Design of Interactive Systems (DIS)

Lecture 3: The Process of human-centred interactive systems design

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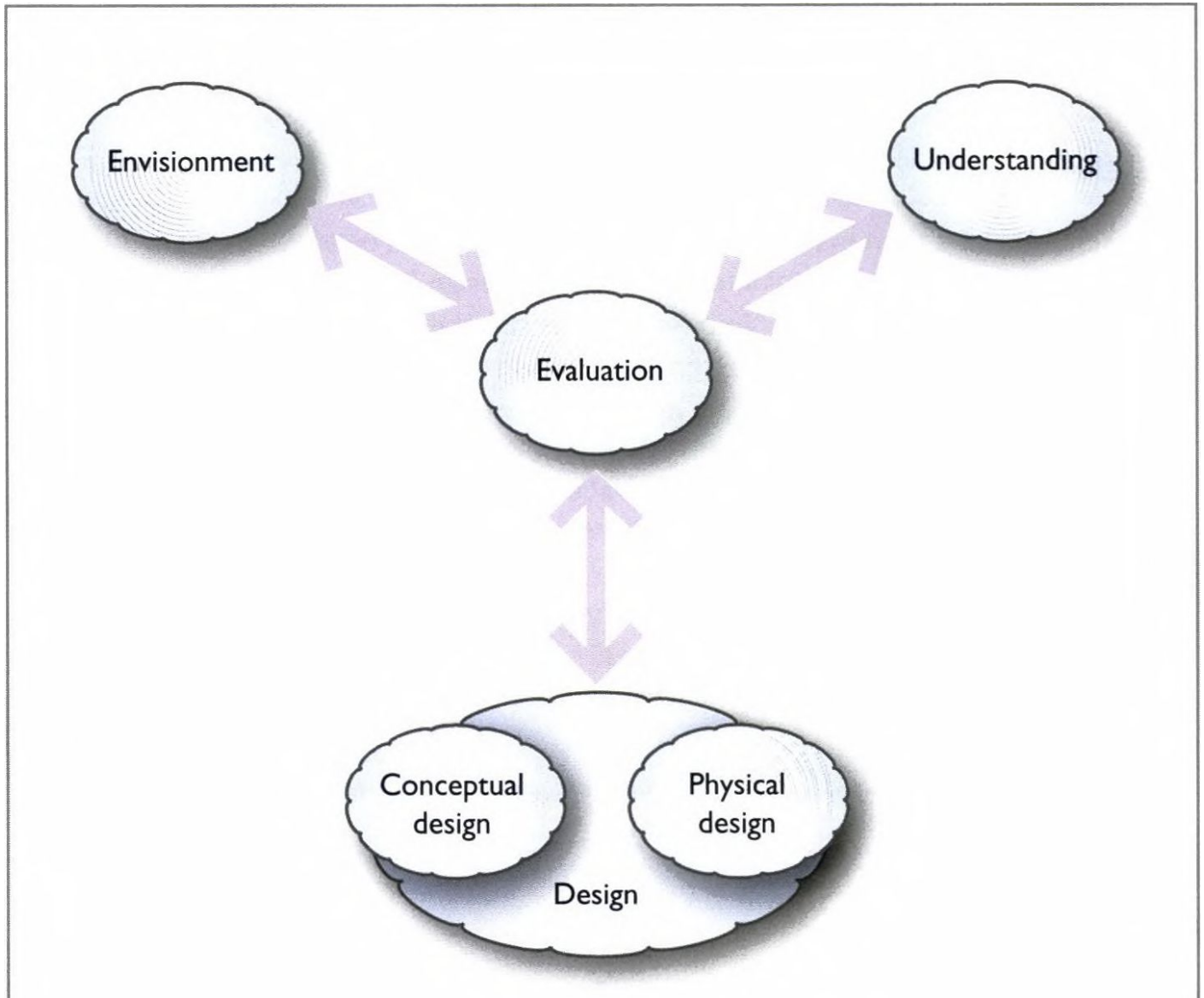
Implementation



Implementation

- Although Figure 3.1 does not include the implementation or production of the design, ultimately things have to be engineered and software has to be written and tested
- The whole system needs to be checked to ensure that it meets the requirements until finally the system can be formally ‘launched’ and signed off as finished
- Clients may demand extra features during completion
- Developer needs to ensure the system meets the specification without any bugs.

