CHAPTER 4:
Design

Designing the User Interface:
Strategies for Effective Human-Computer Interaction

Sixth Edition

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Design

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Organizational Support for Design

- Design is inherently creative and unpredictable. Interactive system designers must blend knowledge of technical feasibility with a mystical esthetic sense of what attracts users.
- Some companies are beginning to employ chief design officers (CDOs), which may help to promote usability and design thinking at every level
- Return on Investment (ROI) business case for focusing on usability has been made powerfully and repeatedly

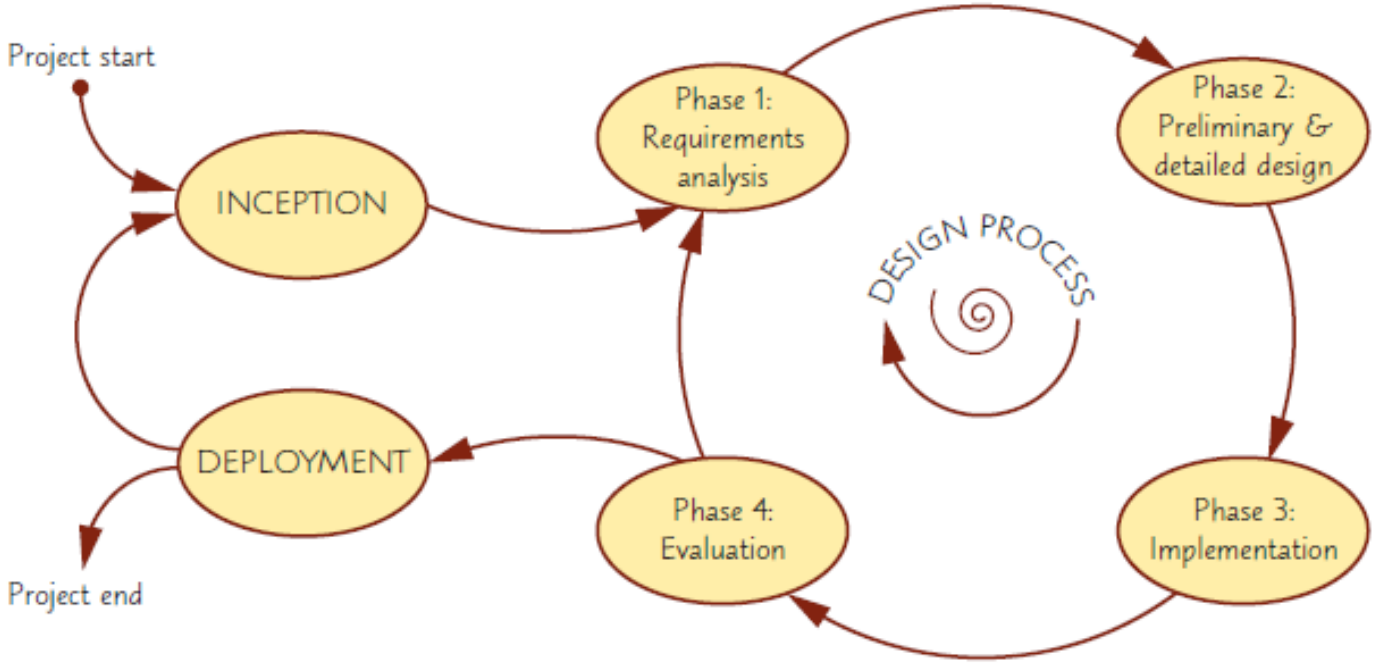
Organizational Support for Design (concluded)

- *Usability engineering* has evolved into a recognized discipline with maturing practices and a growing set of standards
- Usability engineers and user-interface architects, sometimes called the user experience (UX) team are gaining experience in organizational change
- The Usability Experience Professionals Association (UXPA) holds annual meetings called the “World Usability Day”

Design Process

- Rosson and Carroll (scenario-based) design characterization:
  - Design is a process, not a state
  - The design process is *nonhierarchical*
  - The process is *radically transformational*
  - Design intrinsically involves the *discovery of new goals*

Design Process (continued)



An iterative design process would consist of four distinct phases

Design Process: Phase 1 - Requirements Analysis

- Examples of requirements regarding system behavior for three distinct types of interactive systems: an e-commerce website, an ATM, and a mobile messaging app

Functional requirements:

- **Website:** The website shall allow users to purchase items and shall provide other, related merchandise based on past visits and purchases.
- **ATM:** The system shall let users enter a PIN code as identification and shall ensure that the code matches the one on file.
- **Mobile app:** The app shall be able to send messages at all times, even when out of the service area (in which case they are saved for later sending).

Non-functional requirements:

- **Website:** The website shall give users the ability to access their user account at all times, allowing them to view and modify name, mail address, e-mail address, phone, etc.
- **ATM:** The system shall permit the ATM customer 15 seconds to make a selection. The customer shall be warned that the session will be ended if no selection is made.
- **Mobile app:** Messages should send within 2 seconds, returning the user to the new message window (continuing in the background if necessary).

