

MIE240: Human-Centred Systems Design

Human Factors in Systems Design



1

Learning Objectives

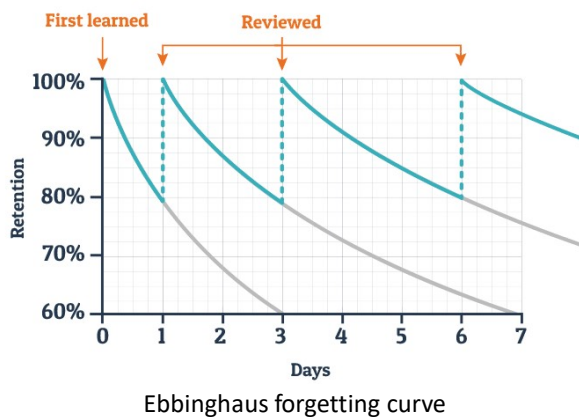
- Review HF goals, intervention areas, & design cycle
- Define human centered design and the objectives of each design phase
- Examine the role of human factors in front end analysis (*understanding user, context, task*)



2

Purpose of the review

Typical Forgetting Curve for Newly Learned Information



Hermann Ebbinghaus



4

Review

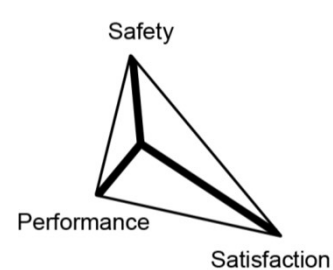
equity: HF for good

Goals of human factors

Safety (↓ risk of injury and death)

Performance (↑ productivity, quality, and efficiency)

Satisfaction (↑ acceptance, comfort, and well-being)

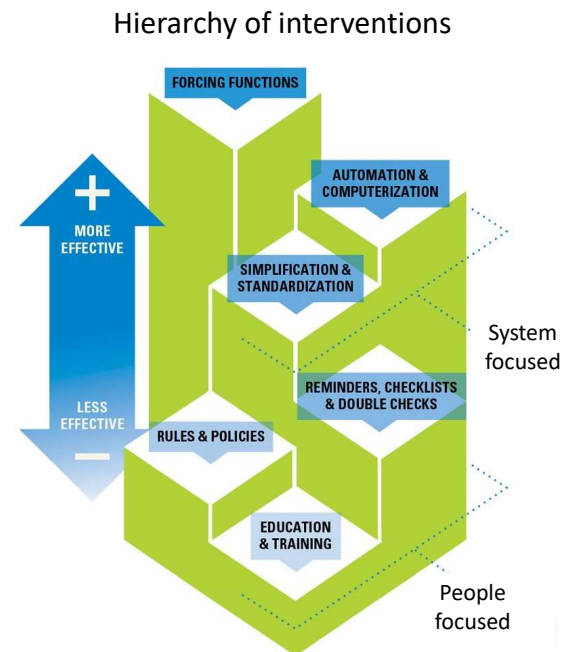


5

Review

Areas of human factors intervention

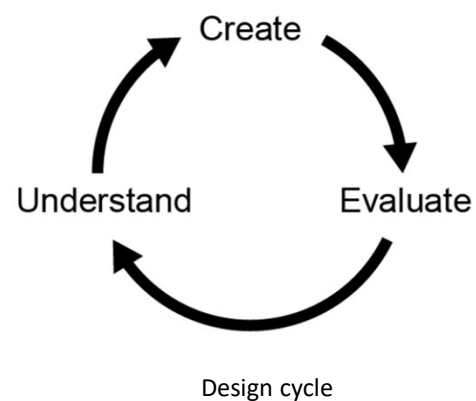
- Task design
- Equipment design
- Environmental design
- Training
- Selection
- Team and organization



6




Human centered design

A design approach that **places users at the center of the development process** to ensure the products and services created are tailored to users' needs. The goal of HCD is **emphasize users' wants, pain points, and needs at each phase of the design process.**



7

Phases of design

-  understand – observe users, their tasks, and environments in which they work and establish empathy
-  create – produce initial design concepts and develop prototypes based on users' needs and understanding of design principles and human behavior and abilities
-  evaluate – identify opportunities to improve design and iteratively refine prototype



9

Front end analysis

Understand phase

1. Understand the users & their needs (e.g.. *know thy user*)
2. Understand the context under which the product, service, system will be used
3. Understand their tasks (*how long and in what order*)

Methods

observation

Video

interviews

surveys

Contextual inquiry *observation in-situ*

Site visits

Task analysis



11

An example: chest retractor

12

1) Know thy user

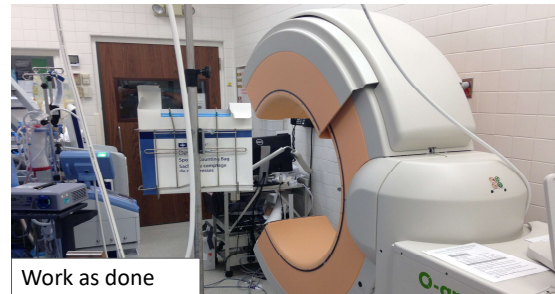
- Who are our users? *surgeon*
- Who else are our users? *sterilizing technicians*
- Why do they need the product/service/system?
- What are their preferences?
- Are there any other people whose feedback is important?

Group	Examples
Lead user	<i>surgeon</i>
User	<i>sterilizing technician</i>
Stakeholder	<i>patient</i>

13

2) Understanding context of use

- Environmental conditions (*temperature/ humidity, lighting, noise, vibrations, exposure to elements*)
- Physical and organization context (*workspace, org culture, time pressures*)
- *workload* and *mental states* (*stress, fatigue, drowsy*)



15

Context of use

- Environmental conditions, physical and organization context, workload & mental states

sterile environment

by work team

lighting conditions

amount of space available

precision

time pressure

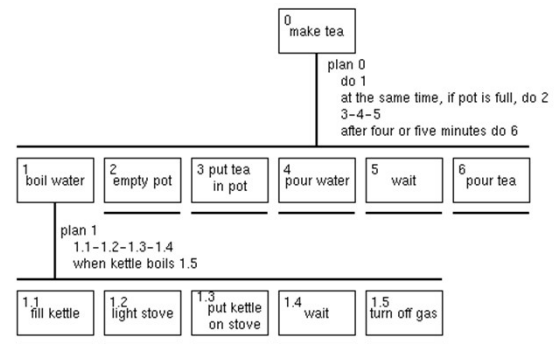
organizational culture

16

3) Understanding users' task

task analysis is a way of systematically describing human interaction with a system

- Encompasses many techniques
- Physical tasks or cognitive tasks
- What, why, who, how, when, and where tasks are performed



Sample hierarchical task analysis

18



<https://www.youtube.com/watch?v=yCILA5EzxGk>

19

User tasks

User 1: nurse

- assemble → orientation pin
- position it to reduce opening
- point to surgeon when asked for

User 2: surgeon

- use chest retractor
- insert in patient.
- _____

User 3: sterilization

- disassemble
- wash
- reassemble



20

Summary

- HCD is design approach that **places users at the center of the development process** to ensure the products and services created are tailored to users' needs. It **emphasize users' wants, pain points, and needs at each design phase**.
- The phases of the design cycle are understand, create, and evaluate
- Front end analysis involves the following objectives:
 - Understanding users
 - Understanding context of use
 - Understanding users' tasks
- Methods for front end analysis include observations, video, interviews, surveys, contextual inquiry, site visits, task analysis



21

Next class (Tues., Jan. 14)

Topic: Task analysis

Review: Ch 2.3

