Design of Human Computer Interface – Notes

LECTURE 2 (9/5)

CHAPTER 1 contd...

Design Principles

* **Visibility**
  so that user can understand what to do next.

* **Feedback**
  sending info back to user about what has been done
  e.g. animated cursor, color change, message etc. pop up.
  → needed so that user can continue on with the next piece of activity

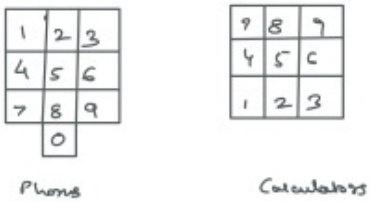
* **Constraints**
  → helping prevent user from making a mistake
  → restricting possible actions that can be performed at a given moment.

* **Consistency**
  → be consistent throughout the design
  → design interfaces to have similar operations and use similar elements for similar tasks
  e.g. Ctrl+A, Ctrl+S, Ctrl+O
  consistency can, however, become down too
  ↳ have to find other initials/combinations of keys

  Internal & External Consistency
  ↳ Designing operations to behave the same within an application

  Designing op.s, interfaces etc. to be the same across apps and devices

External inconsistency



Phone Calculators

* **Affordances**
  Refers to an attribute of an object that indicates how to use it
  e.g. flick switches, door knobs

  ○ Perceived affordances
  → learned conventions of arbitrary mappings b/w action and effect at the interface

CHAPTER 2

① User Research
② Wireframing

★ the why & how of what you're going to design

What is an assumption?
Taking something for granted while it still needs investigation

What is a claim?
Stating something to be true when it is still open to question

Q What do you want to create?
Q What are your assumptions
Q will it achieve what you hope it will?
Q Are there existing problems? why do they exist?

3D TV Case Study: Assumptions

Ppl wouldn't mind wearing special glasses (reasonable)
Ppl wouldn't mind paying a lot more (not reasonable)

Conceptual Model (Blueprint)

- High-level description of how a system is organized and operates
- Enables designers to straighten out their thinking before they layout their widgets

★ Benefits of conceptualizing
★ From Problem to Design space

Presentations / Projects.

Big Doc { Ppt, Demo, Video } Document Submission

Review it before submitting

① Ppt: week 4 (20 min)
each group will present
everyone must take an equal amount.

② By next week
send email with group members names by next class.
cc your members

explain using knowledge of class
- target users
- easy to learn
...

2 Slides
↙ ↘
UI + Functionality | Wireframe/Sketch

- Project has working functionalities - explain some in presentation
- Everybody needs to work on both front-end / back-end i.e. all aspects
- Larger scope, needs to have some no. of functionalities in the guide

Q Are we limited to 2 slides?
Q When is the guide getting posted?

LECTURE 3: CHAPTER 2 CONTD. (9/12)

Conceptual Model can be thought of like a blueprint
Benefits of Conceptualising

- Orientation
- Open minded
- Common Ground
-

Having a good understanding of the problem space can help understand the design space

Conceptual Model - High level description of how a system is organized and operates. Enables designers to straighten out their thinking before they start laying out their widgets.
One simple way vs a variety of ways

Interface Metaphors
Conceptualize what we're doing
a conceptual model instantiated at the interface
visualizing an operation e.g. icon of a shopping cart
Activity: Search some common ecommerce websites and see if they have cart and checkout options trends
Material Metaphors: card is a popular UI
Interaction Types

1. **Instructing** - issuing commands and selecting options:
    1. Users tell the system what to do.
    2. Examples include typing words or commands such as "print this file" or "delete this file".
2. **Conversing** - interacting with a system as if having a conversation
    1. This can range from a simple menu system to a complex dialogue.
    2. Examples include virtual agents, pet robots, toys, and menu-driven systems on cell phones.
    3. The key takeaway is two-way communication.
    4. Pros and cons: Novice users may interact with the system in a familiar way, but misunderstandings can arise due to their lack of experience with it.
3. **Manipulating** - closing, opening, moving marbles in the answering machine, etc.
    1. Involves dragging, selecting, opening, closing, and zooming actions on virtual objects.

2. Exploits someone's knowledge of how they move and manipulate objects in the physical world.
3. Direct manipulation involves the continuous representation of objects and actions of interest, using physical actions and button pressing instead of issuing commands with complex syntax. This allows for rapid, reversible actions with immediate feedback on the object of interest.
4. Why are DM interfaces so enjoyable? novices can learn basics quickly and experienced users can work rapidly. Error messages rarely needed.
5. Disadvantages with DM: spellchecking manually. moving mouse around the screen can be slower than pressing the function keys to do some actions. DM can become screen space gobblers.

