Lecture 5: Human-centred Design

ELEC-D7010 Engineering for Humans

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Today

Levels of automation theory (from Lecture 4)

Human-centered design processes: Overview

Introduction to A5

Example process model: Design optimization

Assignment 5 preview

A5-1: Human-centred design: Project plan [5p, recommended]

A5-2: Levels of automation [5p, optional]
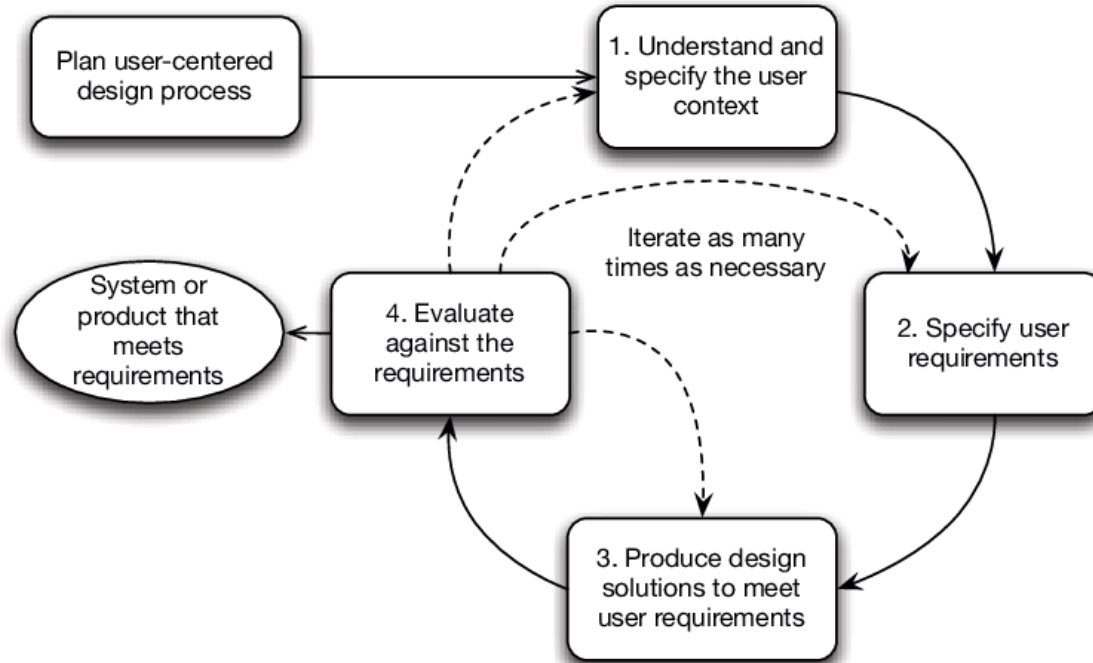
Human-centred design

The case of A5-1

An emergency medical dispatcher is a professional telecommunicator, tasked with the gathering of information related to medical emergencies, the provision of assistance and instructions by voice, prior to the arrival of emergency medical services (EMS), and the dispatching and support of EMS resources responding to an emergency call.

Elements of human-centric design processes

- **The goal of technology development is to improve the human condition**

    - Design objectives are related to humans (e.g., usability, experience etc)

    - Design decisions are taken in the light of best available knowledge about the users

    - Designs are evaluated with representative users in representative circumstances

ISO-9241 User-centered design process

8 characteristics of human-centered design process models

# 1. Empirical research produces objectives and constraints for design

User research is the practice of obtaining and disseminating information about the human use of technology in a standardised (scientific) manner, and utilising this information to support design of technology.

