SINGAPORE UNIVERSITY OF TECHNOLOGY AND DESIGN

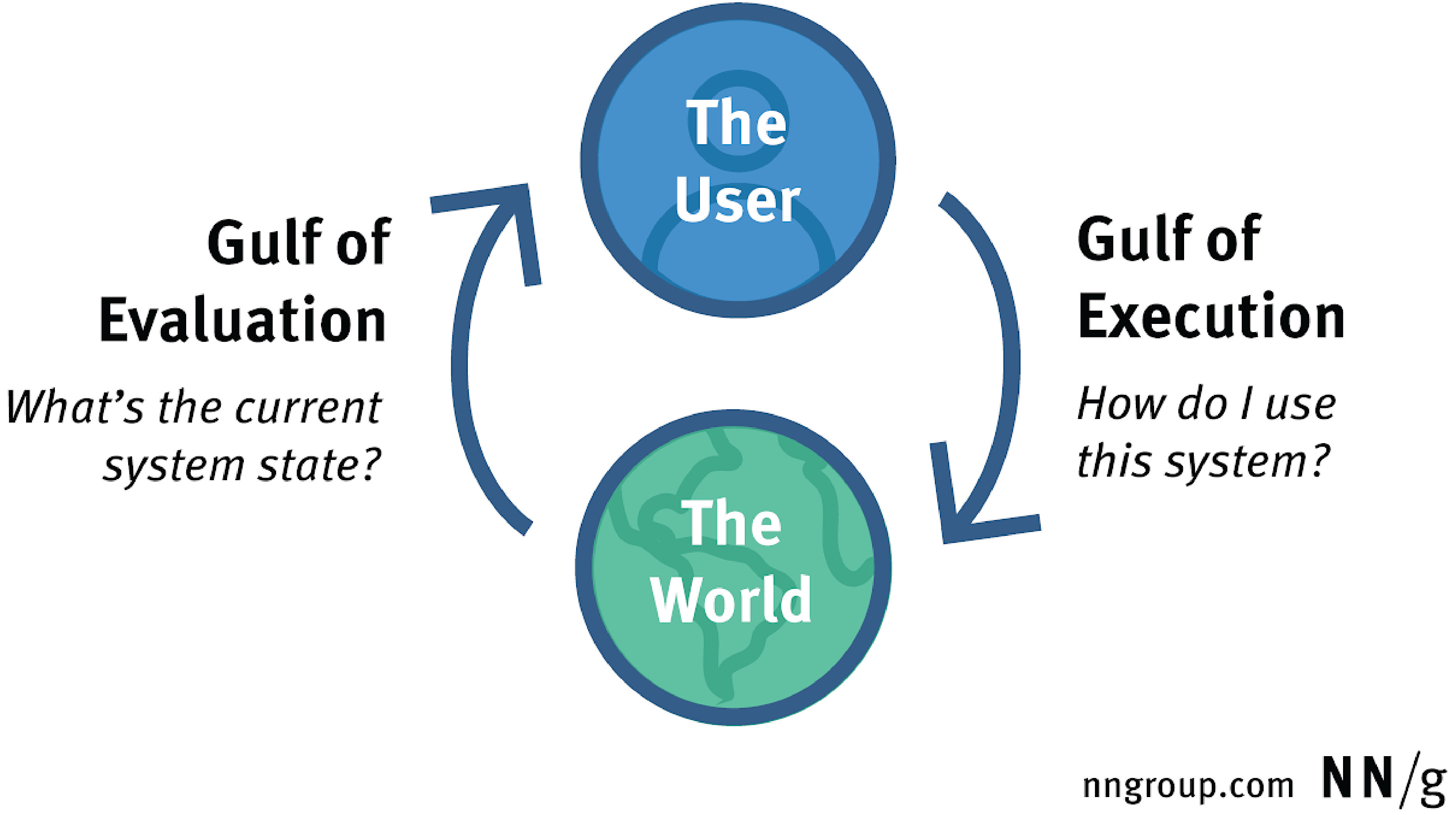
User Interface Design & Implementation

The User in UI Design

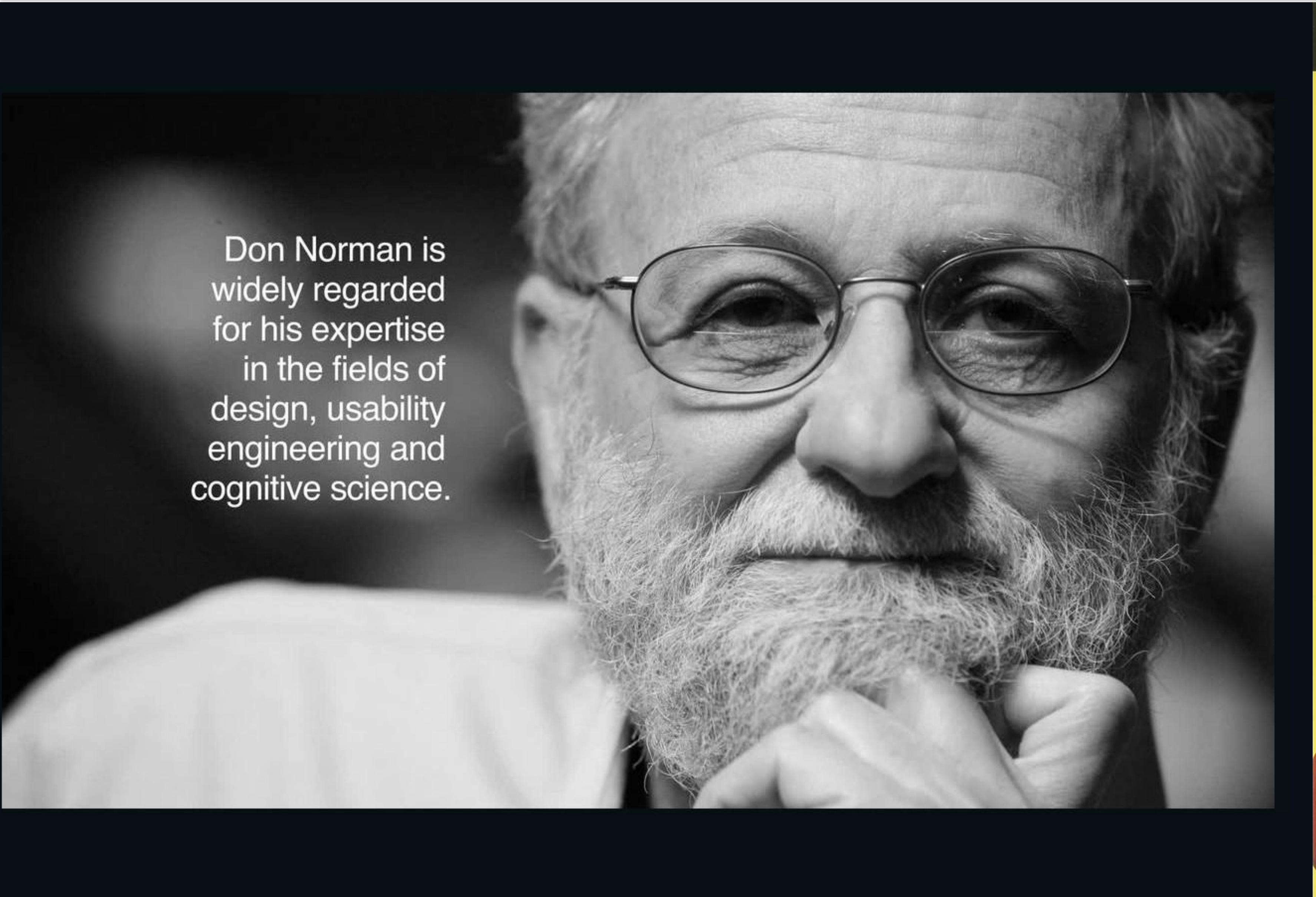
Week 2 – Lecture 2

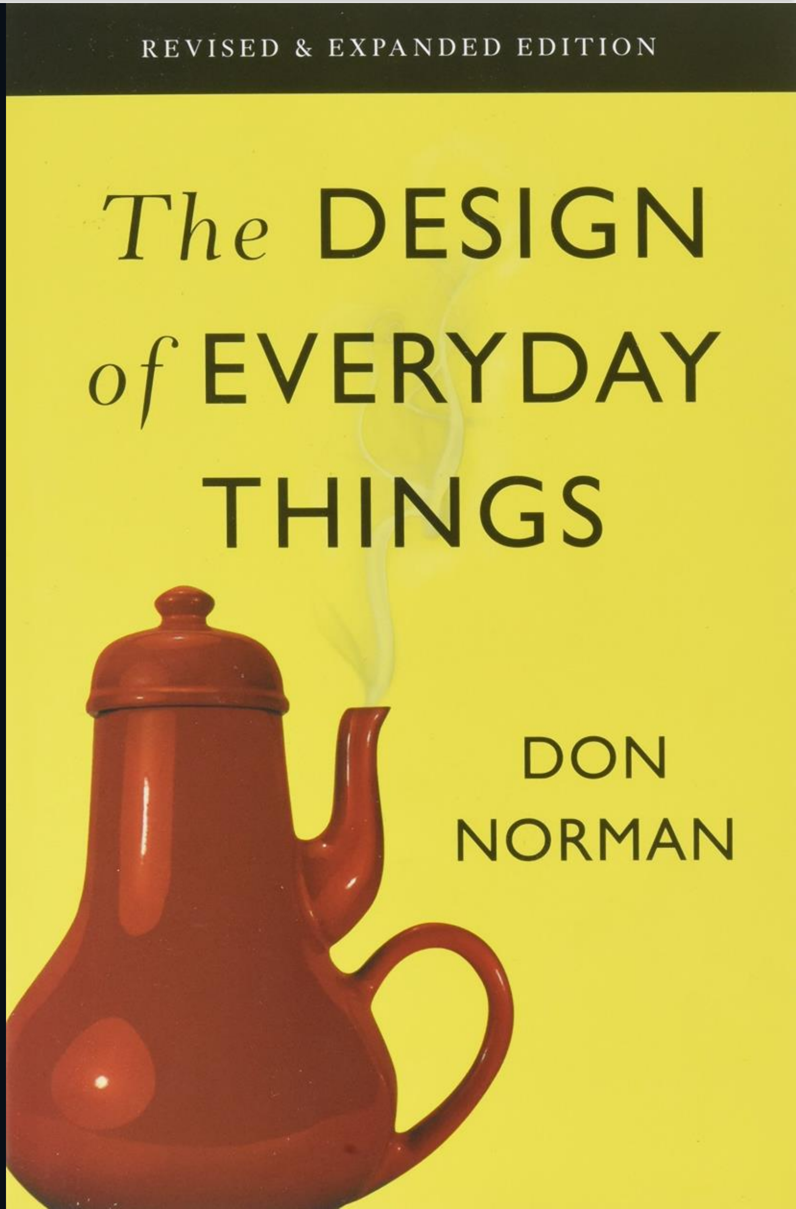
Let’s look at some gulfs in the world

