CS 147 Course Midterm Review

Design Thinking for User Experience Design, Prototyping & Evaluation

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Administrivia

- Heuristic Evaluation Grades
  - hope to have A7 grades by tonight & A9 by Tuesday night (so you know if you need to practice before the midterm)
- OAE: have you gotten email from us & confirmed?
- Course grades
  - in the past, ~67% of class has gotten A+, A, or A-
  - most of remainder B+ or B. Few B- and Cs –lower grades were where student did not carry their share of project work

How to Design and Build Good UIs

- Iterative development process
- Usability goals
- User-centered design
- Design discovery
- Rapid prototyping
- Evaluation
- *Programming*

Iteration

At every stage!

Design



Prototype

Sketch
Paper
Video
Tool
Program

Evaluate

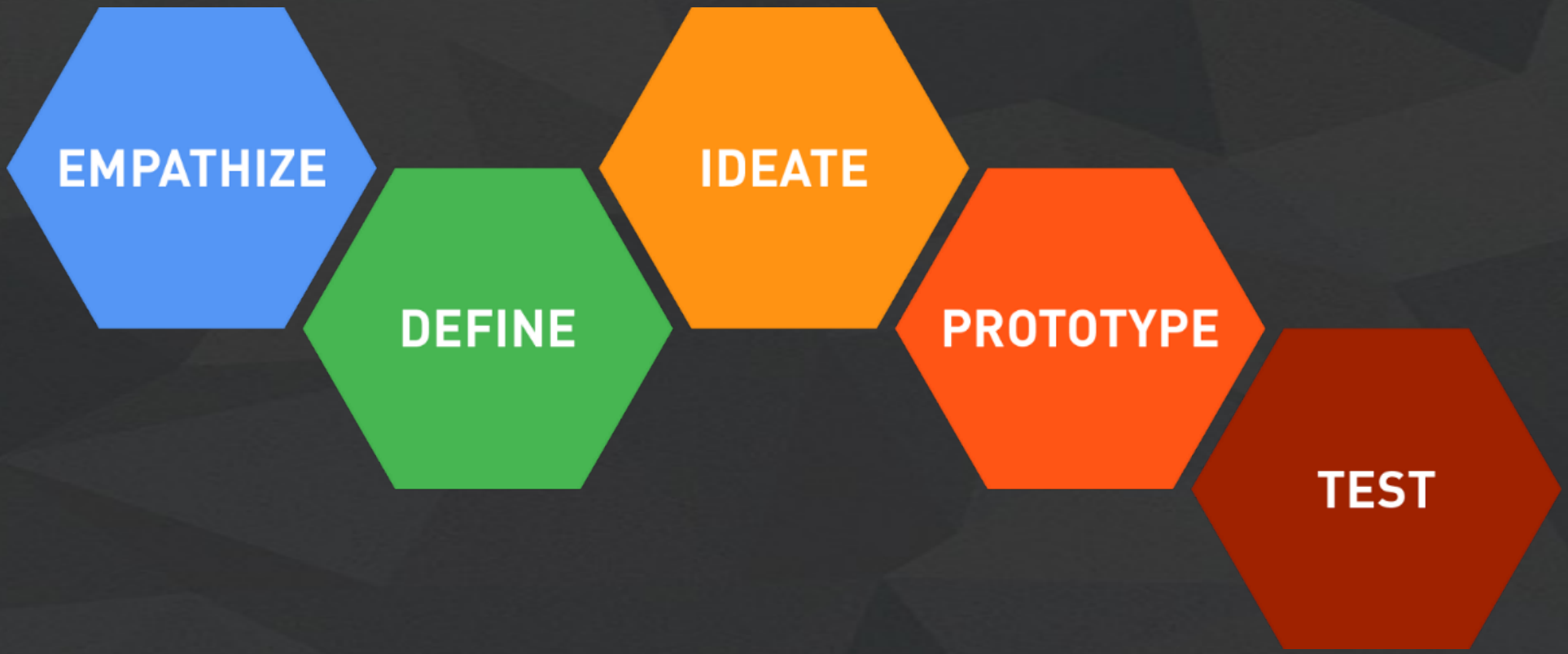
Gut
Crit
Expert Eval
Lo-fi Test
User Study

Usability/User Experience Goals



- Set goals early & later use to measure progress
- Goals often have tradeoffs, so prioritize
- Example goals
  - Learnable
    - faster the 2nd time & so on
  - Memorable
    - from session to session
  - Flexible
    - multiple ways to do tasks
  - Efficient
    - perform tasks quickly
  - Robust
    - minimal error rates
    - good feedback so user can recover
  - Discoverable
    - learn new features over time
  - Pleasing
    - high user satisfaction
  - Fun

Design Thinking Process



User-centered Design
"Know thy User"

- Cognitive abilities
  - perception (e.g., color)
  - physical manipulation (e.g., Fitts' Law to predict speed)
  - Memory (working vs. long term)
  - Fitts' Law, MHP: processors? cycle & decay times?
- Organizational / educational job abilities
- Keep users involved throughout
  - developers working with target customers
  - think of the world in users' terms

Design Discovery

Needfinding & Task Analysis

- Observe existing practices for inspiration
- Make sure key questions answered
- Ethical questions in design w/ underserved communities



ChoreoLab observed/interviewed dancers in studios…. and out in the streets ...

Focus by Writing a “Point of View”

WE MET . . .
(**person** you are inspired by)

WE WERE SURPRISED TO NOTICE. . .
(**tension, contradiction, or surprise**)

WE WONDER IF THIS MEANS. . .
(what did you infer? **need**—verb reflecting user needs)

IT WOULD BE GAME-CHANGING TO. . .
(Frame up an **inspired challenge** for your team.
NOT a reason for the need! Not a solution, but a **more informed problem**)

Ideate: From POV to How Might We

POV: We met Janice, a harried mother of 3, rushing through the airport only to wait hours at the gate. We were surprised at the many games she makes up to to entertain her children so they don't irritate frustrated fellow passengers. It would be game changing to bring the other passengers and the airport facilities into helping families have a better travel experience.

