Participatory Design

COMP2044: Human-Computer Interaction (2024-2025)

Matthew Pike

Overview

Objectives for today

- Motivate what participatory design is and why it is important.
- Understand the different levels of prototyping and when to use them.
- Explore different components of usability.

Participatory Design

What is Participatory Design?

"Participatory design is built on the principles of collaboration, co-creation, and empowerment. Users contribute to the design process, which allows them to provide feedback, suggest ideas, and participate in decision-making. The goal is to create products and services that accommodate users' needs and help them achieve their objectives."

(Interaction Design Foundation - IxDF, 2023)

- Aims to actively involve users as members ("stakeholders") of the design team from the beginning of the design process.
- Contrasts with experimental approaches that treat potential users as passive subjects.

Prototyping

What is a prototype?

- A manifestation of a design which users can explore.
- In other design fields a prototype is a scale model:
  - a miniature building or town (architecture or civil engineering);
  - A scaled-model from miniature to 1:1 – (automotive design).

Figure 1: Lego is a great tool for prototyping in the physical world

- Interactivity makes things more complicated. We need to consider carefully how a user *may* interact with a system.
- We may use a range of fidelities to prototype an interactive system:
  - a series of screen sketches (paper or digital);
  - a storyboard;
  - a video simulating system use;
  - a lump of wood(!);
  - a piece of software with limited functionality.

Figure 2: The original prototype for the PalmPilot was a block of wood. Image from the Computer History Museum with the supporting description - "Jeff Hawkins tested the PalmPilot's design with this model, using a chopstick for a stylus. He took pretend notes in meetings, and counted the steps it took to perform common tasks."

What to prototype?

- **Work flow**: sequence of inter-connected operations.
- **Form factor**: physical dimensions, weight, materials, etc.
- **Interaction modalities** – in what way will users interact with the system and for what tasks?
  - what modalities will be used?
  - which ones are best for which task/scenario?
- **Screen layouts and information display**: Check display is intuitive, meets users' needs.
  - Does the design adhere to relevant guidelines?
- **System breakdowns and recovery** – Test how users might react to an error/failure situation
  - do they understand what is happening and what to do about it?

Why Prototype?

- **Tangible Experiences for Stakeholders**: Prototypes allow stakeholders to be directly involved and provide a more concrete understanding than, for example, written documents.
- **Enhances Communication**: Prototyping facilitates clearer communication between team members and stakeholders, bridging gulfs and misunderstandings.
- **Promotes a Reflective Practice**: Encourages critical reflection - a crucial element of the design process.
- **Decision Support**: An investigative tool that allows designers to explore and evaluate design alternatives and answer fundamental design questions.
- **Cost Efficiency**: Modifying a prototype is significantly more cost-effective than altering a finished product, making early-stage adjustments financially prudent.

When to prototype?

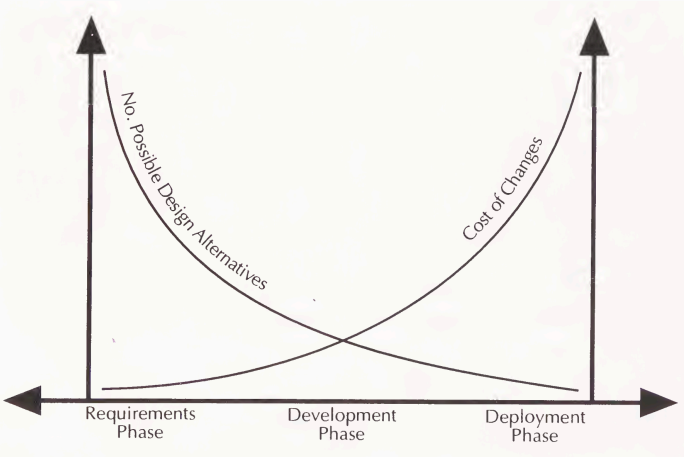

Figure 3: Ehrlich and Rohn identified the relationship between project phase and the number of possible designs and their impact on project cost (Ehrlich & Rohn, 1994).

