Human-Computer Interaction (HCI)

DECO2500/7250

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09

Evaluating Usability – "Expert" or "Non-User" Evaluations

In this session…

- Expert evaluation methods:
  - Heuristic Evaluation
  - Schneiderman's Golden Rules
  - Cognitive Walkthrough
  - Pluralistic Walkthrough
  - RITE UX Evaluation
  - Predictive Models

Expert Analytical/Usability Inspections

- Quick and cheap way of identifying usability issues
- Can be undertaken in a number of ways:
  - Heuristic evaluation
  - Walkthroughs
- These methods represent a minimum standard to meet

Types of Evaluations

METHOD	Controlled settings (laboratory)	Natural settings (field)	Without users
Observing users	✓	✓	
Asking users (questionnaires, interviews)	✓	✓	
Testing users (detailed measures)	✓		
Asking experts (walkthroughs, heuristic eval.)	✓	✓	✓
Modeling (e.g., GOMS, Fitts Law, etc.)			✓

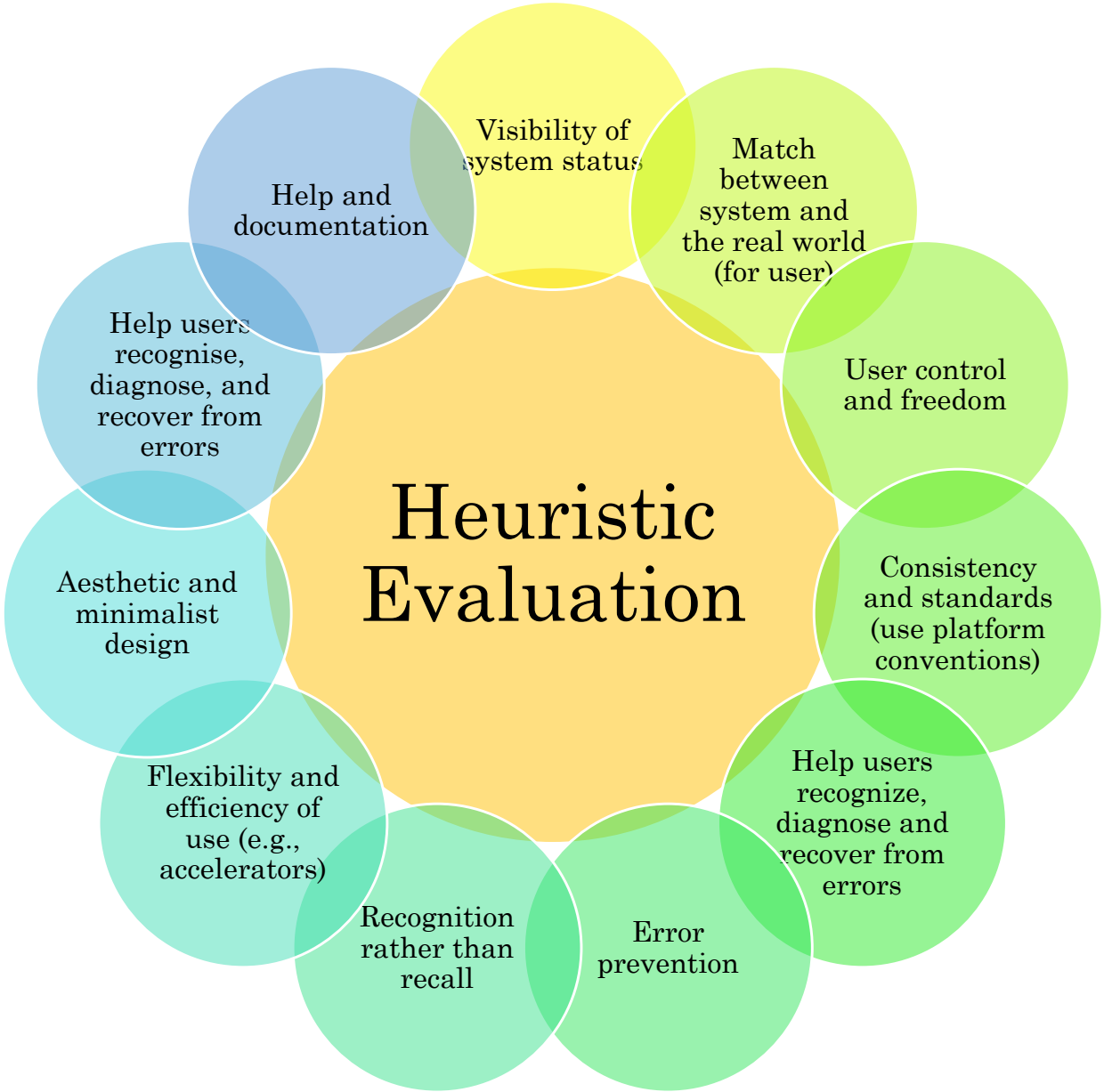
Heuristic Evaluation

Heuristic Evaluation

- Developed by Jacob Nielsen in early 1990s
- Experts analyse the interface with respect to a set of criteria
- Determines whether an application or interface meets a (minimum) standard of usability

Image source: https://medium.muz.li/10-tips-on-how-to-conduct-a-perfect-heuristic-evaluation-ae5f8f4b3257

Heuristic Evaluation Principles



Nielsen, 2001

HOMERUN Heuristics

- **H**igh quality content
- **O**ften updated
- **M**inimal download time
- **E**ase of use
- **R**elevant to users' needs
- **U**nique to the online medium
- **N**et-centric corporate culture supporting site

Nielsen, 1999

Heuristic Evaluation for Smartphone Apps

SMART 1	• Provide immediate notification of application status.
SMART 2	• Use a theme and consistent terms, as well as conventions and standards familiar to user.
SMART 3	• Prevent problems where possible; help users if problem occurs, including with network.
SMART 4	• Display an overlay pointing out main features when appropriate or requested to help first-time users.
SMART 5	• Each interface should focus on one task, so that it's glanceable to users who are interrupted frequently.
SMART 6	• Design a visually pleasing interface. Users 'forgive' attractive interfaces.

Joyce et al. (2016) "Mobile application usability: heuristic evaluation and evaluation of heuristics" In *Advances in Human Factors, Software, and Systems Engineering*

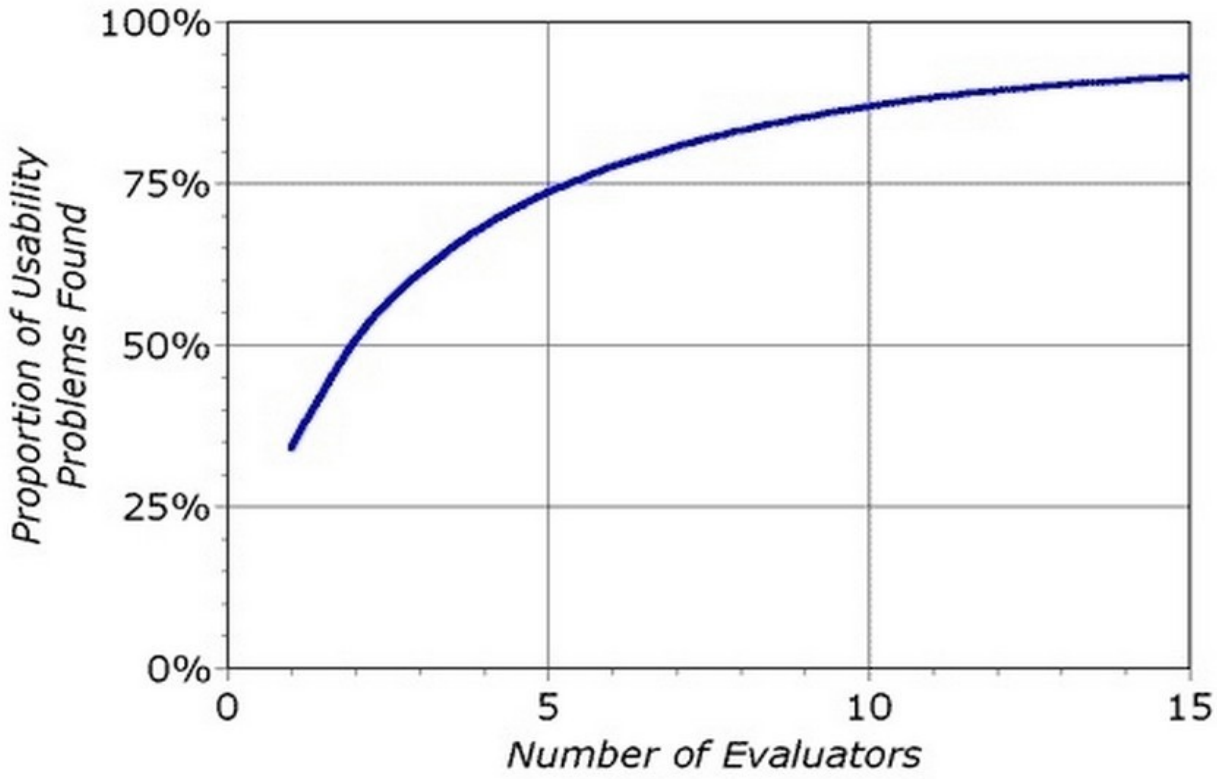
Heuristic Evaluation for Smartphone Apps

SMART 7	• Intuitive interfaces make for easier learning
SMART 8	• Design a clear navigable path to task completion
SMART 9	• Allow configuration options and shortcuts.
SMART 10	• Cater for diverse mobile environments (lighting, ambient noise, gloves, etc).
SMART 11	• Facilitate easier input by displaying keyboard buttons that are as large as possible, supporting, multimodal input, and keeping form fields to a minimum.
SMART 12	• Use camera, microphone and sensors to lessen user's workload (e.g. GPS so the user knows where they are and how to get where they need to go)

Joyce et al. (2016) "Mobile application usability: heuristic evaluation and evaluation of heuristics" In *Advances in Human Factors, Software, and Systems Engineering*

Heuristic Evaluation – Method

- Number of evaluators:
  - Different estimates: depends on the kind of application!
  - 5 evaluators → 75% of issues in some studies
  - 6 – 8 evaluators → 80% of issues in some studies
  - Undiscovered issues may be the most important!