User experience requirements:

- **Website:** The website shall always have a visible navigation menu in the same position on the screen.
- **ATM:** On-screen prompts and instructions shall be clear and accessible. The ATM should return the user's commands within half a second.
- **Mobile app:** The mobile app shall support customization such as color schemes, skins, and sounds.

Design Process: Phase 2 – Preliminary and Detailed Design

- The design phase in turn consists of two stages:
  1. a preliminary stage, where the high-level design or architecture of the interactive system is derived
  2. a detailed stage, where the specifics of each interaction is planned out
- The preliminary stage is also called *architectural* or *conceptual design*
- Examples of suitable design methods include sketching, paper mockups, and high-fidelity prototypes
  - Can be clarified via tools, patterns, best practices

Design Process: Phase 3 – Build and Implementation

- Where all the planning gets turned into actual, running code
  - The actual software and hardware engineering needed to achieve this are outside the scope of this book
  - Included in this text is software development platforms for interactive applications for mobile apps, the web and PC's
  - Make sure to evaluate tool capabilities, ease of use, ease to learn, cost, and performance
  - Tailor tool choices for the size of the job

Design Process: Phase 4 – Evaluation

- Developers test and validate the system implementation to ensure that it conforms to the requirements and design set out earlier in the process
- Chapter 5 covers a range of suitable evaluation methods for this phase in depth

Design Frameworks

- **User-centered design (UCD)**
  - Takes the needs, wants, and limitations of the actual end users into account during each phase of the design process
- **Participatory design (PD)**
  - Direct involvement of people in the collaborative design of the things and technologies they use
- **Agile interaction design**
  - Development methods for self-organizing, dynamic teams and that facilitate flexible, adaptive, and rapid development that is robust to changing requirements and needs

Participatory Design

- Intergenerational and interdisciplinary design team from the University of Maryland's KidsTeam working on new human-computer interaction technologies using paper prototypes

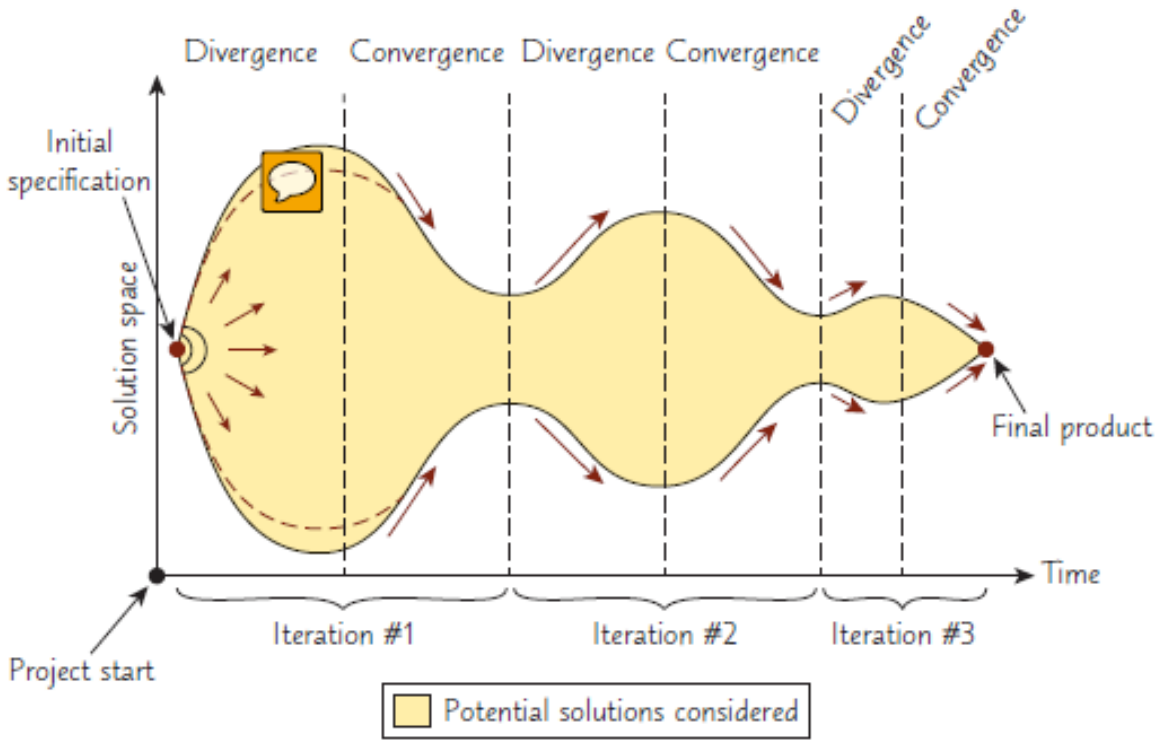
Agile Interaction Design

- Professor Jon Froehlich and his students working in the HCIL Hackerspace at University of Maryland, College Park

Design Methods

- Practical building blocks that form the actual day-to-day activities in the design process
  - Ideation and creativity
  - Surveys, interviews and focus groups
  - Ethnographic observation
  - Scenario development and storyboarding
  - Prototyping

Design Methods (concluded)



- Illustration of how the solutions considered during a design process will grow (diverge) and shrink (converge) iteratively until it eventually fixates on a single point, the finished product
- This particular design process involves three iterations, but real processes may have more or fewer iterations.

