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)

- Generating alternatives and choosing between them is key

- Four approaches: user-centered design, activity-centered design, systems design, and genius design

HCI Design Process

User-centered approach is based on three principles:

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

HCI Design Process

Activity-centered design focuses on the behaviour surrounding particular tasks. Users still play a significant role but their behaviour, instead of their goals and needs, is important

Systems design is a structured, rigorous, and holistic design approach that focuses on context and is particularly appropriate for complex problems. In systems design it is the system (people, computers, objects, devices, etc.) that is the center of attention while the users' role is to set the goal of the system

Genius design relies solely on the experience and creative flair (natural ability) of a designer

HCI Design Process

Four basic activities of interaction design:

1. Establishing requirements

- Who our target users are?
- What kind of support an interactive product can provide?

2. Designing alternatives

- 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
  - Concrete design: consider detail of the product including the colors, sounds, images to use, menu design, icon design, etc.

HCI Design Process

3. Prototyping

- 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

- Determine usability & acceptability of product or design
- Require user involvement throughout 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

What do we mean by needs?

- Not simply ask "What do you need"? because people rarely know what is possible
- Users cannot tell what they 'need' to help them achieve their goals
- We need to understand/ look at:
  - Characteristics and capabilities of users
  - What they are trying to achieve
  - How they achieve it currently
  - Their context
  - What information do they require?
  - Who collaborates to achieve the task?
  - Why is the task achieved the way it is?

Practical Issues

- 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

- For new inventions or envisioned tasks:

- Can be rooted in existing behaviour, "future" needs are 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.

Practical Issues

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

- Can be described as future scenarios

(Hong Kong Economics Times, Apr. 08)

Practical Issues

How to generate alternative designs?

- Humans stick to what they know works
  e.g., S=1+2+3+4+5 can be computed directly but Gauss found that S=[(1+2+3+4+5)+(5+4+3+2+1)]/2, which is generalized as (first-term+last-term)*no. of terms/2
- But considering alternatives is important to 'break out of the box', although designers are trained to consider alternatives, software people are generally not
- Come from individual designer's flair, 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 and evaluation with users and peers using documentation and evaluation using prototypes

- Technical feasibility: some not possible

- Quality thresholds: Usability goals lead to usability criteria set early on and check regularly
  - Safety: How safe?
  - Utility: Which functions are superfluous?
  - Learnability: Is the time taken to learn a function acceptable to the users?
  - Memorability: Can infrequent users remember how to achieve their goal?

Practical Issues

- **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
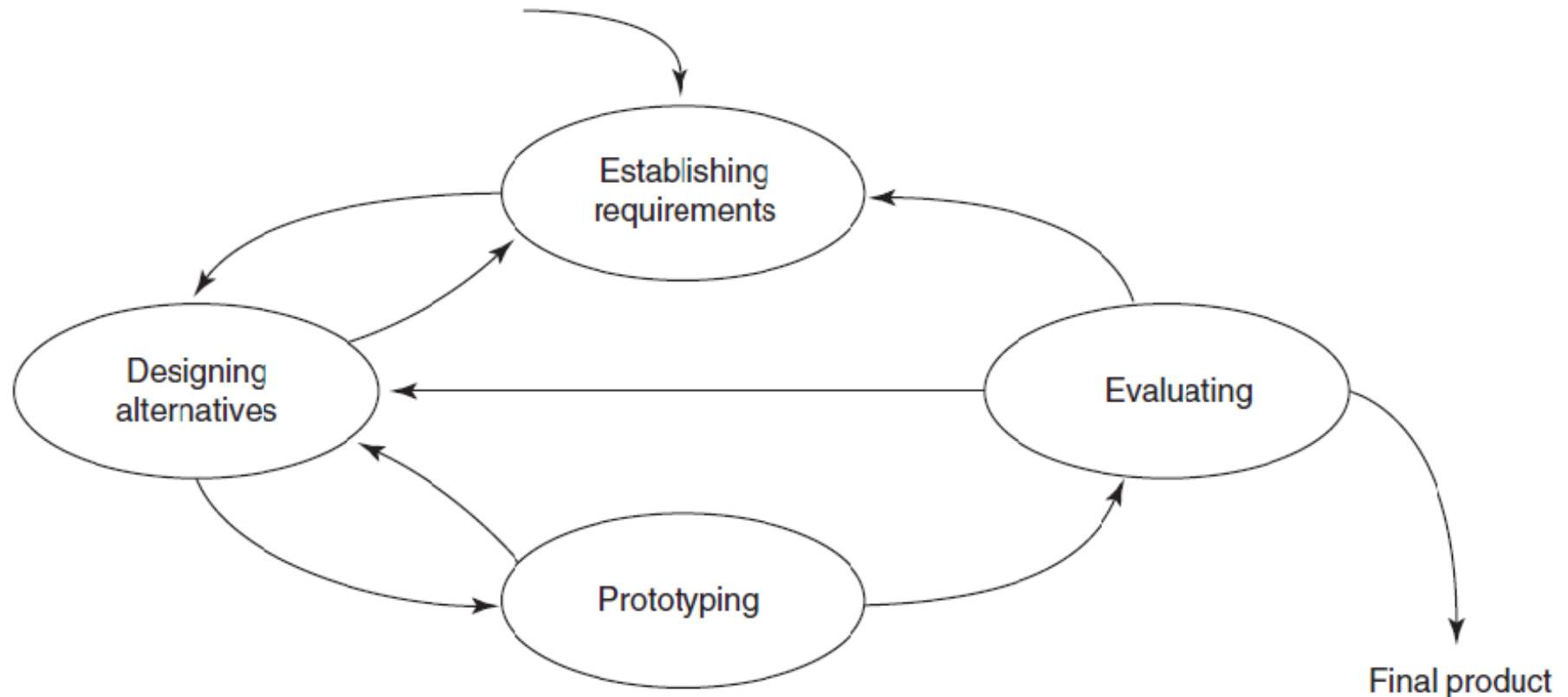
Show how activities are related to each other