The proportion of usability problems identified increases as the number of evaluators used increases

Image source: https://www.interaction-design.org/literature/article/heuristic-evaluation-how-to-conduct-a-heuristic-evaluation

Stages of doing a Heuristic Evaluation

1. Briefing session to tell experts what to do
2. Evaluation period of 1-2 hours:
   - Each expert works separately, referring to Nielsen's usability principles list
   - First pass to get a feel for the product
   - Second pass to focus on specific features
3. Debriefing session

Heuristic Evaluation–Recording Results

Screen / element description	Usability issue	Heuristic category	Probable effect on user
Personal details form in registration process	Action for submitting information is unclear	*User control and freedom*	Can't continue
Should user enter area code on phone number?	Error message pops up when area code isn't entered	*Prevent errors*	Annoyance

Heuristic Evaluation – Method

- Severity ratings are a combination of 3 factors:
  - **Frequency** of encountering problem (common, rare)
  - **Impact** of problem (low, high)
  - **Persistence** – how easily is it overcome each time? (not, very)
- Can be rated on a four-point rating scale

Heuristic Evaluation – Method

0
- Not a problem at all

1
- Cosmetic (e.g. *Freq* – rare; *Imp* –low; *Per* – not) = fix if time

2
- Minor usability problem (e.g. *Freq* – common; *Imp* – low; *Per* – not) = low priority fix

3
- Major usability problem (e.g. *Freq* - common; *Imp* – low; *Per*- very)

4
- Catastrophic usability problem (e.g. *Freq* – common; *Imp* = high; *Per* – very)

Advantages and Problems

- Using *experts* – fewer ethical and practical issues to consider
- Experts have knowledge of application domain *and* usability
- Can be performed at any stage during the design process
- Biggest problems (Bailey, 2001):
  - Important problems may get overlooked – misses
  - Many trivial problems often identified
  - Some problems are not problems at all – false alarms
- Comparisons of heuristic evaluation with other usability methods not scientifically precise

Guidance and Examples

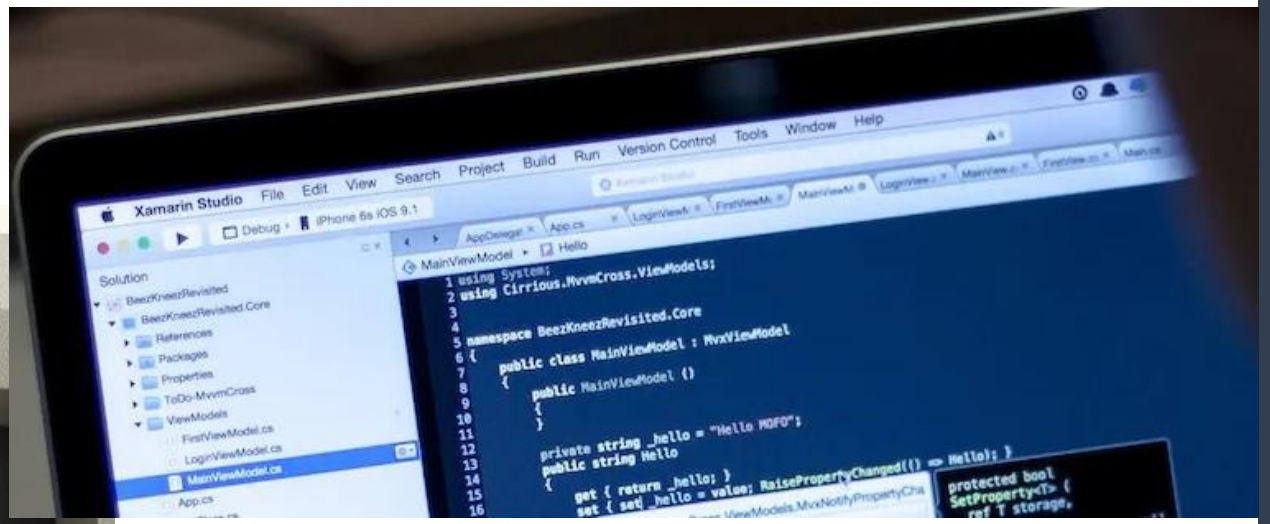
https://www.interaction-design.org/literature/article/user-interface-design-guidelines-10-rules-of-thumb

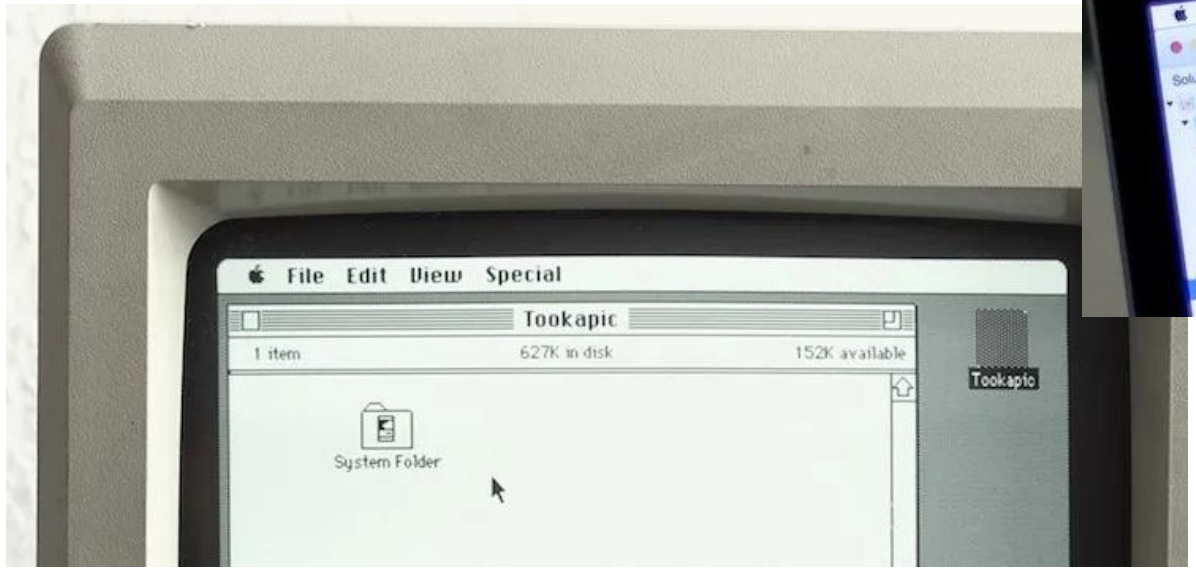
INTERACTION DESIGN FOUNDATION

Schneiderman's Golden Rules

Eight Golden Rules of Interface Design

1. **Strive for consistency.** Utilize familiar icons, colours, menu hierarchy, call-to-actions, and user flows when designing similar situations and sequence of actions.





Eight Golden Rules of Interface Design

2. **Enable frequent users to use shortcuts.** Increased use comes the demand for quicker methods of completing tasks