The two most famous gulfs in this course

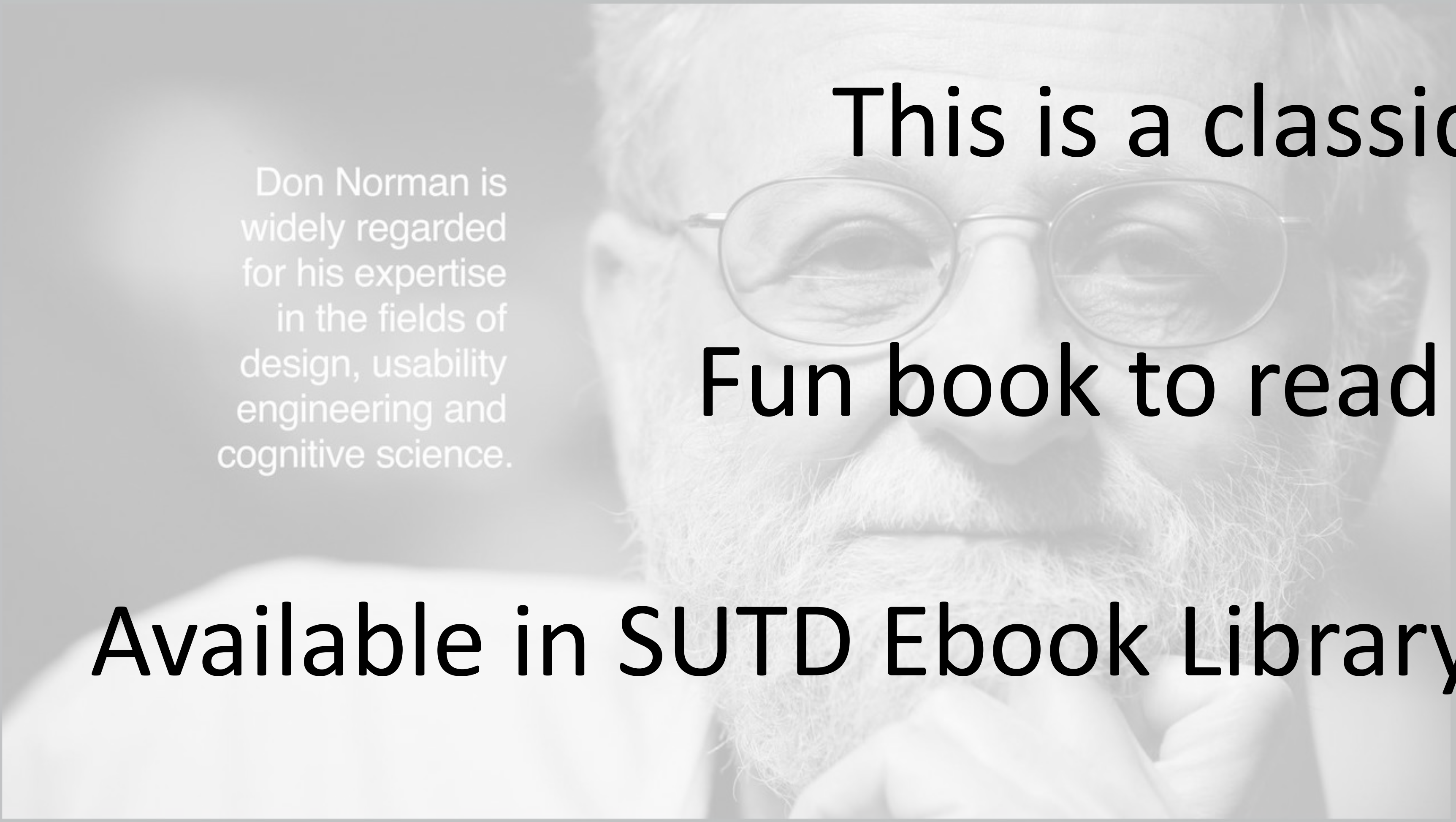


Famous Person #1





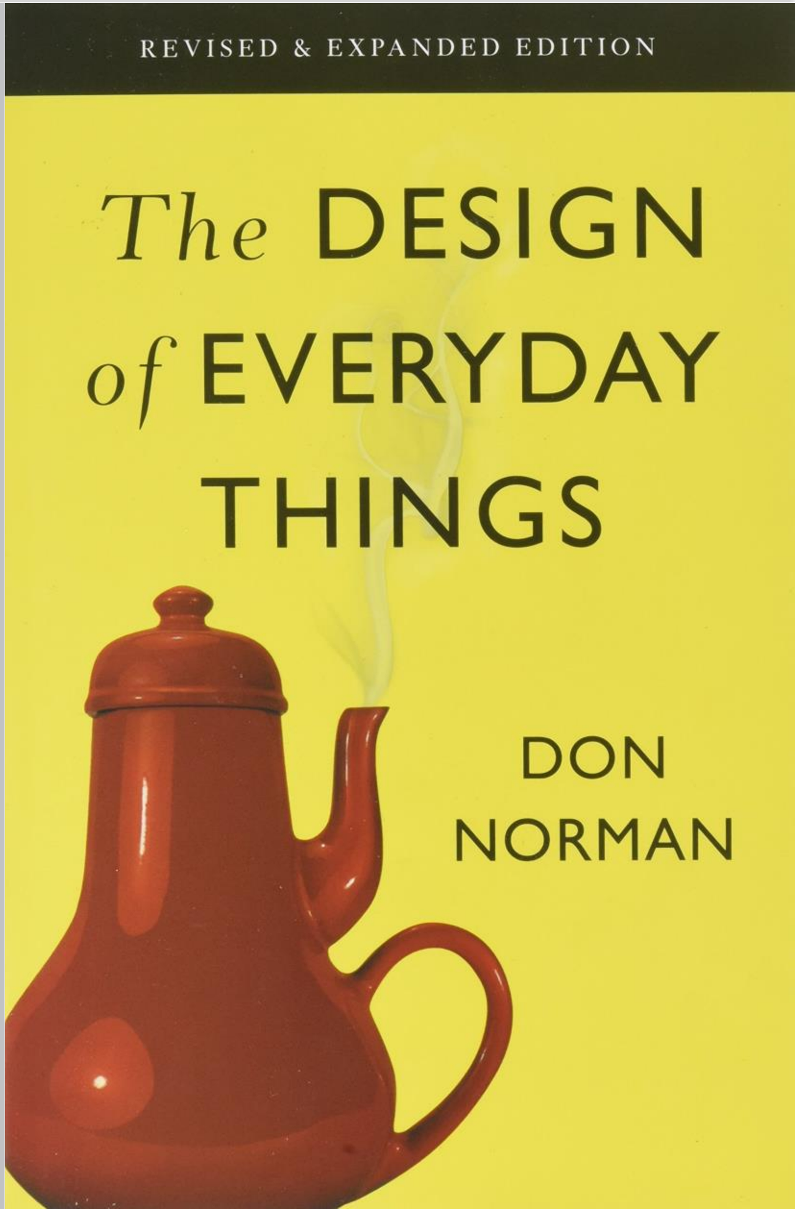
Highly recommended reading



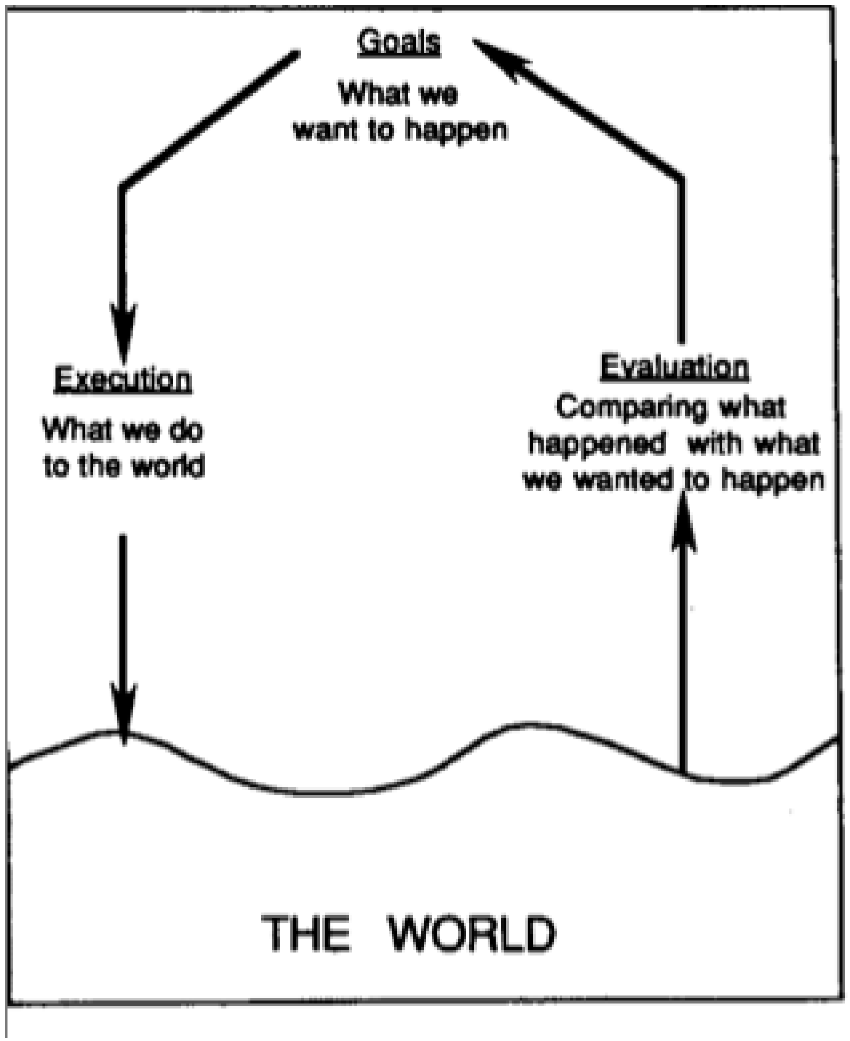
This is a classic

Fun book to read!