Developing personas and scenarios

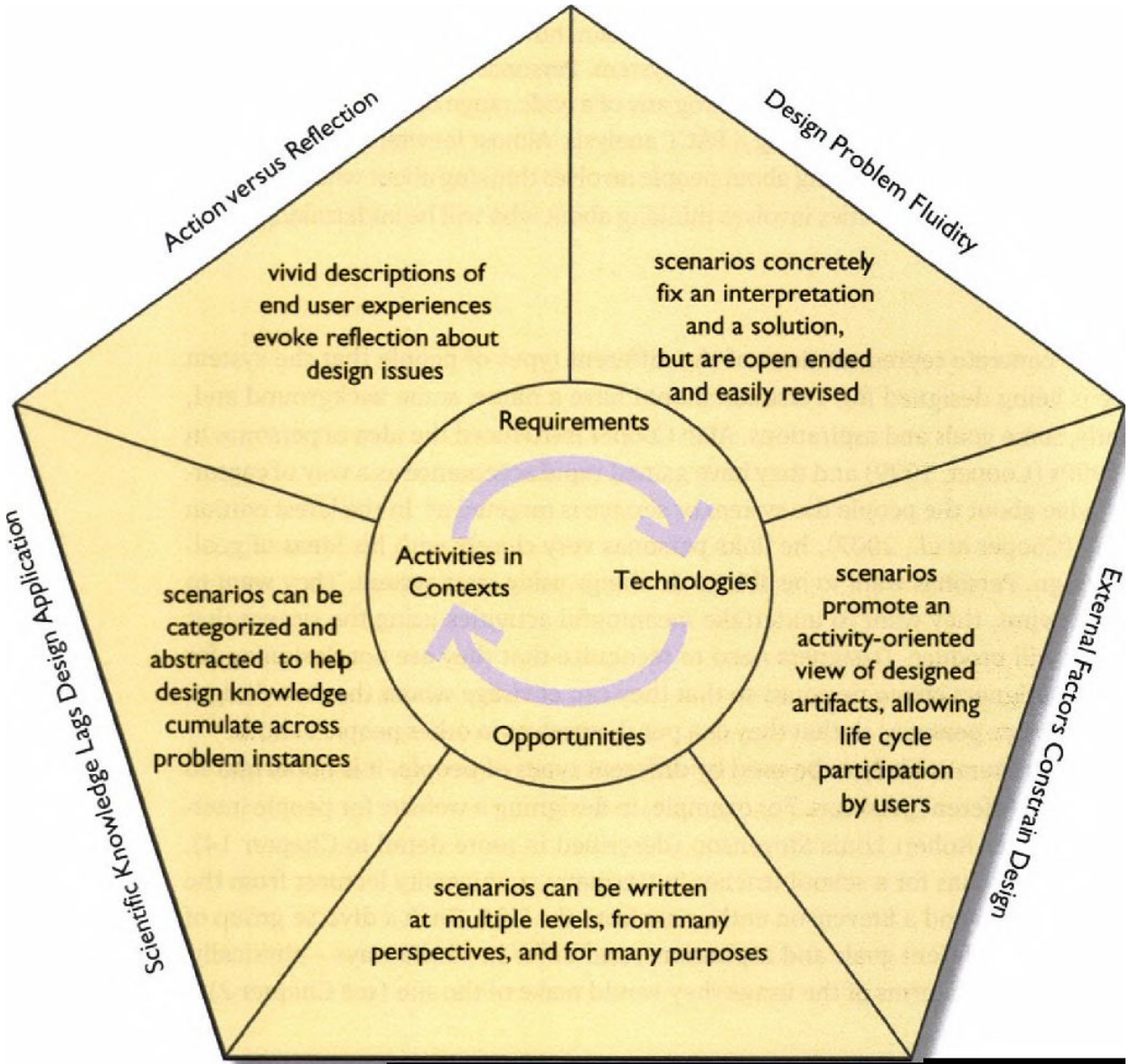
- The people who will use the system are represented by personas:
  1. profiles of the different types, or archetypes,
  2. of people the designer is designing for
- Activities and the contexts in which they will occur are envisioned through scenarios of use
- Different concrete scenarios can be used to envision how different technologies could function to achieve the overall purpose of the system.

Personas

- Personas are concrete representations of the different types of people that the system or service is being designed for
- Personas should have a name, some background and, importantly, some goals and aspirations.
- Personas want to be able to do things using your system
- They want to achieve their aims, they want to undertake meaningful activities using the system
- As any new system is likely to be used by different types of people, it is important to develop several different personas

Scenarios

- Scenarios are stories about people undertaking activities in contexts using technologies.
- *Making Use* (2000) illustrates how scenarios are used to deal with the inherent difficulty of doing design.
- He argues that scenarios are effective at dealing with five key problems of design



Using scenarios throughout design

- They are useful in understanding, envisioning, evaluation, and both conceptual and physical design:
- Four different types of scenario are distinguished: stories, conceptual scenarios, concrete scenarios and use cases.
- Stories are the real-world experiences of people.
- Conceptual scenarios are more abstract descriptions in which some details are stripped away
- Concrete scenarios are generated from abstract scenarios by adding specific design decisions and technologies
- After completion of concrete scenarios, they can be represented as use cases.