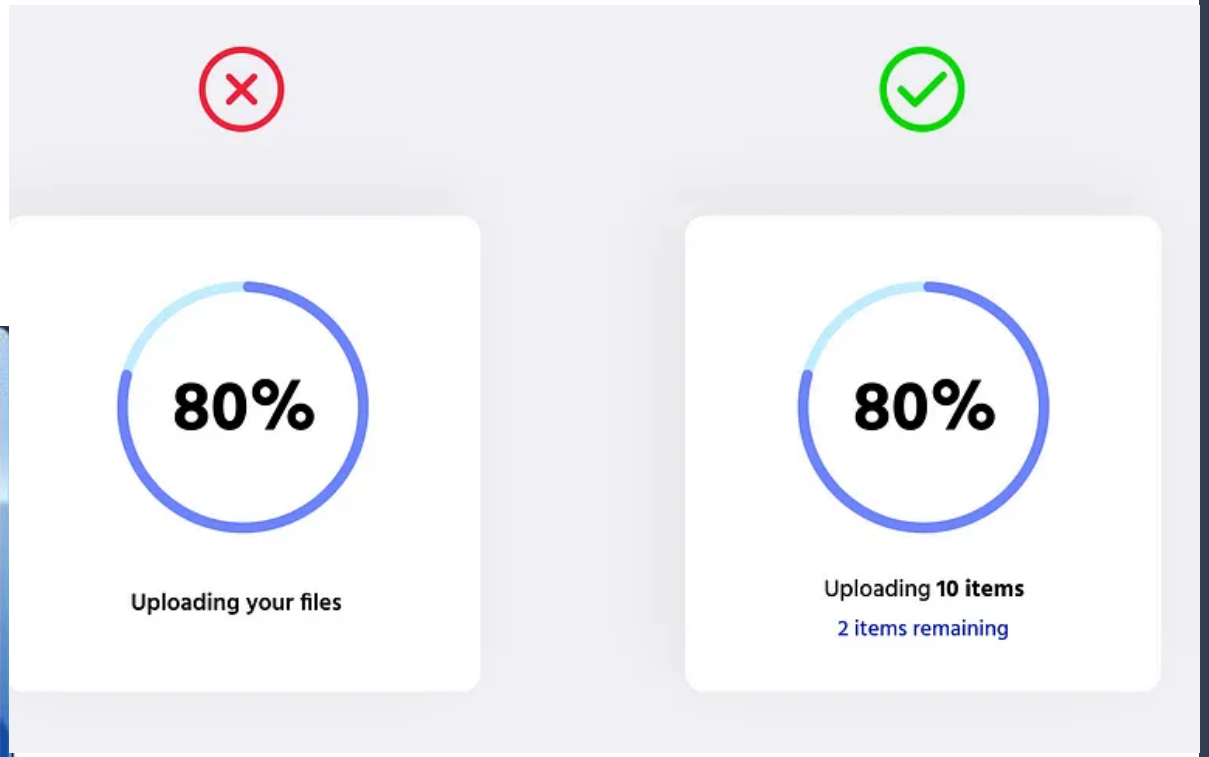
to copy

to paste

to cut

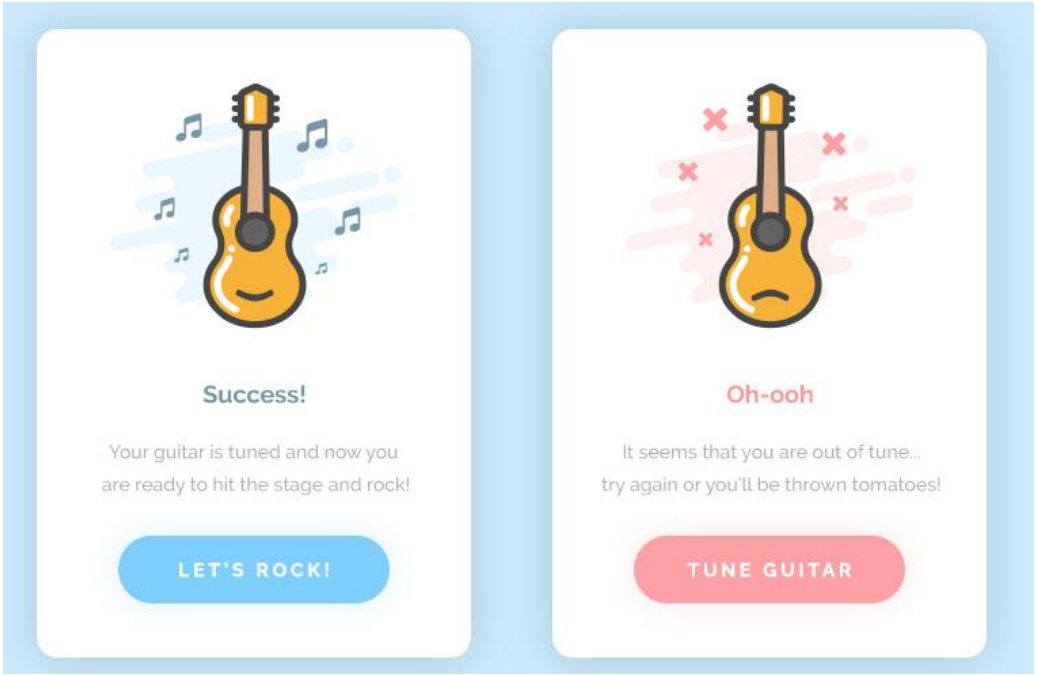
Eight Golden Rules of Interface Design

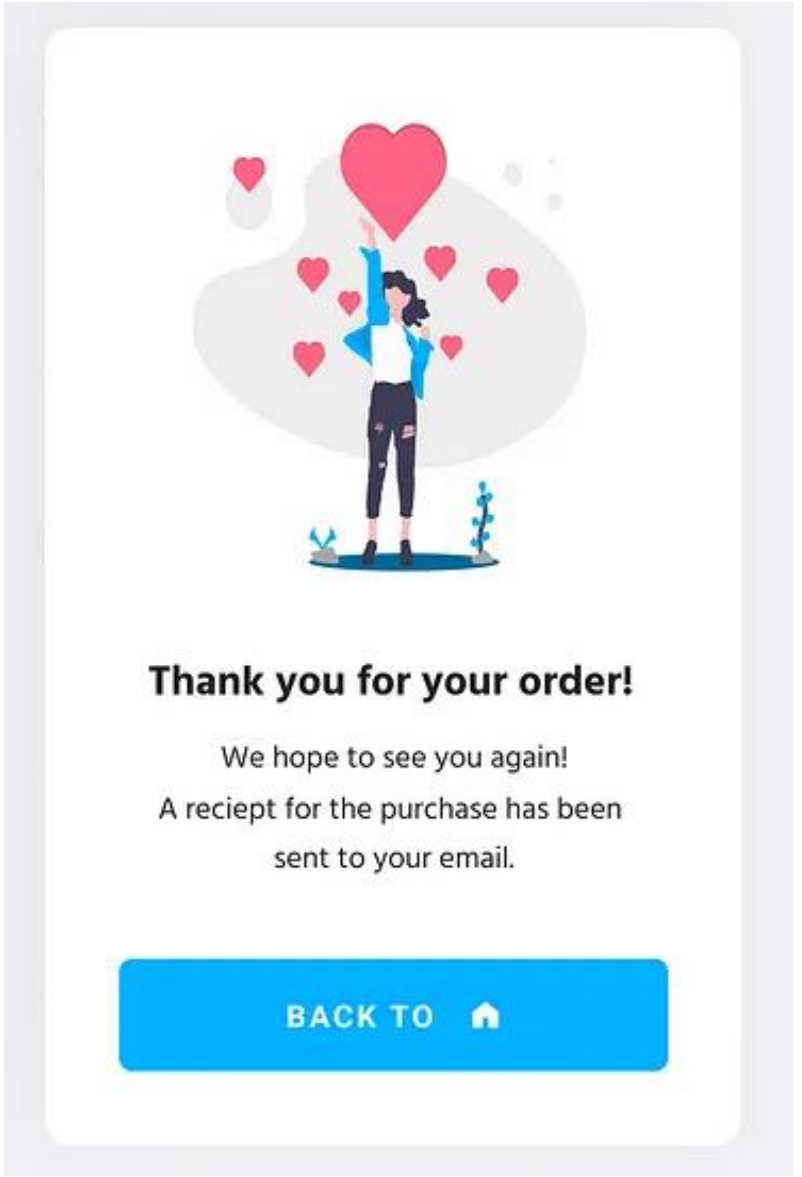
3. **Offer informative feedback.** The user should know where they are at and what is going on at all times.



