HCI Design Process: An Overview

- What is HCI Design Process?
- Practical Issues in HCI Design Process
- Examples of Lifecycle Models
HCI Design Process

What is HCI Design?

- It is a process:
  - A goal-directed problem solving activity informed by intended use, target domain, materials, cost, and feasibility
  - A creative activity
  - A decision-making activity to balance trade-offs (e.g., requirements of product compatibility and ease of use may be contradicting)

- It is a representation:
  - A plan for development
  - A set of alternatives and successive elaborations
HCI Design Process

Four basic activities of interaction design:

1. Identifying needs and establishing requirements
   - Who our target users are?
   - What kind of support an interactive product can provide?
2. Developing alternative designs
   - Suggest ideas for meeting the requirements
   - Two subactivities –
     - Conceptual design: produce the conceptual model for the product, e.g., what the product should do, behave and look like
     - Physical design: consider detail of the product including the colors, sounds, images to use, menu design, icon design, etc.
HCI Design Process

3. Building interactive versions of the designs
   - Not necessarily build a software version, other possible simple prototypes include paper-based storyboard, wood, etc.
   - e.g., When the idea for the PalmPilot was being developed, Jeff Hawkin carved up a piece of wood about the size and shape of the device he had imagined. He used to carry this piece of wood around with him and pretend to enter information into it, just to see what it would be like to own such a device

4. Evaluating designs
   - Determine usability & acceptability of product or design
   - Require user involvement throughout development
HCI Design Process

Three principles for user-centered approach

1. Early focus on users and tasks
   - First understand the users by studying their cognitive, behavioural and attitudinal characteristics
   - Require observing users doing their normal tasks, studying the nature of those tasks, and then involving users in the design process
   - Can be expanded and clarified further:
     - Users’ tasks and goals are the driving force behind the development
     - Users’ behaviour and context of use are studied and the system is designed to support them
     - Users’ characteristics are captured and designed for
     - All design decisions are taken within the context of the users, their work, and their environment
HCI Design Process

- Users are consulted throughout development from earliest phases to the latest and their input is seriously taken into account

2. Empirical Measurement

- Users’ reactions & performance to manuals, simulations, prototypes, etc. are observed, recorded & analysed
- Identify, document and agree specific usability and user experience goals at the beginning of the project
- Help designers to choose between different alternative designs & to check on progress as the product is developed

3. Iterative Design

- When problems are found in user testing, fix them and carry out more tests
HCI Design Process

Example:
Assume that you are involved in developing a new e-commerce site for selling garden plants. Suggest ways of applying the principle of “Early focus on users and tasks”.

- Tasks and goals, behaviours, and characteristics of potential users can be identified by investigating how people shop in existing online and physical shopping situations. For example in physical shops, we can know how people choose plants, what criteria are important, their buying habits, etc. While in existing online shops, we can determine the contexts of use for the new site.

- We can recruit people we believe to be representative of the user group and ask them to evaluate the new site during its development.
Practical Issues

Who are the users?

- Many interpretations of user
  - Most obvious definition:
    - Who interact directly with the product to achieve task
  - Wider definition:
    - Who manage direct users
    - Who receive output from the product
    - Who make the purchasing decision
    - Who use competitor’s products
Practical Issues

- Three categories in the broader user definition:
  - Primary: The person who uses the design directly
  - Secondary: The person who either supplies input or receives output from the design
  - Tertiary: Those affected by the introduction of the system or who will influence its purchase

- Another user definition is stakeholder:
  - People or organizations who will be affected by the system and who have a direct or indirect influence on the system requirements
  - A broad user definition, e.g., direct users and their managers, people who may lose their job because of the introduction of the new product, etc.
Practical Issues

What are the stakeholders for the check-out system of a large supermarket, say, Taste?
Practical Issues

- Check-out operators who sit in front of the machine and pass the customers’ purchases over the bar code reader, receive payment, hand over receipts, etc.