Anthropologist Genevieve Bell at Intel

A plethora of user research methods

Tip: We have a course in Period I on User Research
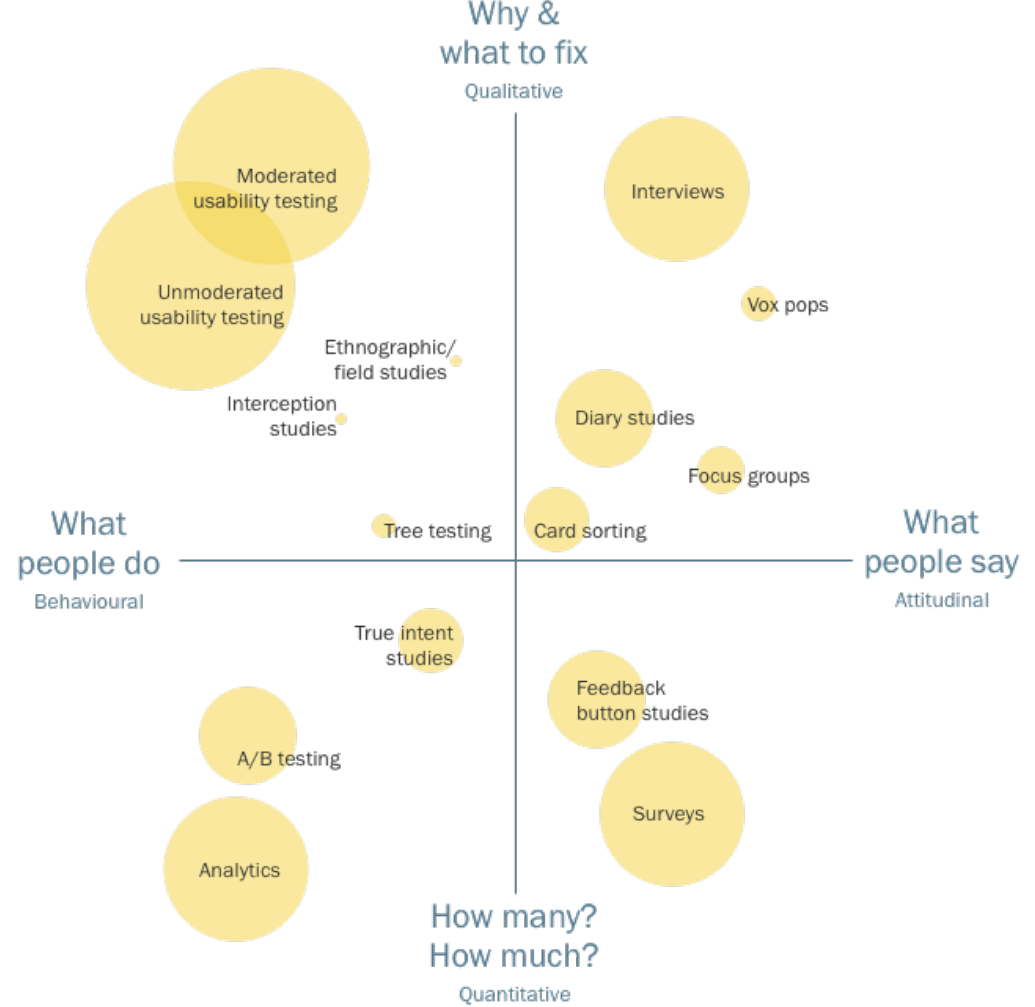
2. Empirical data are summarized to help design decisions