Eight Golden Rules of Interface Design

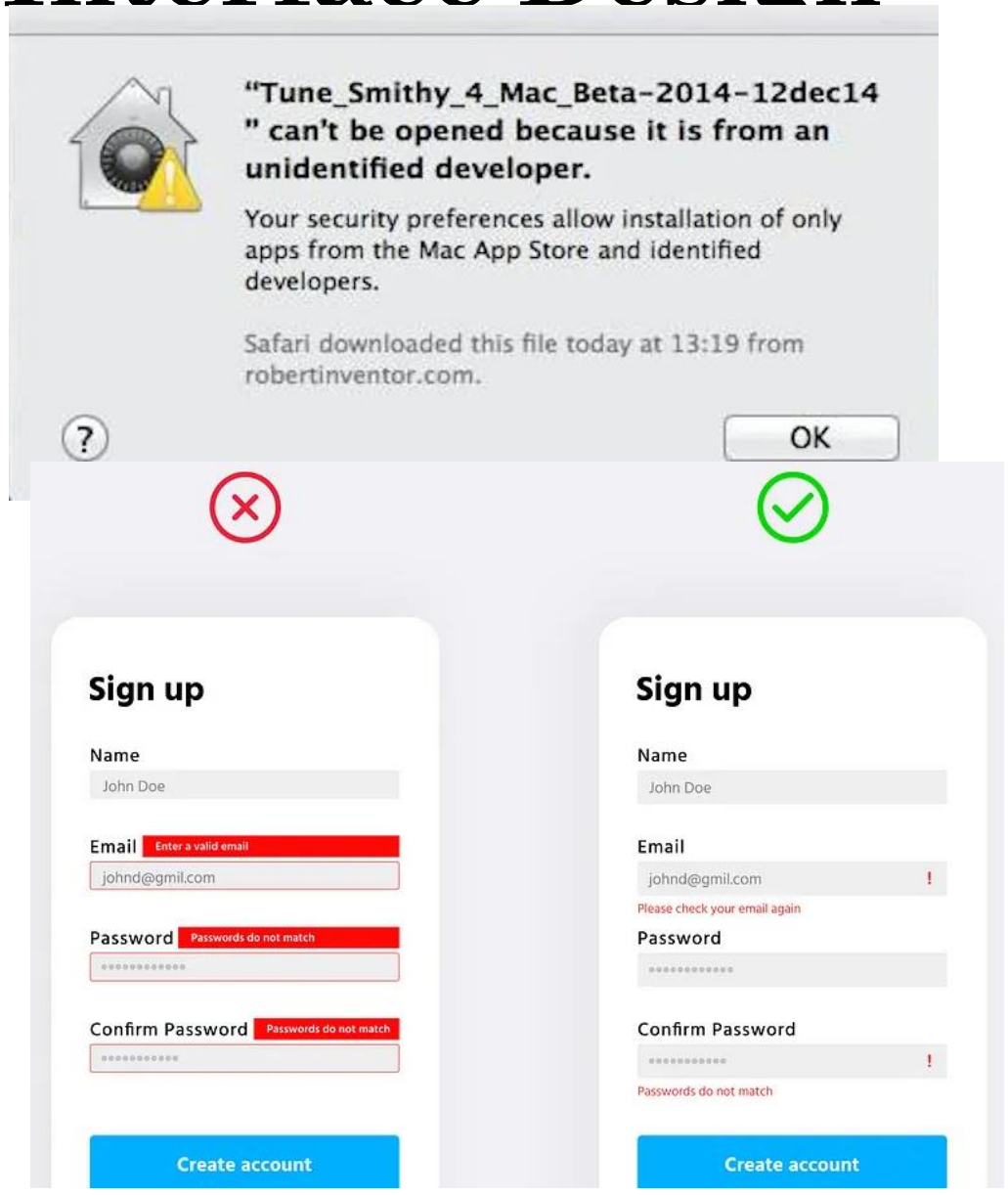
4. **Design dialogue to yield closure.** Don't keep your users guessing. Tell them what their action has led them to.





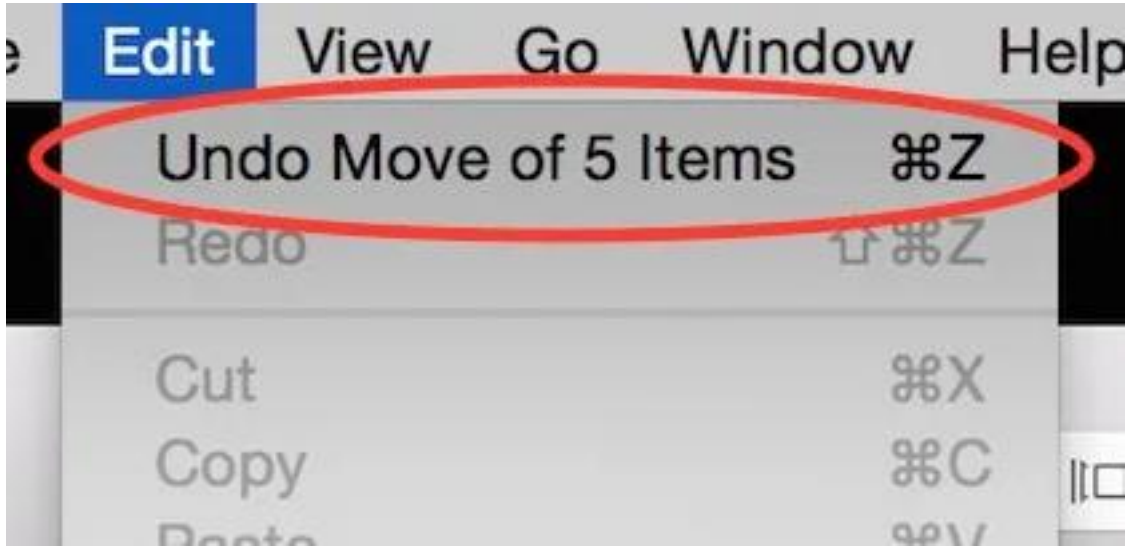
Eight Golden Rules of Interface Design

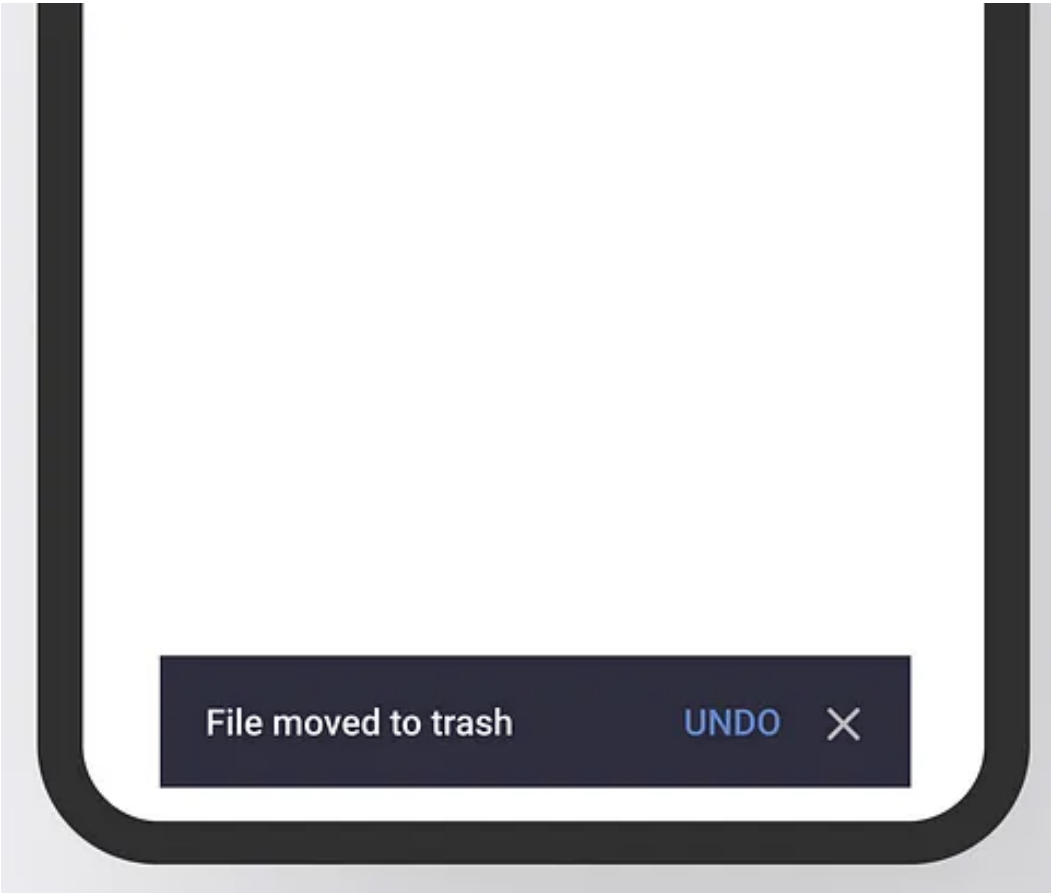
5. **Offer simple error handling.** Systems should be designed to be as fool-proof as possible, but when unavoidable errors occur, ensure users are provided with simple, intuitive step-by-step instructions to solve the problem as quickly and painlessly as possible



