User Interface Design

User Centred Design

Models and Methods

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Aims and Objectives

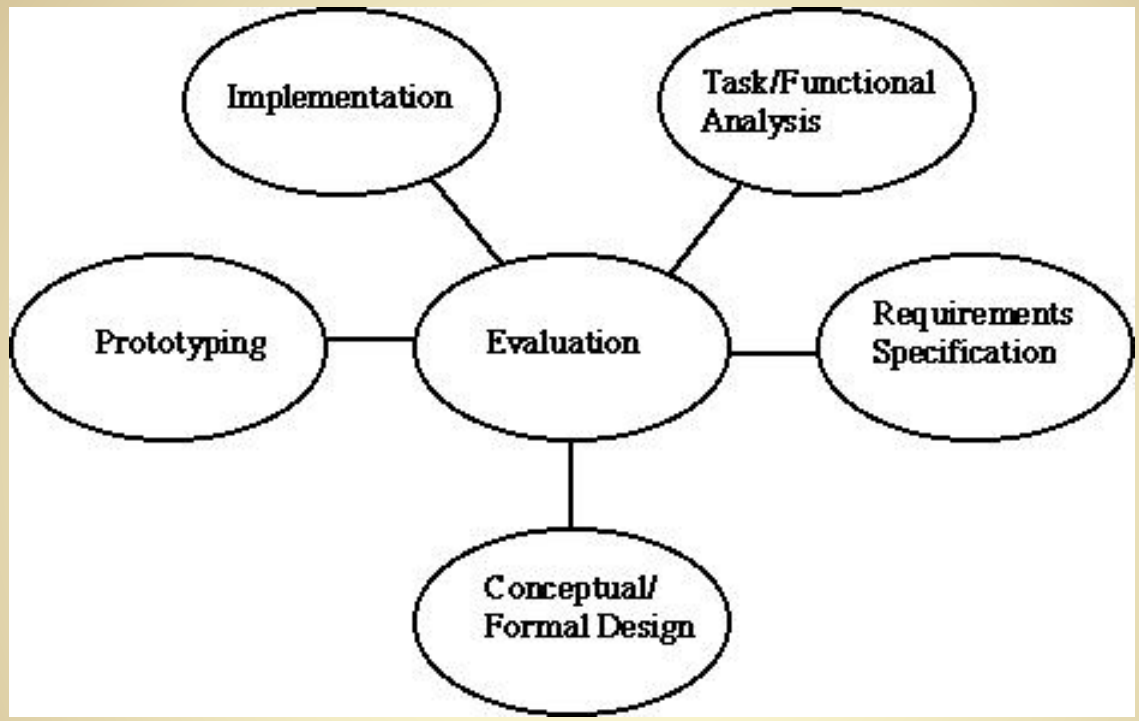
- This lecture relates to the learning outcomes of:

  apply the principles, concepts and models of user-centred design methods to the development and evaluation of interactive system interfaces;.

HCI Design Models

- The Star Life Cycle (Hix and Hartson)
- Interface Design and Usability Engineering (Saul Greenberg)
- The LUCID Design Framework (Logical User Centered Interaction Design)
- Iterative Design Process (Design, Implementation, Evaluation)
- Discover, Design, Use (John Cato)