Requirements

Scenarios

Personas

Narratives
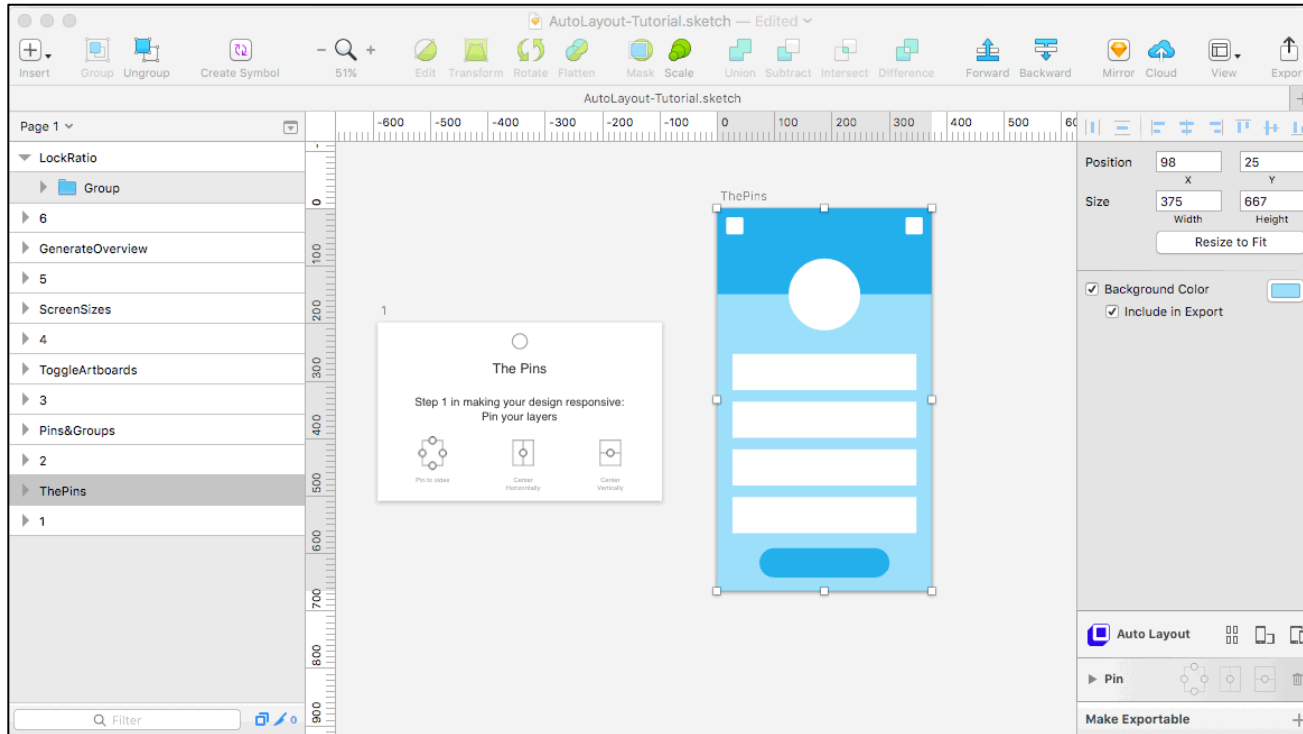
Storyboards

Task diagrams

Use cases

...

Fig. 5.6 The two drawings are the beginning of a story about the farmer Chris using an app while on his tractor. It contains both the persona, the context, and suggestions for the solution. Courtesy of Lone Ørum, Senior UX designer at Invokers a/s