How Might We Generators

http://dschool.stanford.edu/wp-content/uploads/2012/05/HMW-METHODCARD.pdf

Break POV into pieces

Amp up the good/Remove the bad

Explore the opposite

Question an assumption

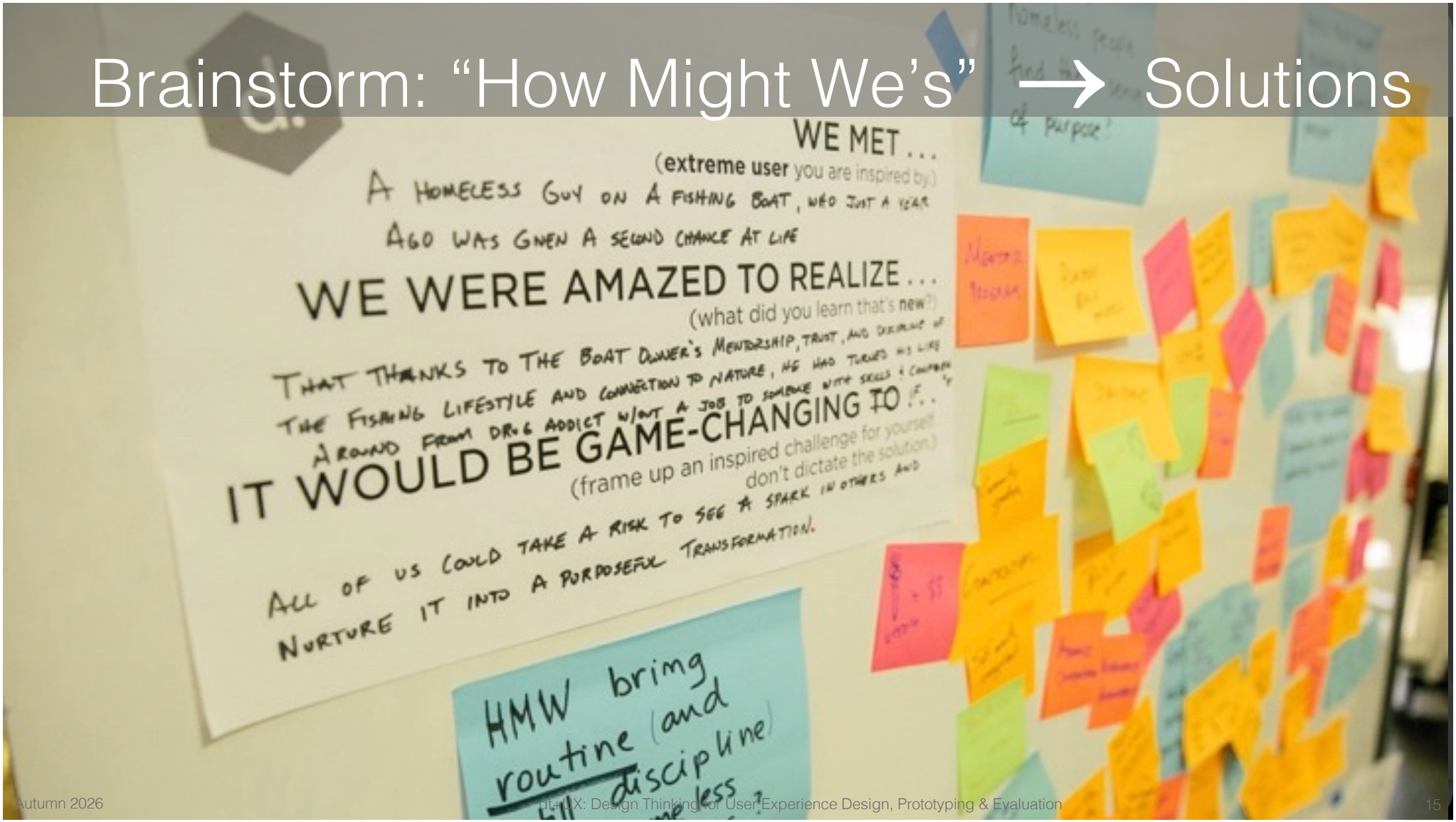
Go after adjectives

Identify unexpected resources

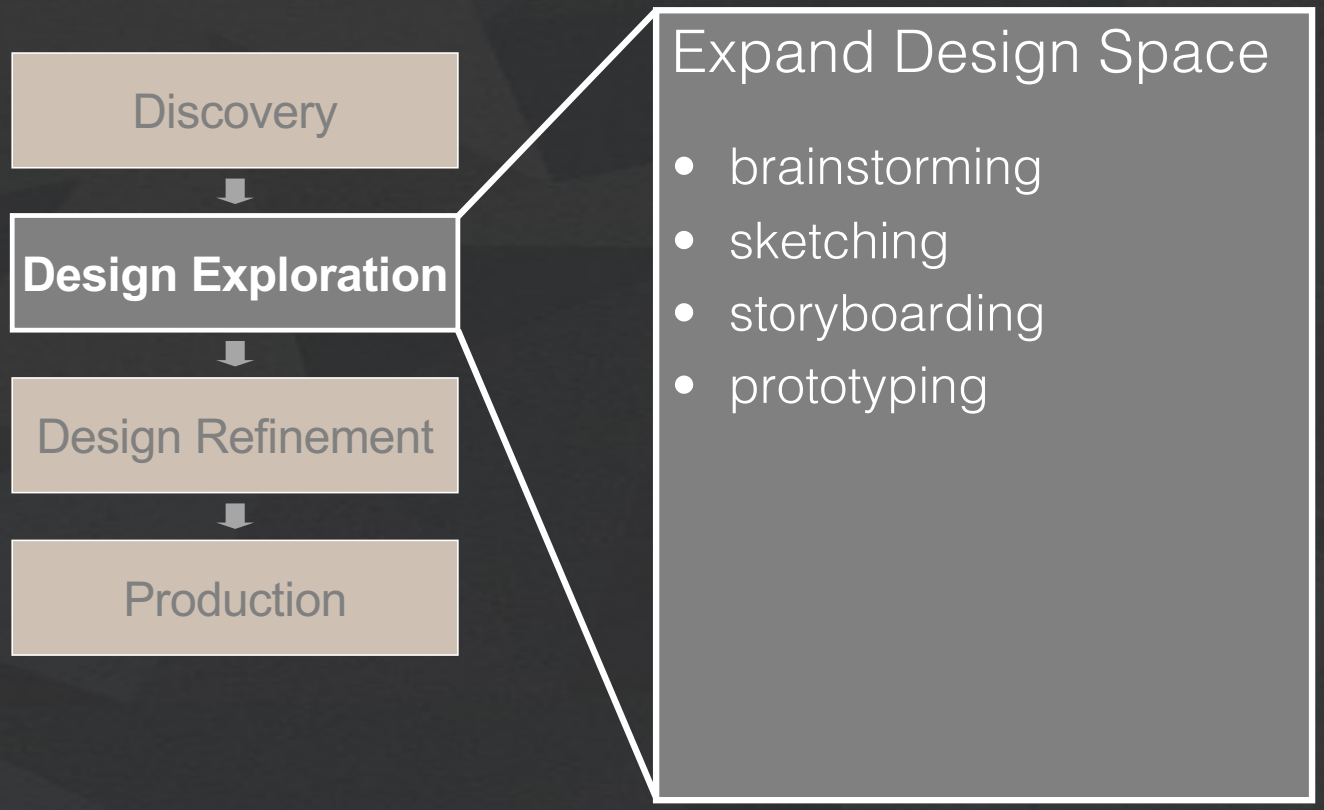
Create an analogy from need or context

Change a status quo

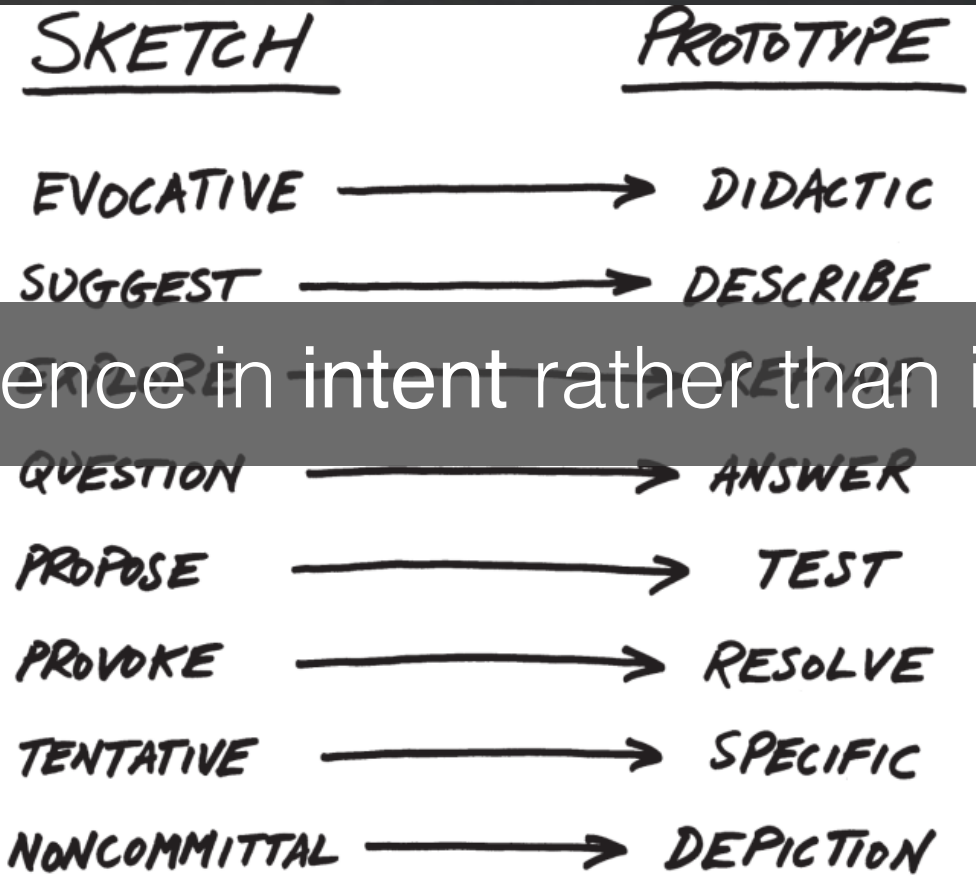
Brainstorm: “How Might We’s” → Solutions