Using scenarios throughout design

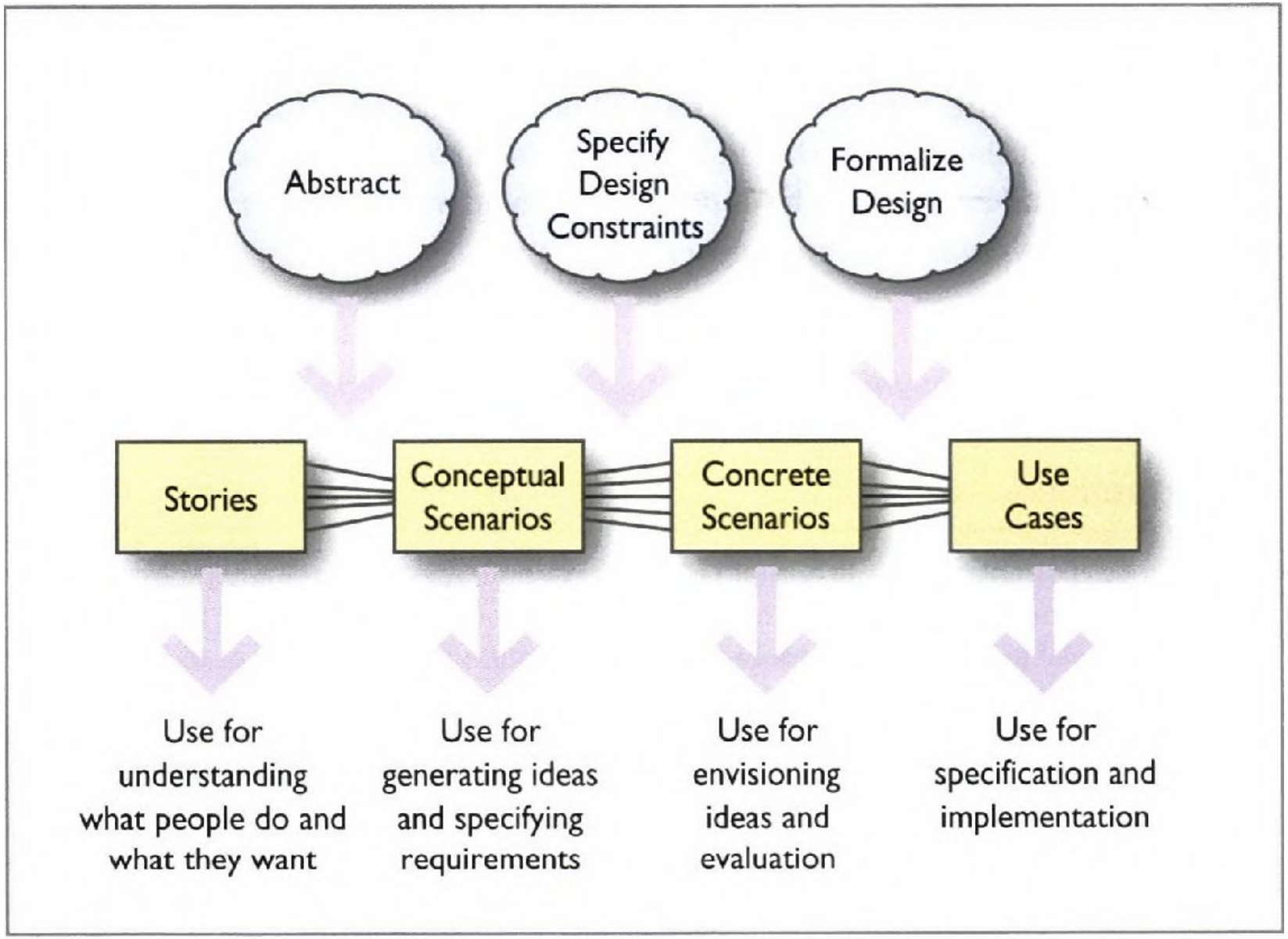


Figure 3.10 Scenarios throughout design

Stories

- Stories are the real-world experiences, ideas and knowledge of people
- These may be captured in any form and comprise small snippets of activities and the contexts
- This could include videos of people engaged in an activity, diary entries, photographs, documents, the results of observations and interviews and so on.

Conceptual scenarios

- Conceptual scenarios are more abstract than stories
- Much of the context is stripped away during the process of **abstraction** and similar stories are combined.
- Conceptual scenarios are particularly useful for generating design ideas and for *understanding* the requirements of the system.
- The process of abstraction is one of classification and aggregation: moving from the details of specific people undertaking specific activities in a specific context using a particular piece of technology to a more general description that still manages to catch the essence of the activity.
- Aggregation is the process of treating a whole thing as a single entity
- Classification is the process of recognizing that things can be collected together
- The most abstract level is to treat everything simply as a 'thing' and every activity as 'doing something'

Concrete scenarios

- Each conceptual scenario may generate lots of concrete scenarios.
- one reasonably abstract scenario may spawn several more concrete elaborations
- Concrete scenarios also begin to dictate a particular interface design and a particular allocation of functions between people and devices
- Concrete scenarios are particularly useful for prototyping and envisioning design ideas and for evaluation
- The more specific the scenario is about some aspects, the more concrete it is.