Levels of Prototyping

- Prototyping can be divided into three levels of fidelity: low, medium, and high.
- The distinction between these levels is based on the medium, detail, and guidance of the prototype.
- The choice of fidelity depends on the design phase, the design question, and the audience for the prototype.

Low Fidelity Prototyping

- **Medium**: Uses a medium unlike the final medium.
- **Effort/Time**: Quick and easy to create.
- **Cost**: Inexpensive.
- **Benefits**:
  - Evaluate multiple design ideas.
  - Aids in communicating and discussing design challenges.
  - Encourages feedback and iteration.
- **Drawbacks**:
  - Limited in the level of detail and realism.
- **Examples**:
  - Sketching, storyboarding, post-it notes, card-based prototyping, video scenarios.

Figure 4: Low cost materials such as post-it notes, paper, push-pins, string, and tape can be used to create low-fidelity prototypes.

Low Fidelity: Video Scenarios

- Gives viewers / users a holistic sense of how an interaction might work
- Requires a reasonable understanding of how to produce video (and some technical competence)
- Not good for interface design but broader interaction design

Example of a Video Scenario: Sketch a Move

- https://www.youtube.com/watch?v=mgnNDGOq-TY

Low Fidelity: Card-based Prototyping

- An index card is used to represent one screen or part of a screen.
- The user can step through the cards during user evaluations, pretending to perform the task while interacting with them.
- Screens or screen elements can be manipulated and moved around to stimulate interaction.

Example of Card-based Prototyping: Hanmail

- https://www.youtube.com/watch?v=GrV2SZuRPv0
- Another example: https://www.youtube.com/watch?v=kKtFE_MZ_5k

Levels of Prototyping: Medium Fidelity

- **Medium**: Again, Uses a medium unlike the final medium.
- **Effort/Time**: Requires more effort than low-fi but gives the user a better feel for the interaction.
- **Cost**: Typically more expensive than low-fidelity prototyping.
- **Benefits**:
  - Balances the provisionality of paper with the polished appearance of s/w prototypes.
  - Characteristics of both low and high fidelity prototyping.
  - Can be generated using familiar tools like PowerPoint, Keynote, or HTML/CSS.
- **Drawbacks**:
  - Still limited in the level of detail and realism.
- **Examples**:
  - Wizard of Oz prototyping;
  - PowerPoint;
  - More recently - Figma, Sketch, Adobe XD, etc.

Medium Fidelity: Wizard of Oz Prototyping

- A human “wizard” simulates the behavior of the system.
- The user interacts with the system as if it were fully functional.
- The wizard provides the system’s output based on the user’s input.
- The user is unaware that the system is not fully functional.
- Example: https://www.youtube.com/watch?v=uKMYf-UdRio

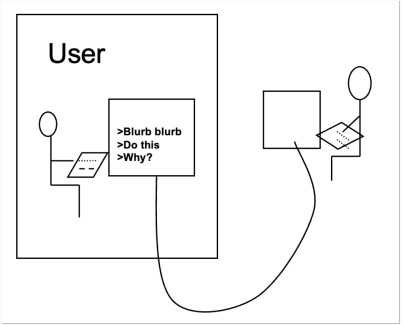

Figure 5: Using Wizard of Oz Prototyping can be an effective way to prototype realistic user interactions with a system.

Levels of Prototyping: High Fidelity

- **Medium**: Uses materials you would expect to find in the final product.
- **Effort/Time**: Greatest effort and time required.
- **Cost**: Most expensive.
- **Benefits**:
  - Provides a realistic representation of the final product.
  - Users may be unaware that they are interacting with a prototype.
- **Drawbacks**
  - Danger that users think they have a full system ...
  - Time and cost to create - potentially wasted if the design changes.

Compromises in Prototyping

- All prototyping involves trade-offs between cost, time, and fidelity. These are called compromises.
- Two common types of compromise - horizontal and vertical.
  - **Horizontal Compromise**: Prototype with a wide range of features but lacks depth in any one area.
  - **Vertical Compromise**: Prototype that covers a narrow range of features but does so in great depth.
- Compromises must be considered carefully and their impact on the design process understood.