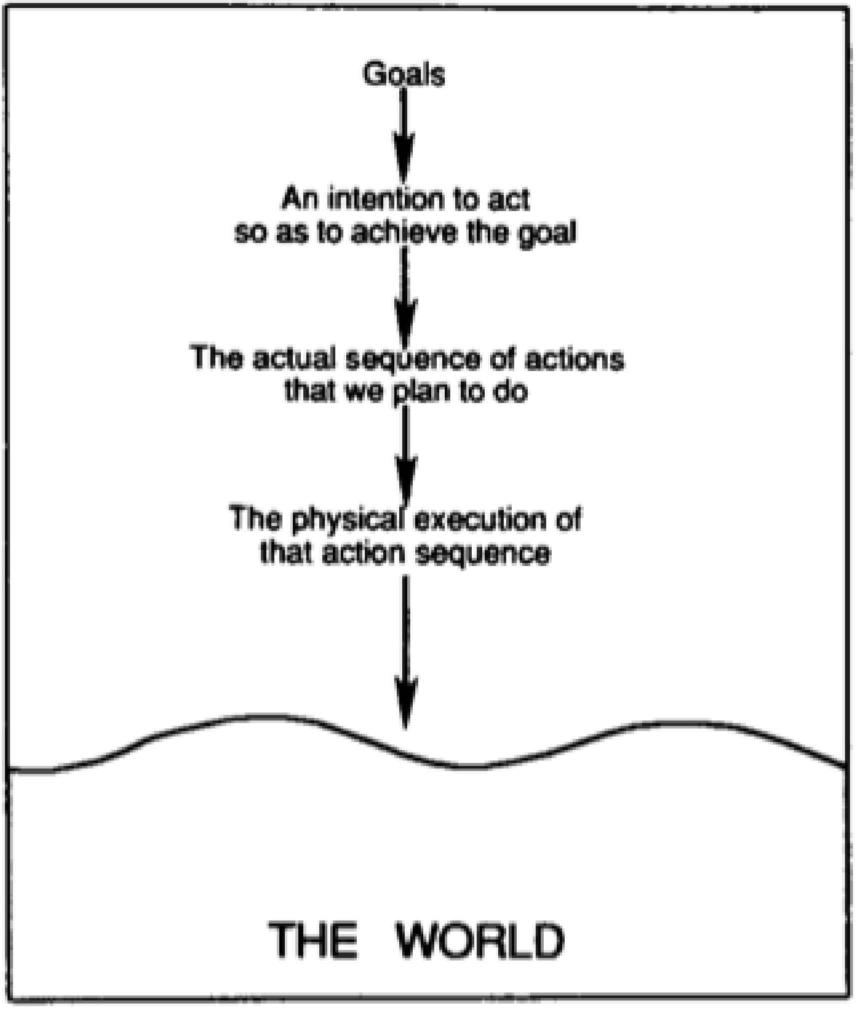
Available in SUTD Ebook Library

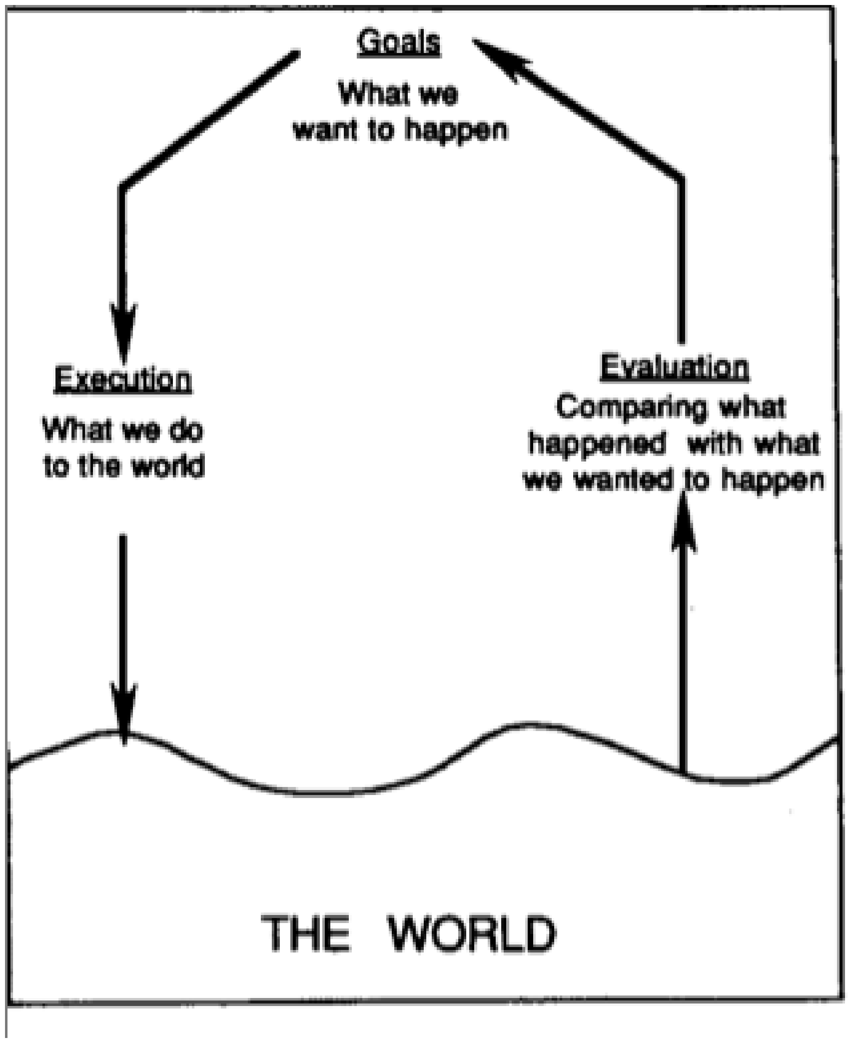


Forming the goal

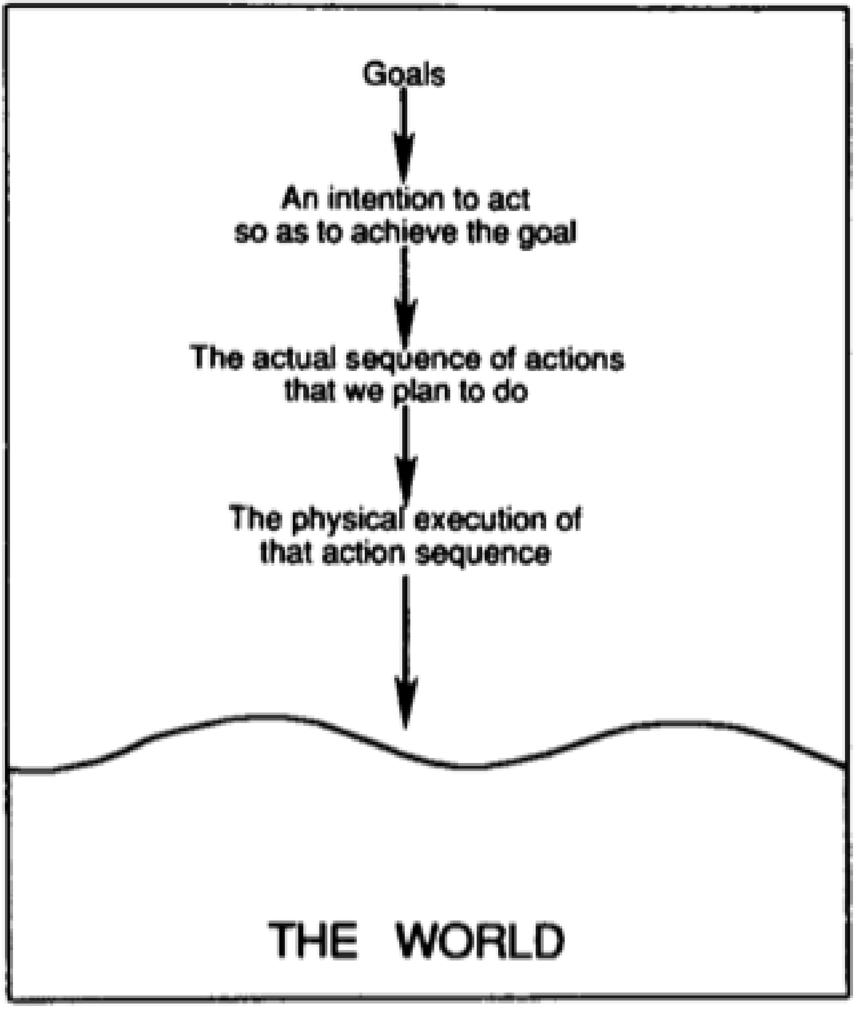


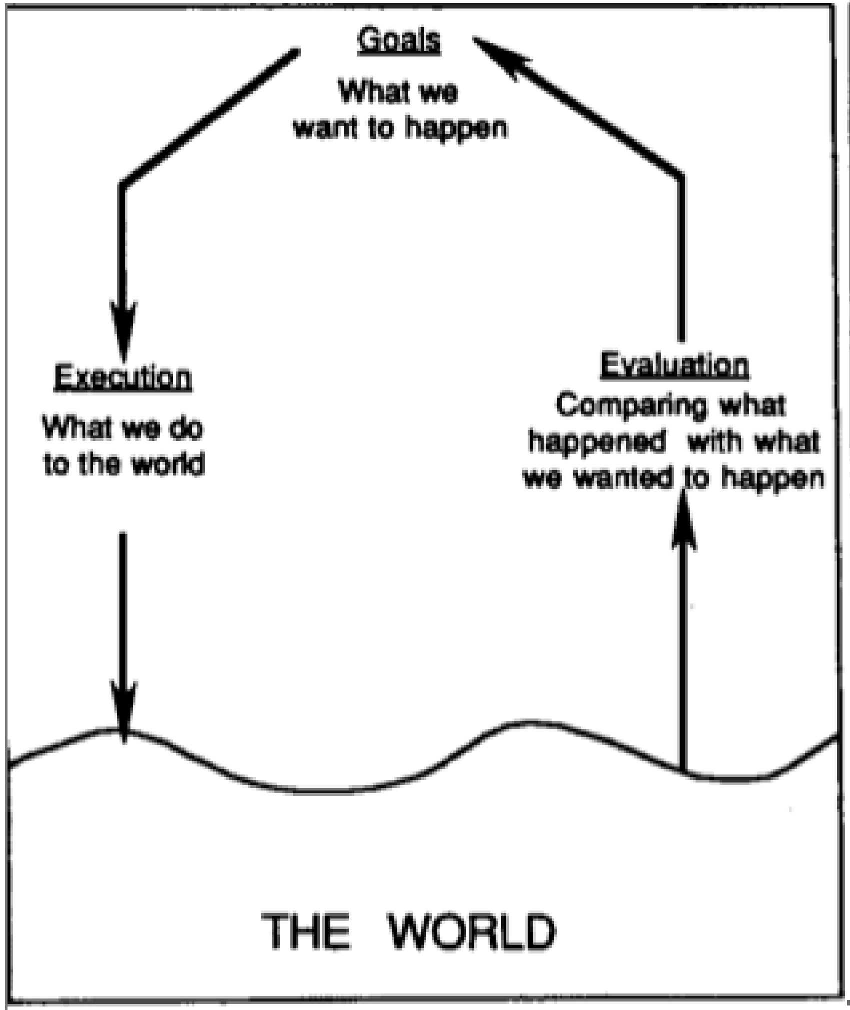
Stages of execution

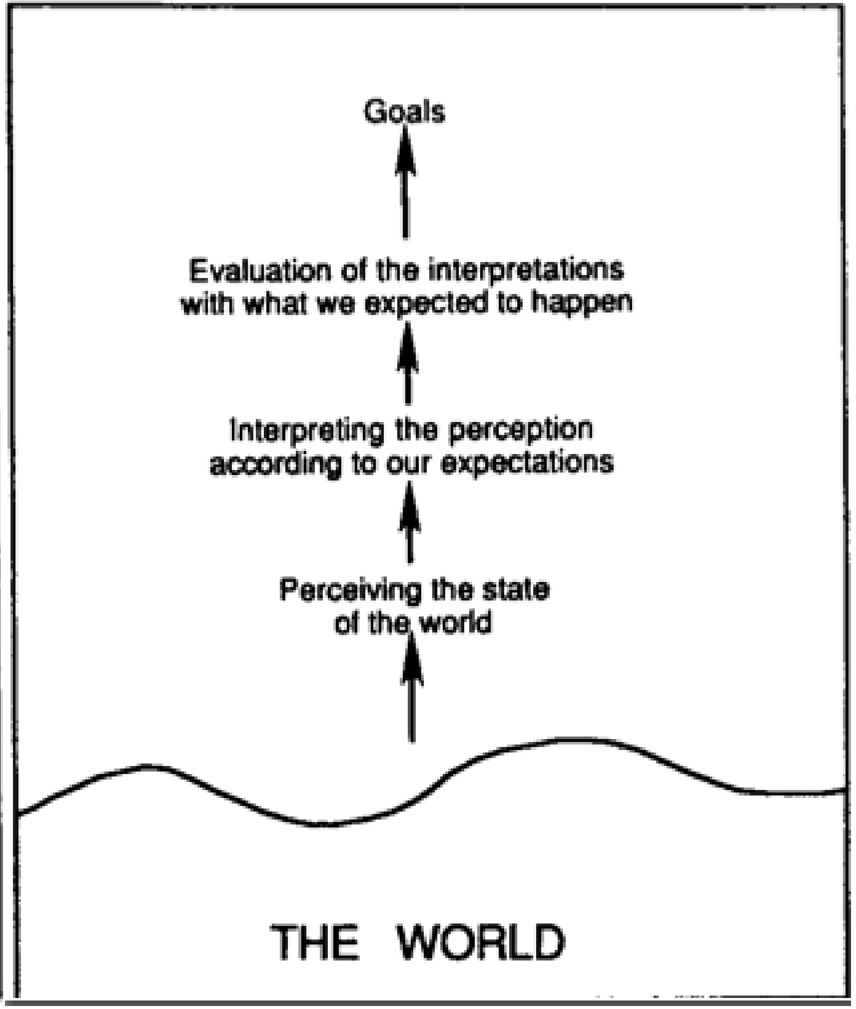




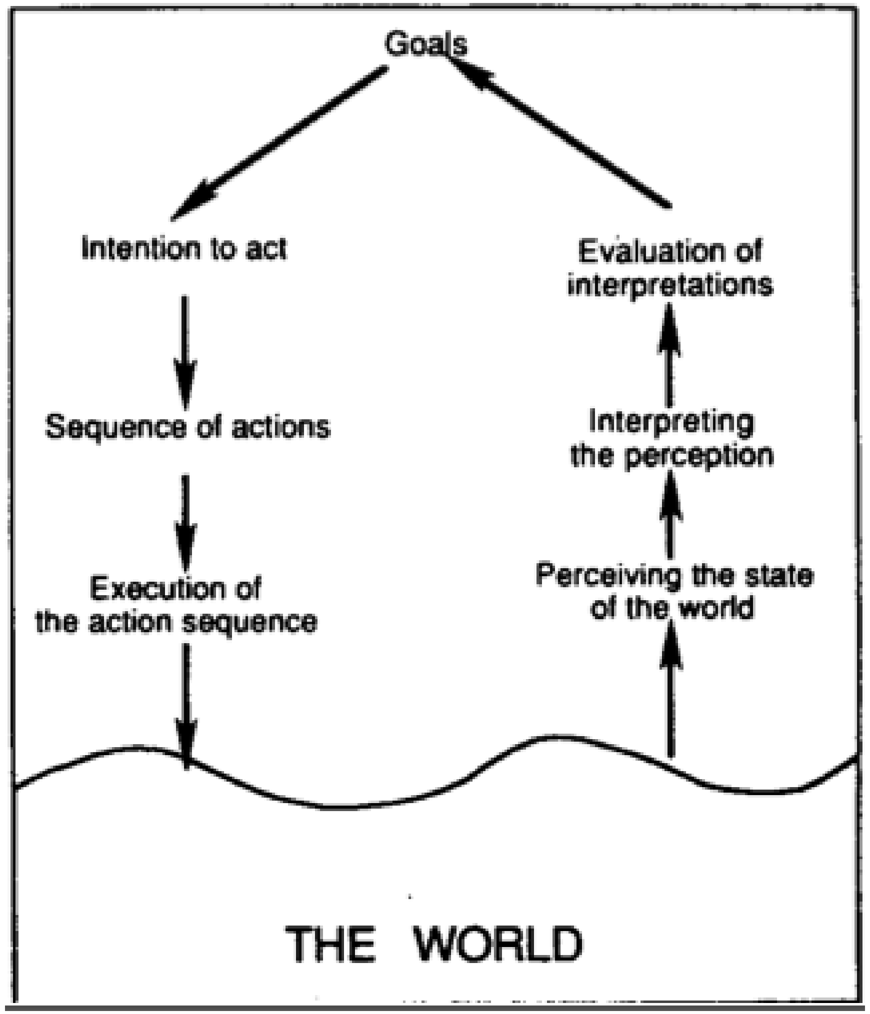
Stages of evaluation





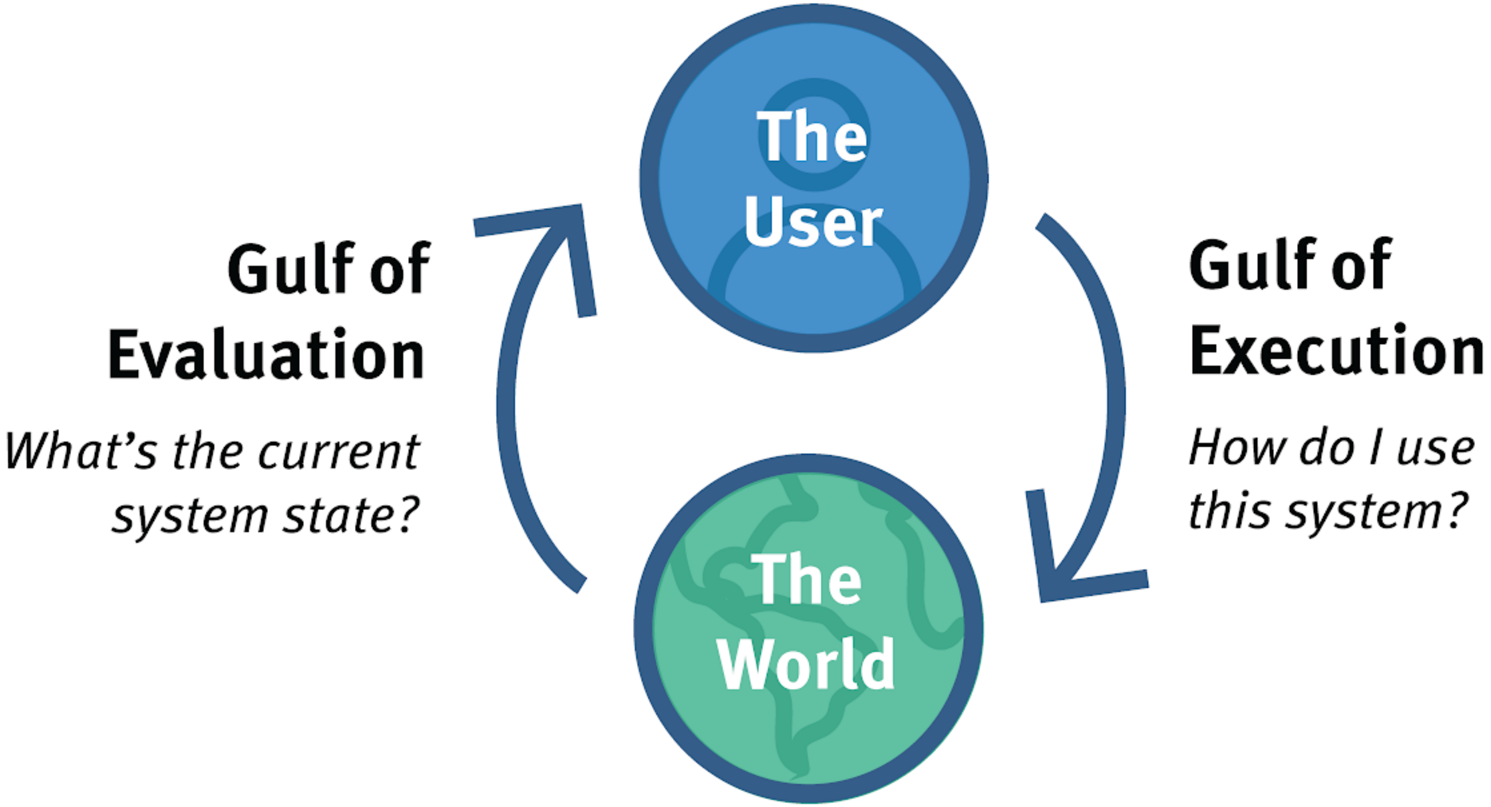


Don Norman’s seven stages of action



User Mental Model

What users believe they know about a UI ***strongly impacts how they use it.***



User Mental Model

What users believe they know about a UI ***strongly impacts how they use it.***

- What users know (or think they know) about a system
- Base their **predictions** about the system on their mental models
- Plan their future **actions** based on how their mental model predicts the appropriate course of action