Use cases

- A use case describes the interaction between people (or other ‘actors’) and devices
- It is a case of how the system is used and hence needs to describe what people do and what the system does.
- The specification of use cases both informs and is informed by the task/ function allocation process.
- A set of use cases can be produced which specifies the complete functionality of the system and the interactions

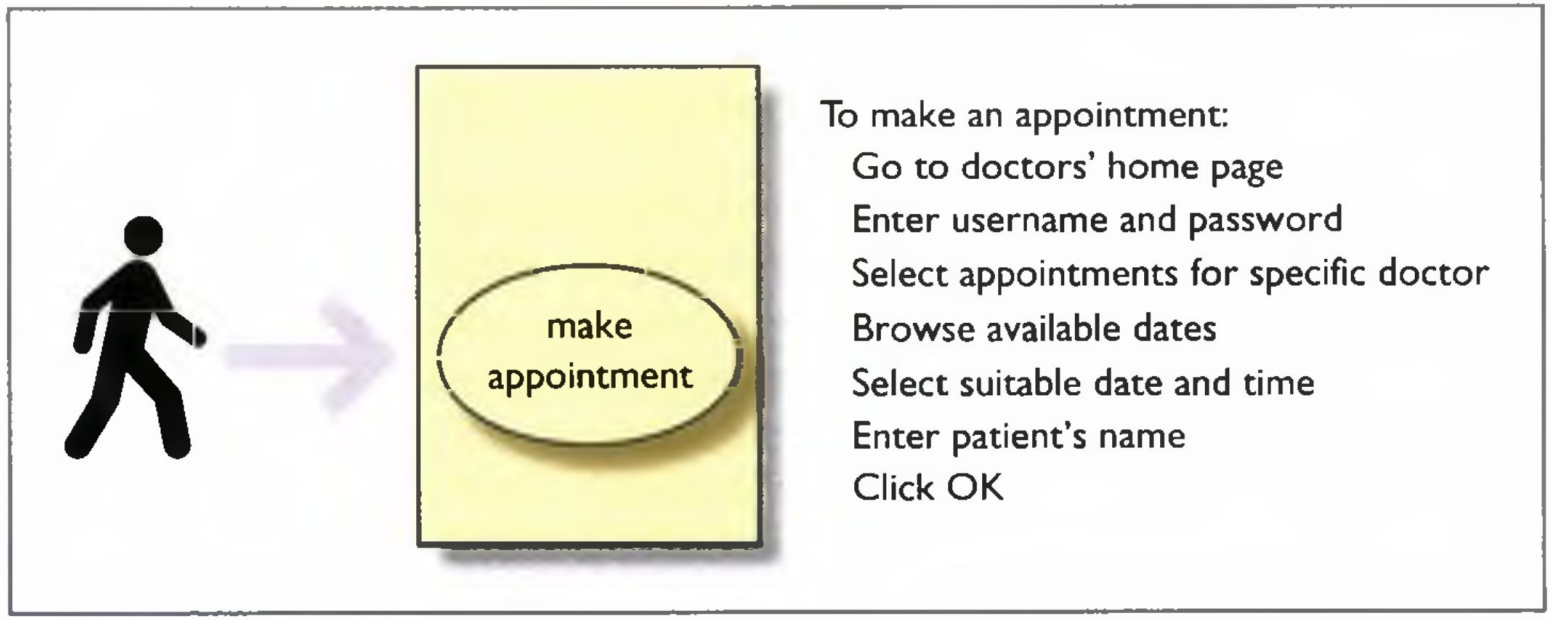


Figure 3.11 Use case for booking an appointment

A scenario-based design method

- The use of the different types of scenario throughout design can be formalized into a scenario-based design method.

