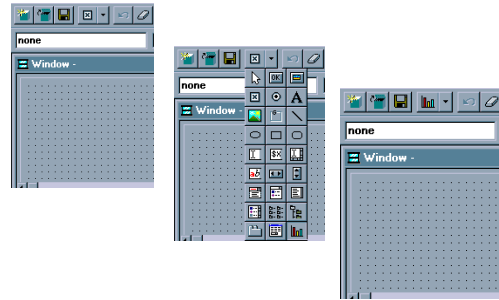


## Lecture 2: User-Centered Design

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## UI Hall of Fame or Shame?

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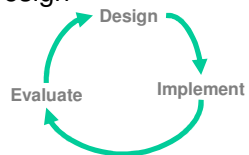


Source: Interface Hall of Shame

## Today's Topics

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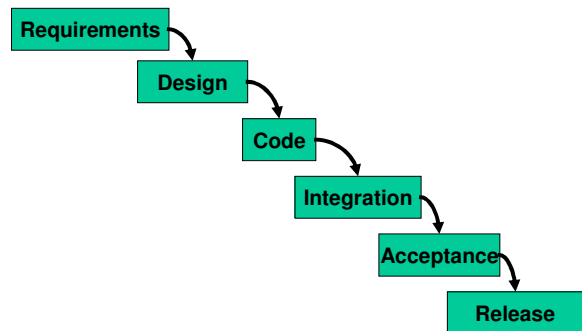
- Iterative Design



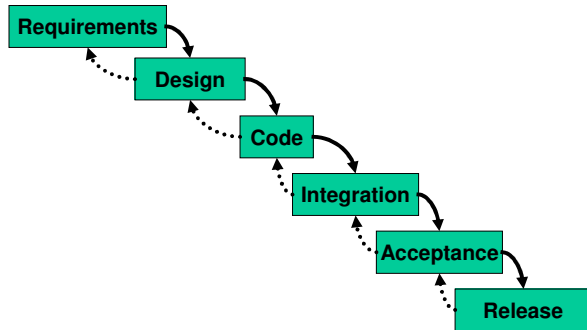
- Task Analysis

## Traditional Software Engineering Process: Waterfall Model

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## Feedback in the Waterfall Model



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## Waterfall Model Is Bad for UI Design

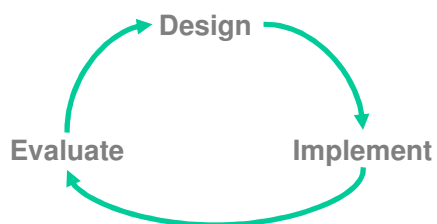
- User interface design is risky
  - So we're likely to get it wrong
- Users are not involved in validation until acceptance testing
  - So we won't find out until the end
- UI flaws often cause changes in requirements and design
  - So we have to throw away carefully-written and tested code

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## Iterative Design



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## Iterative Design the Wrong Way

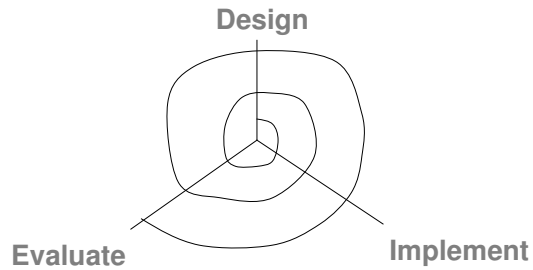
- Every iteration corresponds to a release
  - Evaluation (complaints) feeds back into next version's design
- Using your paying customers to evaluate your usability
  - They won't like it
  - They won't buy version 2

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## Spiral Model

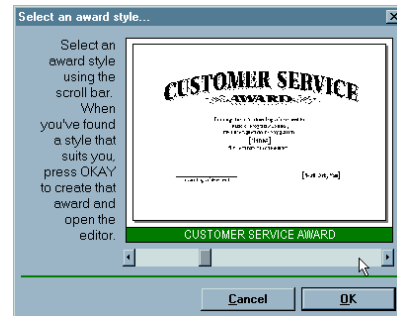


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## Early Prototypes Can Detect Usability Problems



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## Iterative Design of User Interfaces

- Early iterations use cheap prototypes
  - **Parallel design** is feasible: build & test multiple prototypes to explore design alternatives
- Later iterations use richer implementations, after UI risk has been mitigated
- More iterations generally means better UI
- Only mature iterations are seen by the world

