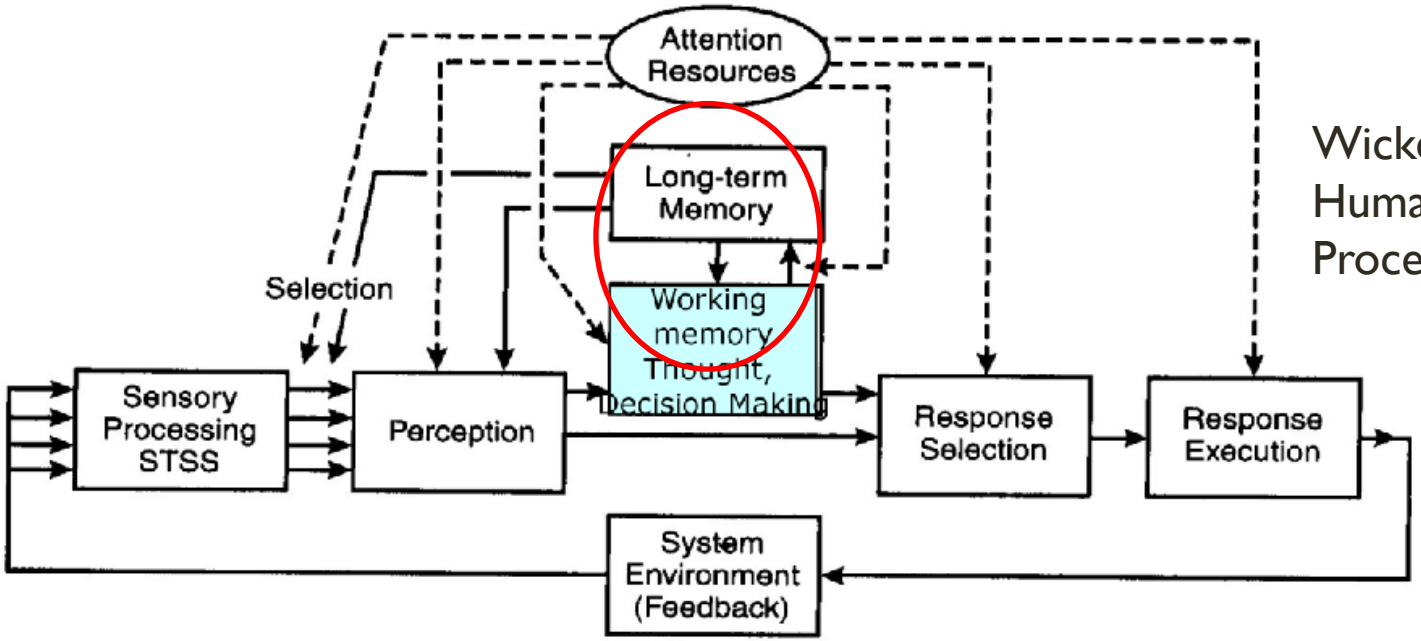


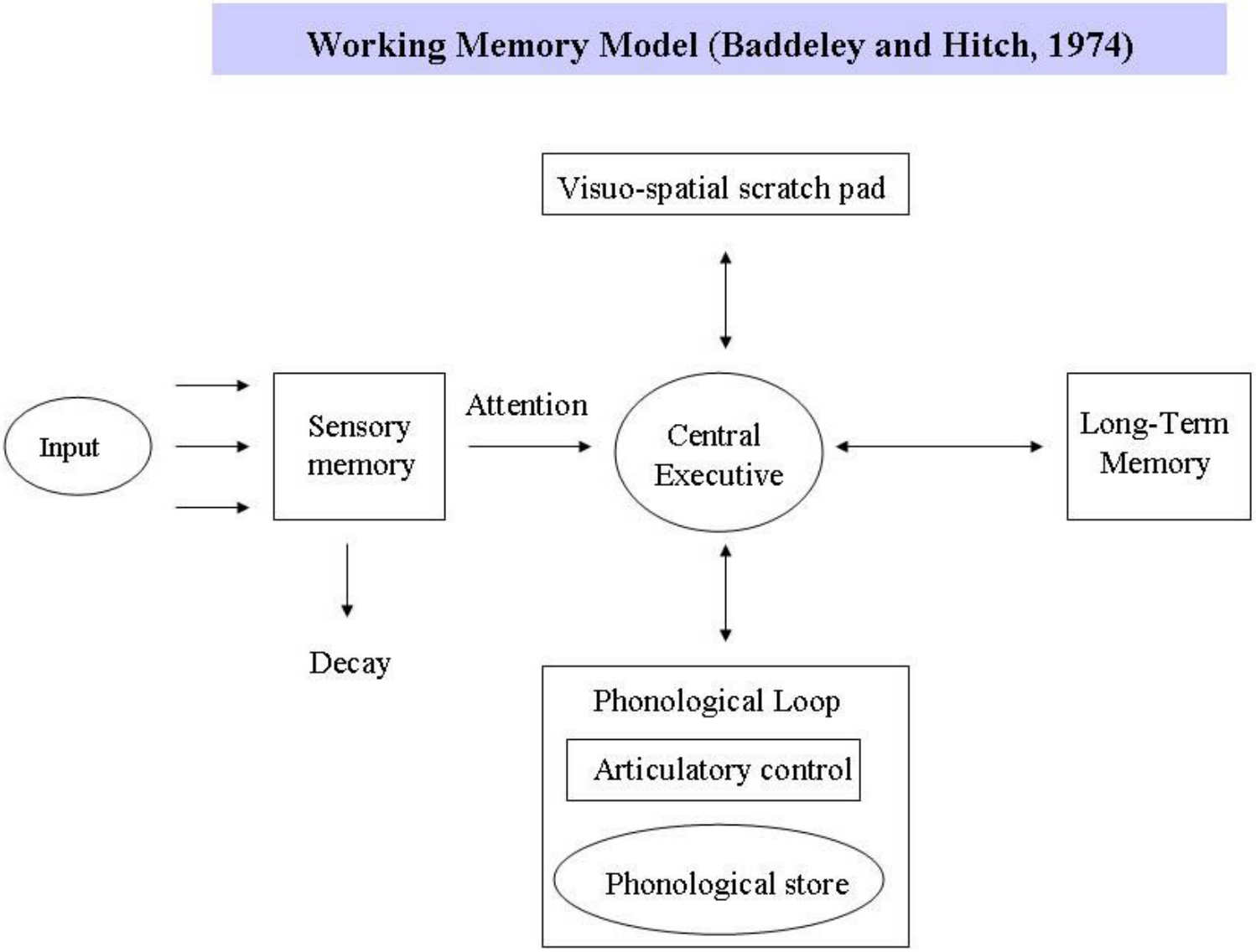
Figure 1.3 A model of human information processing stages.

Wickens Model of Human Information Processing

Working Memory (WM)

