

CSE 3461

User Interfaces

Introduction

Andriy Pavlovych, PhD

Course Outline

Concepts of human-computer interaction and usability testing:

- human information processing
- usability principles
- models of interaction
- user interface paradigms
- design of user interfaces
- developing Graphical User Interfaces using a specific User Interface Management system

Course Description

Time

- Tue, Thu 14:30–16:00

Instructor

- Andriy Pavlovych (andriyp@cse.yorku.ca)

Course Web-Page

- <http://www.eecs.yorku.ca/course/3461/>
 - Notes, updates

Textbook (tentative)

- Interaction Design: Beyond Human - Computer Interaction (3rd ed.), by Yvonne Rogers, Helen Sharp, Jenny Preece. Wiley, 2011.
 - Book web site: <http://www.id-book.com/>

Recommended Readings

Donald A. Norman, *The Design of Everyday Things*, Doubleday 1990, ISBN 0-385-26774-6.
Basic Books 2002, ISBN 0-465-06710-7

Alan Cooper, *The Inmates are Running the Asylum*, Sams 1999, ISBN 0-672-31649-8.

Evaluation

Assignments	30%
Project, part 1	10%
Project, part 2	10%
Midterm	20%
Final	30%

* – number of assignments is to be determined (approx. 5)

Missed work

- Makeups of missed assignments, exams will NOT be possible

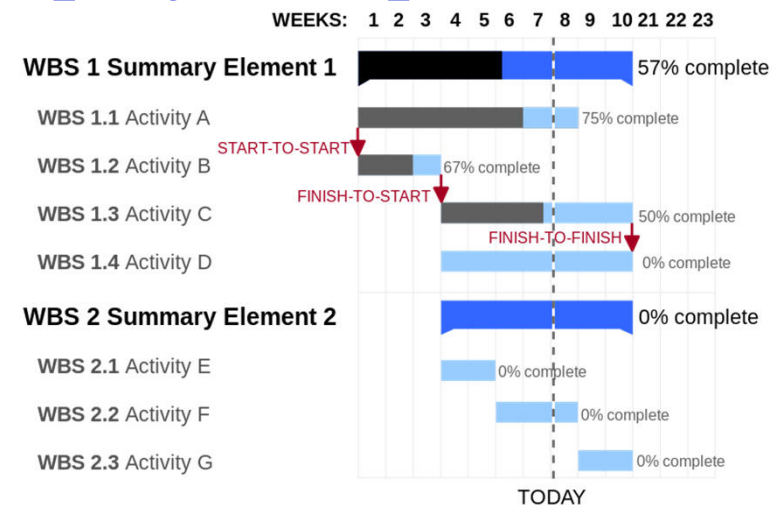
The Project

In groups of three

Java Swing is suggested

You will be doing bi-weekly project reports

- Gantt chart required with proposal



- You will show updates each report

Challenges

- Strong programming skills (Java Swing)
- Some understanding of computer architecture and human perception
- Ability to pay attention to detail
- Ability to be open-minded

Human-Computer Interaction (HCI)

This course will teach you about the importance of the human-computer interface in the design and development of things people use.

We will touch on many of the cognitive, and social characteristics of people, as well as methods for learning more about the people you wish to use your systems (analyzing the tasks they perform, the way they perform them, the way they think and feel about what they do, etc.).

Human-Computer Interaction (HCI)

Capabilities/limits of computers and other systems

- effects on design and implementation decisions

Methods of design, ways to implement, evaluate, and improve a design

Blend of psychological, social, design, and computer science elements

Objectives

Stress importance of good user interface design

To highlight connection between psychology, design and computer science

To provide the future user interface designer with concepts and strategies for making design decisions, expose tools, techniques, and ideas for interface design

Interfaces in the World

Not just computers!

- VCR
- Mouse
- Phone
- Copier
- Car
- Plane cockpit
- Airline reservation
- Air traffic control
- Home control

Goals of HCI

Allow users to carry out tasks

- Safely
- Effectively
- Efficiently
- Enjoyably

Usability

Crucial issue in this area!

Combination of

- Ease of learning
- High speed of user task performance
- Low user error rate
- Subjective user satisfaction
- User retention over time

HCI How?

How do we improve interfaces?