The Star Life-Cycle



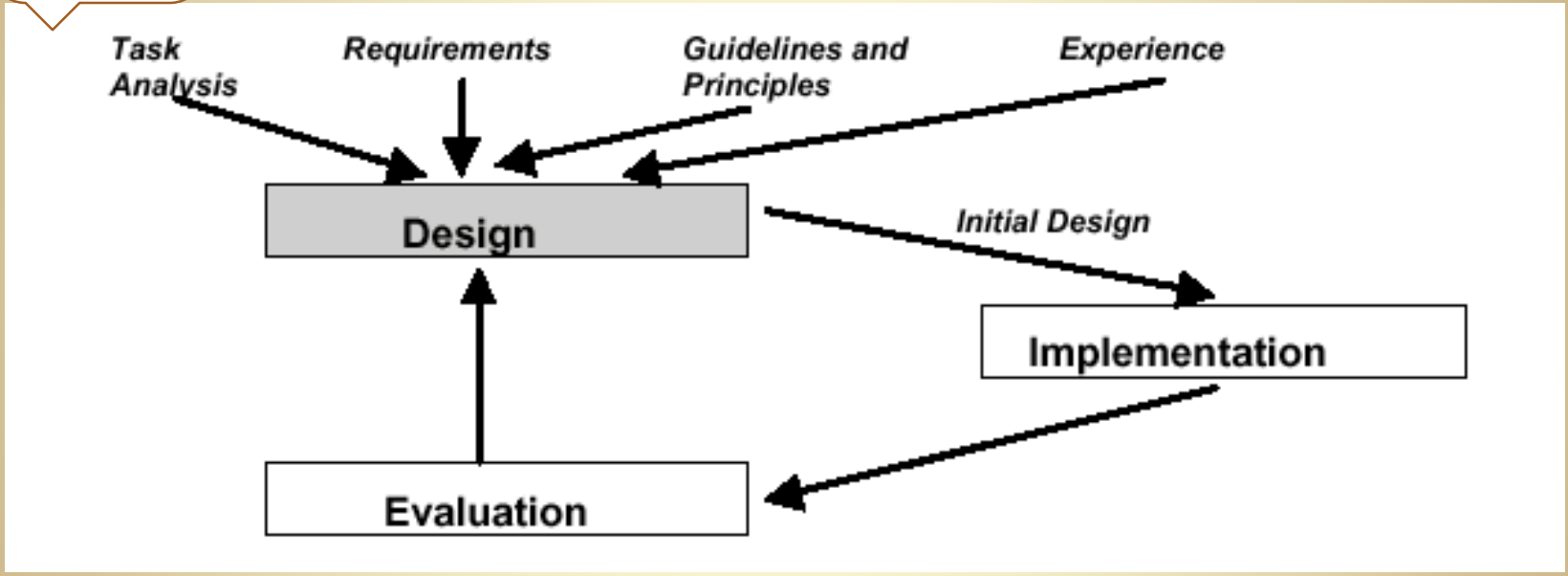
Overview

The activities in the LUCID framework are organized into six "stages":

Envision	Develop a clear, shared and communicable vision of the product. Decide on the usability goals for the interface design. "UI Roadmap" to document the preliminary analysis and concepts developed during these activities
Conduct User and Task Analysis	Perform a comprehensive and systematic analysis of user task requirements through studying users to understand needs, expectations, tasks and work process and determine implications for the interface of this information
Design and Prototype	Create a design concept and create a key screen prototype to illustrate it
Evaluate and Refine	Evaluate the prototype for usability and iteratively refine expand the design.
Complete Detailed Design and Production	Complete the detailed screen design for the full program. Develop all user-assistance material included in the interface. Manage late-stage change.
Evaluate and Refine	Repeat usability evalution activities with early versions of the program or an enhanced prototype.
Release and Follow Up	Plan and implement the introduction of the product to users, including final usability evaluations to ensure that the has met the goals established at the beginning of the project. Create and monitor feedback mechanisms to gather data for future releases

Use Cases
Scenarios
Storyboarding

Iterative Design Using Prototypes



Usability engineering lifecycle model

- Holistic view of usability engineering
- Provides links to software engineering approaches, e.g. OOSE
- Stages of identifying requirements, designing, evaluating, prototyping
- Can be scaled down for small projects
- **Uses a style guide** to capture a set of usability goals

Gathering requirements

Focus Groups

- Qualitative research is where you ask small groups of people about their opinion of eg what the system/interface should have.
- Used usually to gather requirements
- Discussions are all group based and participants freely share their thoughts and ideas.

Card Sorting

- Used when interviewing users
  - Place out range of cards which show functionality and user should pick out a key set of cards that are of a particular challenge to them.
  - Second stage is to ask them to select cards that do not present a challenge.
  - This technique provides a good basis for interview.

- Used for web site design
  - Each page/section gets its own card and description
  - Participants are asked too group cards however they feel makes sense and to describe the decisions made.
  - For best effect need 10-15 people.

Example

Task Analysis

- Task analysis is not just one technique but the name for a whole group of techniques that focus on understanding how the user goes about their tasks.

- Task analysis is about understanding the task (including non-computerised aspects) rather than analysing the functional requirements of a system.

Paired Task

- Write down instructions to make a jelly and peanut butter sandwich

- Solution example of jelly and peanut butter sandwich!