Example: Scenario

3. Design proceeds iteratively from low-fidelity to high-fidelity

Example in GUI design

Sketching

Wireframing

Software prototypes

Beta deployment

AB testing

Continuous testing

4. Creative design is increasingly computer-assisted
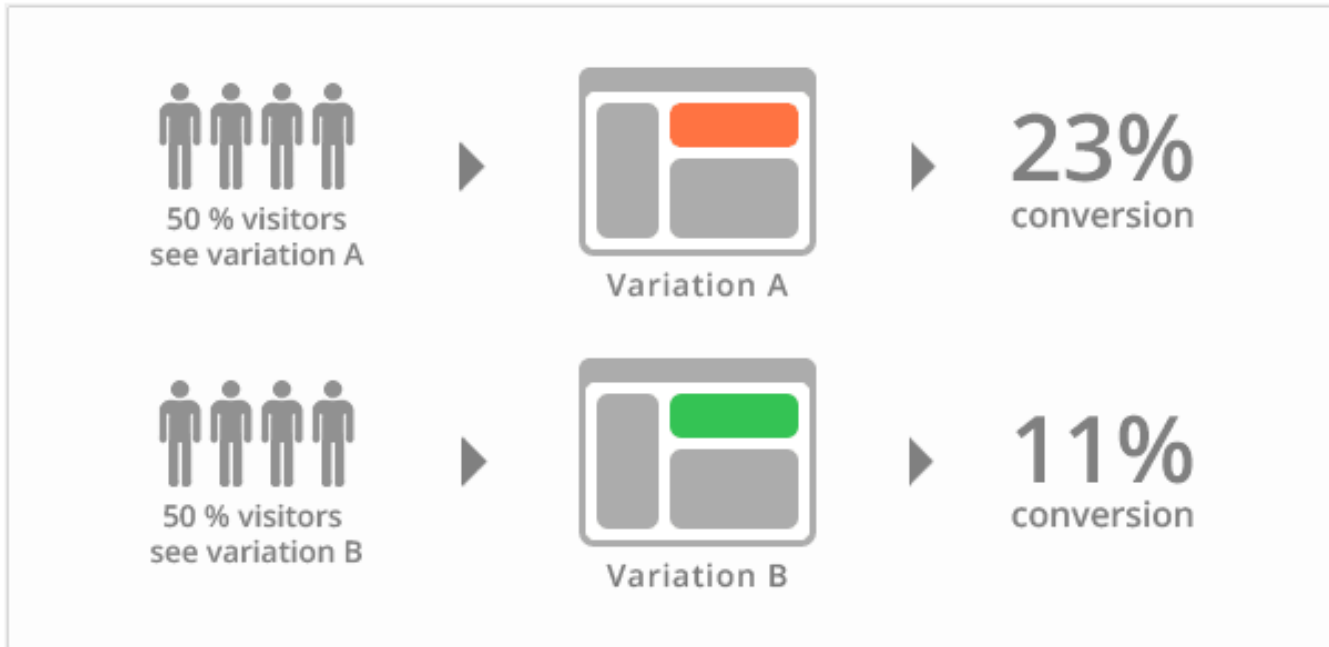
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5. Prototypes need to be empirically evaluated against stated design goals
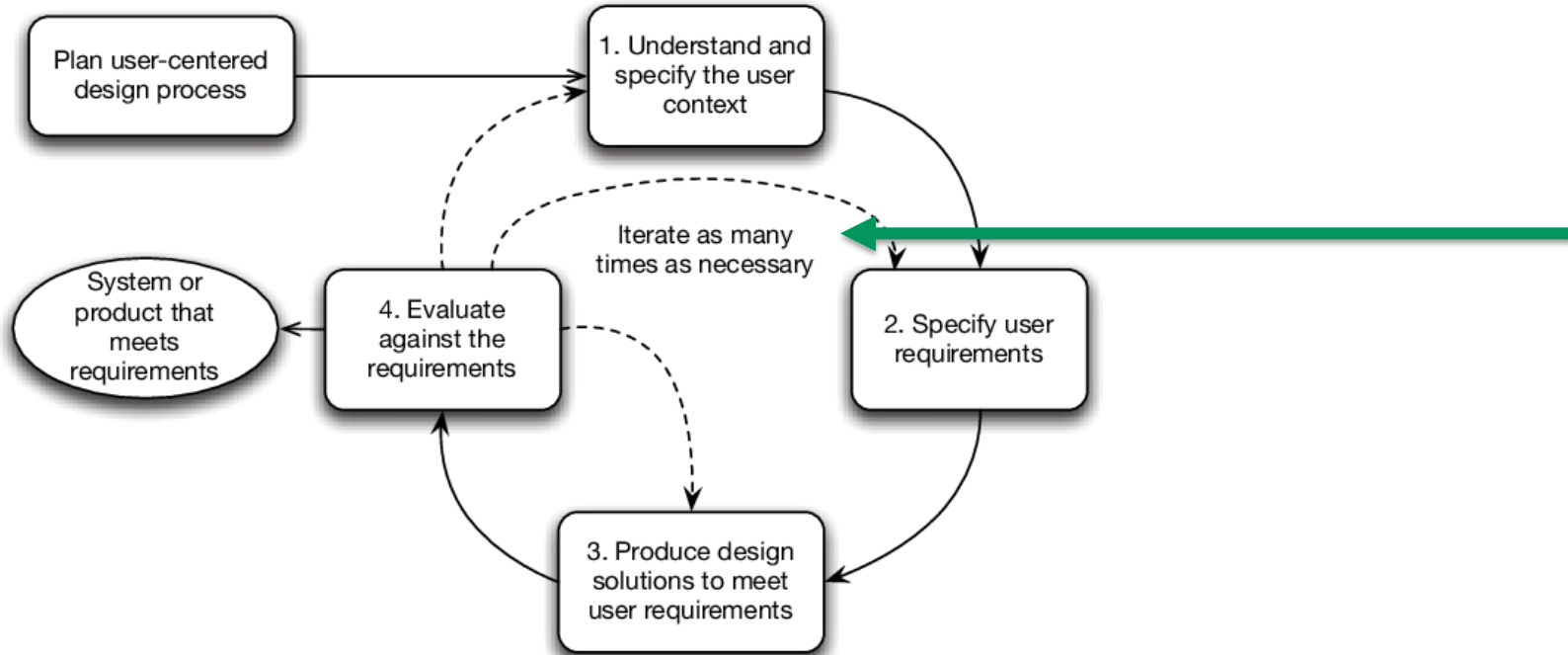
Example: Usability testing (Lecture 9)

