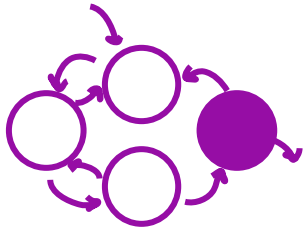
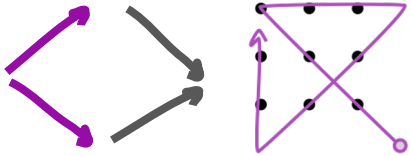
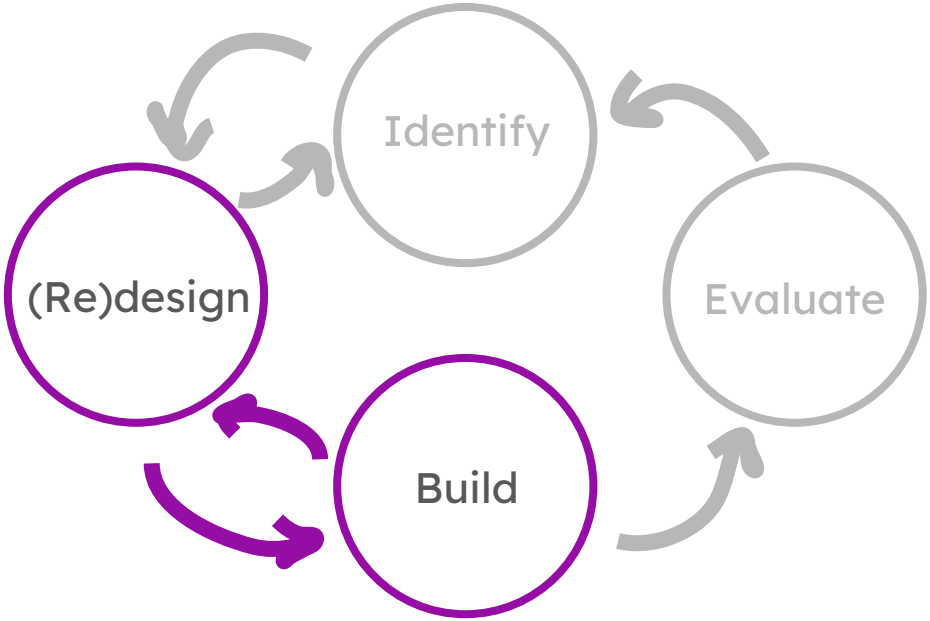


Human Computer Interaction

Taslima Akter

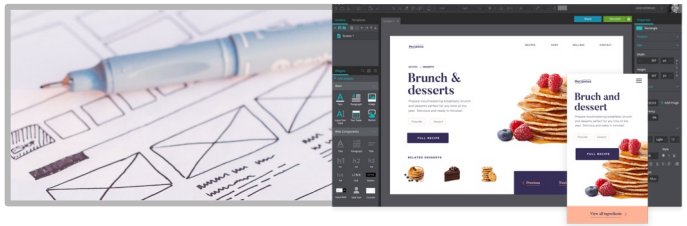
Design Processes & Methods – Part 9





Design thinking involves problem framing and convergent/divergent thinking. Constraints are good, but make sure you know which constraints are real.

Sketching, storyboarding, and **prototyping** help you test ideas early / cheaply / quickly. They're meant to be thrown away.