Eight Golden Rules of Interface Design

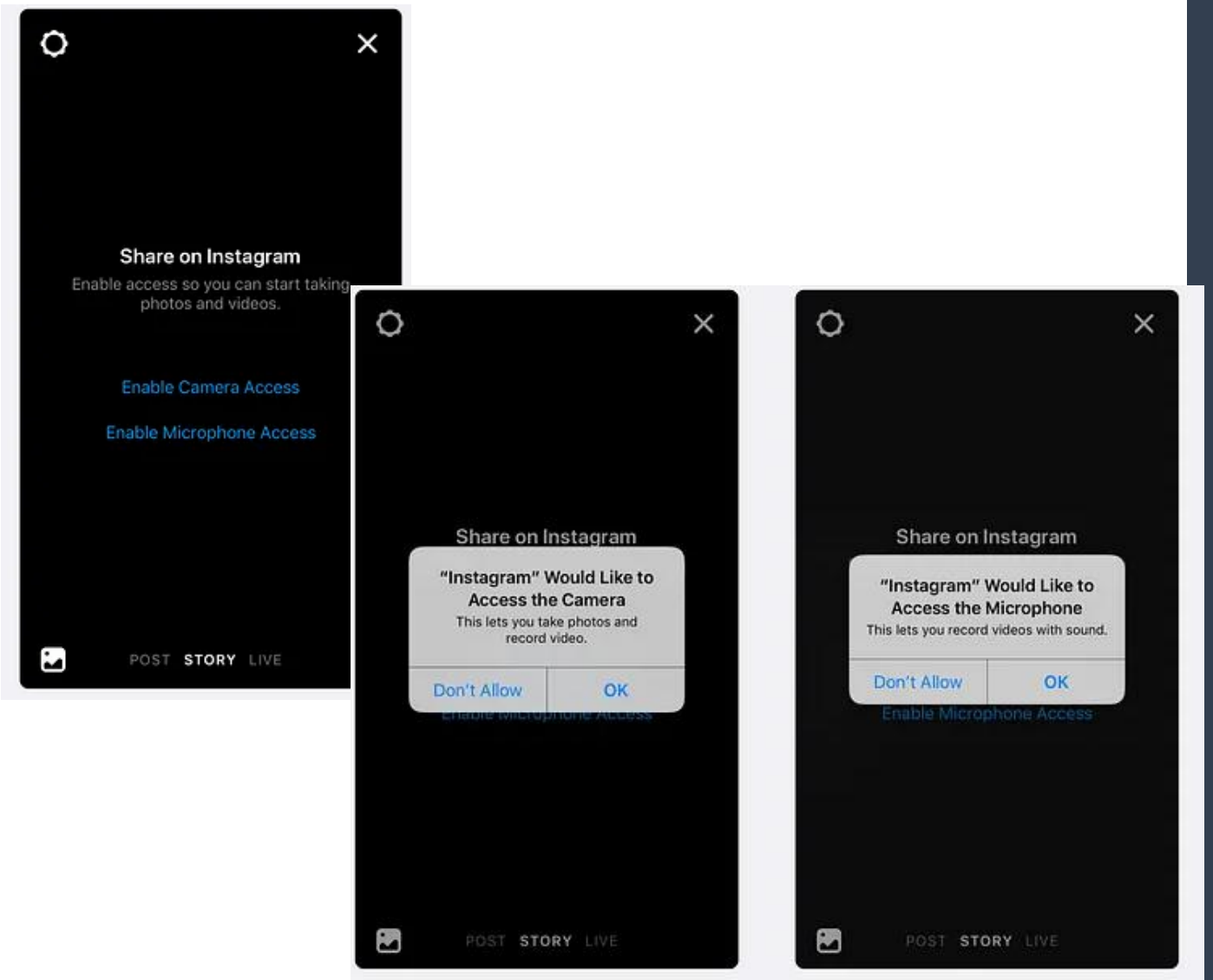
6. **Permit easy reversal of actions.** Designers should aim to offer users obvious ways to reverse their actions.





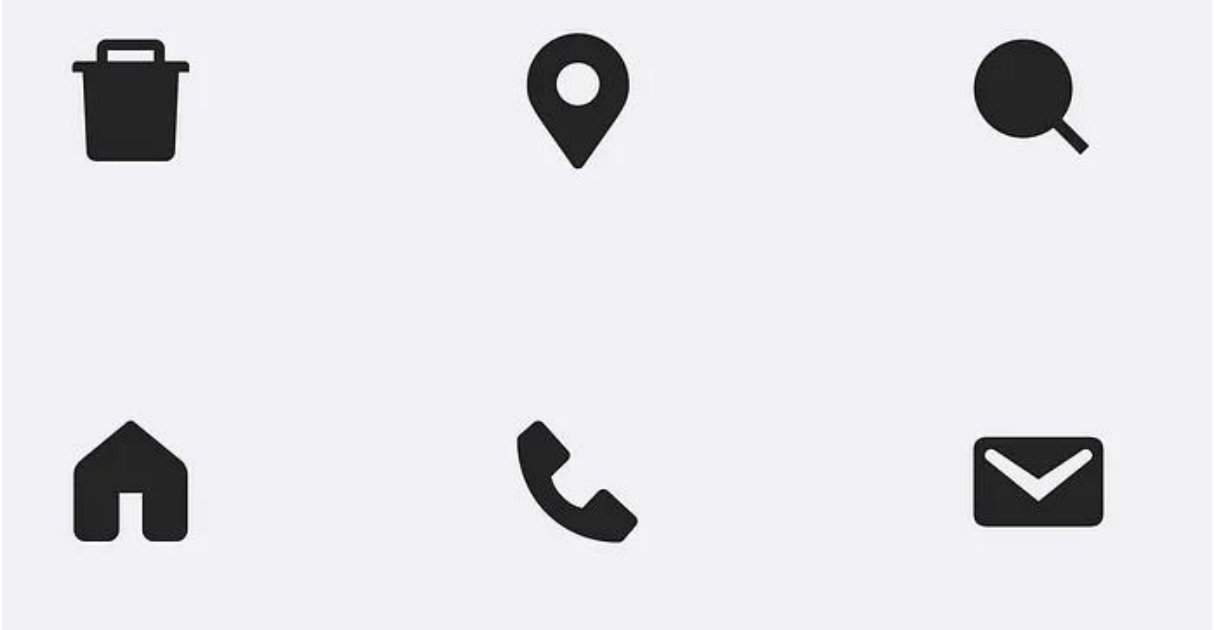
Eight Golden Rules of Interface Design

7. **Support internal locus of control.** Allow your users to be the initiators of actions. Give users the sense that they are in full control of events occurring in the digital space.



Eight Golden Rules of Interface Design

8. **Reduce short-term memory load.** Interfaces should be as simple as possible with proper information hierarchy, and choosing recognition over recall



Advantages and Problems

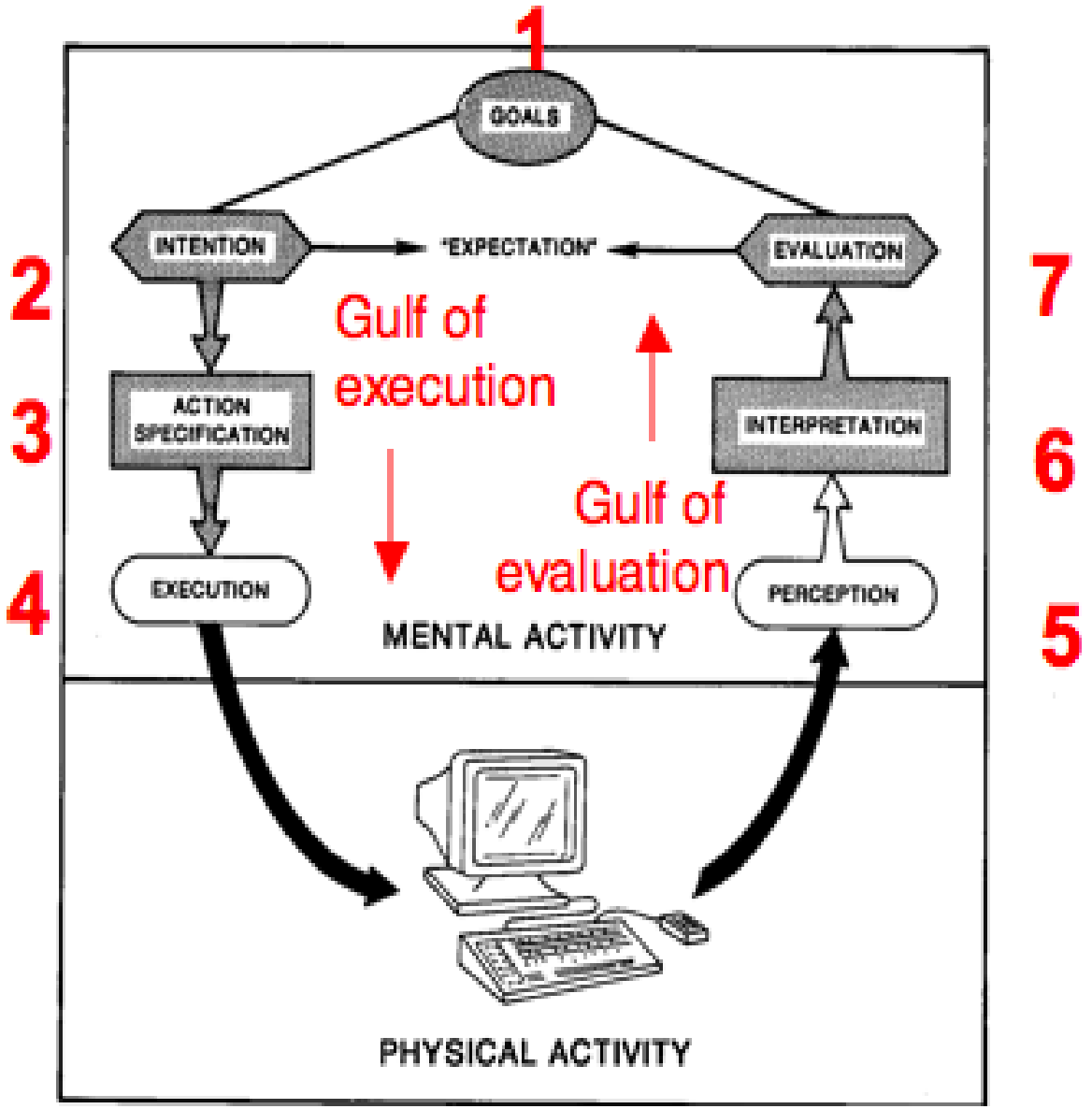
- Extremely easy to understand with clear and practical applications

Cognitive Walkthrough

Cognitive Walkthrough

- Users learn by exploring (Wharton et al. 1994)
- Focus on ease of user learning and are task-specific
- Process
  - Designer presents an aspect of the design and usage scenarios.
  - Expert is told assumptions about user population, context of use, task details.
  - One or more experts walk through the design prototype with the scenario.
  - Experts are guided by three (or more) key questions