Design Process: Exploration



From Sketch to Prototype



Difference in **intent** rather than in **form**

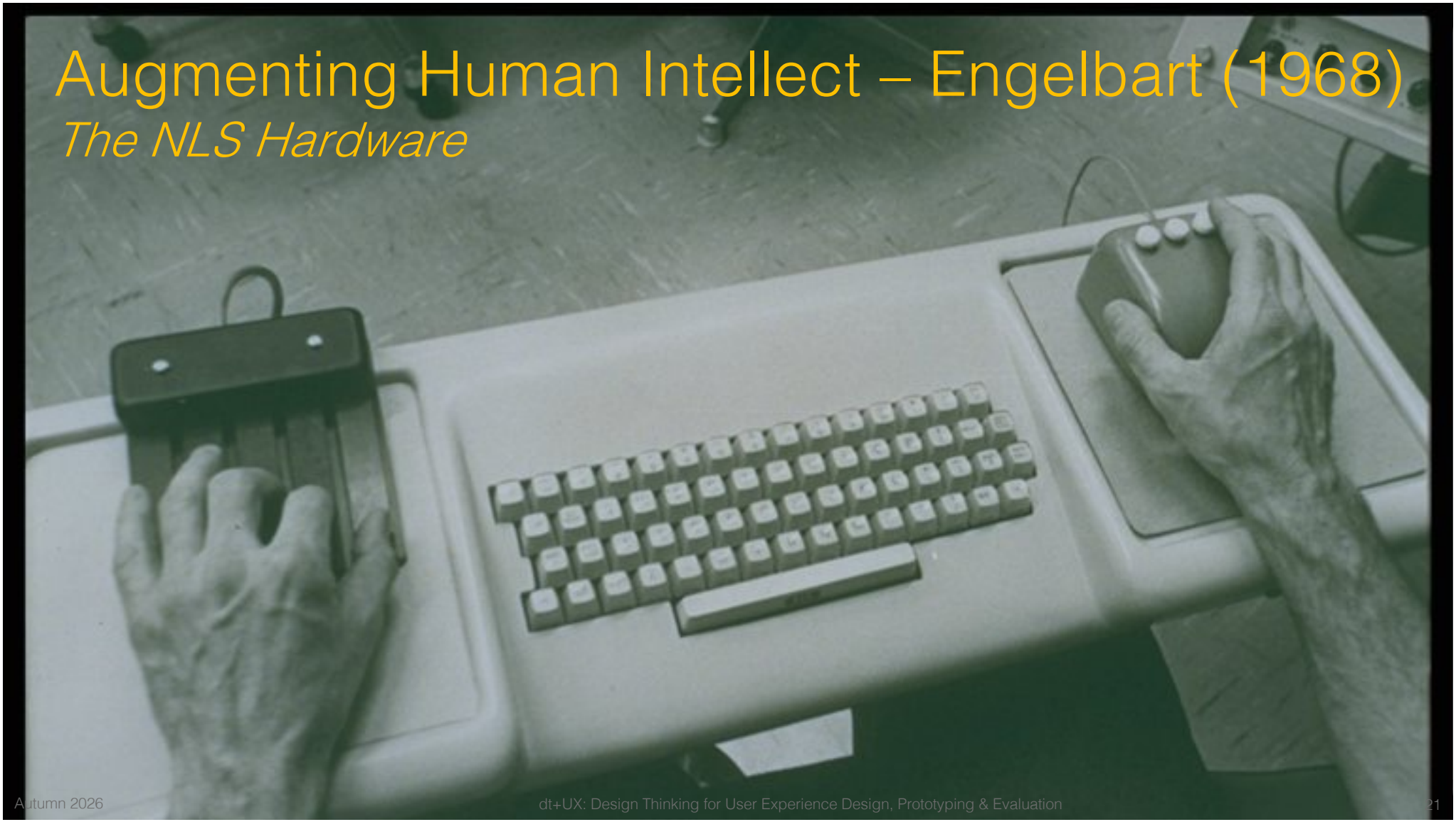
Courtesy Bill Buxton

Design Exploration Summary

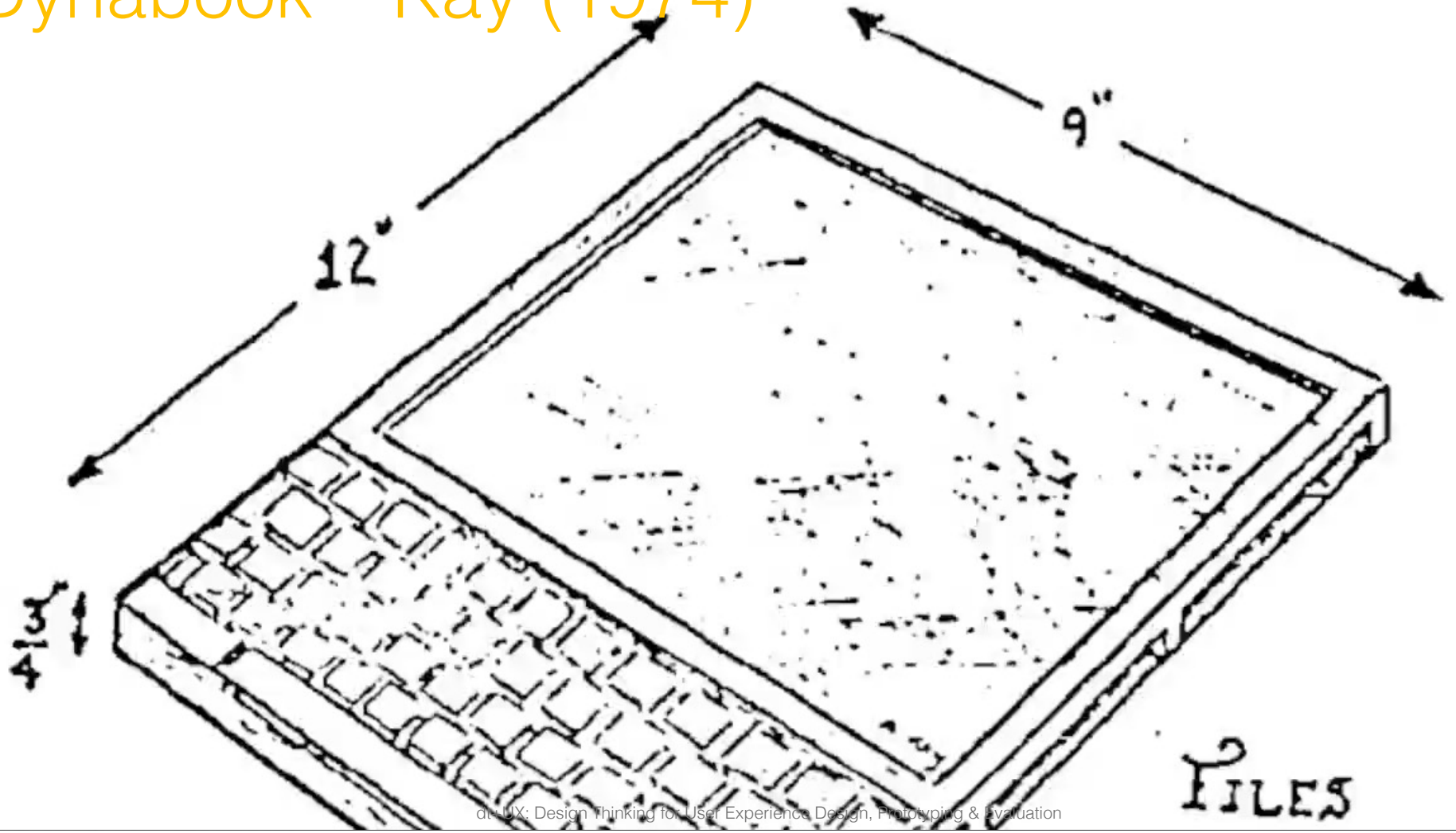
- Sketching allows exploration of many concepts in the very early stages of design