1. Educate software professionals
2. Draw upon fast accumulating body of knowledge regarding H-C interface design
3. Integrate UI design methods & techniques into standard software development methodologies now in place

UI Design/Develop Process

Analyze user's goals & tasks

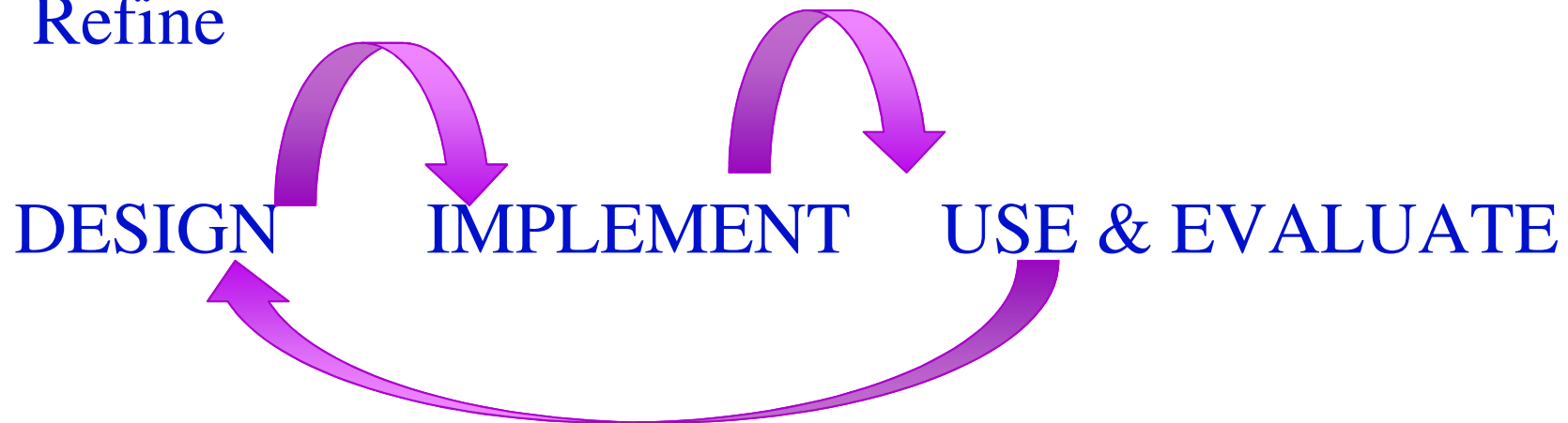
Create design alternatives

Evaluate options

Implement prototype

Test

Refine



History of HCI

Digital computer grounded in ideas from 1700's & 1800's

Technology became available in the 1940's and 1950's

The “user” concept is relatively new

History of HCI

Mechanical Computers <http://www.thocp.net>

1623 Schickard makes "Calculating Clock".

1674 Leibniz designs his "Stepped Reckoner"

1820 de Colmar makes "Arithmometer"

1889 Felt invents the first printing desk calculator.

1935 IBM introduces "IBM 601", punch card machine

1945 Mauchly & Eckert "ENIAC" for ballistics.

Enigma: German coding machine in WWII

Batch Processing...

- One task at any time, performed sequentially
- No “interaction” between operator and computer after starting the run
- Punch cards, tapes for input, serial operations

Mid 1960's: Timesharing mode of computing
interactive systems, not “jobs”

- computers too expensive for individuals:
timesharing increased accessibility
- text processing, editing
- email, shared file system

Human Role

How is human viewed in HCI

What is human role?

Different roles – different frameworks

Human Roles

Human as...

1. Sensory processor

Experimental psych, sensory psych

2. Interpreter/Predictor

Cognitive psych, AI

3. Actor in environment

Activity theory, ethnography

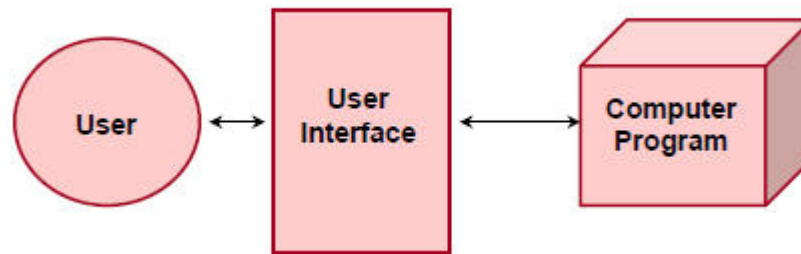
What Makes a System Usable

Usability results when the system...

1. Sensory processor - Fits within human limits
2. Interpreter/Predictor - Fits with knowledge
3. Actor in environment - Fits with task and social context