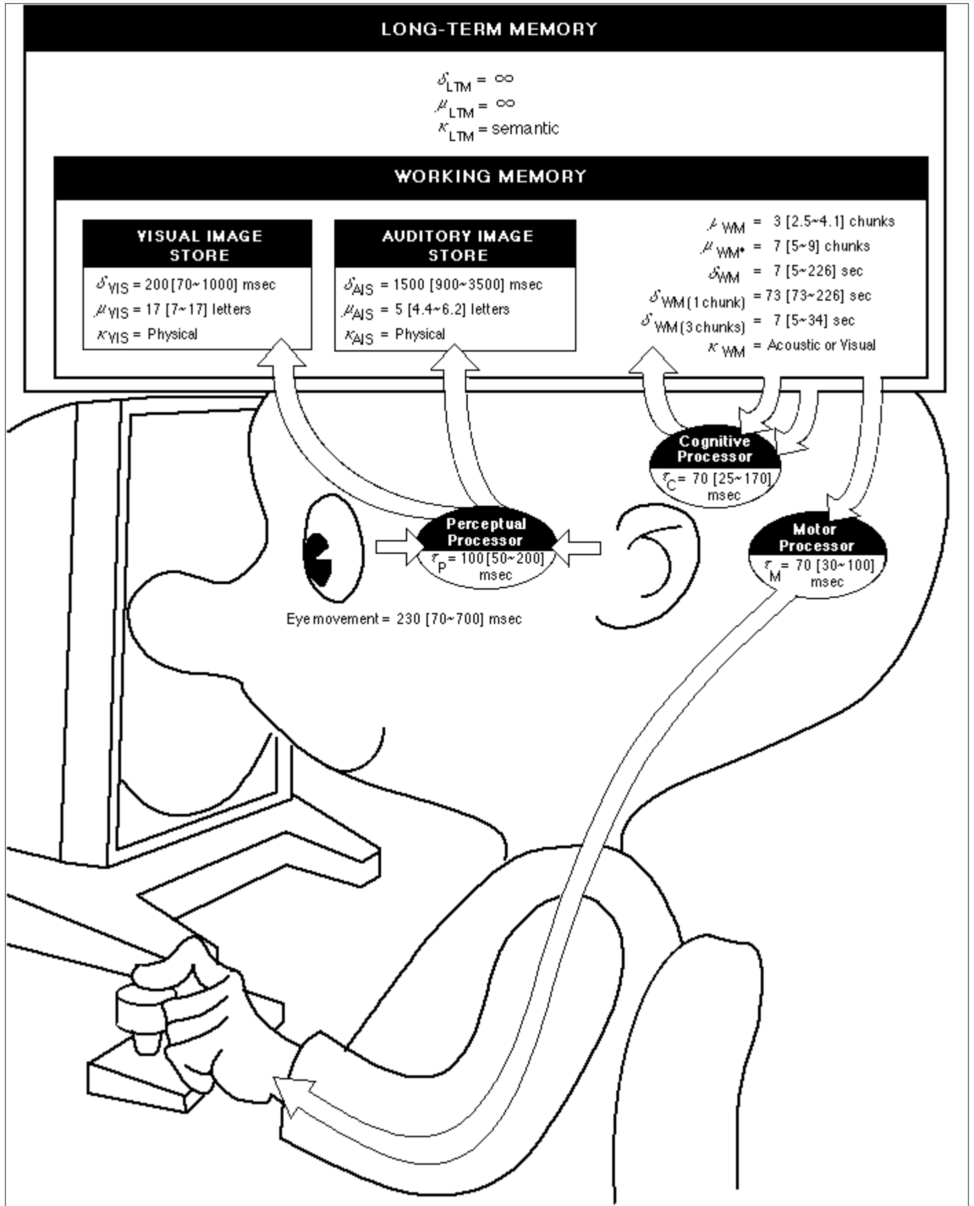
User Mental Model

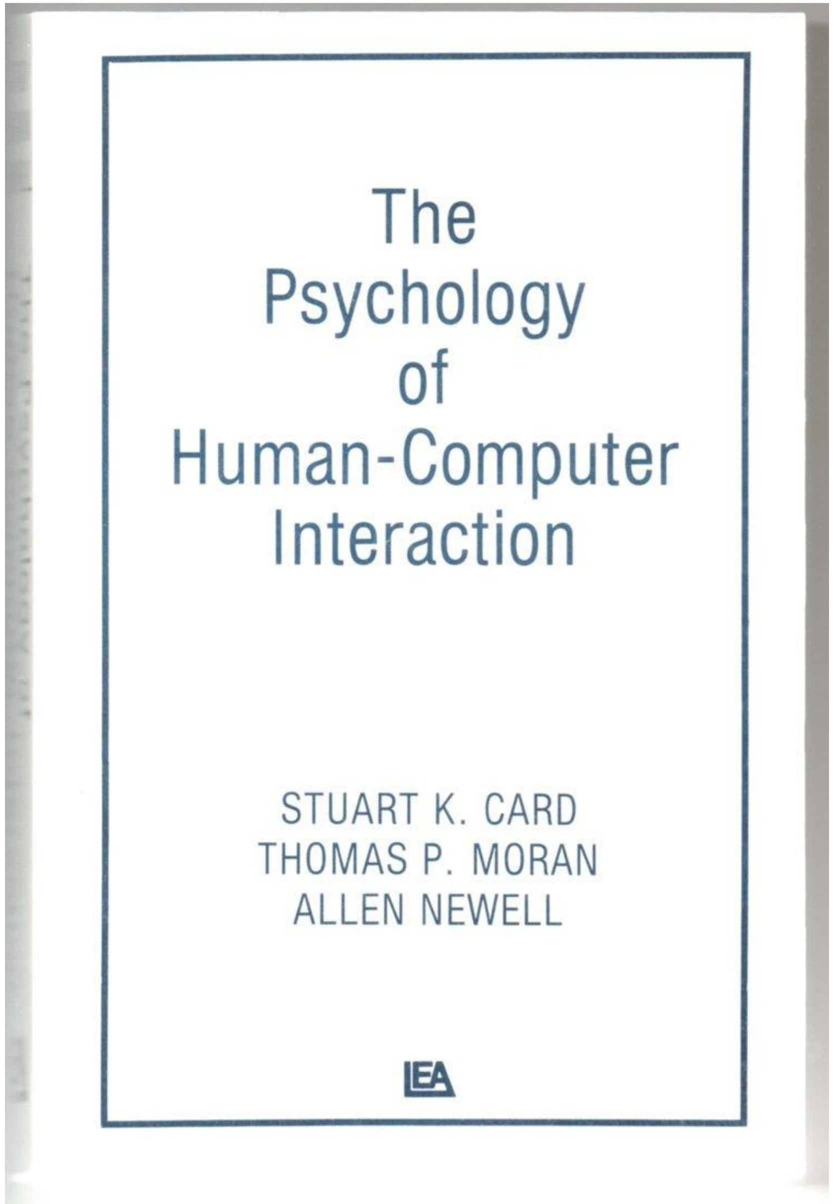
What users believe they know about
a UI ***strongly impacts how they use it.***

Users form and build their mental models from

- Previous experience with the system
  - *“You reap what you sow.”*
- Previous experience from other systems
  - Pro: transfer of learning
  - Con: design inertia
- Metaphors: mapping or analogy to the real world
  - Desktop metaphor: folders, files and recycle bin
- Other users of the system

Model Human Processor





Famous Persons #2 #3 #4

Stuart Card

Senior Research Fellow
at Xerox PARC

Pioneer in many areas of
Human-Computer
Interaction

CHI Academy Member

Thomas Moran

Engineer at IBM Almaden
Research Center
Manager at Xerox PARC

Founding Editor of
Human-Computer Interaction
journal

CHI Academy Member

Allen Newell

Researcher at RAND
Professor at Carnegie Mellon

Pioneer in Computer Science,
Cognitive Psychology and
Artificial Intelligence

Recipient of Turing Award

Famous Person #5

Bonnie John

Professor at Carnegie Mellon
Researcher at IBM T. J. Watson Research Center
UX designer at Bloomberg

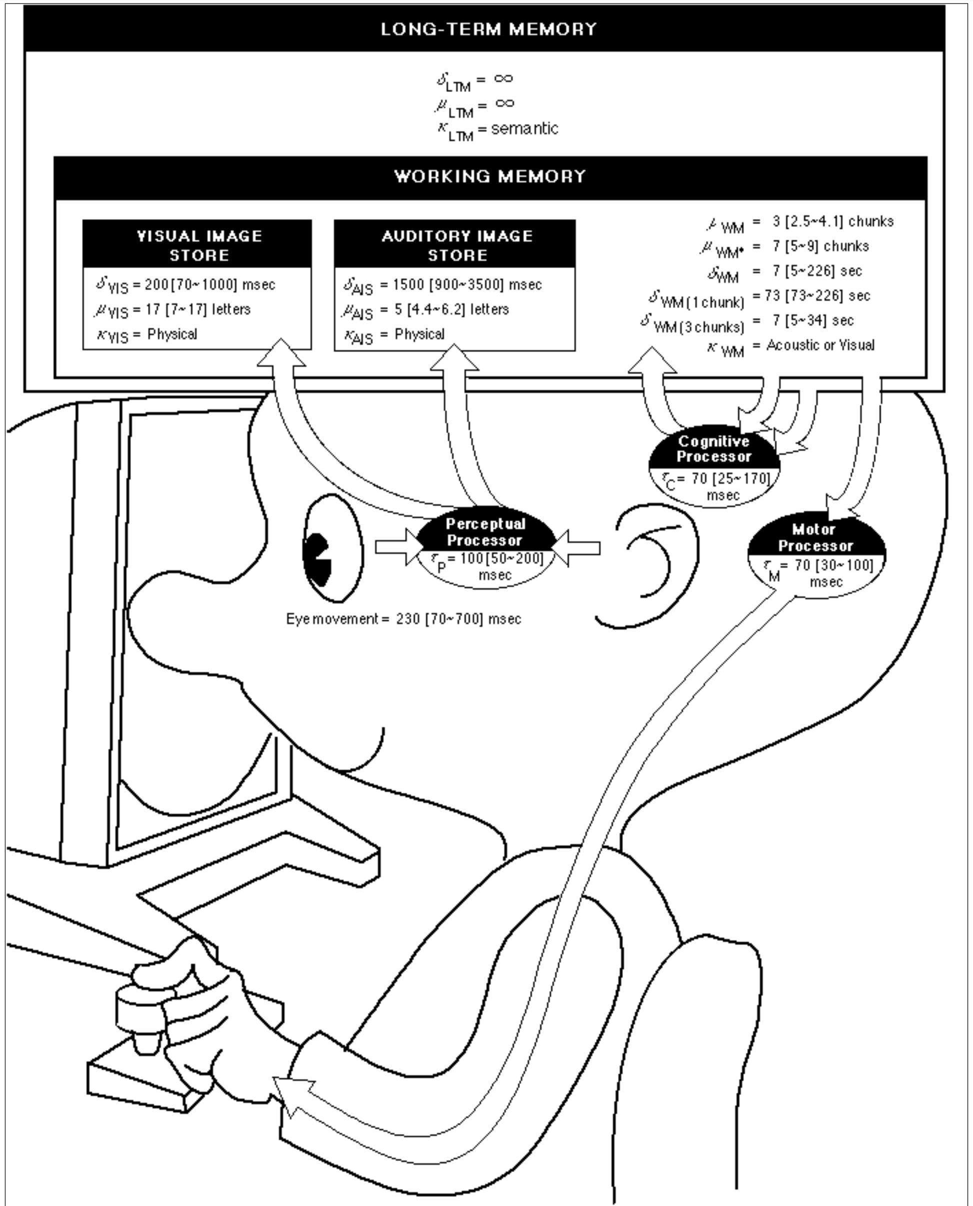
Pioneer in HCI, Usability Methods and GOMS

CHI Academy Member

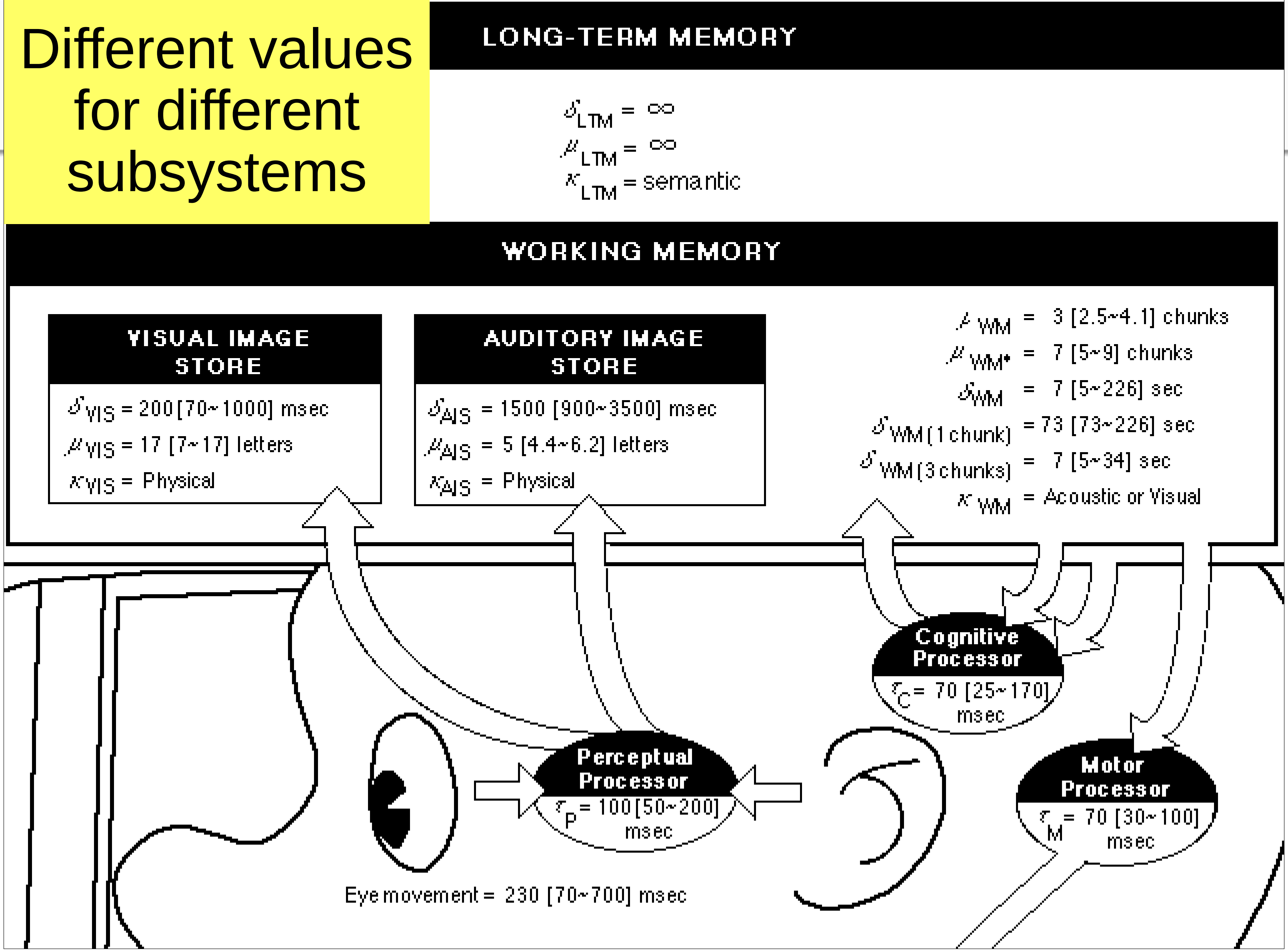
Subsequent slides on Model Human Processor were by Bonnie

Thanks Bonnie!