Seven Stages of Action

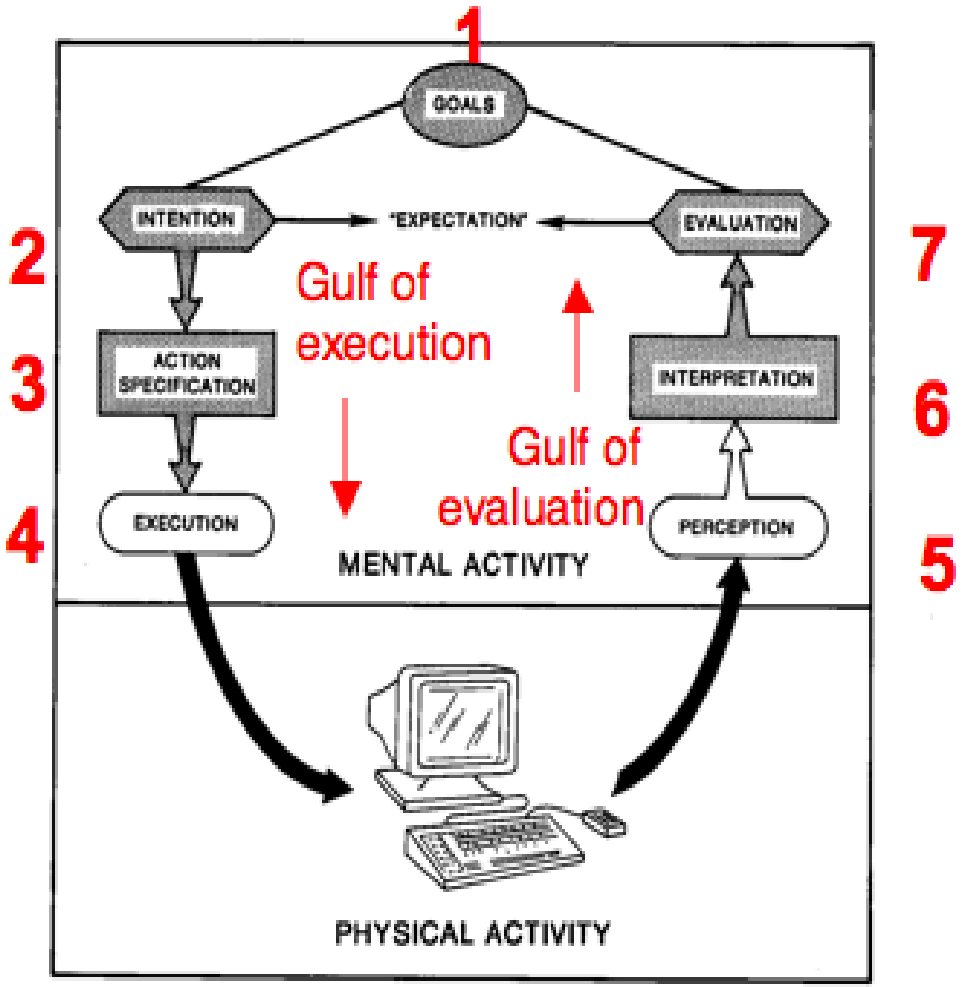


Norman (1986)

Gulf of Execution and Evaluation

- Interfaces should be designed to reduce these gulfs

Gulf of Execution



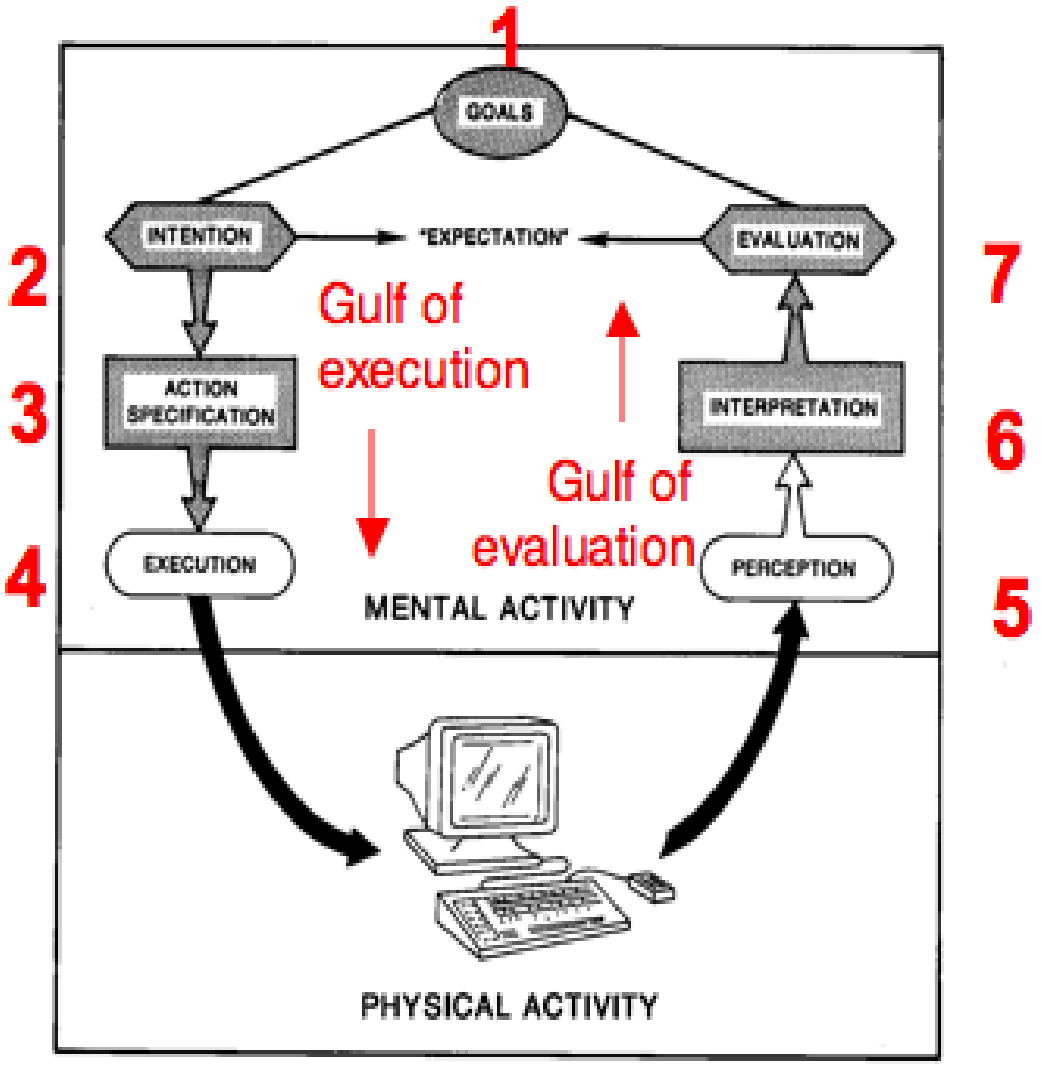
Gulf of Evaluation

Cognitive Walkthrough – Method

1. Identify typical users and include one or more expert evaluators and a designer
2. Select representative tasks
3. Create prototype to test users on tasks
4. Identify ‘valid’ action sequences to do tasks
5. Keep records
6. Revise design

Cognitive Walkthrough – Method

- Evaluators pose four questions as they go (Polson et al. (2002):
  1. Will the user try and achieve the right outcome? 2 / 3
  2. Will the user notice that the correct action is available to them? 3 / 4
  3. Will the user associate the correct action with the outcome they expect to achieve? 5 / 6 / 7
  4. If the correct action is performed; will the user see that progress is being made towards their intended outcome 5 / 6 / 7



Advantages and Problems

- More detailed information
- Useful to examine small parts of your system
- Time consuming