4. Exploring- moving through a virtual environment or physical space
    1. Physical space with embedded sensor technologies

Chapter 3 - Cognitive Aspects

Cognitive refers to being related to or involving conscious intellectual activity such as thinking. It is important to understand the cognitive capabilities and limitations of users. Cognitive processes include:

- Attention
- Perception
- Memory
- Learning
- Reading, speaking, and listening
- Problem-solving, planning, reasoning and decision making

Cognition can also be classified at a higher level as fast vs slow thinking (Kahneman, 2011) and experiential vs reflective cognition (Norman, 1993).

Attention

Having relevant goals can make the decision-making process easier. It is important to consider what is relevant at that point in time and whether the user's attention will be drawn to the relevant information.

Attention involves both audio and visual senses. Focused and divided attention allows us to be selective.

As an example activity, try finding the price of a double room at the Holiday Inn in Columbia (as shown in the slides).

Is it possible to perform multiple tasks without one or more of them being detrimentally affected? Heavy multitaskers are easily distracted and find it difficult to filter out irrelevant information.

Design Implications for Attention

- Make important information stand out when it needs to be attended to.
- Use techniques such as color, ordering, spacing, underlining, and sequencing to make things stand out.
- Avoid cluttering the interface.
- Simple and clean interfaces for search engines and form fillings are easier to use.

Perception

How information is acquired from the world and trasnformed into experiences
design representations that are readily perceivable - sight, hearing, text
Tabs, Margins, Padding help to add breathing room
Design Implications

- Icons should enable users to readily distinguish
- sounds should be audible and distinguishable
- tactile feedback should allow users to recognize and distinguish meanings
- Bordering and spacing are effective ways of visually grouping information

Memory

We recognize things better than we recall things. Context is important for remembering.
First encode and then retrieve knowledge
The more attention paid to something, the more likely it is to be remembered

Recognition vs Recall

All things dont have equal ability to be recognized/recalled
GUIs in MP3 players give users visual options that users need only browse through until they recognize one
Activity: Remembering Stuff (average 7-8)
8, 6, 0, 1, 34, 56, 78, 2
Dog, horse, snake, bird, cat, doplhin, tiger, elephant
cheddar cheese, hot weather, banana split, hot chocolate, jazz music
Since we can recognize better than we can recall, we can have more than 7-8 icons, tabs etc.
Digital Content Mangement- Recall-directed and recognition-based scanning. For example, Apple's spotlight tool
Memory Aids- sensecam device, developed by microsoft, can improve memory
Design Implications- conistently placing things

Learning

Active learning
People find it hard to learn by following instructions in a manual
how to learn to use a computer based application
Dyna-linking - diagram/abstract representation linked with a concerte illustration. changes in one is matched to changes in the other.
Expecting to have internet access reduces the need and extent to which we remember

Design interfaces that encourage exploration and that constrain and guide learners

Reading, Speaking and Listening

The ease with which ppl read speak and listen differs:
Many people prefer listening over reading
Reading can quicker than the others
dyslexics have problems with reading
Applications- voce UIs like siri, Alexa, etc. Chatbots, TTS systems are more examples
Design Implications-

- speech based menus and instructions should be short
- accentuate the intonation of artificially generated speech voices
- provide opportunitites for making text larger on a screen

Problem Solving, Reasoning and Decision Making

All these involve reflective cognition
Design Implications- Provide info and help pages that are easy to access for people

Mental Models - everyday reasoning (thermostat vs faucet)

GOAL: Mental model should match conceptual model
Gulfs of execution and evaluation

Chapter 5- Emotional Interaction (9/26)

Affect and reflection
Angry-less tolerant
Happy- designers can get away with small errors/minor things
Expressive Interfaces - color, icon, graphical elements and animations are used to make the look and feel of an interface appealing

The aesthetics of an interface has an impact on how people perceive the interface's usability

Friendly Interfaces - slides
Sometimes some interfaces might cause unintentional negative emotions
when something is complicated when it should have been simple, it can also cause negative emotions

Frustrating interfaces
app crashes
lot of steps that if canceled, results in loss of progress
system doesnt do what the user wants
when appearance of the interface is noisy, gimmicky, etc.

Gimmicks
amusing to the designer but not necessarily to the user

Errors
Word has unexpectedly crashed due to type 2 error. Avoid terms like Fatal, invalid, bad etc.