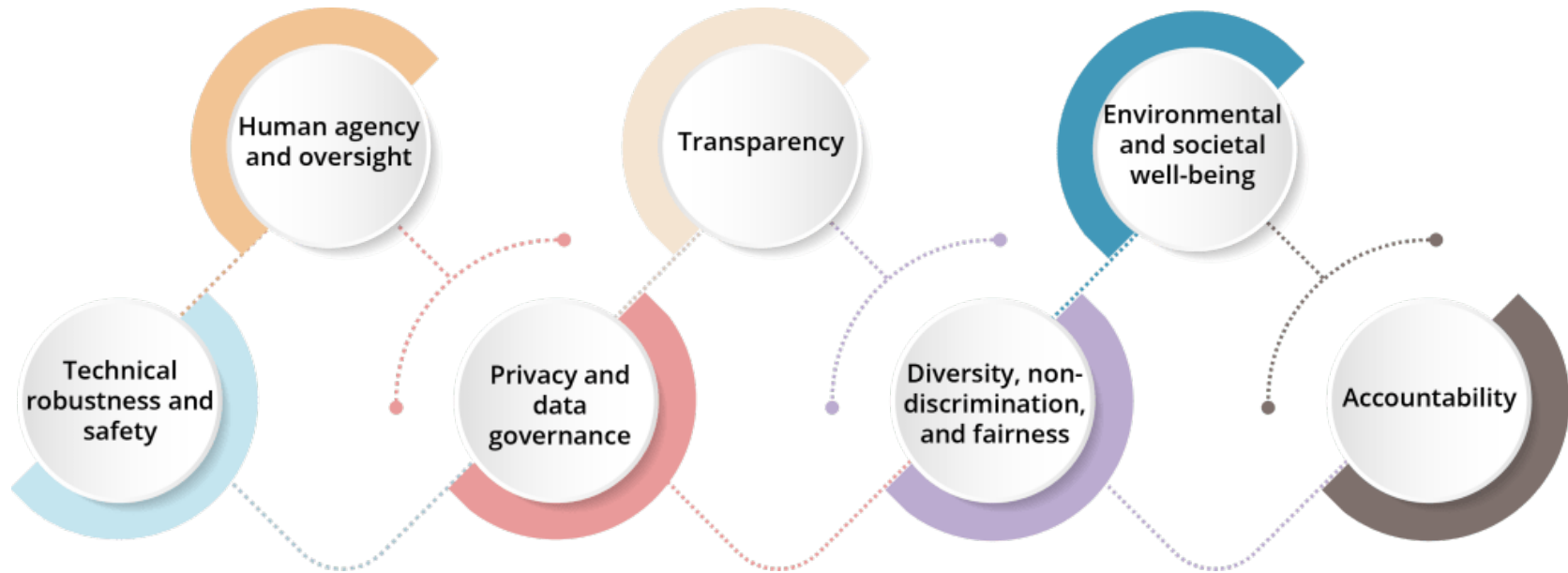# 6. Evaluation is becoming increasingly computer-assisted