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
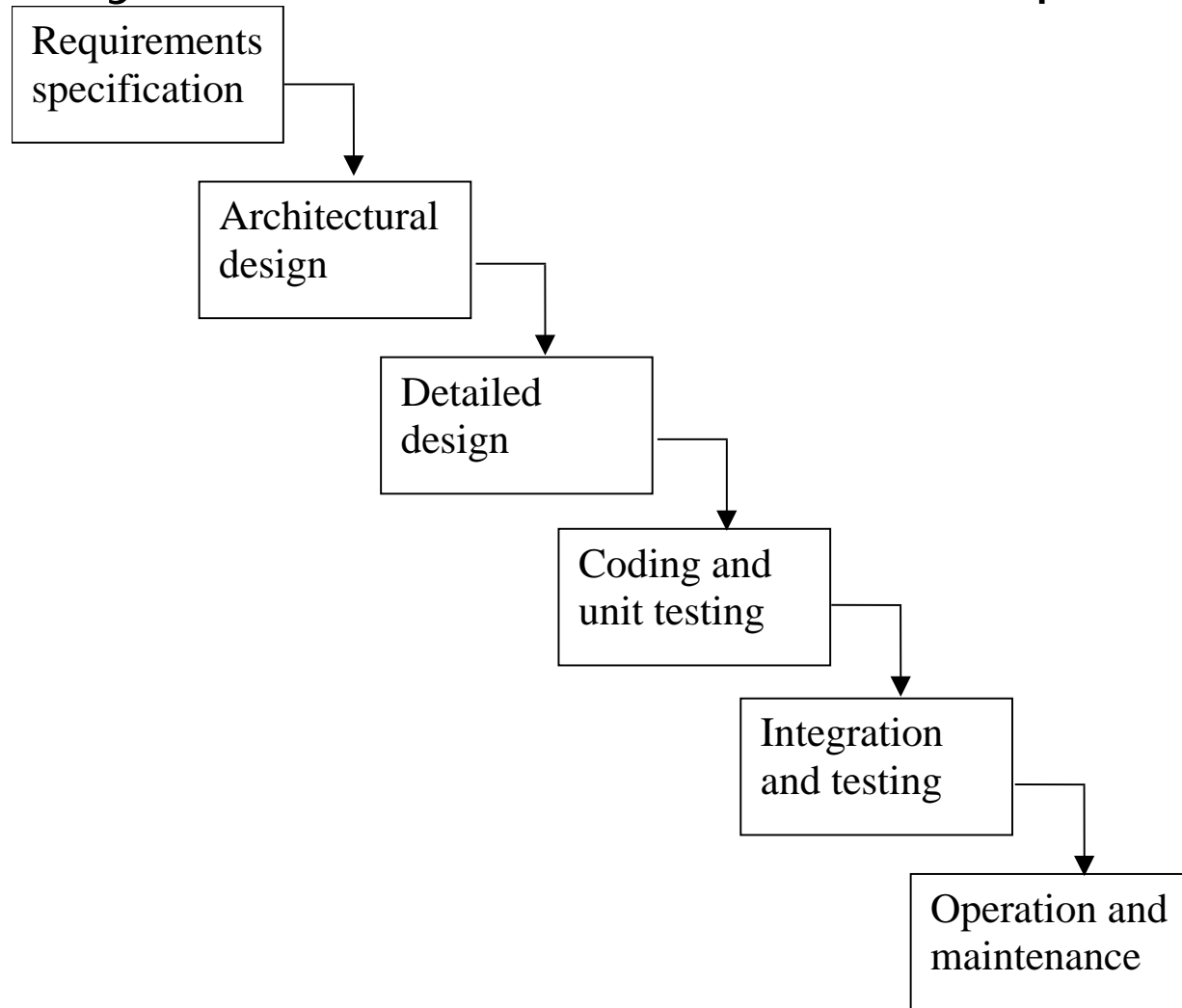
Lifecycle Models