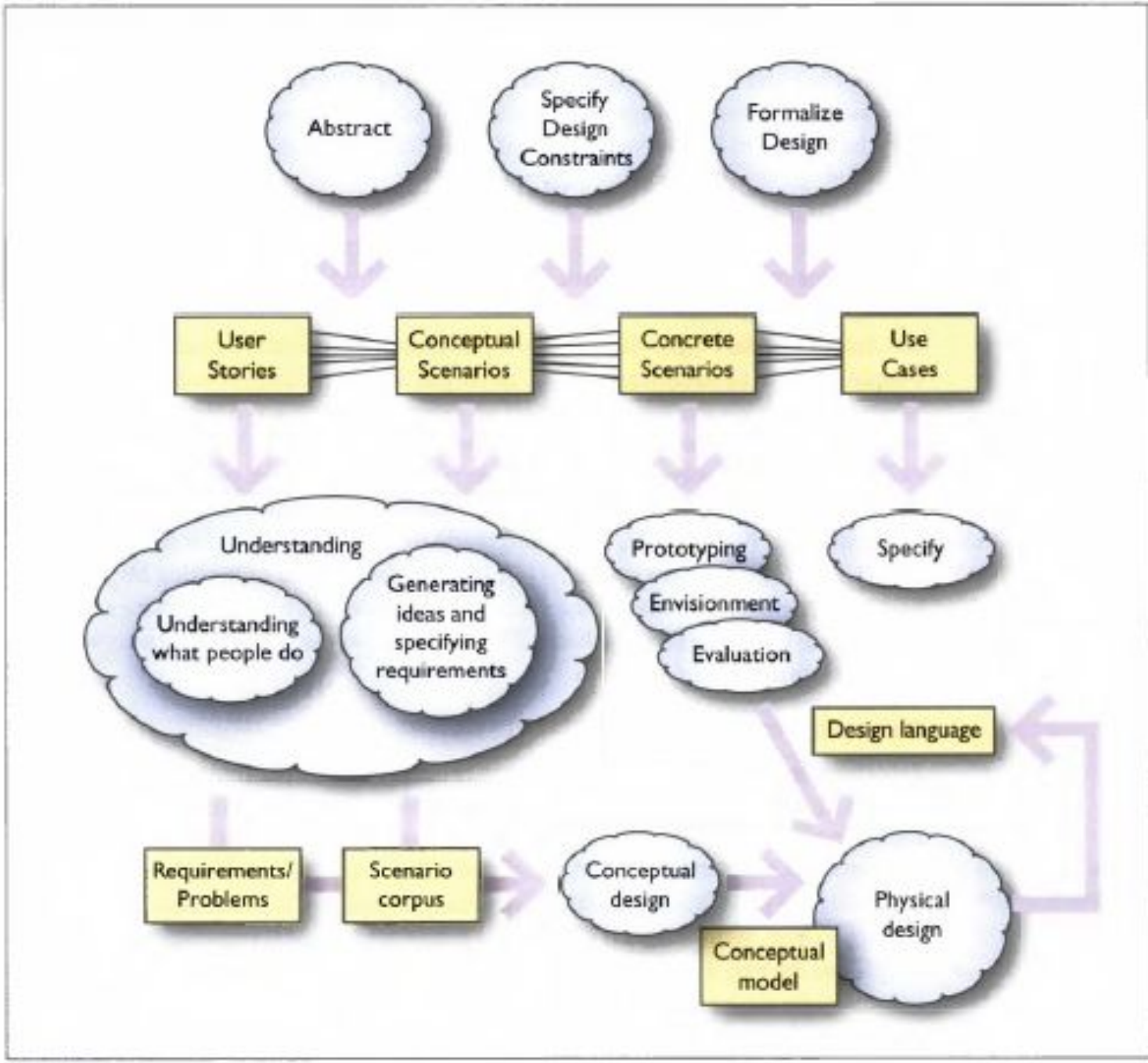


Figure 3.12 Overall scenario-based design method

Overview

- **Chapter 1**: Designing interactive systems: a fusion of skills
- **Chapter 2**: PACT: a framework for designing interactive systems
- **Chapter 3**: The process of human-centred interactive system design
- **Chapter 4**: Usability
- **Chapter 5**: Experience Design
- **Chapter 6**: The Home Information Centre (HIC): a case study in designing interactive systems

Usability

- Usability has always been the central pursuit of HCI
- Definition: “usability is that systems should be easy to use, easy to learn, flexible and should engender a good attitude in people (Shackel, 1990)”.
- Aim:
  - Understand the key issues and concepts of access
  - Understand the principles underlying usability
  - Understand the key issues of acceptability
  - Understand the general principles of good interactive systems design.

Different views of Good Design

The interactive systems designer aims to

- **View-1:** produce systems and products that are *accessible, usable, socially* and *economically acceptable*.
- **View-2:** produce systems that are *learnable, effective* and *accommodating*.
- **View-3:** balance the PACT elements with respect to a domain.

Good Design

- **Accessibility** concerns removing the barriers that would otherwise exclude some people from using the system at all.
- **Usability** refers to the quality of the interaction in terms of parameters such as *time taken to perform tasks, number of errors made* and *the time to become a competent user*.
- A system must be *accessible* before it is *usable*.
- Acceptability refers to fitness for purpose in the context of use.

Accessibility

- Legislation such as the UK's Equality Act 2010 and Section 508 in the USA now requires software to be accessible.
- People will be excluded from accessing interactive systems for several reasons

Accessibility

- Physically people can be excluded (devices making excessive demands on their ability)
- Conceptually people may be excluded because they cannot form a clear mental model of the system.
- Economically people are excluded if they cannot afford some essential technology.
- Cultural exclusion results from designers making inappropriate assumptions about how people work and organize their lives
- Social exclusion can occur if equipment is unavailable at an appropriate time and place

Overcome Barriers of Accessibility

- Two main approaches
  - design for all/ universal design
    - goes beyond the design of interactive systems and applies to all design endeavours
  - inclusive design
    - Varying ability is not a special condition of the few but a common characteristic of being human and we change physically and intellectually throughout our lives.
    - If a design works well for people with disabilities, it works better for everyone.
    - At any point in our lives, personal self-esteem, identity and well-being are deeply affected by our ability to function in our physical surroundings with a sense of comfort, independence and control.
    - Usability and aesthetics are mutually compatible

Principles of universal design*

Equitable use. The design does not disadvantage or stigmatize any group of users.