Example: AB testing

7. Iterate, iterate, iterate...

8. Adheres to ethical practice that values humans

Example: EU's guidelines to ensure ethical AI

Process models: A helicopter view

Introduction to materials in A5-1

Back to the case of A5-1...

You will need to pick 1 process model and apply it (hypothetically of course) to this case

Process models in design and engineering

Design process models emphasize creative problem-solving and learning about the domain

- Human-centered design
- User-centered design
- Interaction design
- Service design
- Experience design
- Design thinking

Engineering process models emphasize the derivation of decisions based on knowledge on users
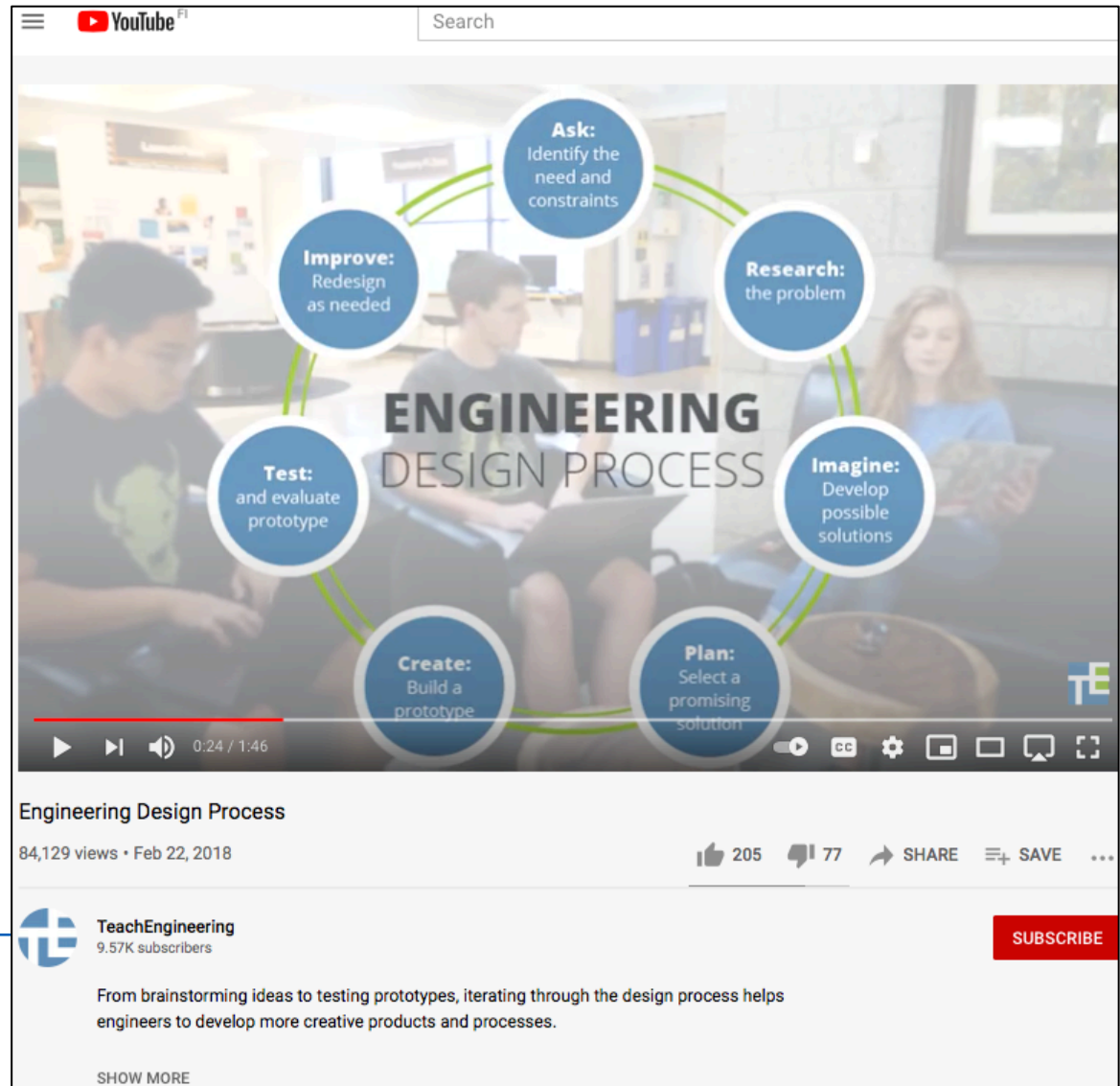
- Human factors engineering
- Software engineering
- Design engineering
- Design optimization
- Systems engineering