Pluralistic Walkthrough

Pluralistic Walkthrough

Involves a diverse group of stakeholders

Many variations on cognitive walkthrough theme

Supports participatory design – end user involvement

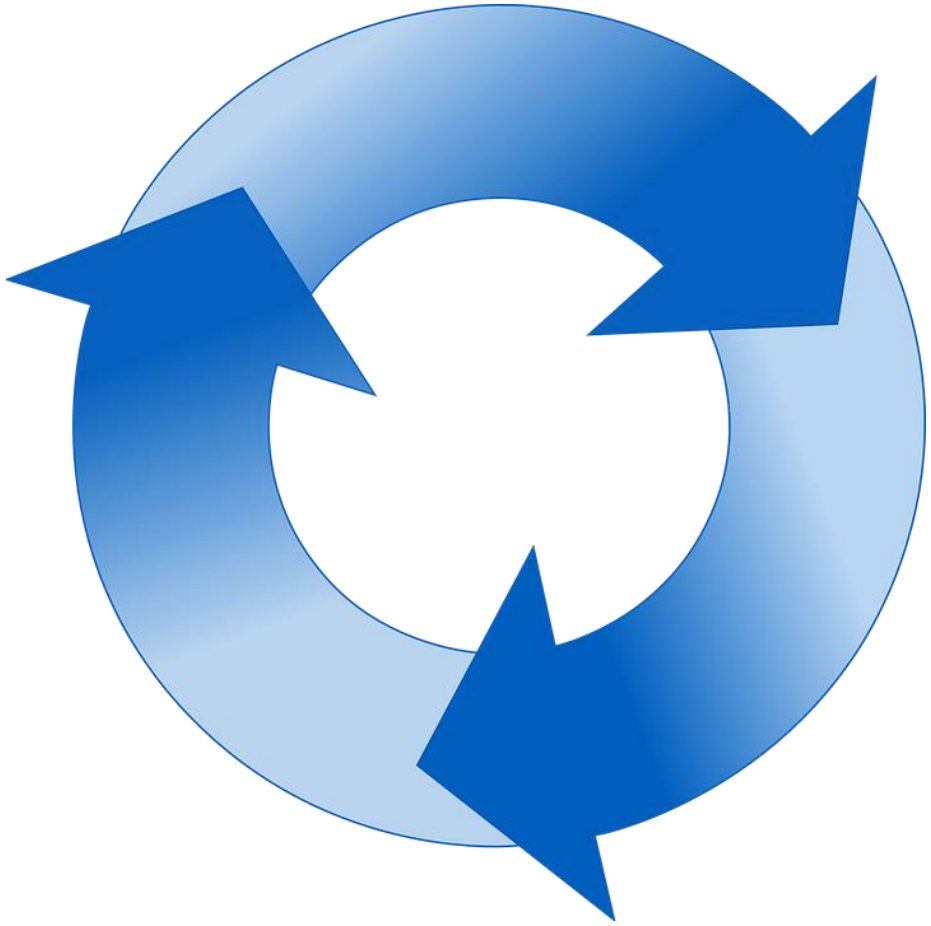
Advantages and Problems

- Strong focus on the user's task
- Performance (quantitative) data is produced
- Involves a multidisciplinary team
- Can take a very long time to complete

RITE UX Evaluation

UX Evaluation RITE

- **R**apid, **I**terative, **T**esting and **E**valuation
- A variant on Pluralistic walkthrough
- Facilitated by UX expert
- A key feature is the fast turnaround



UX Book, §13.6

UX Evaluation RITE

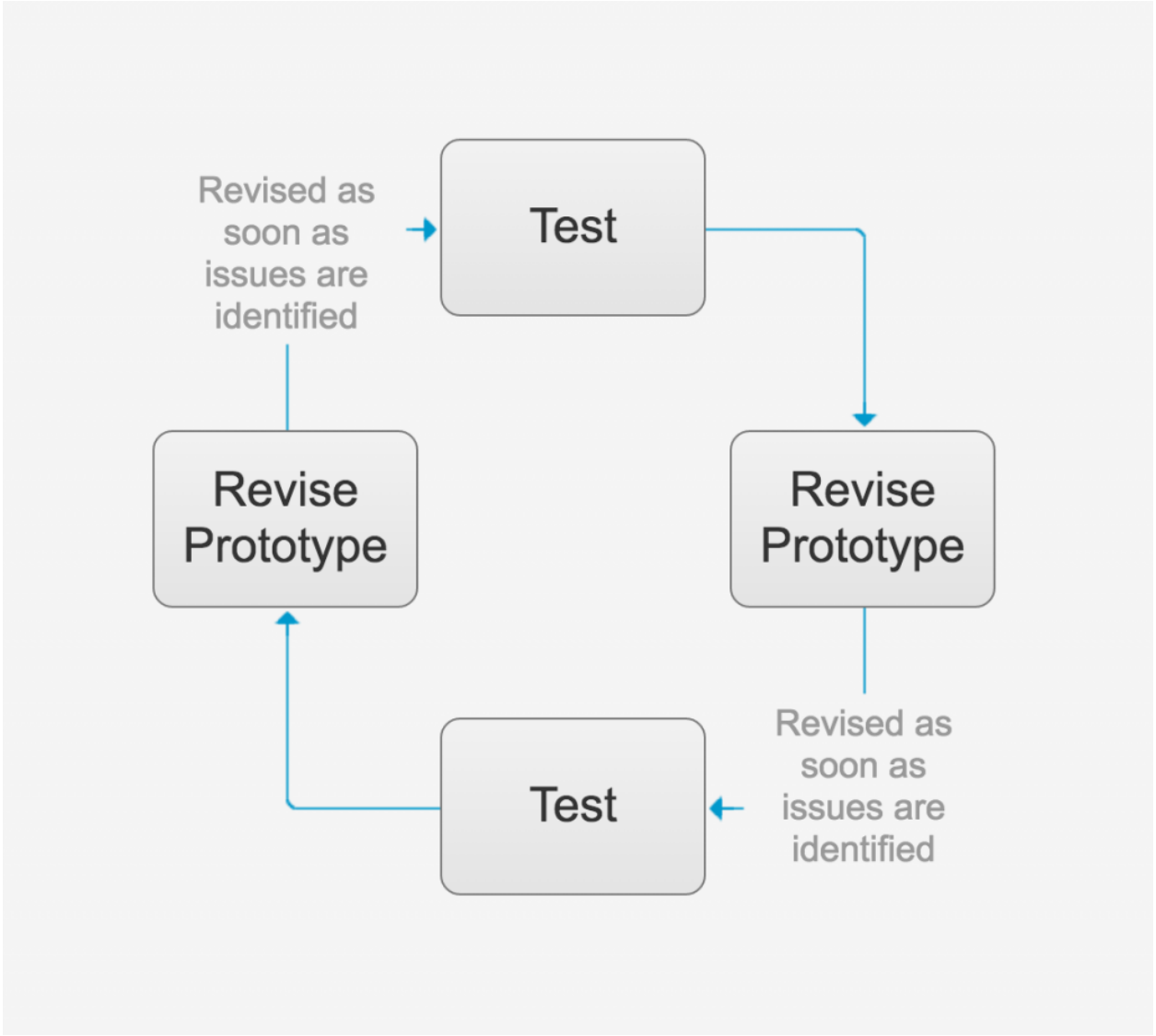


Image source: https://blogs.adobe.com/creativecloud/how-to-support-design-decisions-through-iterative-testing/

Advantages and Problems

- Involves the entire team
- Decision-makers are kept directly in the loop about the usability of the system
- Provides rapid identification or problems and solutions
- Time consuming
- No clear deadline when the testing will be finished
- Rare problems may not emerge

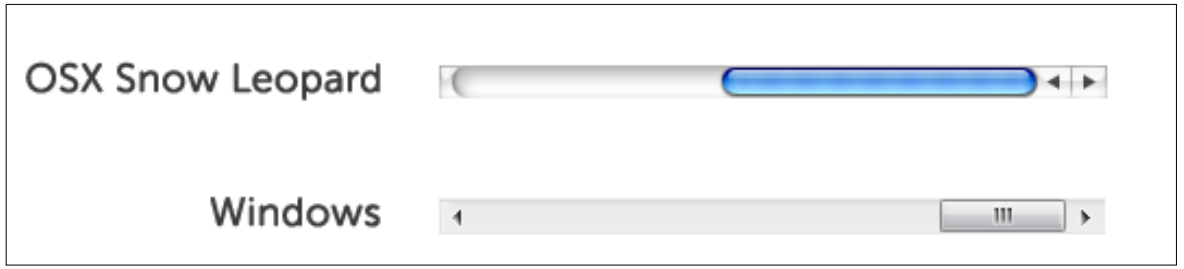
Predictive Models

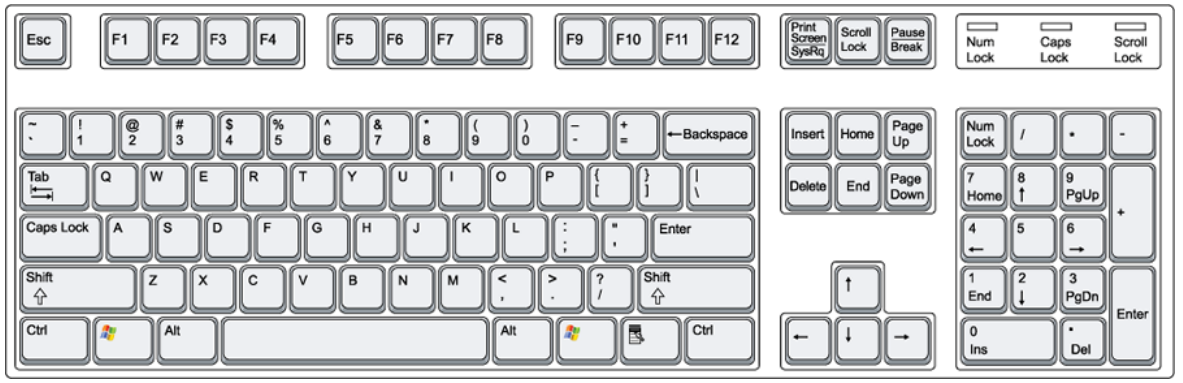
Predictive Models

- Users are not directly involved
- Formulas are used to derive various measures of user performance
- Less expensive than user testing
- Usefulness limited to systems with predictable tasks
- Based on expert error-free behaviour