Have precise rather than vague error messages.
AFFDEX SDK: detects emotions of the face

Persuasive Tech and Behavioral Change
When you are deliberately trying to change people's behavior and attitudes. e.g., pop up ads, reminders etc. Trying to **persuade**
Nintendo's pocket pikachu -changing bad habits and improving well being

Tracking Devices
Fitbit, Apple Fitness

Anthropomorphism
attributing human like qualities to inanimate objects like cars, computers, virtual pets, robots, Grocery Store breakfast cereals, etc.
Computers that flatter and praise users in education software program

Criticism- people prefer impersonal, make users feel less responsible for their actions is better
Virtual Characters
People found Clippy annoying and frustrating

Next Class
On Blackboard, same timings

1. Quiz
    1. live at 6:10
    2. **Tests** tab, will become visible at the time
    3. 35 minutes, 25 questions
    4. Study/Prepare very well - read the book and notes
    5. Chapters 1,2,3,4
    6. MCQs, True/False, Fill in the blank
2. Feedback Session

Chapter 7: Gathering Data (10/17)

Interaction Design
Establishing Reqs
Design Alternatives
Prototyping
Evaluating

Five Key Issues:

1. **Setting goals**
   - Goals you set will influence the nature of data gathering. What techniques used and what analysis.
   - e.g, which of these icons is the most interesting?
   - Once goals are established, we can think about the data to look for and what to do with it.
2. **Identifying participants**
   - Who to gather data from? Who fits the profile?
   - Sampling- choosing who will participate in data gathering. **Saturation sampling** (access to all members of target population). **Random sampling**. **Stratified Sampling** (divide the population into groups then random sampling). **Convenience sampling** (they are available). **Volunteer Panels** (prepared to participate).
3. **Relationship with participants**
   - Must be clear, professional
   - **Informed consent form**- explain and provide info like how data gathered will be used, protection of personal info and if participant wants to withdraw etc.
4. **Triangulation**
   - Concerned with investigating from different perspectives
   - Multiple sources of data enhances **credibility**
5. **Pilot Studies**
   - A study you do before the real one
   - A small trial run- check equipment, questions, potential problems can be discovered, things can be anticipated at this time.

If someone has participated in the Pilot study, they cannot participate in the main study.

Data Recording

Notes, photos, audio/video, etc. each with its merits and de-merits

Interviews

- Unstructured Interviews- no script, no structure. Rich but hard to replicate.
-
- Structured Interview- tightly scripted, questionnaire, can be replicated easily but not as rich
- Good to use when goals are super clear and understood
- Giving specific options for choice of answer
- Semi-structured- half structure half not. Script but can go outside if there is more to explore.
- Focus Groups- Group interview, someone leads the group and lets them discuss. Environment is supportive.
- Meant for scenarios that can benefit a group setting e.g. community issues

Interview Questions

1. Closed questions- specific answers to choose from. Easy to analyze
2. Open questions- no pre determined format

Avoid:

- Having long questions
- Compound sentences
- Assumptions
- Jargon
- Leading questions (why do you like…)
- Unconscious bias

Running the interview

Introduce yourself, explain goals, reassure ethical issues, ask to record, consent form

Warm up- non threatening, easy questions
Main Body- present questions in logical order. more probing questions at the end
Cool-off period- few easy questions at the end
Closure- thank interviews and signal end

<u>Activity</u>

Three closed interview questions (i.e., pre-determined format). Also provide possible answers for these questions.

1. On a scale of 1-10 how important are dietary restrictions in meals for you?

2. Do you prefer restaurants in the same area with less variety of meals, or restaurants in a wider area with more variety?
3. For future scope for a better experience with your profile, would you prefer a section for favorited meals, favorited restaurants, or both?
4. Would you prefer to get notified (email/text message) when meals from a certain restaurant become available? (Yes/no) break down the email assumption

Five Common Interview mistakes to avoid-
- Insufficient Rapport or Too much rapport
- Not probing enough
- Multitasking - note taking
- Allowing observers to influence the interview
- Leading the participant

Do open ended questions, purpose of the study vague

Questionnaires
Questions can be closed or open questions.
Sampling can be a problem when population size is unknown

Design:
- Question order can influence the impact
- May need different versions for diff populations
- Avoid having long questionnaires
- Decide if phrases are positive, negative etc.
- Give clear instructions to complete the questionnaire

Question and response format
- **Rating scales**
  - *Likert Scales* - Set of statements representing a range of options. Consistency is important. Let participant know what the highest is (e.g., 5). Used for measuring opinions, beliefs and attitudes.
  - *Semantic Differential scales* - choose a pair of words that represent a range of possible options. Bipolar attributes. Helpful/unhelpful, satisfied/unsatisfied. Boring/Exciting.
  - *3,5,7 or more points*- no overlap for range of answers
- **Yes/No Checkboxes**
- **Checkboxes with many options.**

Encouraging a good response

- Make sure purpose is clear
- Promise anonymity
- Ensure it is well designed
- Offer a short version for those who don't have time

Advantages/disadvantages of online questionnaire?