Interacting subsystems



Different values for different subsystems



Parameters for memories and processors

- Memory parameters
  - ∂ = Decay time of an item
  - μ = Storage capacity in items
  - κ = Code type (physical, acoustic, visual, semantic)

- Processor parameter
  - τ = Cycle time

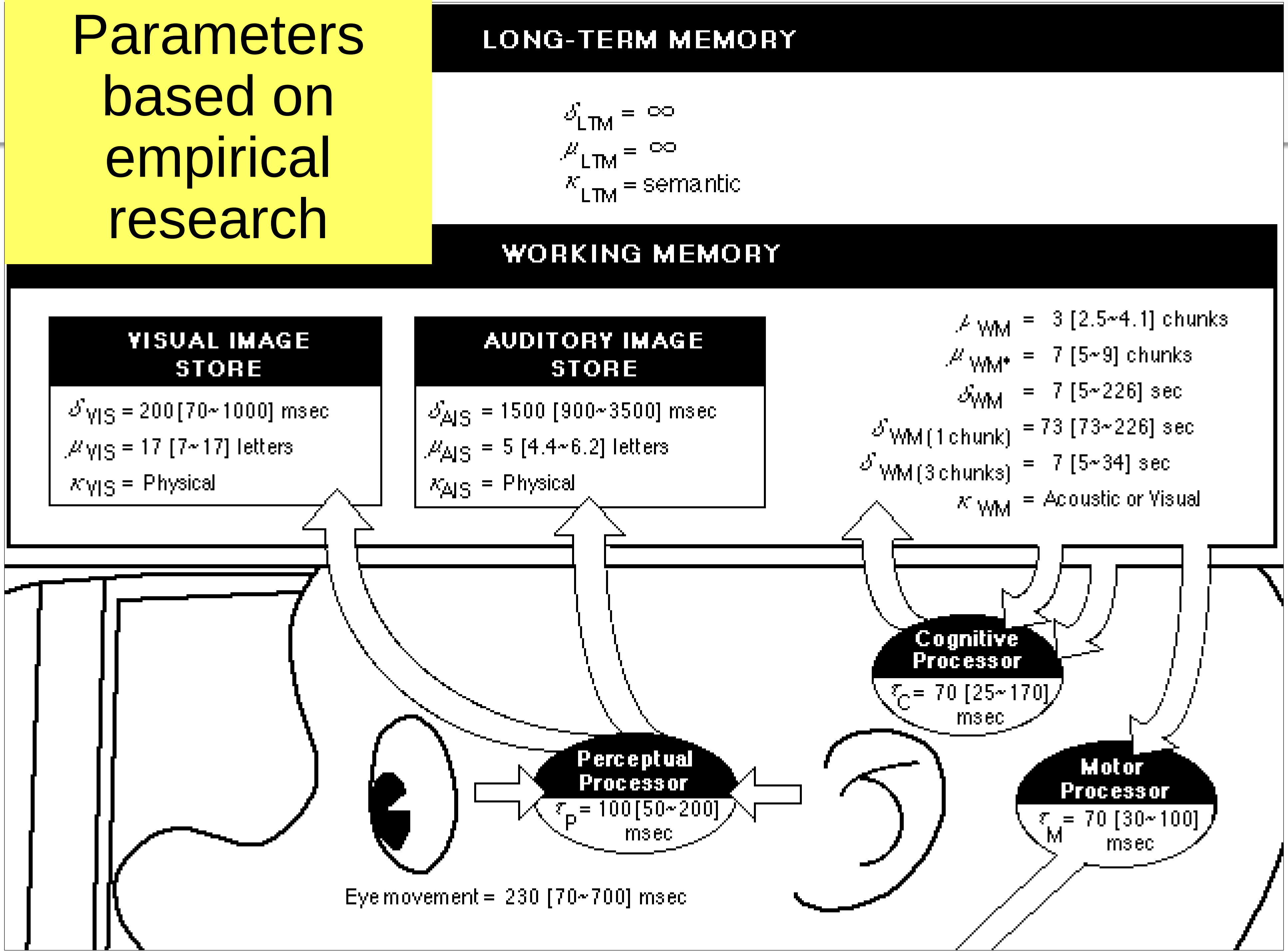
Assumptions in a Model

Fastman
Middleman
Slowman

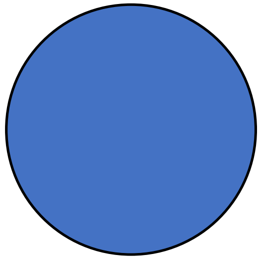
Quantitative values are shown as:

Middleman [Fastman ~ Slowman]

Parameters based on empirical research

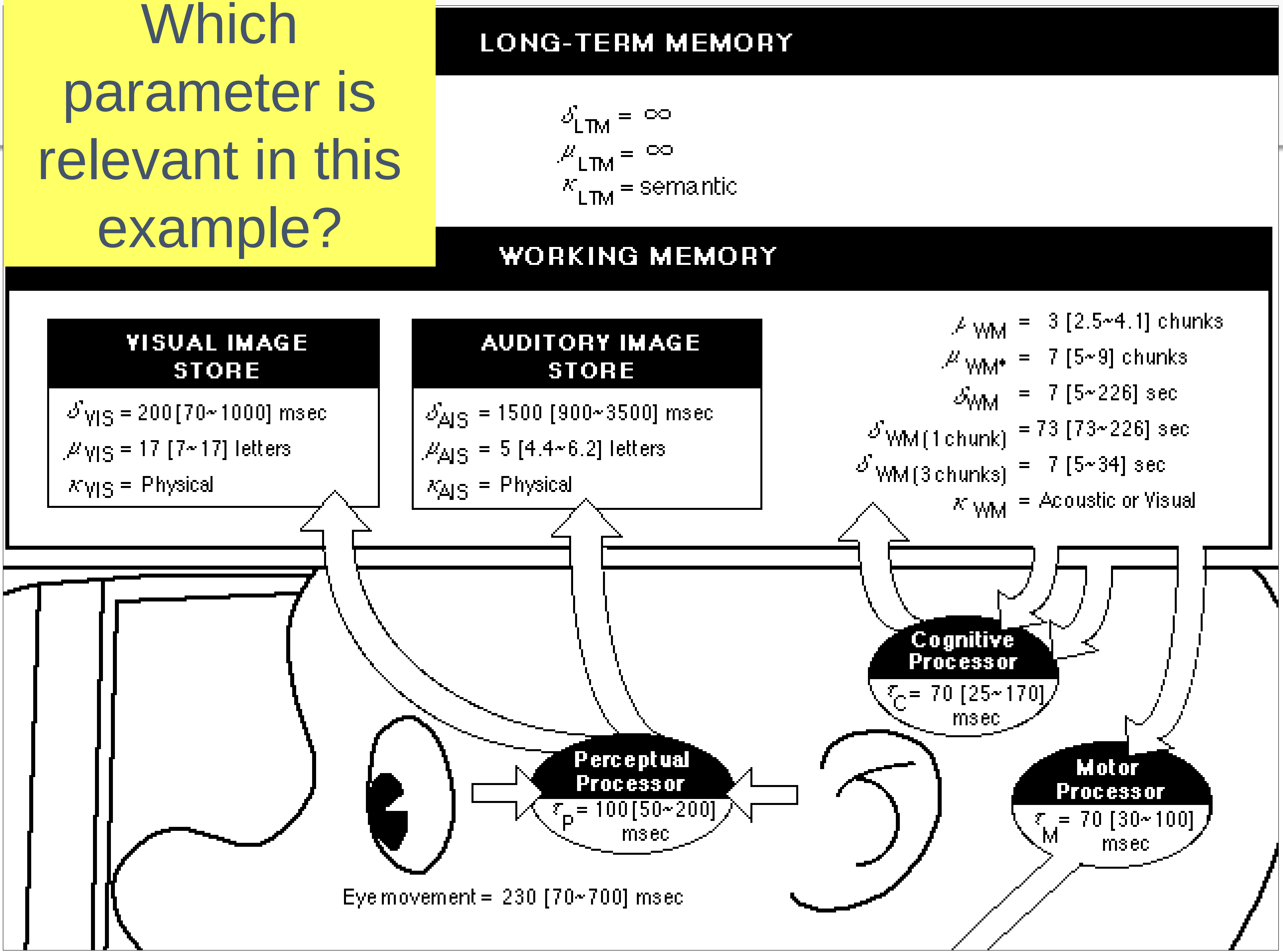


Example: Animation

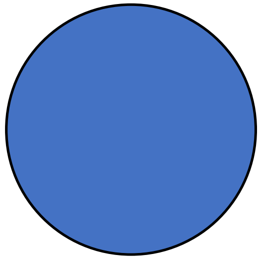


- When does a sequence of still pictures look like movement?
- When will the dot appear to smoothly grow & when does it appear jittery?

Which parameter is relevant in this example?

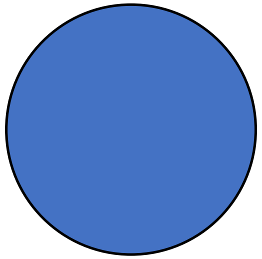


Example: Animation



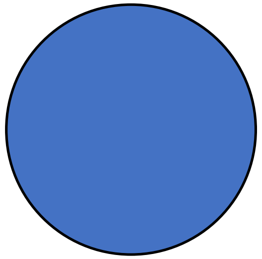
- Stills are being presented every **300** milliseconds (msec)
- Animation or sequence of stills?

Example: Animation



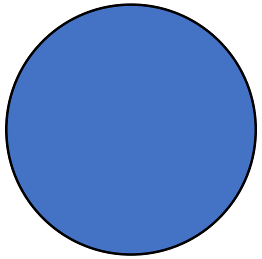
- Stills are being presented every **200** milliseconds (msec)
- Animation or sequence of stills?