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## User-Centered Design

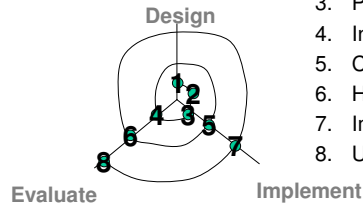
- Iterative design
- Early focus on users and tasks
  - user analysis: who the users are
  - task analysis: what they need to do
  - involving users as evaluators, consultants, and sometimes designers
- Constant evaluation
  - Users are involved in every iteration
  - Every prototype is evaluated somehow

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## User-Centered Design in 6.831



1. Task analysis
2. Design sketches
3. Paper prototype
4. In-class user testing
5. Computer prototype
6. Heuristic evaluation
7. Implementation
8. User testing

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## Case Study: Olympic Message System

- Cheap prototypes
  - Scenarios
  - User guides
  - Simulation (Wizard of Oz)
  - Prototyping tools (IBM Voice Toolkit)
- Iterative design
  - 200 (!) iterations for user guide
- Evaluation at every step
- You are not the user
  - Non-English speakers had trouble with alphabetic entry on telephone keypad

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## User & Task Analysis

- First step of user-centered design
- User analysis: who is the user?
- Task analysis: what does the user need to do?

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## Know Thy User

- Identify characteristics of target user population
  - Age, gender, ethnicity
  - Education
  - Physical abilities
  - General computer experience
  - Skills (typing? reading?)
  - Domain experience
  - Application experience
  - Work environment and other social context
  - Relationships and communication patterns

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## Multiple Classes of Users

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- Many applications have several kinds of users
- Example: Olympic Message System
  - Athletes
  - Friends & family
  - Telephone operators
  - Sysadmins

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## How To Do User Analysis

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- Techniques
  - Questionnaires
  - Interviews
  - Observation
- Obstacles
  - Developers and users may be systematically isolated from each other
    - Tech support shields developers from users
    - Marketing shields users from developers
  - Some users are expensive to talk to
    - Doctors, executives, union members

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## Example: Self-Service Grocery Checkout

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- Who are the users?
  - Grocery shoppers
  - Wide range of ages (10-80) and physical abilities (height, mobility, strength)
  - No computer experience
  - No training: walk up and use
  - Knowledge of food, but not about supermarket inventory techniques
  - Supermarket shoppers often ask each other for help finding things
- Major user classes
  - Family shopping is often done by women, often accompanied by small children
  - Store clerks who need to help shoppers

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## Task Analysis

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- Identify the individual tasks the program might solve
- Each task is a goal (*what*, not *how*)
- Often helps to start with overall goal of the system and then decompose it hierarchically into tasks
  - Overall goal: shoppers pay for their own groceries
  - Tasks:
    - Enter groceries into register
    - Bag groceries
    - Pay

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## Essential Parts of Task Analysis

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- What needs to be done?
  - Goal
- What must be done first to make it possible?
  - Preconditions
    - Tasks on which this task depends
    - Information that must be known to the user
- What steps are involved in doing the task?
  - Subtasks
  - Subtasks may be decomposed recursively

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## Example: Self-service Grocery Checkout

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- Goal
  - Enter groceries into register
- Preconditions
  - All the groceries you want are in your cart
- Subtasks
  - Enter prepackaged item
  - Enter loose produce

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## Other Questions to Ask About a Task

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- Where is the task performed?
  - Front of supermarket, standing up
- How often is the task performed?
  - At most a few times a week
- What are its time or resource constraints?
  - A minute or two
- How is the task learned?
  - By trying it
  - By watching others
  - By being shown how by store personnel
- What can go wrong? (Exceptions, errors, emergencies)
  - Barcode is missing or smudged
  - Shopper wants to buy alcohol or cigarettes
- Who else is involved in the task?

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## How to Do a Task Analysis

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- Interviews with users
- Direct observation of users performing tasks

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## Dangers of Task Analysis

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- Duplicating a bad existing procedure in software
- Failing to capture good aspects of existing procedure

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## Hints for Better User & Task Analysis

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- Questions to ask
  - Why do you do this? (goal)
  - How do you do it? (subtasks)
- Look for weaknesses in current situation
  - Goal failures, wasted time, user irritation
- Contextual inquiry
- Participatory design

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## Contextual Inquiry

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- Observe users doing real work in the real work environment
- Be concrete
- Establish a master-apprentice relationship
  - User shows how and talks about it
  - Interviewer watches and asks questions
- Challenge assumptions and probe surprises

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## Participatory Design

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- Include representative users directly in the design team
- OMS design team included an Olympic athlete as a consultant

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