Usability (Revisited)

Measuring Usability

- We can measure usability, but it is multidimensional. We cannot say a system is 80% usable.
- We can measure:
  - **Effectiveness**: How well users can achieve their goals.
    - e.g., the number of tasks completed, the number of errors made, etc.
  - **Efficiency**: How much effort is required to achieve the goals.
    - e.g., time taken to complete a task, the number of steps required, etc.
  - **Satisfaction**: How much users enjoy the interaction.
    - e.g., user ratings, feedback, etc.
- Can't necessarily design a product for every possible context - some products clearly need to be designed for a specific use.
  - e.g. An emergency phone in a lift.

Components of Usability

(Jordan, 2020)

- **Guessability**: Cost to the user in using a product to perform a new task for the first time.
- **Learnability**: Cost for a user to achieve a competent level of performance on a task.
- **Experienced user performance**: Someone who has used a product many times before should be able to perform particular tasks with consistent ease.
- **System Potential**: The maximum level of performance that could be achieved in theory.
- **Re-usability**: The possible decrement in performance after the user has not used the product for a comparatively long period of time.

(Nielsen, 1994)

- **Efficiency** - Once users have learned the design, how quickly can they perform tasks?
- **Learnability** – Similar to Jordan's "Learnability".
- **Errors** – How many errors do users make, how severe are these errors, and how easily can they recover from the errors?
- **Satisfaction** – How pleasant is it to use the design?
- **Memorability** – Similar to Jordan's "Re-usability".

Seven Principles for Transforming Difficult Tasks into Simple Ones (Norman, 2013)

- Use both **knowledge** in the world and knowledge in the head.
- **Simplify** the structure of the task.
- Make things **visible**. Bridge the Gulfs of execution and Evaluation.
- Get the **mappings** right.
- Exploit the power of constraints both natural and artificial.
- Design for error.
- When all else fails, standardise.

Figure 6: The importance of simplifying an interface cannot be overstated. Removing features can be as difficult as adding them.

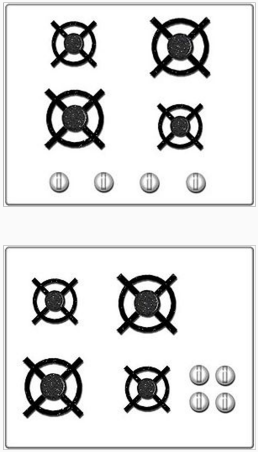

Figure 7: Which of the two designs has the more successful mapping? Why don't all designs use the more effective mapping?

Figure 8: Poor mapping is but one of a number of design issues at play here. Recall Gestalt ...

Conclusion

Summary

- Participatory design is an approach to design in which users are actively involved as members of the design team from the very beginning of the design process.
- Prototyping is essential in the design process. It enables designers to explore and evaluate design alternatives and answer fundamental design questions.
- Prototyping can be divided into three levels of fidelity: low, medium, and high.
- Usability is a complex idea that can be measured by how effective, efficient, and satisfying it is.
- Usability has several components, such as learnability, experienced user performance, and system potential.
- Norman proposes seven principles for transforming difficult tasks into simple ones.

Web Articles

- Usability 101: Introduction to Usability
  - https://www.nngroup.com/articles/usability-101-introduction-to-usability/
- UX Prototypes: Low Fidelity vs. High Fidelity
  - https://www.nngroup.com/articles/ux-prototype-hi-lo-fidelity/

References

Ehrlich, K., & Rohn, J. A. (1994). Cost justification of usability engineering: A vendors's perspective. In *Cost-justifying usability* (pp. 73–110).

Interaction Design Foundation - IxDF. (2023, March 17). *What is participatory design?* https://www.interaction-design.org/literature/topics/participatory-design

Jordan, P. W. (2020). *An introduction to usability*. Crc Press.

Nielsen, J. (1994). *Usability engineering*. Morgan Kaufmann.

Norman, D. (2013). *The design of everyday things: Revised and expanded edition*. Basic books.