Example: Animation



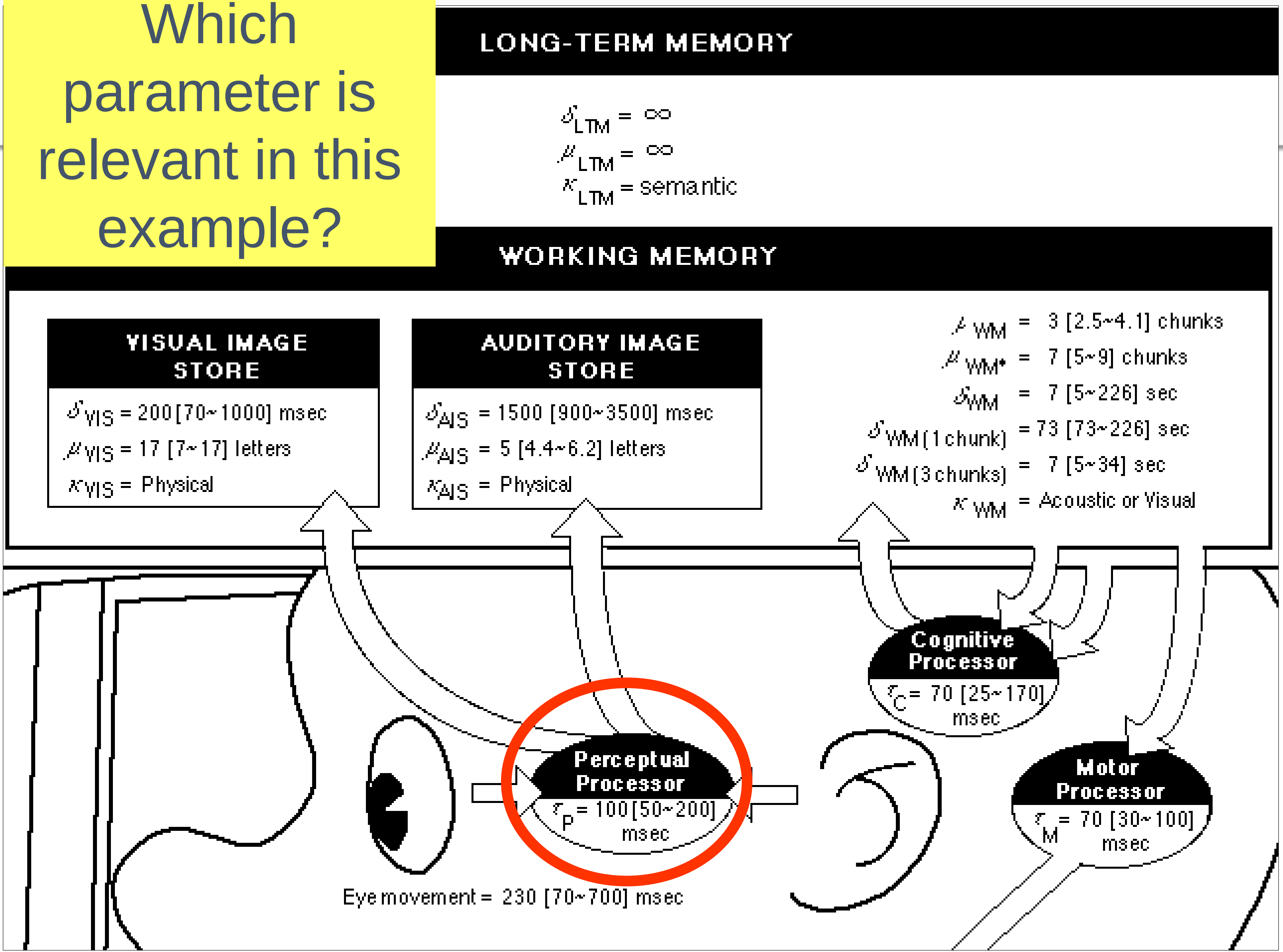
- Stills are being presented every **100** milliseconds (msec)
- Animation or sequence of stills?

Example: Animation



- Stills are being presented every **50** milliseconds (msec)
- Animation or sequence of stills?

Which parameter is relevant in this example?



Animation Explanation

Perceptual processor speed:
Tp = 100[50~ 200]

Assume middleman

Frame speed > 1 frame / 100 msec

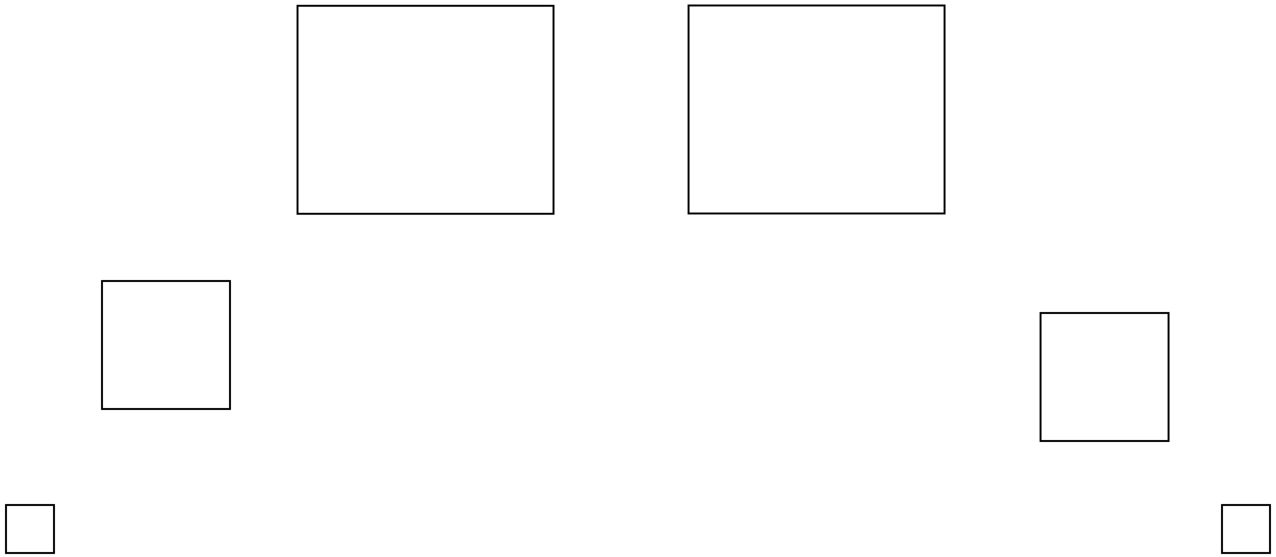
= 10 frames/ sec
should maintain the illusion of animation

To ensure animation for more people, assume Fastman

Frame speed > 1 frame / 50 msec

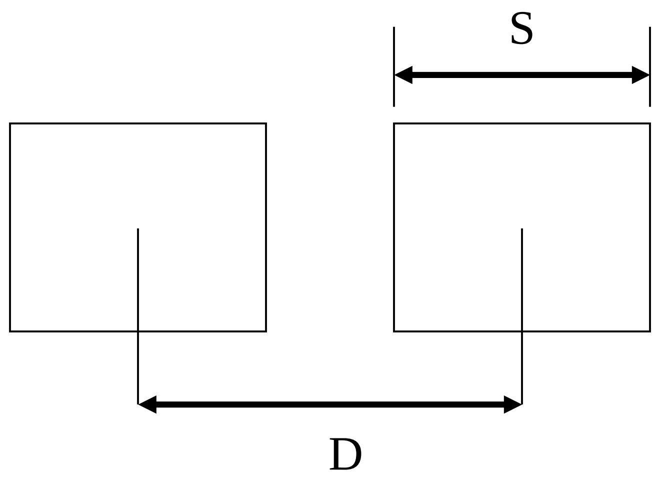
= 20 frames/ sec

Example: Moving to a target



For each pair of squares, tap back and forth with a pen.

Fitts's law

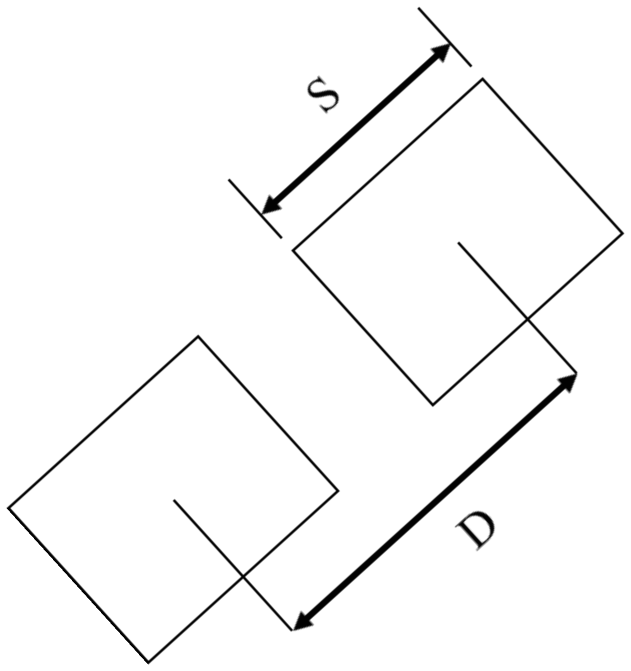


The time Tpos to move the hand to a target size S which lies a distance D away is given by:

$$Tpos = I_M \log2\ (D/S + 0.5),$$

where $I_M = 100[70 \sim 120]$ msec/bit.

Fitts's law



S and D are measured along the line of motion

Example: Practice

What happens when you play a video game over and over?

Users get faster with practice

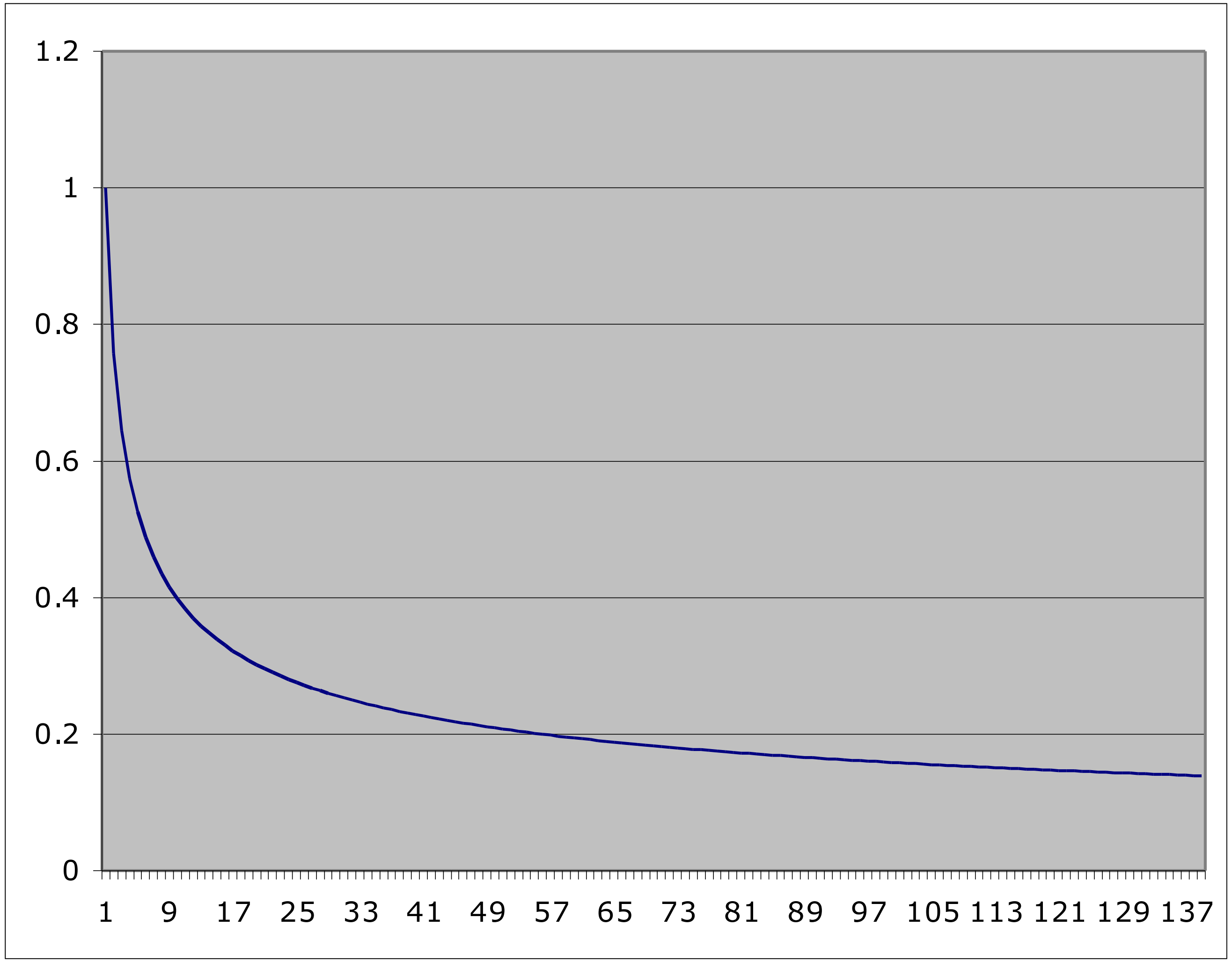
The Power Law of Practice

The time T_n to perform a task on the n^{th} trial follows a power law:

$$T_n = T_1 \, n^{-\alpha},$$

where $\alpha = 0.4$ [0.2 ~ 0.6]

$T_n = T_1 n^{-.4}$, where $T_1 = 1$



Example: Making Decisions

User takes more time to answer the phone as number of buttons increase.