- "Think about" or manipulate information
- Temporary storage

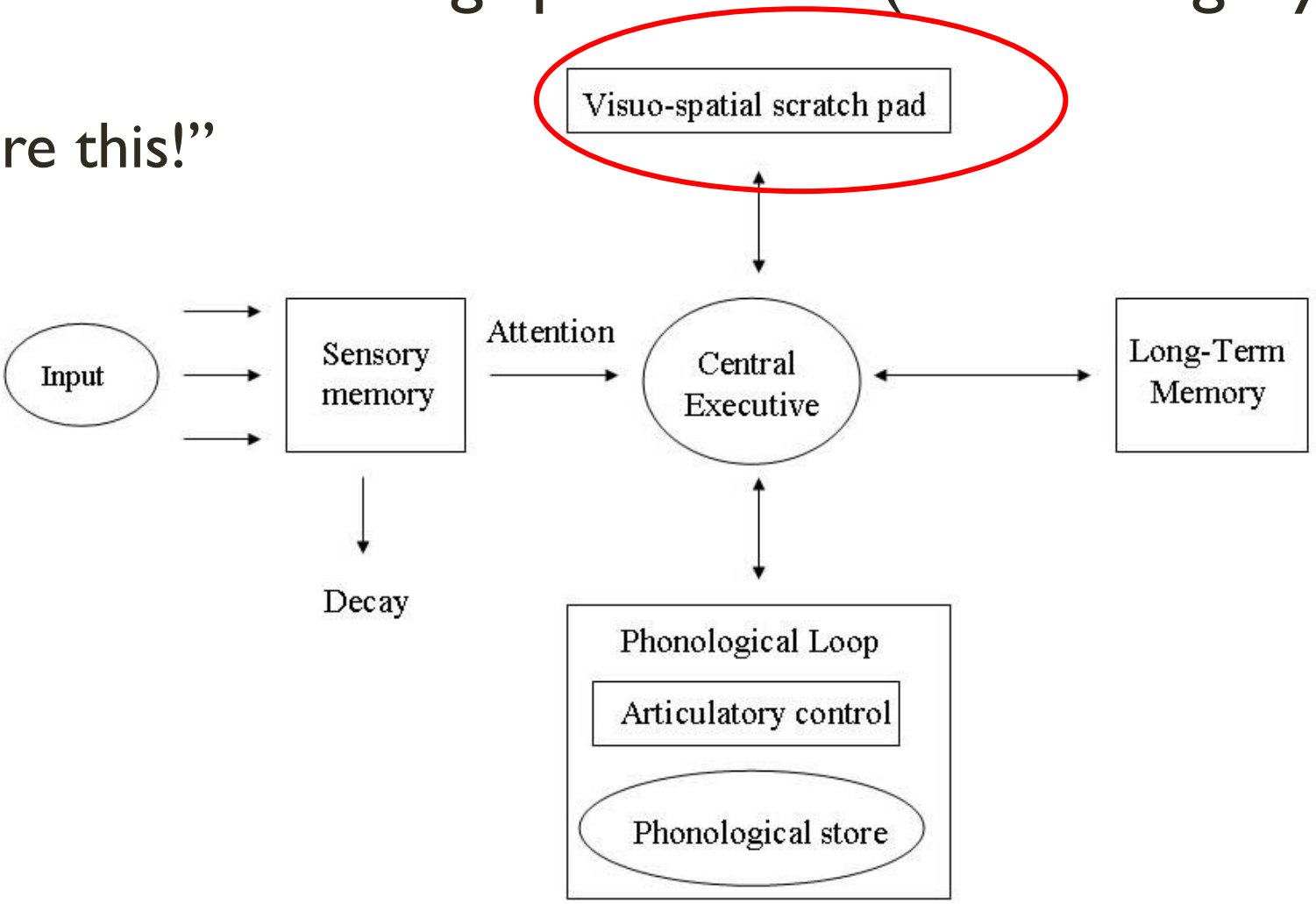
Working Memory



Working Memory

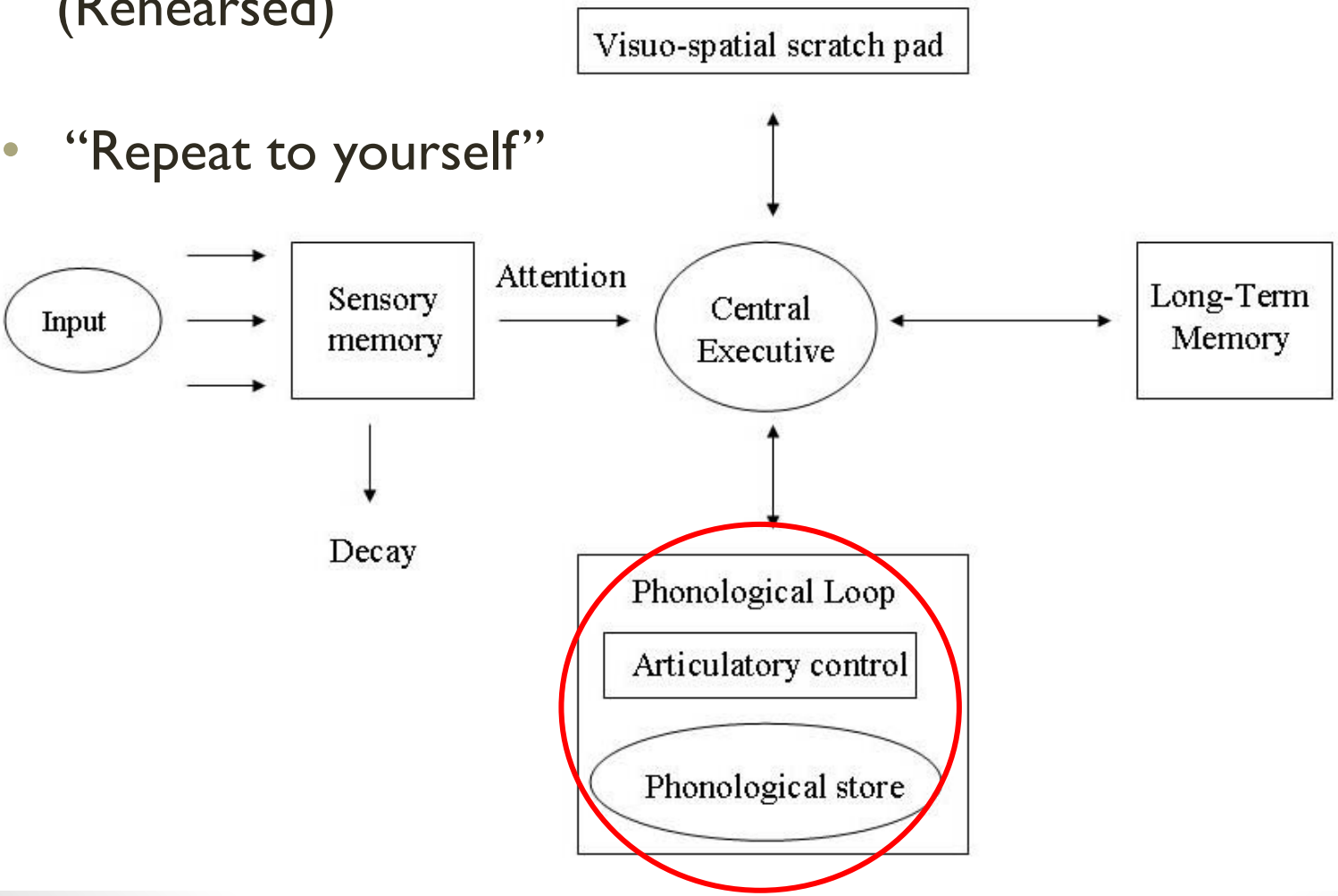
Information in analog spatial form (visual imagery)

"Picture this!"



Working Memory

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



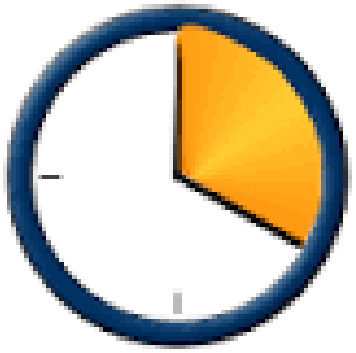
Example of Working Memory

23	2345
x 38	x 3867
874	9068115

Working Memory Limitations

Limited capacity

Length of Time & Amount of Information



15-20 seconds

7

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)

Social Security #
123 45 6789

FBICIAUSA
vs.
FBI CIA USA

- **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)