Ethnographic Observation

- **Preparation**
  - Understand organization policies and work culture
  - Familiarize yourself with the system and its history
  - Set initial goals and prepare questions
  - Gain access and permission to observe/interview

- **Field Study**
  - Establish rapport with managers and users
  - Observe/interview users in their workplace and collect subjective/objective quantitative/qualitative data
  - Follow any leads that emerge from the visits

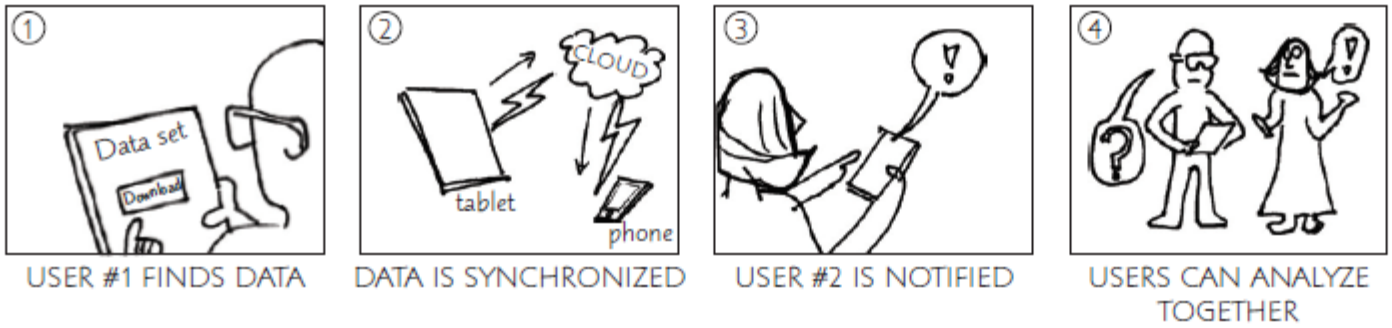
Ethnographic Observation (concluded)

- **Analysis**
  - Compile the collected data in numerical, textual, and multimedia databases
  - Quantify data and compile statistics
  - Reduce and interpret the data
  - Refine the goals and the process used

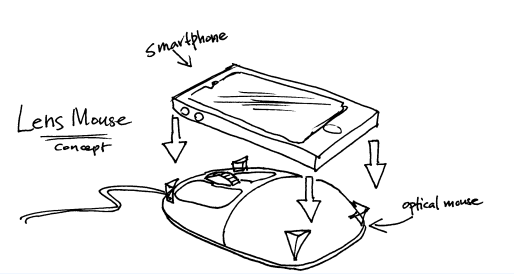
- **Reporting**
  - Consider multiple audiences and goals
  - Prepare a report and present the findings

Storyboarding

- Hand-drawn storyboard for a collaborative software that allows multiple people to view a common dataset using their personal smartphones and tablets



Prototyping



- **Low-fidelity prototypes** are generally created by sketching, using post-it notes, or cutting and gluing pieces of paper together (paper mockups)
- **Medium-fidelity prototypes** are often called *wireframes*, and provide some standardized elements (such as buttons, menus, and text fields), even if potentially drawn in a sketchy fashion, and has some basic navigation functionality
- **High-fidelity prototypes** look almost like the final product and may have some rudimentary computational capabilities; however, the prototype is typically not complete and may not be fully functional

Design Tools, Practices, and Patterns

- Design Tools
  - Dedicated prototyping design tools are specifically designed for the purpose of creating interface mockups rapidly and effortlessly
- Design Guidelines and Standards
  - Guideline documents are a powerful tool for interaction design
  - Four E's: *Education, Enforcement, Exemption, Enhancement*
- Interaction Design Patterns
  - Best-practice solutions to commonly occurring problems specified in such a way that they can be reused and applied to slightly different variations of a problem over and over again
  - *Model-View-Controller (MVC),* document interface, Web app page architecture

Social Impact Analysis

Describe the new system and its benefits

- Convey the high level goals of the new system
- Identify the stakeholders
- Identify specific benefits

Social Impact Analysis (continued)

Address concerns and potential barriers

- Anticipate changes in job functions and potential layoffs
- Address security and privacy issues
- Discuss accountability and responsibility for system misuse and failure
- Avoid potential biases
- Weigh individual rights vs. societal benefits
- Assess trade-offs between centralization and decentralization
- Preserve democratic principles
- Ensure diverse access
- Promote simplicity and preserve what works

Social Impact Analysis (concluded)

Outline the development process

- Present and estimated project schedule
- Propose process for making decisions
- Discuss expectations of how stakeholders will be involved
- Recognize needs for more staff, training, and hardware
- Propose plan for backups of data and equipment
- Outline plan for migrating to the new system

Legal Issues

Potential Controversies

- What material is eligible for copyright?
- Are copyrights or patents more appropriate for user interfaces?
- What constitutes copyright infringement?
- Should user interfaces be copyrighted?
- Evolving public policies related to:
  - Privacy
  - Liability related to system safety/reliability
  - Freedom of speech