Uncertainty Principle

Decision time T increases with uncertainty about the judgment or decision to be made:

$$T = I_C H$$

where H is the information- theoretic entropy of the decision and I_C = 150 [0~ 157] msec/ bit.

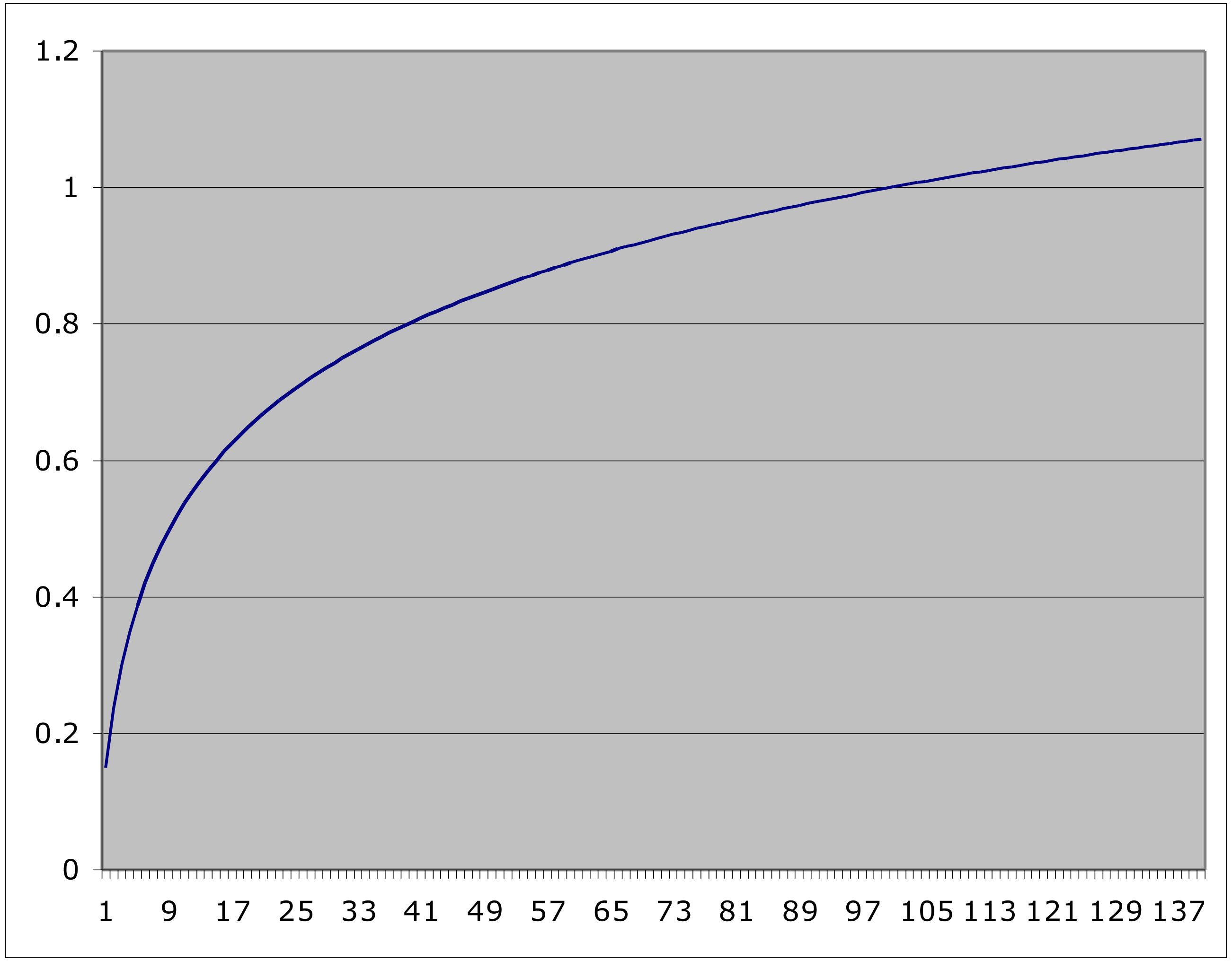
For n equally probable alternatives (called Hick's Law)

$$H = \log_2 (n + 1)$$

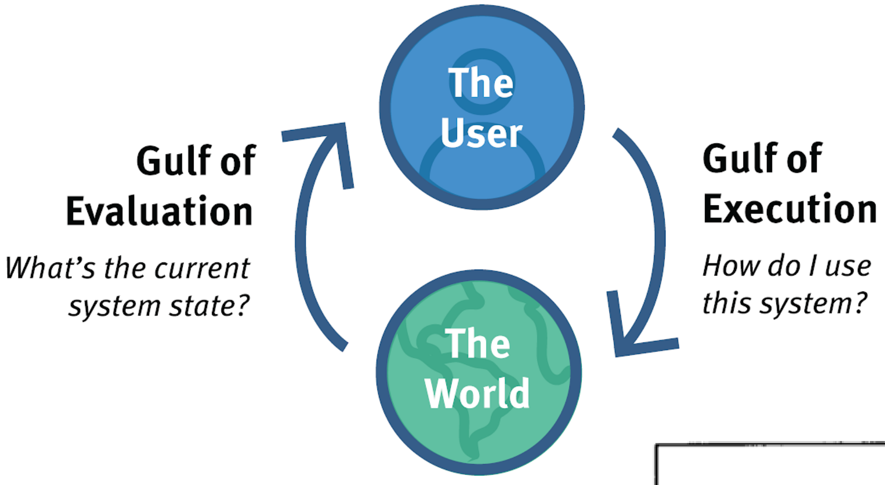
For n alternatives with different probabilities, p_i , of occurrence

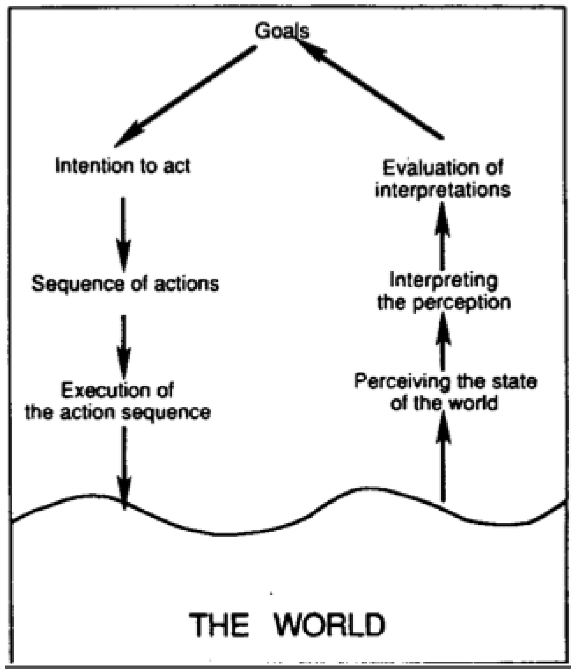
$$H = \Sigma_i p_i \log_2 (1/ p_i + 1)$$

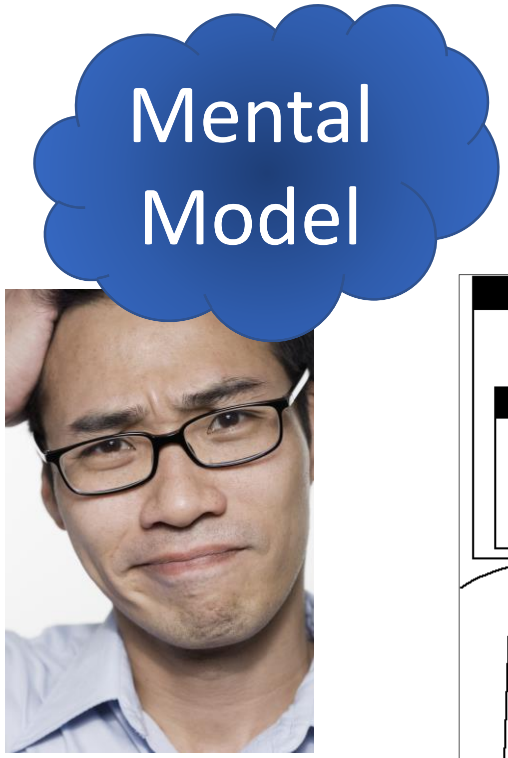
$T = I_C H$, where I_c=150msec/bit and $H = \log_2 (n+1)$

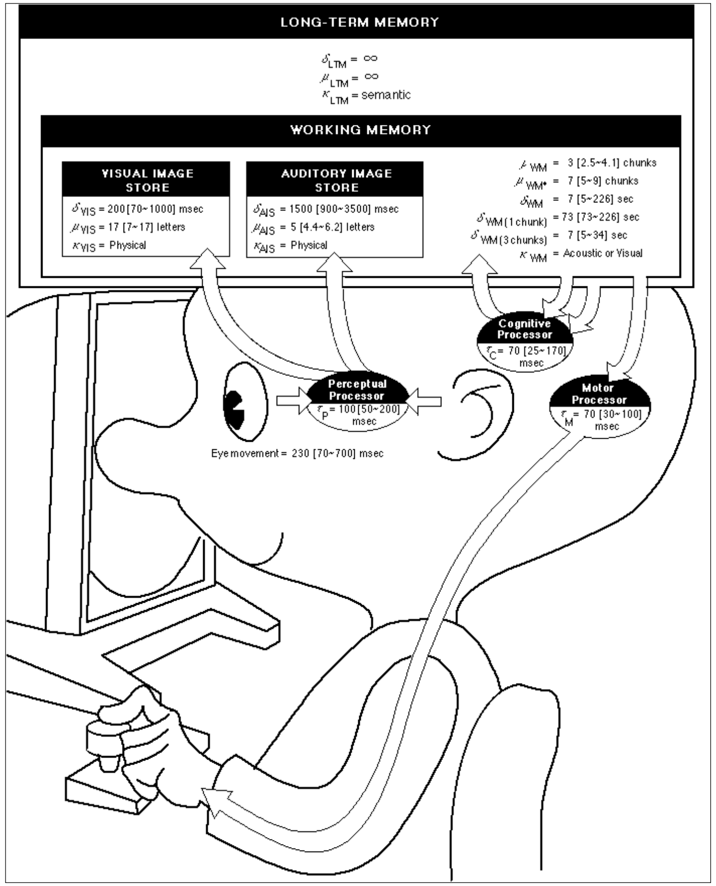


The User in UI Design









Come prepared for next class

- Read assigned articles and watch videos on Jakob Nielsen's 10 Usability Heuristics
- Find examples of user-interface that abided or failed to abide with a heuristic
- Come prepared to share with your fellow students
  - We will go from heuristic #1, #2, #3 and so on
  - First student to volunteer gets 3 mins to share an example and discuss
  - 10 students will get credit for class participation!
  - Come prepared with examples for a few heuristics, because you might not get to share your preferred one!