- As investment goes up, need to use more and more formal criteria for evaluation
- Experience prototyping lets us quickly test assumptions behind many ideas & learn more about the problem & solution space

Augmenting Human Intellect – Engelbart (1968)

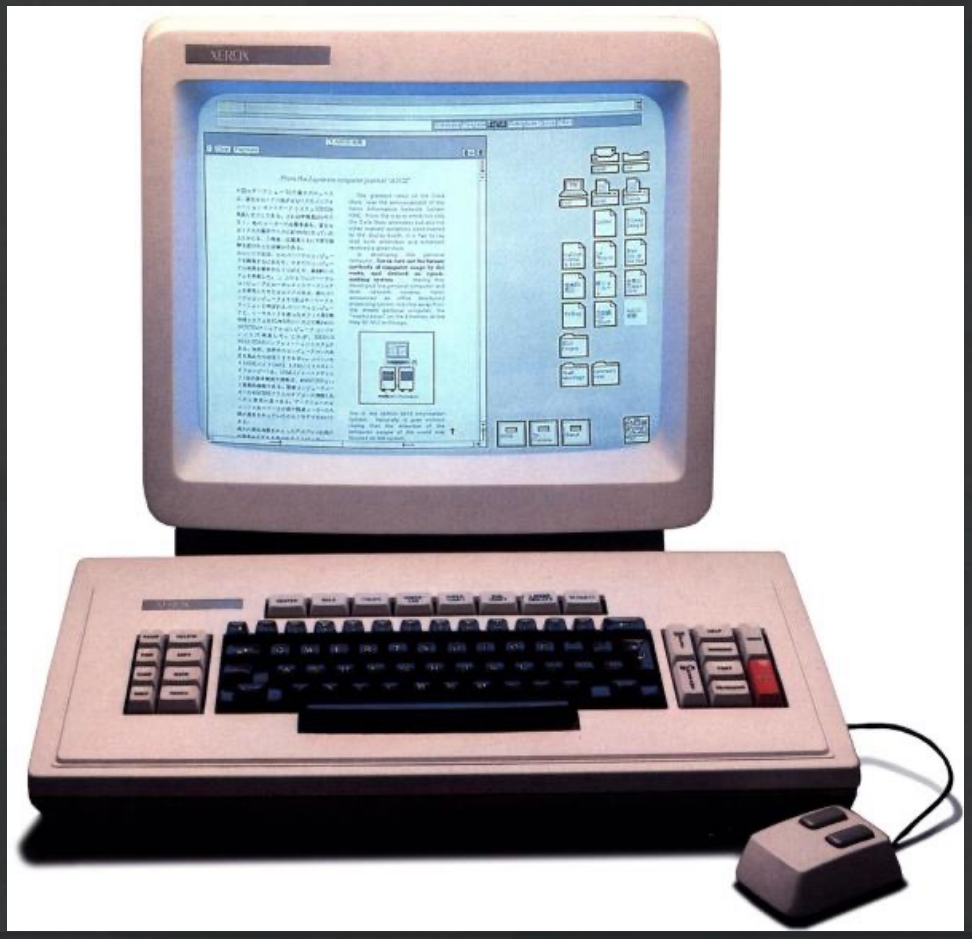
The NLS Hardware



Dynabook – Kay (1974)