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Example: NASA's HFE process

a. Operation and scenario development

b. Task analyses

c. Function allocation between humans and systems

d. Allocation of roles and responsibilities among humans

e. Iterative conceptual design and prototyping

f. Empirical testing, e.g., human-in-the-loop, testing with representative population, or model-based assessment of human-system performance

g. In-situ monitoring of human-system performance during flight.

Example

Engineering design

Example

Design thinking

Example

UCD

INVIQA

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User-centred design:
6 popular UCD methods

By Alexander Baxevanis

1 May 2006   Experience design

User-centred design (UCD) is a project approach that puts the intended users of a site at the centre of its design and development. It's achieved by **talking directly to the user** at key points in the project to make sure the site will deliver upon their requirements.

The stages are carried out in an **iterative** fashion, with the cycle being repeated until the project's usability objectives have been attained. This makes it critical that the participants in these methods accurately reflect the profile of your actual users.

ISO 13407 outlines four **essential activities** in a user-centred design project:

- **Requirements gathering:** understanding and specifying the context of use
- **Requirements specification:** specifying the user and organisational requirements
- **Design:** producing designs and prototypes
- **Evaluation:** carrying out user-based assessment of the site

The following is a typical top-level characterisation of the most **popular user-centred design methods:**

Method	Cost	Output	Sample size	When to use
Focus groups	Low	Non-statistical	Low	Requirements gathering

Example

Systems engineering

Part of special issue:

Human-Centered Computing in Health Information Systems. Part 1: Analysis and Design

Edited by Jiajie Zhang

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A systems engineering perspective on the human-centered design of health information systems

George M. Samaras [a] , Richard L. Horst [b]

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Abstract

The discipline of systems engineering, over the past five decades, has used a structured systematic approach to managing the "cradle to grave" development of products and processes. While elements of this approach are typically used to guide the development of information systems that instantiate a significant user interface, it appears to be rare for the entire process to be implemented. In fact, a number of authors have put forth development lifecycle models that are subsets of the classical systems engineering method, but fail to include steps such as incremental hazard analysis and post-deployment corrective and preventative actions. In that most health information systems have safety implications, we argue that the design and development of such systems would benefit by implementing this systems engineering approach in full. Particularly with regard to bringing a human-centered perspective to the formulation of system requirements and the configuration of effective user interfaces, this classical systems engineering method provides an excellent framework for incorporating human factors (ergonomics) knowledge and integrating ergonomists in the interdisciplinary development of health information systems.

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Example

Service design

Assignment 5

Assignment 5 overview

A5-1: Human-centred design: Project plan [5p, recommended]

A5-2: Levels of automation [5p, optional]