Flexibility in use. The design accommodates a wide range of individual preferences and abilities.

Simple, intuitive use. Use of the design is easy to understand, regardless of the user's experience, knowledge, language skills, or current concentration level.

Perceptible information. The design communicates necessary information effectively to the user, regardless of ambient conditions or the user's sensory abilities.

Tolerance for error. The design minimizes hazards and the adverse consequences of accidental or unintended actions.

Low physical effort. The design can be used efficiently and comfortably, and with a minimum of fatigue.

Size and space for approach and use. Appropriate size and space are provided for approach, reach, manipulation, and use, regardless of the user's body size, posture, or mobility.

* Compiled by advocates of universal design, listed in alphabetical order: Bettye Rose Connell, Mike Jones, Ron Mace, Jim Mueller, Abir Mullick, Elaine Ostroff, Jon Sanford, Ed Steinfeld, Molly Story, Gregg Vanderheiden.

Inclusive Design

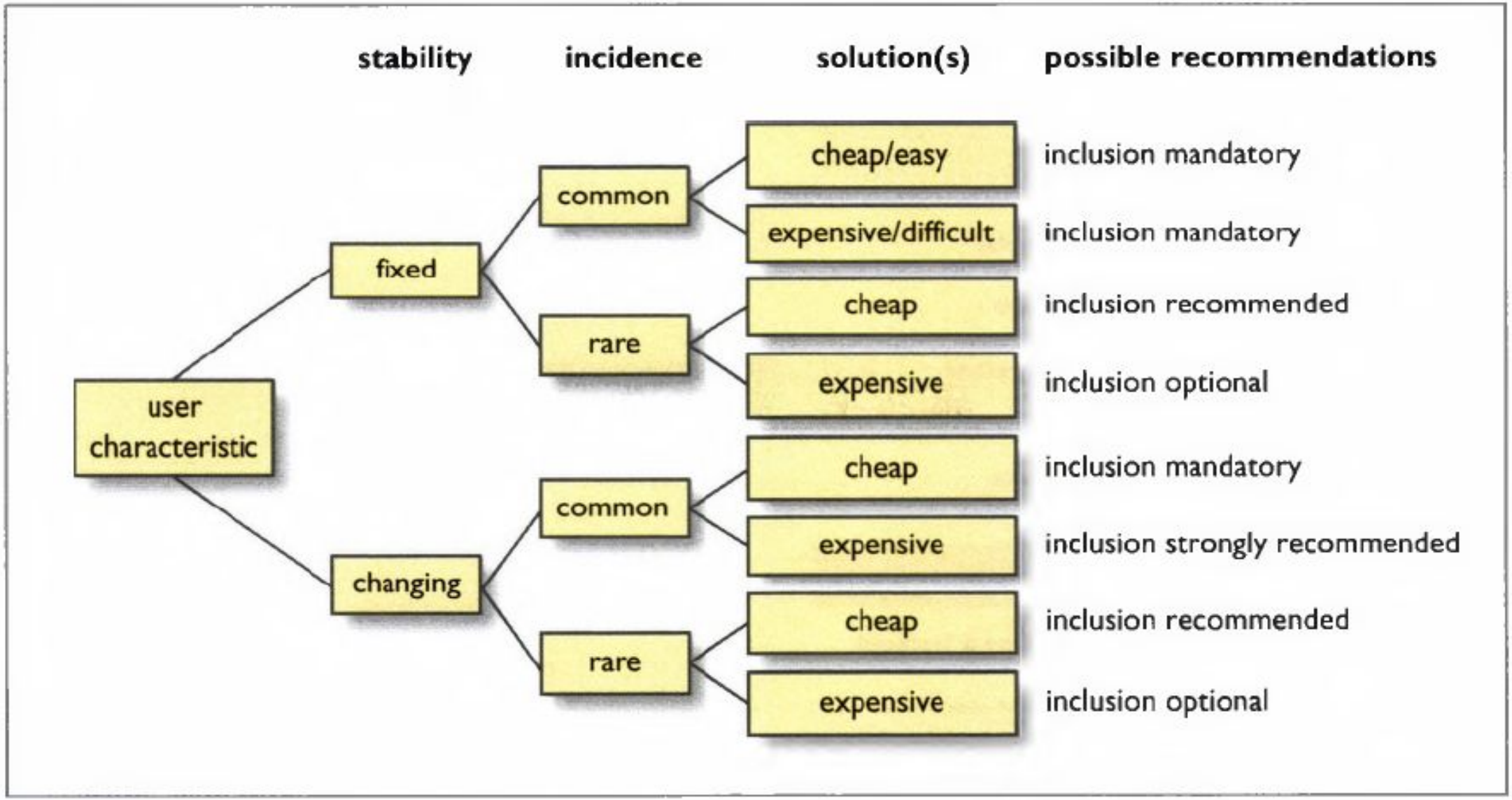


Figure 4.1 Decision tree for inclusivity analysis

Accessibility

- As a way of ensuring an accessible system, designers should:
  - include people with special needs in requirements analysis and testing of existing systems;
  - consider whether new features affect users with special needs (positively or negatively) and note this in the specification;
  - take account of guidelines - include evaluation against guidelines;
  - It will be effective in that it contains the appropriate functions and information content, organized in an appropriate manner.