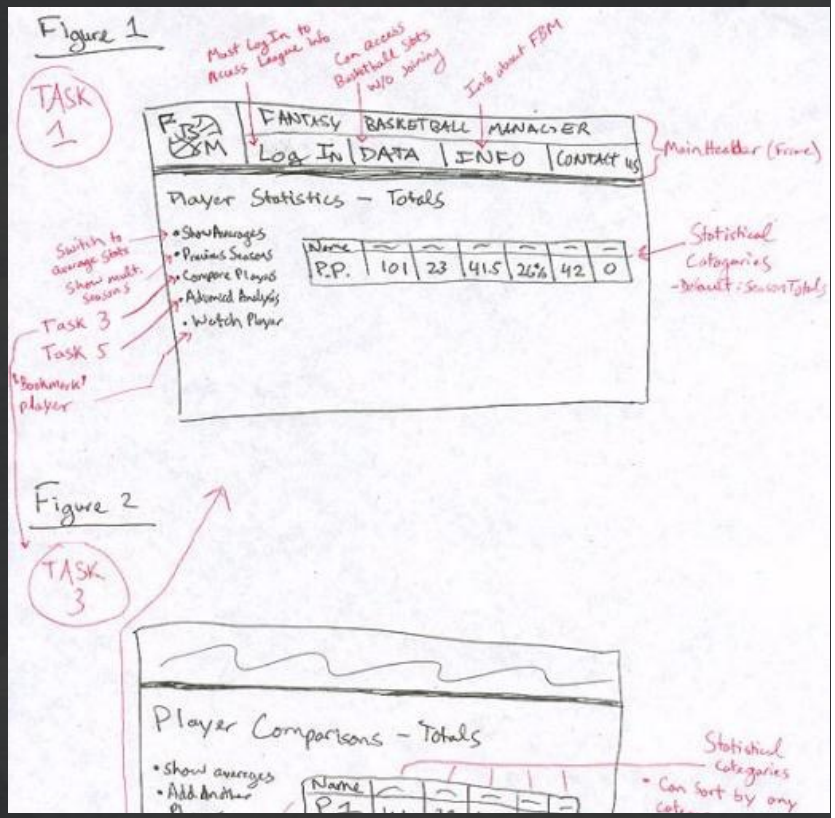
Xerox Star – 1st Commercial GUI (1981)



Rapid Prototyping

- Build a mock-up of a design so you can test it
- Low fidelity techniques
  - paper sketches
  - cut, copy, paste
  - low-fi testing allows us to quickly iterate
  - get feedback from users & change right away
- Interactive prototyping tools
  - SketchFlow, Balsamiq, Axure, proto.io, Marvel, Invision, Figma, etc.
- UI builders
  - Expression Blend + Visual Studio, Xcode Interface Builder, etc.