Ways to use TA

What the user is analysed doing	Purpose of task analysis
Performing a manual task	Computerise or provide computerised support for the task
Performing a task using an existing computerised system	Rewrite or update the system
Performing a task using an existing computerised system	Evaluate the usability and fitness for the task of the system
Performing a task using an existing computerised system	Provide documentation or training for using the system

Using Task Analysis

Data Gathering

- **System documentation**
- **Observation** of users carrying out tasks is one of the most valuable techniques
- **Interviews** can be used as a very direct way to get information from users and experts
- **Questionnaires** for asking specific questions. Can reach many people with low resource.
- **Focus groups and workshops** for collecting multiple viewpoints.

Human-Centred Design Methods

Method	Cost	Output	Sample size	When to use
Focus groups	Low	Non-statistical	Low	Requirements gathering
Card Sorting	High	Statistical	High	Design
Usability testing	High	Statistical & non-statistical	Low	Design & evaluation
Questionnaires	Low	Statistical	High	Requirements gathering & evaluation
Interviews	High	Non-statistical	Low	Requirements gathering & evaluation

Usability Evaluation Methods

Contextual Inquiry

- An approach to answering the question, "What should we build to help people do their work better?"

- Goal is to obtain data from users that includes
  - Users' environment; Tasks; Co-workers and other people users interact with; Cultural influences on work ;Breakdowns and areas for improvement in current processes

- When possible, observe users in environment
  - Actions speak louder than words
  - People usually cannot say what innovations they would like
  - Having conversations with users in the context of their work creates richer data

Contextual Inquiry

- Produces large amounts of raw data – models provide
  - Shared understanding of the data
  - Shared language for the design / quality team
  - Deliverables for communication outside the design / quality team
  - Usable data for requirement definition and design ideas
- Data is used to inspire, constrain, prune, and guide design ideas
  - Cross functional team studies the data, brainstorms ideas, and evaluates their feasibility
  - Although the process is flexible, each model has a role in the process
  - "Grounded" brainstorming because ideas are driven by the data on customers' work practices

Heuristic Evaluation

- Involves a small team of evaluators to evaluate an interface based on recognized usability principles
- Advantages
  - Low cost, "Discount usability engineering"
  - Can expose problems user testing doesn't expose
  - Provides a language for justifying usability recommendations
- Disadvantages
  - Should use usability experts
  - Problems unconnected with tasks
  - Heuristics may be hard to apply to new technologies
- Sample heuristics include:
  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 vs. recall
  7. Flexibility and efficiency of use
  8. Aesthetic and minimalist design
  9. Error recovery
  10. Help and documentation

Using Neilson's heuristics Paper Prototyping

Cognitive Walkthrough

- Procedure based on a set of questions to evaluate the user's cognitive processes in context of one or more specific tasks
  - Based on a theory of Exploratory Learning
  - Originally intended for Walk-up-and-use
- Finds:
  - Mismatch between user's & designer's concept of task
  - Poor choice of words for menus and buttons
  - Inadequate feedback to the user
  - Assumptions about users' knowledge
- For each correct action to perform a task, answer the following 4 questions
  1. Will the user try to achieve the right effect?
  2. Will the user notice that the correct action is available?
  3. Will the user associate the correct action with the effect he or she is trying to achieve?
  4. If the correct action is performed, will the user see that progress is being made toward solution of the task?

  5. Itunes cognitive walkthrough Part 1 Part 2

Think-Aloud Usability Studies

- Traditional "Usability Test" asks users to "think aloud" as they work
  - On an interesting or important task
  - Using an interface you are interested in improving
  - While recording the interaction (often done in a specialized usability lab)
  - Analysis tailored to specific project by critical incident criteria

- Expensive, but provides rich user data
  - When the system doesn't work as specified
  - What problems actual users have with the interface
  - Positive aspects that should be retained for new versions
  - Problems arising along "incorrect" paths
  - Integration arising from tasks
  - Users always surprise you

Example

Overview of Evaluation Methods

Methods	Purpose	Relative Expense	Relative Training Needed
Contextual Inquiry and Contextual Design – watch users in their workplace	Requirements and ideas for improvement	High	High
Heuristic Evaluation – set of guidelines and standards	Verify usability standards for given interface	Low	Medium
Cognitive Walkthrough – step through scenarios	Evaluate interfaces for “first-time” user tasks	Medium	Medium
Think-Aloud Usability Testing - users say what they do to achieve a goal	Verify usability with actual users	High	High

Using the results

- It is an iterative process. What I say is not always what you think I said so always justify.
- Detailed design of elements of a system interface
- Aid the design of user documentation although how many of us use it?