lo-fi wireframe vs. hi-fi mockup

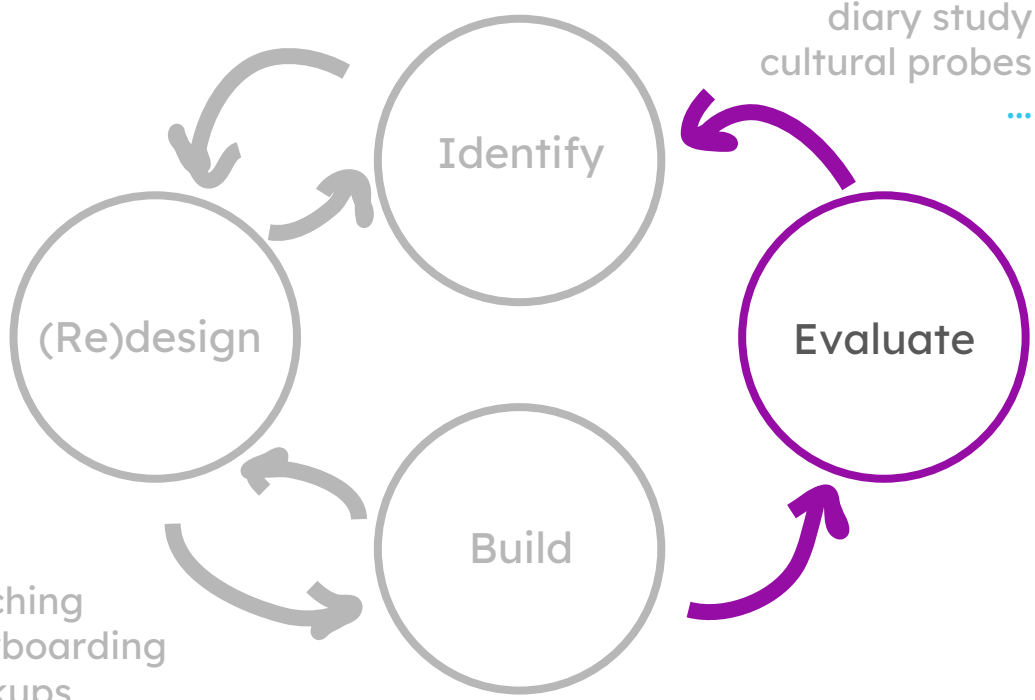
storyboard

low-fi / non-functional

hi-fi / functional

observations
interviews
focus groups
diary study
cultural probes
...

pt.2

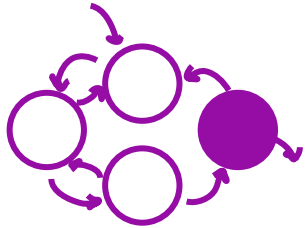


pt.4

GOMS analysis
heuristic evaluation
Cognitive walkthrough
think-aloud protocol
eye tracking
surveys
A/B testing
log analysis
...

pt.3

sketching
storyboarding
mockups
prototyping
...



GOMS analysis

heuristic evaluation

Cognitive walkthrough

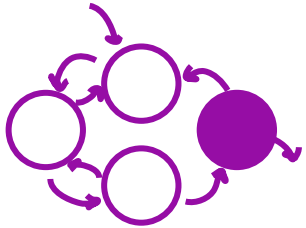
think-aloud protocol

eye tracking

surveys

A/B testing

log analysis



Expert Review

- GOMS analysis
- heuristic evaluation
- Cognitive walkthrough

Testing w/ Users

- think-aloud protocol
- eye tracking
- surveys
- A/B testing
- log analysis

Interface Evaluation Methods

- UI Inspection

- Usability Testing

- Formal user testing (beyond paper prototypes)

Inspection-based methods

- We need evaluation to guide improvement
  - Can be relatively slow and expensive
  - Study participants can be scarce
  - Can waste participants on obvious problems

Inspection-based methods

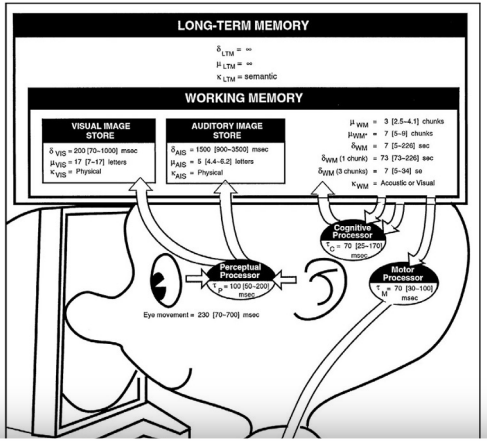
- Evaluator, not user, evaluates the application
- Simulate study participants
  - Instead of actual participants, use inspection to quickly and cheaply identify likely problems
- Inspection methods are **rational**, not empirical

Expert Review

- Expert evaluates the system
- Leverages guidelines, principles to assess the usability of a system
- May benefit from having domain knowledge
- Best if not the same person who designed the system