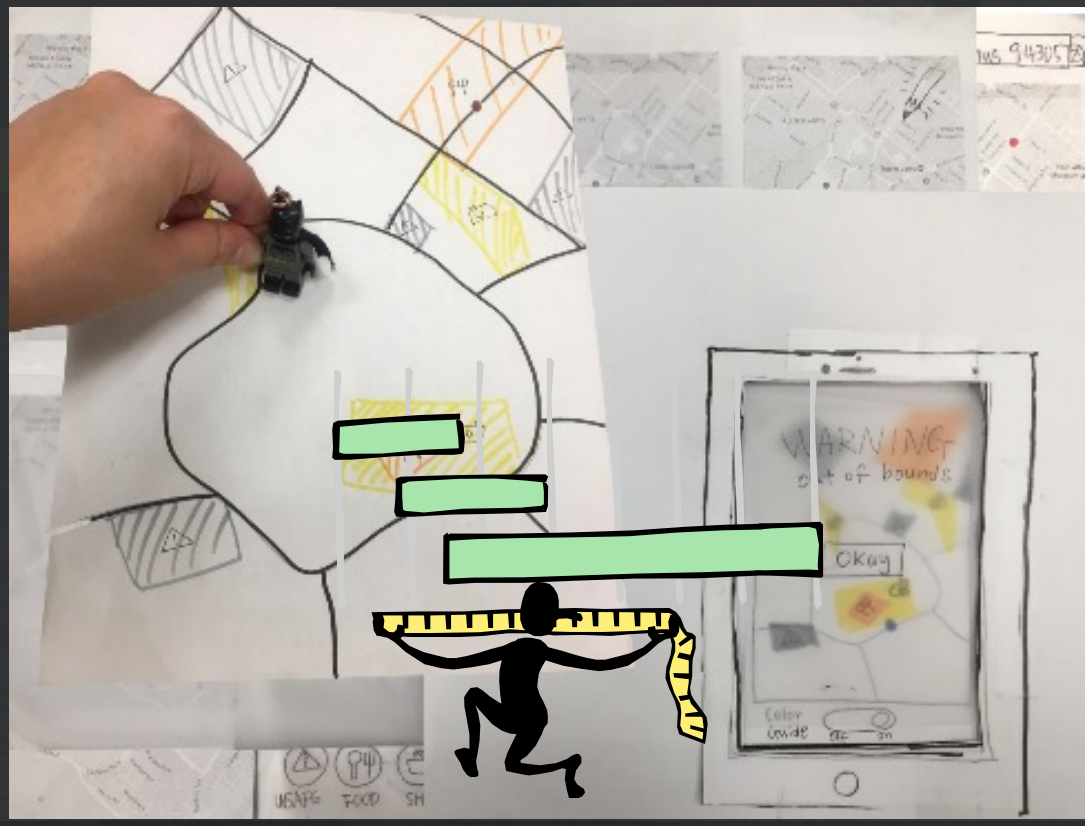
Fantasy Basketball



Evaluation

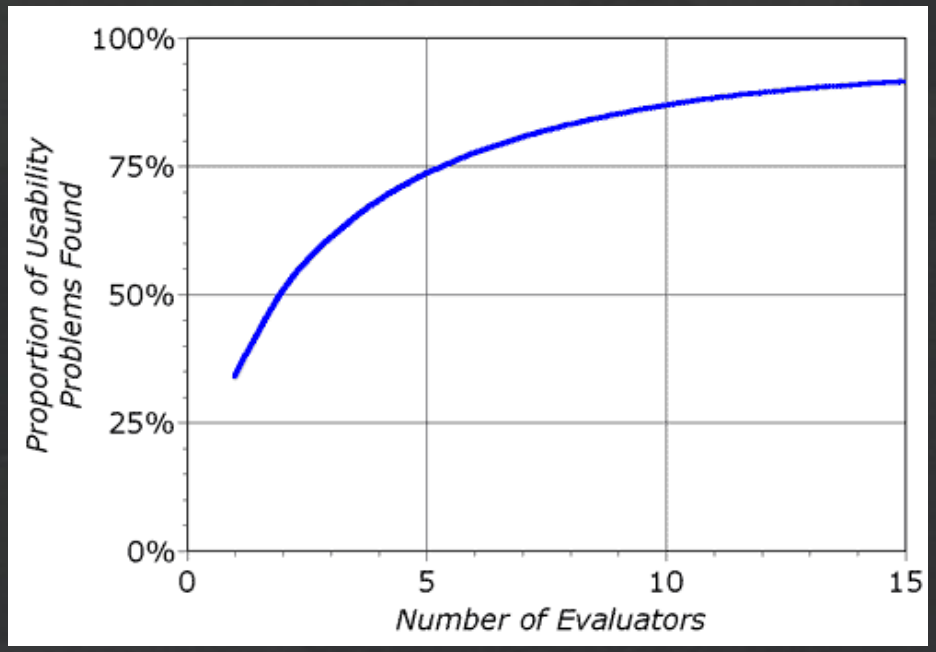
- Test with real customers (participants)
  - w/ interactive prototype
  - low-fi with paper “computer”
- Low-cost techniques
  - expert evaluation
  - walkthroughs
  - online testing

Wanderlust

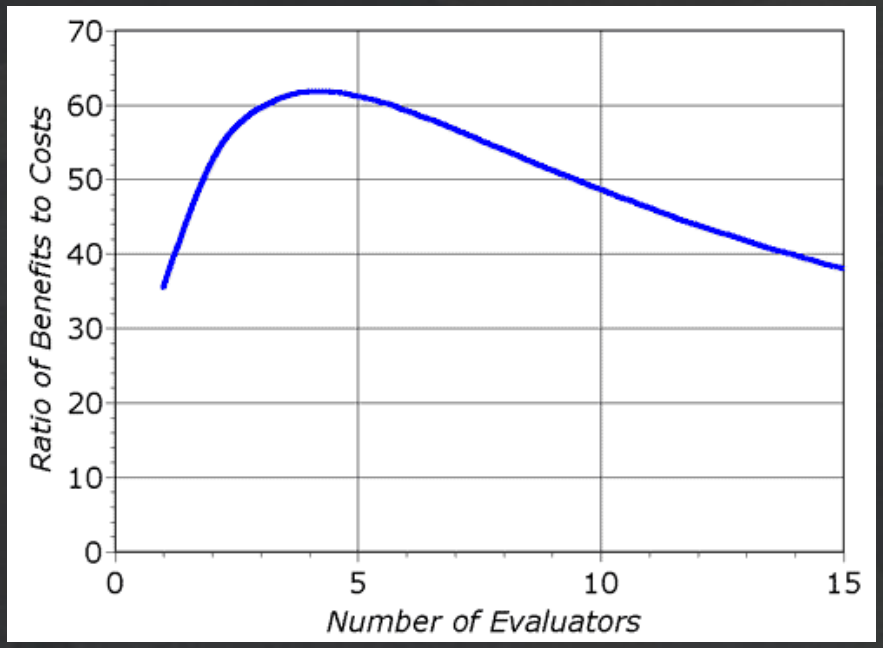


Heuristic Evaluation Decreasing Returns

problems found



benefits / cost



* Caveat: graphs for a specific example

Heuristic Evaluation Summary

- Have evaluators go through the UI twice
- Ask them to see if it complies with heuristics
  - note where it doesn't & say why
  - exact heuristic less important than finding the problem
- Combine the findings from 3 to 5 evaluators
- Have evaluators independently rate severity
- Alternate with user testing

The Art of Balance in Visual Design

Promotion & demotion of important objects

First Question for any design

- What are the most important things?

Information should be prioritized based on its importance to the user

Visual Hierarchy and Reading Order

Weak visual hierarchies provide little or no guidance on what is important.



Strong visual hierarchies guide visual & logical progression by showing what is important.

Strong visual hierarchies create a sense of order and balance

Using Proximity to Indicate Relationships

"The whole is greater than the sum of the parts."
– David Hothersall

Gestalt Psychology in information design

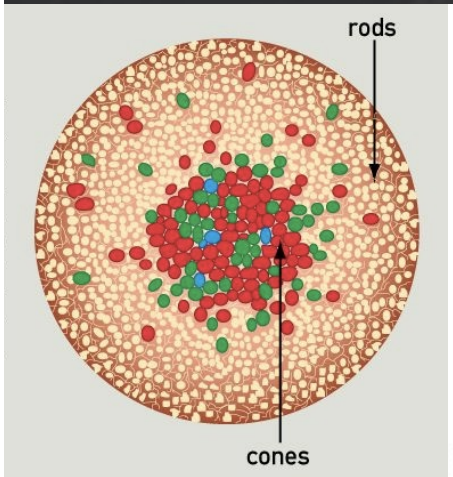
Information blocks should be grouped together if related, but unrelated elements should be located at some distance from each other.

Gestalt Principles of Perception Group Information

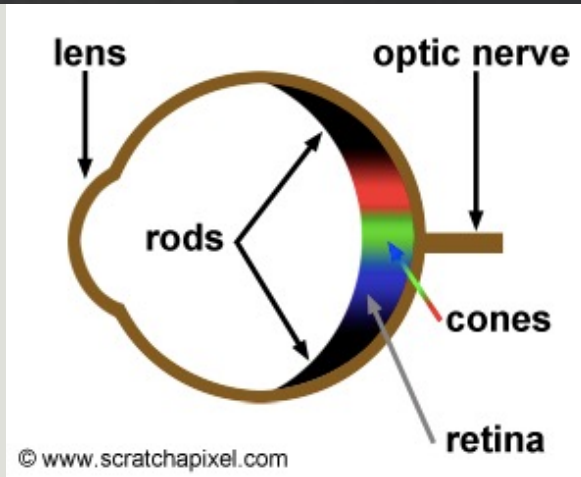
Proximity	Similarity	Continuation	Closure
			
Elements close together	Similarity of shape, size, or color	Aligned along a line or curve	Individual elements form a single object