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

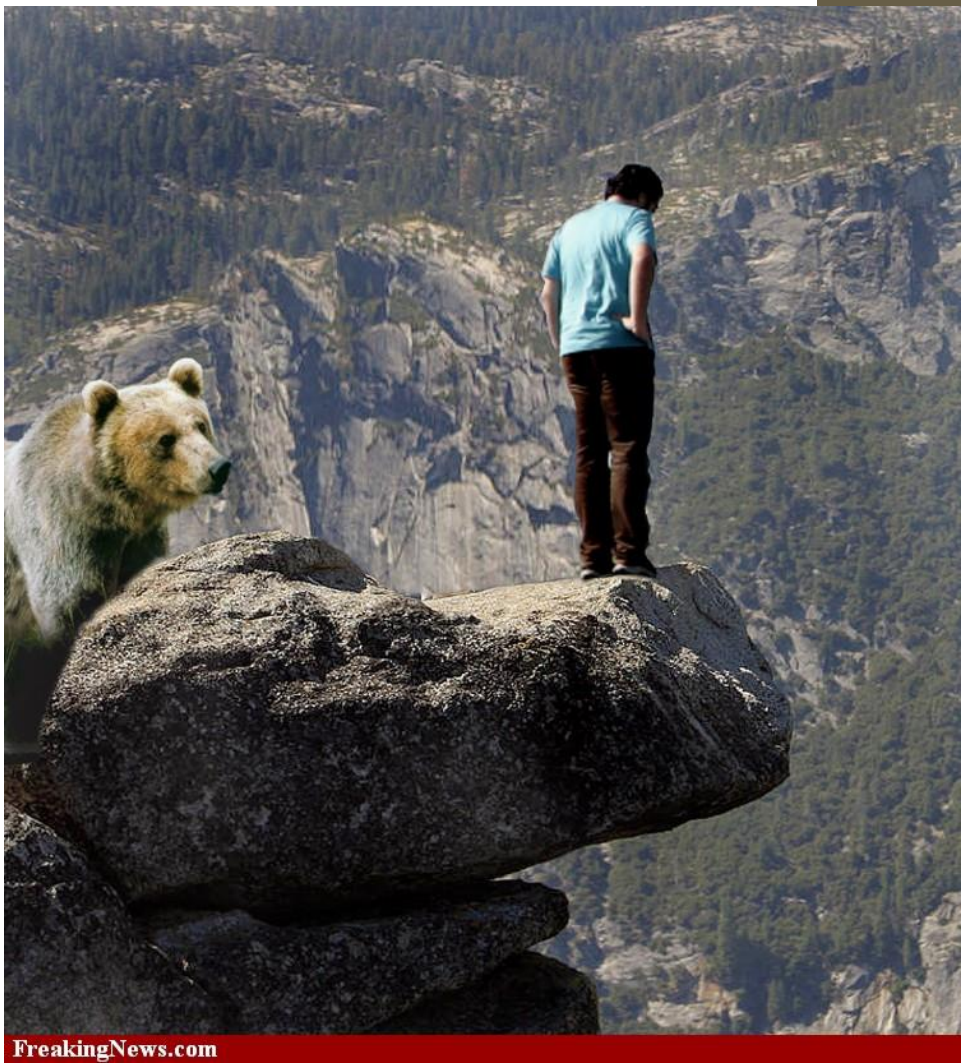
- Decay and time more disruptive for similar material

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., 1-800-438-4357 ; 1-800-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