Ex. 1: GOMS Analysis

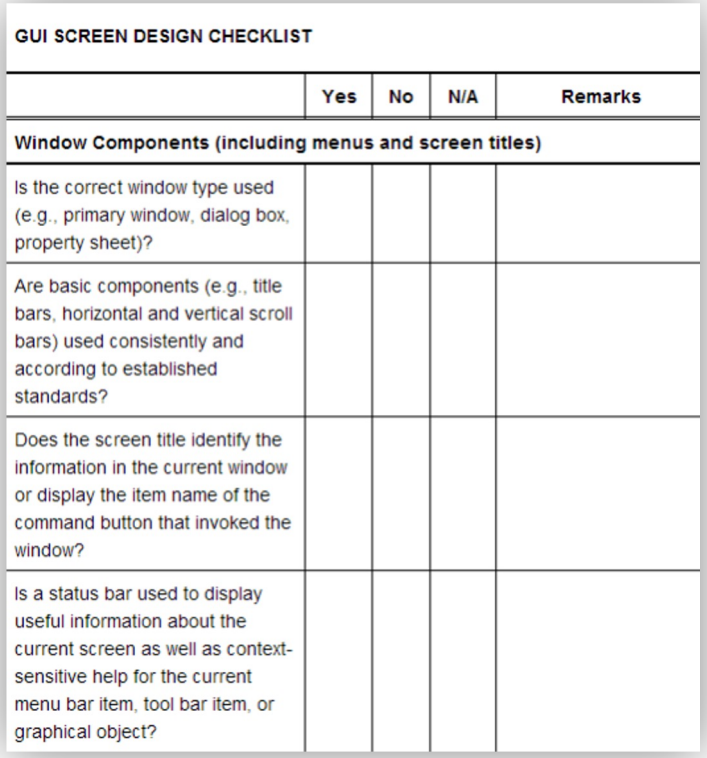
- Expert evaluates keystroke-level interactions (clicks, mouse moves, etc.) with a system to complete a task
- Yields accurate predictions of how much time the task will take on average
- Goal: time efficiency



Parameter	Mean	Range
Eye movement time	230 ms	70-700 m
Decay half-life of visual image storage	200 ms	90-1000
Visual Capacity	17 letters	7-17 lette
Decay half-life of auditory storage	1500 ms	90-3500
Auditory Capacity	5 letters	4.4-6.2 le
Perceptual processor cycle time	100 ms	50-200 m
Cognitive processor cycle time	70 ms	25-170 m
Motor processor cycle time	70 ms	30-100 m
Effective working memory capacity	7 chunks	5-9 chunk
Pure working memory capacity	3 chunks	2.5-4.2 ch

Ex. 2: Heuristic Evaluation

- Expert evaluates system with a checklist of “heuristics”
- Very closely related to Norman’s principles, Shneiderman’s Eight Golden Rules
- “discount” usability method--simple, cheap, fast
- 3-5 experts is optimal



GUI SCREEN DESIGN CHECKLIST

	Yes	No	N/A	Remarks
Window Components (including menus and screen titles)				
Is the correct window type used (e.g., primary window, dialog box, property sheet)?				
Are basic components (e.g., title bars, horizontal and vertical scroll bars) used consistently and according to established standards?				
Does the screen title identify the information in the current window or display the item name of the command button that invoked the window?				
Is a status bar used to display useful information about the current screen as well as context-sensitive help for the current menu bar item, tool bar item, or graphical object?				

Ex. 2: Heuristic Evaluation

http://www.nngroup.com/articles/how-to-conduct-a-heuristic-evaluation/

Nielsen’s 10 Heuristics

- Visibility of system status
- Match between system and the real world
- User control and freedom
- Consistency and standards
- Error prevention
- Recognition rather than recall
- Flexibility and efficiency of use
- Aesthetic and minimalist design
- Help recognize, diagnose, and recover from errors
- Help and documentation

Nielsen’s 10 Heuristics

1. Visibility of system status
2. **Match between system and the real world**
3. **User control and freedom**
4. Consistency and standards
5. Error prevention
6. Recognition rather than recall
7. **Flexibility and efficiency of use**
8. **Aesthetic and minimalist design**
9. Help recognize, diagnose, and recover from errors
10. **Help and documentation**

Heuristic #2: Real World Match

- **Match between system and the real world**
- The system should speak the users' language, with words, phrases and concepts familiar to the user, rather than system-oriented terms.
- Follow real-world conventions, making information appear in a natural and logical order. Refers to word and language choice, mental model, metaphor, mapping, and sequencing.