Usability

- A system with a high degree of usability will have the following characteristics:
  - It will be efficient in that people will be able to do things using an appropriate amount of effort.
  - It will be effective in that it contains the appropriate functions and information content, organized in an appropriate manner.
  - It will be easy to learn how to do things and remember how to do them after a while.
  - It will be safe to operate in the variety of contexts in which it will be used.
  - It will have high utility in that it does the things that people want to get done.

Key Principles of Usability

- *Early focus on users and tasks*
- *Empirical measurement*
- *Iterative design*
- *Integrated usability*

Key Principles of Usability

- *Early focus on users and tasks*
  - Designers must first understand who the users will be, in part by studying the nature of the expected work to be accomplished, and in part by making users part of the design team through participative design or as consultants.

Key Principles of Usability

- *Empirical measurement*
  - Early in the development process, intended users' reactions to printed scenarios and user manuals should be observed and measured.
  - Later on they should actually use simulations and prototypes to carry out real work, and their performance and reactions should be observed, recorded and analysed.

Key Principles of Usability

- *Iterative design*
  - When problems are found in user testing, as they will be, they must be fixed. This means design must be iterative: there must be a cycle of design, test and measure, and redesign, repeated as often as necessary.
  - Empirical measurement and iterative design are necessary because designers, no matter how good they are, cannot get it right the first few times (Gould et *al.,* 1987, p. 758).

Key Principles of Usability

- *Integrated usability*
  - All usability factors must evolve together, and responsibility for all aspects of usability should be under one control

Value Sensitive Design

- Value Sensitive Design is a design approach that aims to account for human values in a principled and comprehensive manner emphasizing the moral perspective, usability and personal preferences.
- It focuses on three types of investigations
  - Conceptual investigations
  - Empirical investigations
  - Technical investigations

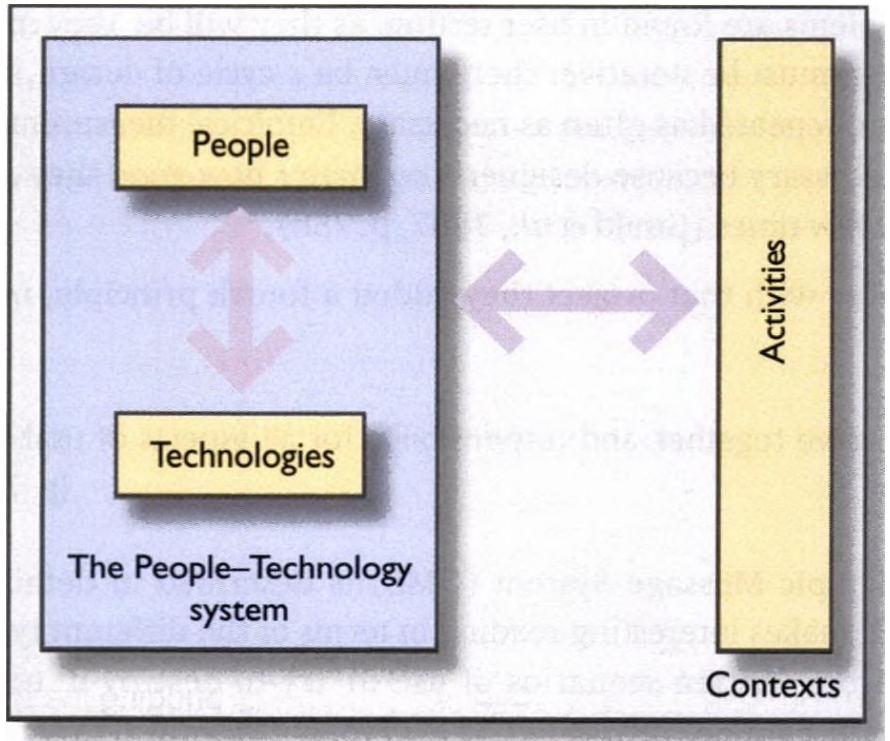
Value Sensitive Design

- **Conceptual investigations** concern philosophically informed analyses of the central constructs and issues under investigation.
- **Empirical investigations** focus on the human response to the technical artefact, and on the larger social context in which the technology is situated.
- **Technical investigations** focus on the design and performance of the technology itself, involving both retrospective analyses of existing technologies and the design of new technical mechanisms and systems.

Usability Aim

- One way to look at usability is to see it as concerned with achieving a balance between the four principal factors of human-centred interactive systems design, PACT:
  - People
  - Activities people want to undertake
  - Contexts in which the interaction takes place
  - Technologies (hardware and software)

  Two relationships need to be optimized.