Human Abilities: Retina

Distribution & types of cones in the retina has major impact on our visual abilities



http://www.webexhibits.org/causesofcolor/1G.html



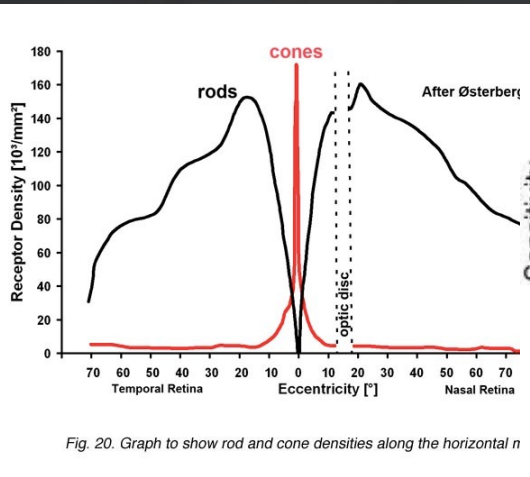
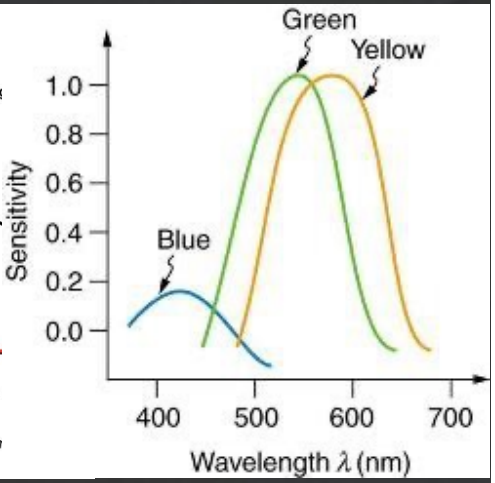
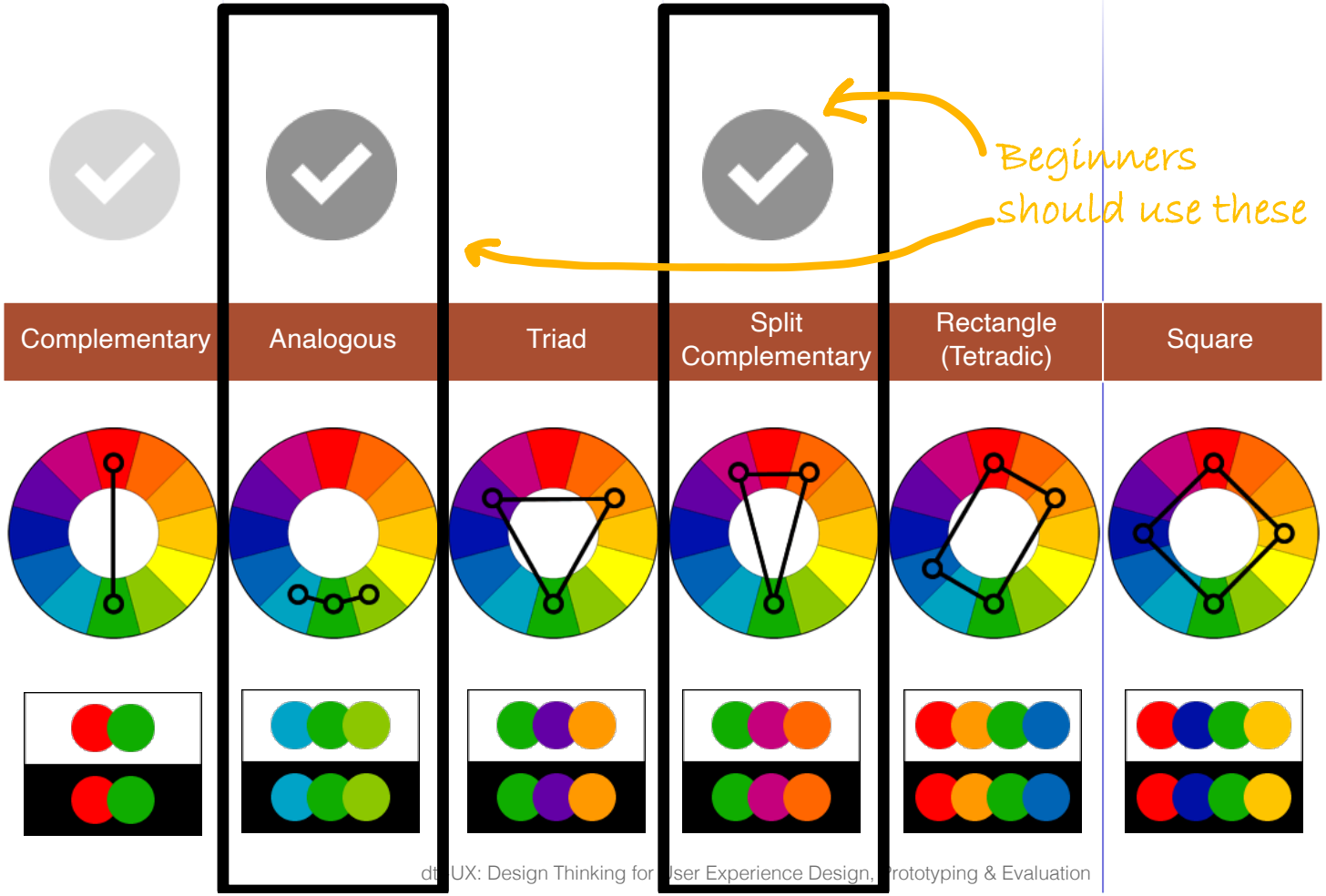