Heuristic #2: Real World Match

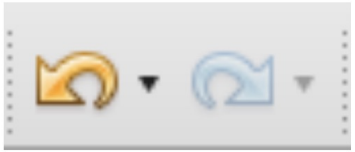
“mailto”, “protocol”?

Speak the user’s language

“mailto is not a registered protocol” —> “Your browser doesn’t have an email app connected”

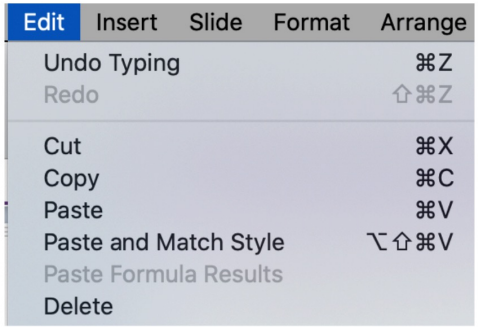
Heuristic #3: User in Control

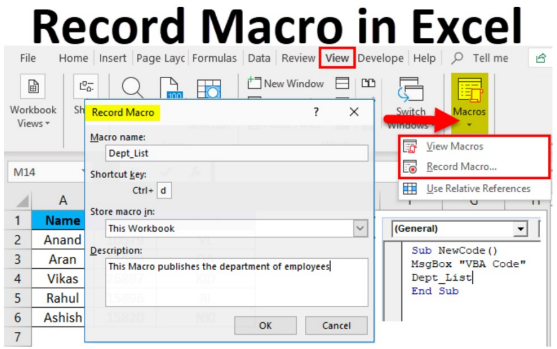
- User control and freedom
- Users often choose system functions by mistake and will need a clearly marked “emergency exit” to leave the unwanted state without having to go through an extended dialogue.
- Support undo and redo. Not just for navigation exits, but for getting out of any situation or state



Heuristic #7: Flexibility and Efficiency

- Avoid repetitive actions that must be done manually. Allow users to automate frequent actions.
- Allow multiple ways to do things.
- UI should cater to both inexperienced and experienced users (accelerators for experts).



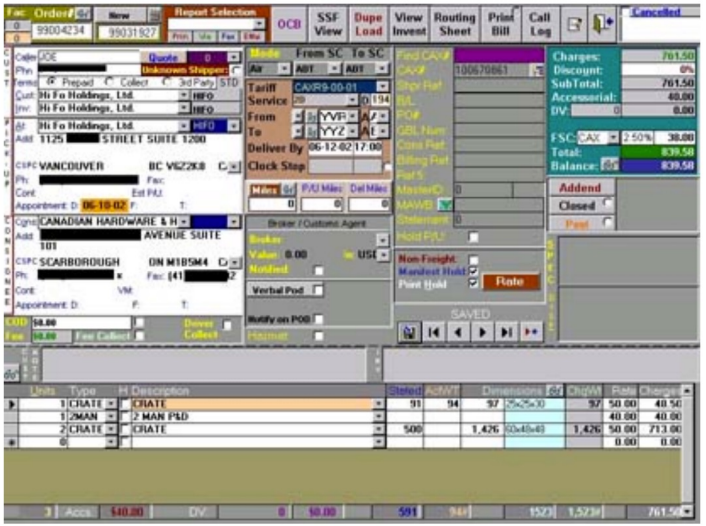


Heuristic #8: Aesthetic and Minimalist Design

- Dialogues should not contain information which is **irrelevant or rarely needed.**
- Every extra unit of information competes with the relevant units of information and diminishes their relative visibility.

Heuristic #8: Aesthetic and Minimalist Design

- Not just about “ugliness”.
- This is about clutter, overload of visual field, visual noise, distracting animations, and so on.



Heuristic #10: Help and Documentation

- Even though it is better if the system can be used without documentation, **it may be necessary to provide help and documentation.**
- Any such information should be easy to search, focused on the user's task, list concrete steps to be carried out, and not be too large.