Norman's Characterization

- Don Norman (Norman, 1988) focuses on the **interface between a person and the technology** and **on the difficulty of people having to translate their goals into the specific actions required by a user interface**.

  - People have goals - things they are trying to achieve in the world. But devices typically only deal with simple actions. This means that two 'gulfs' have to be bridged.

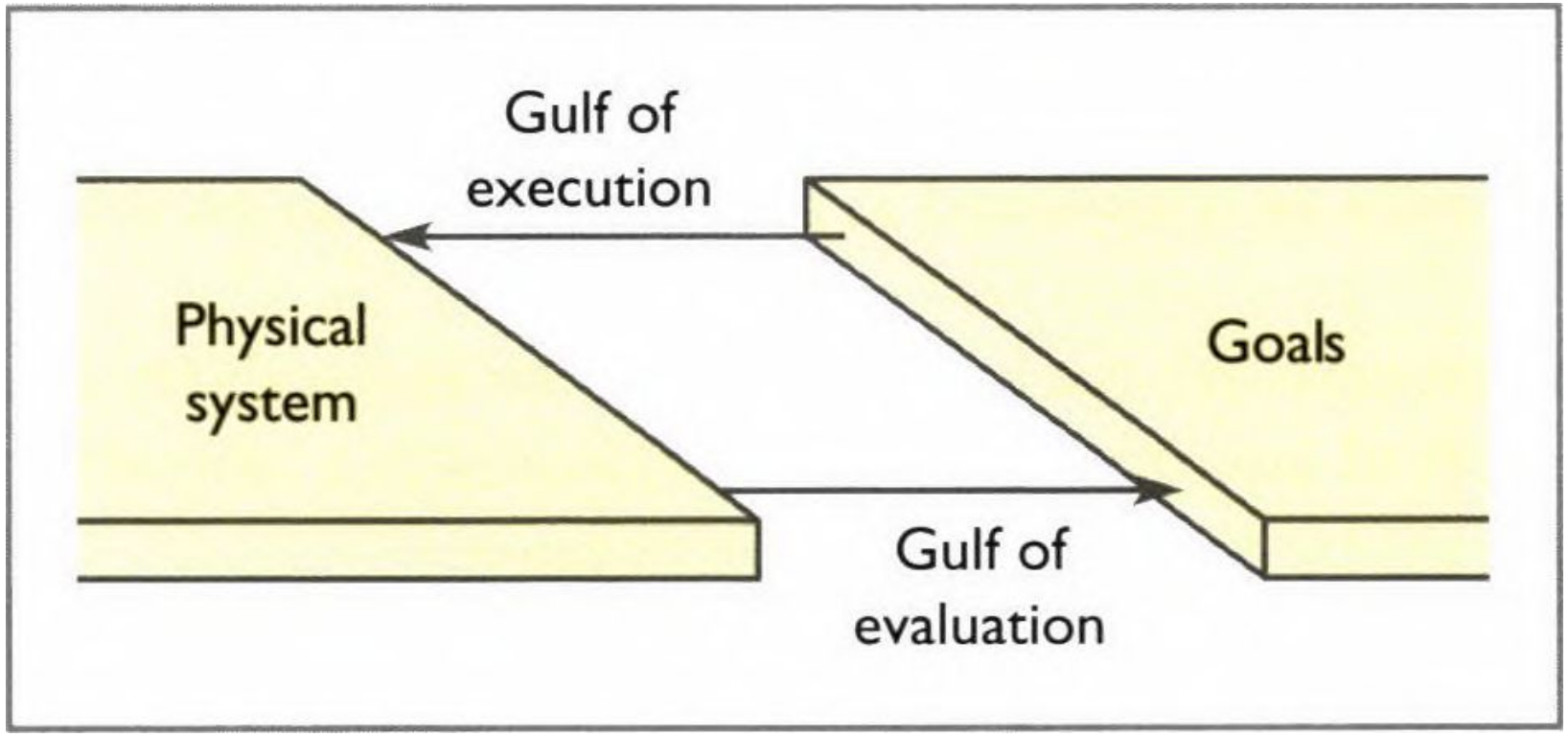
Norman's Characterization

- The gulf of execution is concerned with translating goals into actions, and the gulf of evaluation is concerned with deciding whether the actions were successful in moving the person towards his or her goal.

- These gulfs have to be bridged both semantically (does the person understand what to do and what has happened?) and physically (can the person physically or perceptually find out what to do or what has happened?).

Norman's Characterization

- A key issue for usability is that very often the technology gets in the way of people and the activities they want to do.
- *E.g.,* Using remote control to using a hammer or driving a car.
- Bridging the gulfs



Acceptability

- Acceptability is about fitting technologies into people's lives.
- The key features of acceptability
  - *Political*
  - *Convenience*
  - *Cultural and social habits*
  - *Usefulness*
  - *Economic*