Predicting Discrete Movement Time

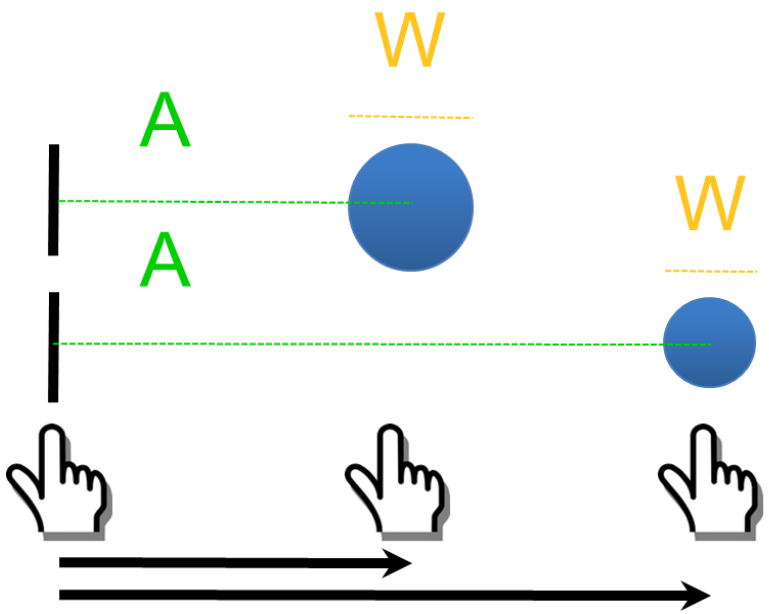
- Fitts' Law (Fitts, 1954)
- Time to point at an object using a device is a function of:
  - Distance from the target object
  - Object's size.
- The further away and the smaller the object, the longer the time to locate it and point to it.
- Useful for when the time to locate an object is important (e.g., a mobile phone, handheld devices)



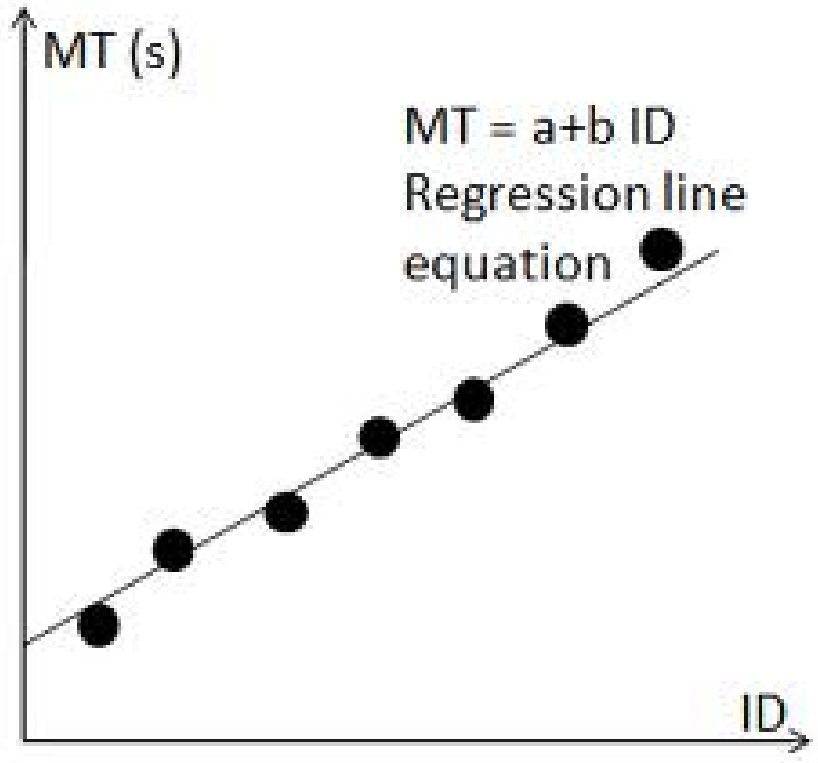


Predicting Discrete Movement Time

$MT = a + b \log_2 (2A/W)$



MT = Movement Time (usually milliseconds)
A = Amplitude (or Distance) of movement
W = Width of target
ID = index of difficulty in bits: $\log_2(2A/W)$
MT = a + b * ID



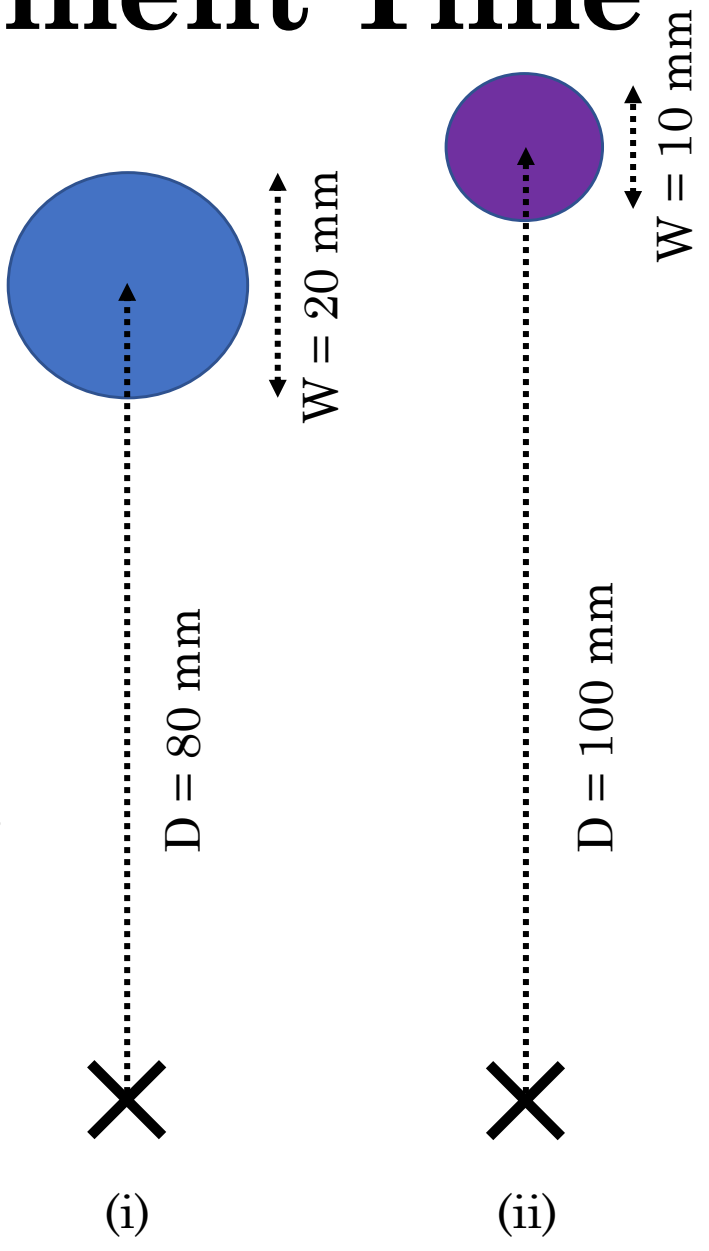
Log-linear relationship

Slightly different version:
$MT = a + b \log_2 (A/W + 1)$

Predicting Discrete Movement Time

$$MT = a + b \log_2 (D/W + 1)$$

- Assume *a* = 50ms and *b* = 150ms
- $MT_i = 50 + 150 * (\log_2 (80/20 + 1)) = 398$ ms
- $MT_{ii} = 50 + 150 * (\log_2 (100/10 + 1)) = 569$ ms



Timeline

*may be subject to change

Studio Topics*

- No studios this week
  - 2 x drop-in sessions throughout the week
  - You should continue working on your assessments during this time

- No lecture this week
- Studios to cover expert evaluation methods

- DECO2500: Assessment work
- DECO7250: Annotated Bibliography studio

- Assessment work (nor formal studio activities)

- Interface Inquiry Critique (in studios)

Week 9 – No Studios

Week 10 – Studio 8

Week 11 – Studio 9

Week 12 – Studio 10

Week 13 – Studio 11

Exam Period

Assessment Deadlines

In-Class Quiz

Interface Inquiry Report DUE: 22/05/2023 by 3PM (AEST)

Design Proposal DUE: 05/06/2023 by 3PM (AEST)

DECO7250 Annotated Bibliography DUE: 12/06/2023 by 3PM (AEST)

Summary

- Inspections can be used to evaluate requirements, mock-ups, functional prototypes, or systems
- User testing and heuristic evaluation may reveal different usability problems
- Shneiderman's eight golden rules are intended to help designers solve problems as to improve usability, an interface needs to be well designed to be "user-friendly"
- Walkthroughs are focused: suitable for evaluating small parts of a product
  - Cognitive walkthroughs: design team
  - Pluralistic walkthroughs: design team and users
- Predictive models, such Fitts' Law, can be used to predict expert, error-free performance for certain kinds of tasks

Next Time…

- **No studios this week due to public holiday**
  - Drop-in sessions Thursday/Friday 2 – 4pm (see Blackboard for details)
- **No lecture next week due to public holiday**
  - Studios on as normal that will cover today's topics
- **Lecture resumes week 11 (08/05/2023) for in-class quiz**