Observation

1. Direct observation in the field
   - If you don't plan you can receive a lot of data and that might be hard to analyze
   - Should be flexible to adapting to situations

2. Structuring frameworks to guide observation
   - Keep goals and questions in focus
   - The Person (who is using), The Place (where are they using), The Thing (what are they doing with it)
   - More detailed:
     - Space
     - Actors
     - Activities
     - Objects
     - Acts
     - Events
     - Time
     - Goals
     - Feelings
3. Observation in the field
   - <u>Context</u> is important- how ppl interact with one another, environment and technology
4. Observation in a controlled environment
   - Emphasis on <u>what</u> individuals do
5. Thinking out loud technique

LECTURE 10 - PROTOTYPING, FIDELITY (10/31)

Prototypes

Can be all different kinds. A paper is a paper prototype.
Series of screen sketches
Lump of wood
Cardboard mockup

- Purpose of the prototype has an influence on the kind of prototype built
  - e.g., prototype that lets autistic children communicate
- **Low Fidelity Prototyping**
  - Where the medium for them is not like the final medium of the product
  - Paper/cardboard prototype, post it notes, storyboards, wizard of oz, task sequences
  - Quick to make, inexpensive and can change pretty quickly
  - Doesn't look like the final product
  - **Storyboard**
  - **Sketching:** important to low fidelity prototyping. Doesn't have to be a really good drawing.
  - Progressive Disclosure: if the user wants more information, they can get more information
- **High Fidelity Prototyping**
  - User materials you would expect in the final product
  - Prototype looks more like the final product
  - Two common types of compromise:
    - **Horizontal- wide range of functions less detail**
    - **Vertical- few functions more detail**
  - **Conceptual Design**
  - **Interaction design**
  - **Concrete design**
    - Colors, icons buttons
    - User characteristics, context
    - Accessibility
    - Cross cultural design
- Can Generate card based prototype from use case

LECTURE 11 - Evaluation (Chapter 13) (11/7)

Evaluation is on both **usability** (how easy to use and learn) and **user experience** of the system.
Methods of Evaluation

Why, what, where and when to evaluate: Being usable alone is not enough.

- **WHY**
  - Check user reqs, see if they like it
- **WHAT**
  - Conceptual model, early prototype, more complete prototypes
  - Website selling clothes: evaluate **navigation,** see if its **secure** (since you're purchasing)
  - Toy for a 5 year old child: **safety**, **appearance, attractive, engaging, manipulate**
- **WHERE**
  - Depends on what's being evaluated (lab/controlled env, or a natural setting)
  - Remote studies- social networking behavior
  - Living Labs: mix of labs and the wild setting
- **WHEN**
  - Related to the type of product
  - Throughout design finished products can be evaluated

Types of Evaluation *

- Controlled setting
- Natural settings - context plays a role
- Settings not involving users - to predict analyze and model aspects of the interface

Participants' rights and getting their consent- participants need to be told why evaluation is being done, what they'll have to do. They can withdraw at any time, and sign **Informed Consent Forms**.

Things to consider when interpreting data

- **Reliability**
  - *How reliable a method is to produce the same result on different occasions under the same circumstances*
  - If it is reliable, two evaluators should get similar results.
  - Different evaluations can have different degrees of reliability

    - e.g., observing users in their **natural setting** vs a **controlled experiment** (high reliability since easy to replicate)
    - **Unstructured interviews** have low reliability
- **Validity**
  - *Does the evaluation method measure what it is intended to?*
- **Ecological Validity**
  - *Does the environment of the experiment distort the result?*
  - Studies that don't impact location etc have high ecological validity
- **Biases**
  - Can be unconscious
  - Can lead to distorted results
  - e.g. certain evaluators can do things differently, tone of questions, etc.
- **Scope**
  - *How generalizable are the results*
  - Findings from the study

Exercise: parking signs

- Cons
  - Information overload
  - Goal doesn't match design
- Pros
  - Red and green universally understood
  - Good clear visibility
  - Red lines vs solid green for colorblind
  - No info overload

Random houses

- Not sure we can click on then
- Don't know where we're gonna go

Clever Design
Exercise: website best and worst features
Embrace UI: Adam Argyle- YouTube videos