- Customers who want the system to work properly so that they are charged the right amount of goods, receive the correct receipt, are served quickly and efficiently

- Supermarket managers and supermarket owners who want the operators to be happy and efficient and the customers to be satisfied and not complaining; They also do not want to lose because the system cannot handle the payments correctly

- Warehouse staff, supermarket suppliers, supermarket owners’ families, other shop owners whose business would be affected by the success or failure of the system
Practical Issues

What do we mean by needs?

- Not simply ask “What do you need”? because people do not necessarily know what is possible
- We need to understand:
  - Characteristics and capabilities of users
  - What they are trying to achieve
  - How they achieve it currently
  - Whether they would achieve their goals more effectively if they were supported differently
- e.g., in designing a child’s toy – a toy should not require too much strength to operate, but may require greater strength to change battery
Practical Issues

- For new invention, the “future” needs can be indicated from similar behaviour that is already established.
  - e.g., need identification of cell phones can be started from investigating behaviour in standard telephones: call making, phone book services, voice mail services, the number of the last person to ring, etc.
  - e.g., e-commerce developers have found that referring back to customers’ non-electronic habits and behaviours can be a good basis for enhancing e-commerce activity.
Practical Issues

(Hong Kong Economics Times, Apr. 08)
Practical Issues

How to generate alternative designs?

- Do not stick with a solution that works
- e.g., $S=1+2+3+4+5$ can be computed directly but Gauss found that $S=\frac{(1+2+3+4+5)+(5+4+3+2+1)}{2}$, which can be generalized as $(\text{first-term+last-term})\times\text{no.of term}/2$
- Designers are trained to consider alternatives, software people are generally not
- Come from the individual designer’s flair (natural ability), creativity & experience
- Also come from inspiration from similar or different products and applications
- e.g., word processor was inspired by typewriter??
- Creative thinking techniques can be learned, e.g., Thinkertoys : a handbook of creative-thinking techniques
Practical Issues

How do you choose among alternative designs?

- Via communication using documentation and evaluation using prototypes
  - **Documentation**: a detailed report which describes all possible designs, including their advantages and disadvantages, and design tradeoff according to specifications

- **Prototyping**: Producing a limited version of the product with the purpose of answering specific questions about the design or appropriateness

- **Usability engineering**: specifying quantifiable measures of product performance, documenting them in a usability specification, and assessing the product against them
Lifecycle Models

Show how activities are related to each other

Lifecycle models are:

- Management tools
- Simplified versions of reality

Many lifecycle models exist, e.g., waterfall model for software engineering, Star model for HCI and ISO 13407
Lifecycle Models

A simple HCI lifecycle model:

1. Identify needs/establish requirements
2. (Re)Design
3. Build an interactive version
4. Evaluate
5. Final product
6. End with evaluation that ensures the final product meets the prescribed usability criteria
Lifecycle Models

Waterfall lifecycle model of software development

- Requirements specification
- Architectural design
- Detailed design
- Coding and unit testing
- Integration and testing
- Operation and maintenance
Lifecycle Models

Star lifecycle

- Suggested by Hartson and Hix (1989)

- Important features
  - Evaluation is at the center of activities
  - Interconnected via the evaluation activity
  - No particular ordering of activities. Development may start in any one of the activities
  - Derived from empirical studies of interface designers
Lifecycle Models

- Implementation
- Task analysis
- Prototyping
- Evaluation
- Requirements specification
- Conceptual design

Lifecycle Models

ISO 13407 Human-centered design process for interactive systems

- It specifies 4 human-centered design activities which are central to a system development project:
  - Understand and specify the context of use
  - Specify the user and organizational requirements
  - Produce design solutions
  - Evaluate designs against requirements
Lifecycle Models

1. Identify need for human-centred design
2. Understand and specify the context of use
3. System satisfies specified user and organizational requirements
4. Specify the user and organizational requirements
5. Evaluate designs against requirements
6. Produce design solutions