Fig. 20. Graph to show rod and cone densities along the horizontal n



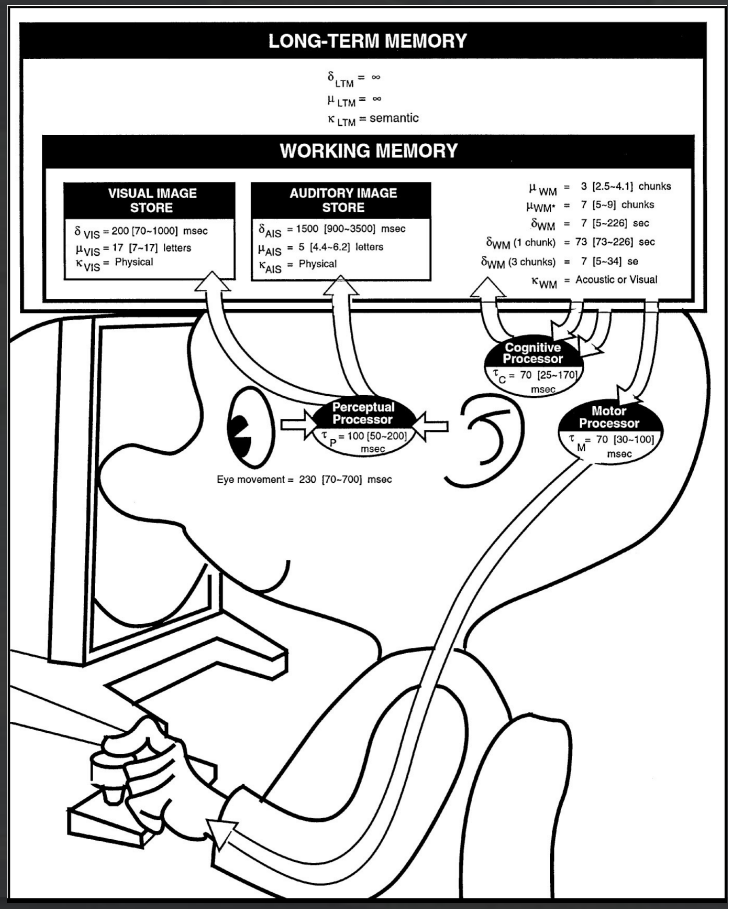
http://webvision.med.utah.edu/imageswv/Ostergr.jpeg

Using Appropriate Color “Harmonies”



The Model Human Processor

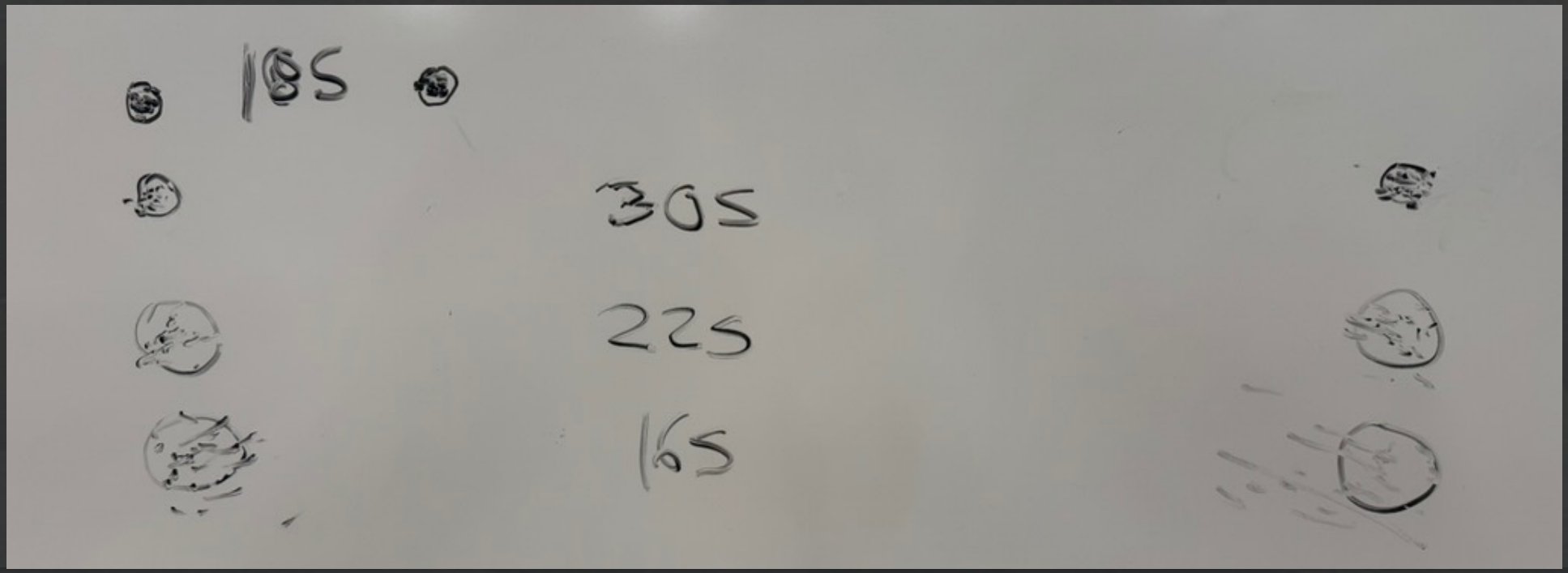
- Developed by Card, Moran & Newell (’83)
  - based on empirical data
- Basic model underlies other HCI techniques
- Allows us to make predictions w/o users
  - e.g., GOMS modeling
- Know the processors, memories, cycle times, & decay times
  - 100ms is a good enough approx. for times



Experimental Results

- Task

  Quickly tap each target 50 times accurately



Principles of Operation (cont.)

Fitts' Law

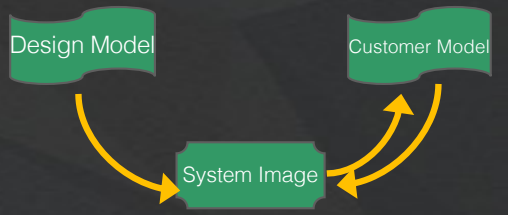
- time Tpos to move the hand to target size S, which is distance D away is given by:

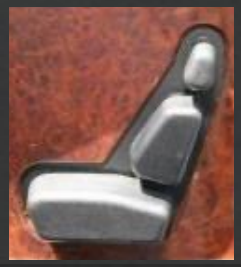
  Tpos = a + b log2 (D/S + 1)

- summary
  - time to move the hand depends only on the *relative precision* required

Conceptual Models

- Conceptual model?
  - mental representation of how the object works & how interface controls effect it
- Design model should equal customer's model?
  - mismatches lead to slow performance, errors, & frustration
- Design guides?
  - use customer's likely conceptual model to design
  - make things visible
  - map interface controls to customer's model
  - provide feedback





What Makes a Good Answer (H/W or Test)?

- Easy to understand
  - legible, well-annotated, good explanations, visual presentation instead of just listing bullets, clear structure (such as well designed visual hierarchy)
- Grounded in your prior work
  - e.g., needfinding, POV, HMW, EP results, usability results, data driven (if possible)
- Ideas/designs are novel
  - beyond what is heard/seen or already exists to push for something that feels new & exciting
- Backed by evidence
  - from your work or from principles of design, humans cognitive/perceptual/motor attributes
- Goes beyond just facts
  - based on some reasonable inference and integration, not straightforward and superficial
  - points made are insightful & point to a bigger picture as opposed to just stating the facts
- User-centered
  - findings and insights tie back to the user, keeping user experience in mind, ensuring a diverse set of participants and reasons why they were important
- Covers everything that was asked for

QUESTIONS?

Exit ticket



http://hci.st/cs147-26au-exit-8-813

Due at 3:30 PM Tue, 11/10