User-centered design approach can be exemplified via the following simple interaction design lifecycle model:

End with evaluation that ensures the final product meets the prescribed usability criteria

Lifecycle Models

Waterfall lifecycle model of software development
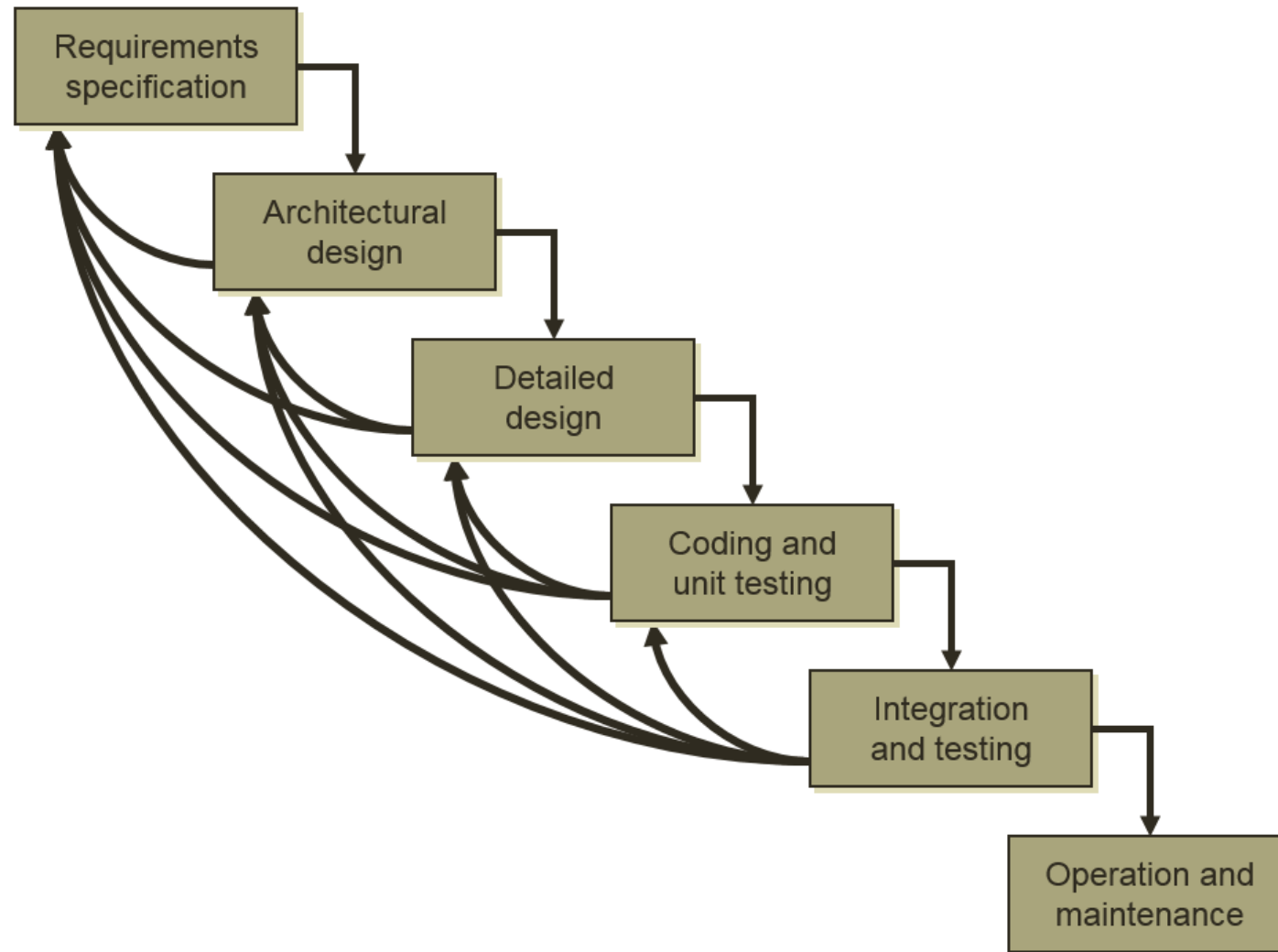
Lifecycle Models