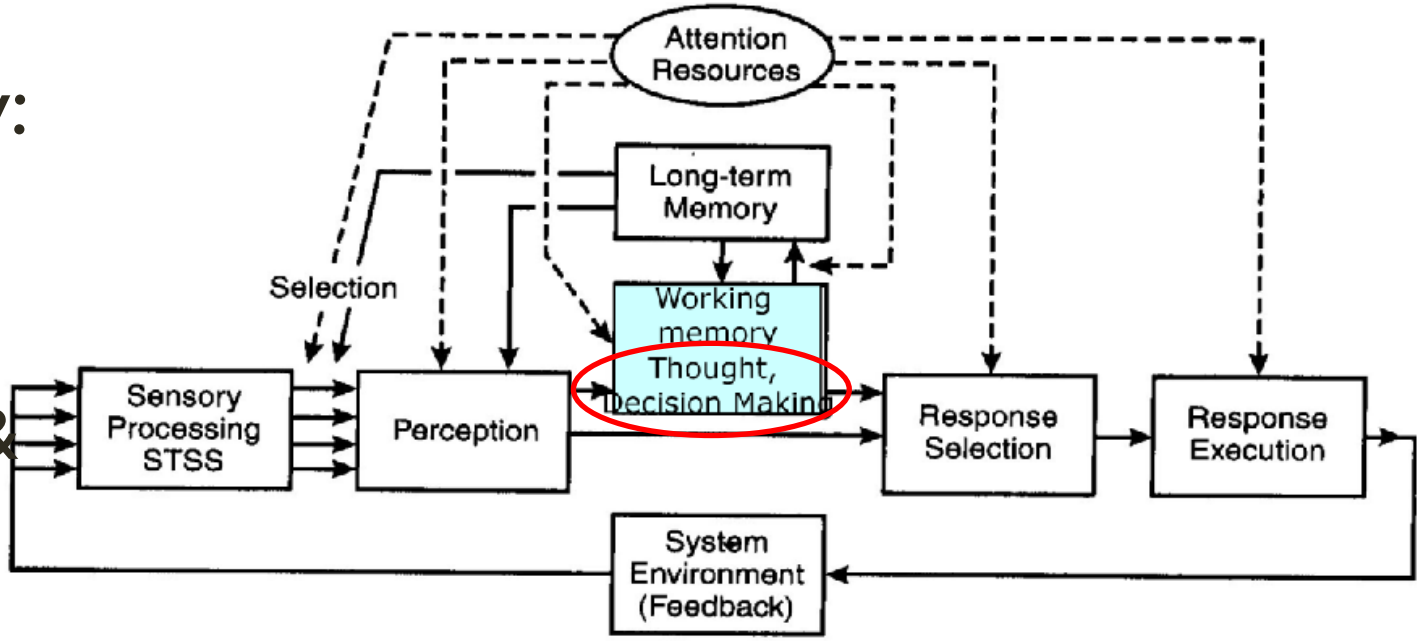
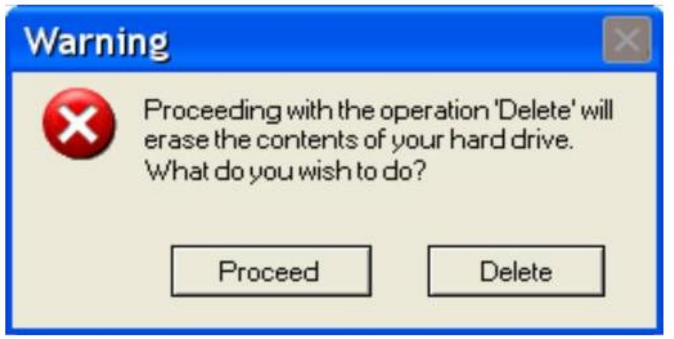


Figure 1.3 A model of human information processing stages.

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

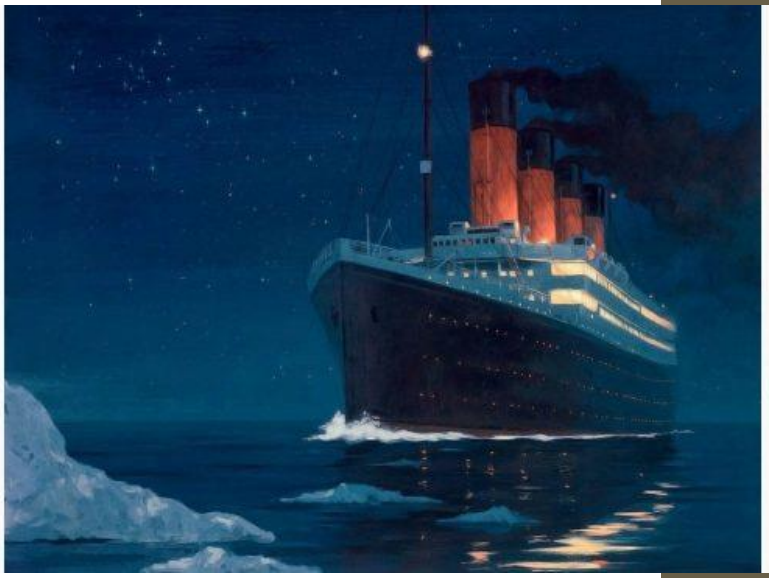
- How people ideally *should* make decisions
- Mathematical assessments of probability
- Example: Purchasing a car
  - Cars have many attributes:
    - Type, stereo, navigation, MPG, maintenance, etc.
  - Determine best option summing:
    - magnitude of each attribute
      - E.g., - poor stereo, + 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, Tuesday, Oct. 1, 2024

CITI PROGRAM

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

CITI
Collaborative Institutional Training Initiative

Verify at

An example of Certificate of Completion