Heuristic evaluation process

- Evaluators go through interface several times
  - Inspect various dialog events
  - Compare with list of usability principles
- Usability principles
  - Nielsen’s heuristics
  - Supplemental list of category-specific heuristics (competitive analysis of testing existing products)
- Use violations to redesign/fix problems

Examples

- Can’t copy information from one window to another
  - Violates “Minimize memory load” (H6)
  - Fix: allow copying
- Typography uses different fonts in 3 dialog boxes
  - Violates “Consistency and standards” (H4)
  - Slows users down, probably won’t be found by usability testing
  - Fix: pick a single format for the entire interface

Example heuristic violation

- 1. [H4 consistency] [Severity 3] [Fix 4]
- The interface used the string “Save” on the first screen for saving the person’s file, but used the string “Write File” on the second screen.
  People may be confused by this different terminology for the same function.
- Fix: Change the second screen to “Save”.

Phases of heuristic evaluation

- Pre-evaluation and training
  - Give expert evaluators needed domain knowledge & information on the scenario
- Evaluation
  - Individuals evaluate interface and make lists of problems
- Severity rating
  - Determine how severe each problem is
- Aggregation
  - Group meets and aggregates problems (w/ ratings)
- Debriefing
  - Discuss the outcome with the design team

Severity Rating

- Used to allocate resources to fix problems
- Combination of:
  - **frequency** - how common?
  - **impact** - how hard to overcome?
  - **persistence** - how often to overcome?
- Should only be calculated after all problems by all evaluators have been identified
- Should be done independently by all evaluators, then discussed as a group and aggregated

Severity Rating

0 - Do not agree this is a problem.

1 - **Usability blemish**. Mild annoyance or cosmetic problem. Easily avoidable.

2 - **Minor usability problem**. Annoying, misleading, unclear, confusing. Can be avoided or easily learned. May occur only once.

3 - **Major usability problem**. Prevents users from completing tasks. Highly confusing or unclear. Difficult to avoid. Likely to occur more than once.

4 - **Critical usability problem**. Users will not be able to accomplish their goals. Users may quit using system all together.

Ex. 3: Cognitive Walkthrough

- Heuristic evaluations focus on the **product as a whole**, while cognitive walkthroughs focus on **specific tasks**.
- Evaluation method based on:
  - A person works through an interface in an exploratory manner
  - A person has goals
  - The person is applying means-ends reasoning to work out how to accomplish these goals
- Evaluation by an expert, who goes through a task while simulating this cognitive process

Preparation: need four things

- Person description, including level of experience and any assumptions made by the designer
- System description (e.g., paper prototype)
- Task description, specifying the task the expert has to carry out, from a person's point of view
- Action sequence describing the system display and the actions needed to complete the task. One system display and one action together are one step.

Cognitive walkthrough process

- Designer/developer prepare the required documents described
- Give these documents to the usability expert
- Expert reads the descriptions, carries out the task by following the action list
- At each step in the action list, asks four questions
- Record problems similar to heuristic evaluation

Cognitive Walkthrough Questions

At each step:

- Will the user try and achieve the right outcome?
- Will the user notice that the correct action is available to them?
- Will the user associate the correct action with the outcome they expect to achieve?
- If the correct action is performed; will the user see that progress is being made towards their intended outcome?

Pros/Cons of Expert Review

- Fast, cheap & easy
  - (Almost) anyone can do one
  - Can use at any time in development process
  - Requires few resources
- Good at identifying obvious problems

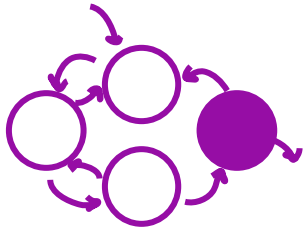
- Doesn't involve real users
  - Susceptible to making assumptions about users
- Less good at identifying deep usability issues

Activity 14

15 minutes

Activity 14: Heuristic Evaluation

- In pairs, consider UTSA Canvas website
- Describe how it violates two of the usability principles
- Measure severity of the violation
- Submit answer to Canvas individually for credit



Human Computer Interaction

Taslima Akter

Design Processes & Methods – Part 9

Materials in this course were compiled from courses taught by: Matt Bietz, Stacy Branham, Tyler Fox, Elena Agapie, Nigini Oliveira, Katharina Reinecke, Andrew Davidson, Jennifer Turns, Daniel Epstein, Andrea Hartzler. Thank you to all.