- **Requirements specification**:
  - Designers and customers try capture what the system is expected to provide, expressed in natural language or more precise languages
  - Functional requirements: Services the system must provide in working domain
  - Nonfunctional requirements: Features of the system which are not directly related to the actual services such as efficiency and learnability
- **Architectural design**:
  - High-level description of how the system will provide the services required
  - Factor system into major components of the system, indicate how they are interrelated
  - Need satisfy functional and nonfunctional requirements

Lifecycle Models

- **Detailed design:**
  - Refine architectural components and interrelations to identify modules to be implemented separately
  - Refinement is governed by the nonfunctional requirements

- **Coding and unit testing:**
  - Implement and test the individual modules in executable programming language

- **Integration and testing:**
  - Combine modules to produce components from the architectural description

- **Operation and maintenance:**
  - Product is delivered to customer and any enhancements are provided by designers while product is still live

Lifecycle Models

Can be improved by including iterations:

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
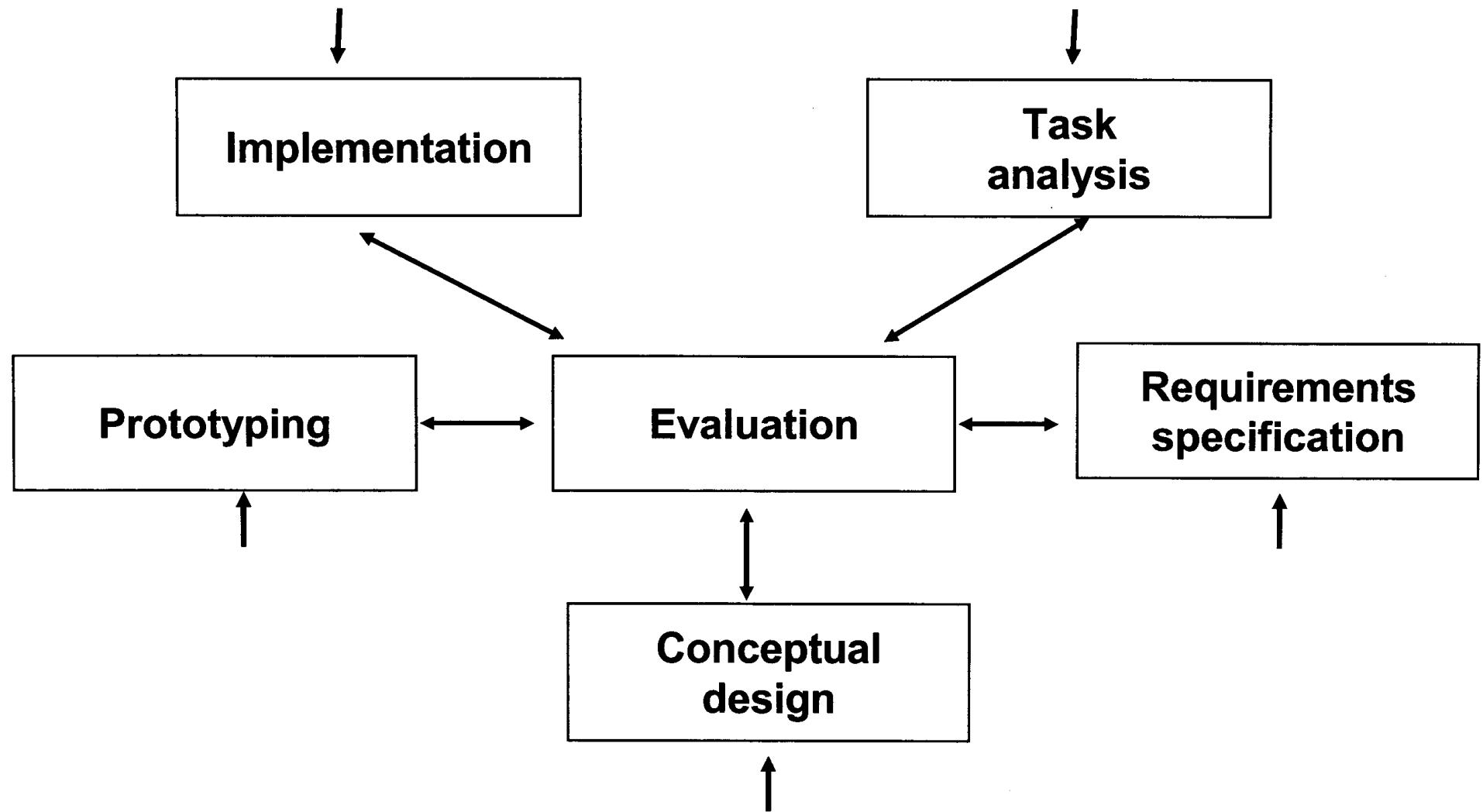
Lifecycle Models

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