Simple View of the User Interface

A user interface is the junction between the user and the computer

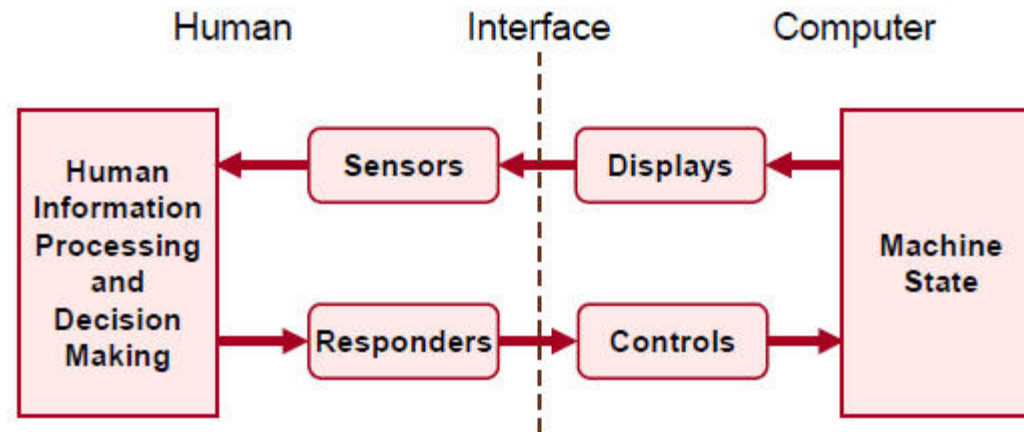


Correct View

A User Interface is much more than a layer slapped between the user and the computer

Incorporates an understanding of

- the user
- the task and task flow
- the environment
- etc.



Human-Computer Interaction

What is considered a “computer”?

- Desktop and laptop computers
- Handheld computers
- Video game consoles
- Mobile phones
- ATMs
- Photocopiers, microwaves

Interface Examples



HCI What? HCI Why?

What happens when a human and a computer system interact to perform a task?

Why is this important?

1. Computer systems affect every person
2. Safety, satisfaction, utility is critical
3. Product success depends on ease of use

What is the User Interface (UI)?

Different actors perceive it very differently!

Developer's View

- Application functionality is separate from UI
- UI often seen as an add-on

User's View

- Users don't distinguish between the UI and the application
- If the UI is well designed and usable, then entire application appears usable
 - *Credo: The interface IS the computer!*

What is the UI?

UI includes all aspects of the system that influence interaction with users

This includes:

- conceptual model (how UI objects correspond to real world objects)
- metaphors, to help the user (e.g., “desktop”)
- input controls and their behaviour
- means for navigation within and flow between screens
- Integration and consistency among different applications
- visual design of the screens

The Study of HCI

What's involved in the study of HCI?

- Physiological and psychological factors
- How interfaces affect people emotionally
- Identifying the requirements of an interface's design
- Prototyping different designs
- Evaluating interface designs
- Observing users

Physiological and Psychological Factors

Studying how information is transmitted to and from people

- sight, hearing, touch
- monitor, keyboard, foot pedals, mouse, joystick, touch pad, touch screen, game controller, steering wheel, microphone, headphones, speakers, video camera

Understanding how humans process information, what they're more likely to remember, how much they're able to remember, the common errors people make

Emotions

I hit the wrong switch again!

Who designs these instrument panels???

How Interfaces Affect People Emotionally

Understanding what feels “at home”, comfortable, slick, fun to use, aesthetically pleasing

Knowing what frustrates users

- When they can't find out how to do the task they want
- When they have to do repetitive things
- When interfaces behave differently than they expect
- When they accidentally do something destructive

Changing Ringer Volume

Press “Program”

Press “6”

Set volume

Low - Press “1”

Medium - Press “2”

High - Press “3”

Press “Program”

Bad designs

- Elevator controls and labels on the bottom row all look the same, so it is easy to push a label by mistake instead of a control button



- People do not make same mistake for the labels and buttons on the top row. Why not?

From: www.baddesigns.com

Good and bad design

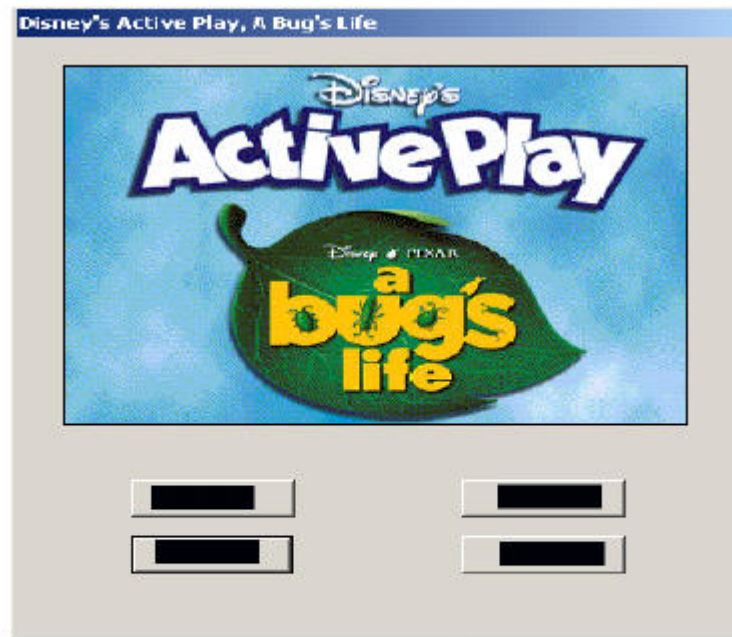


What is wrong with the remote on the right?

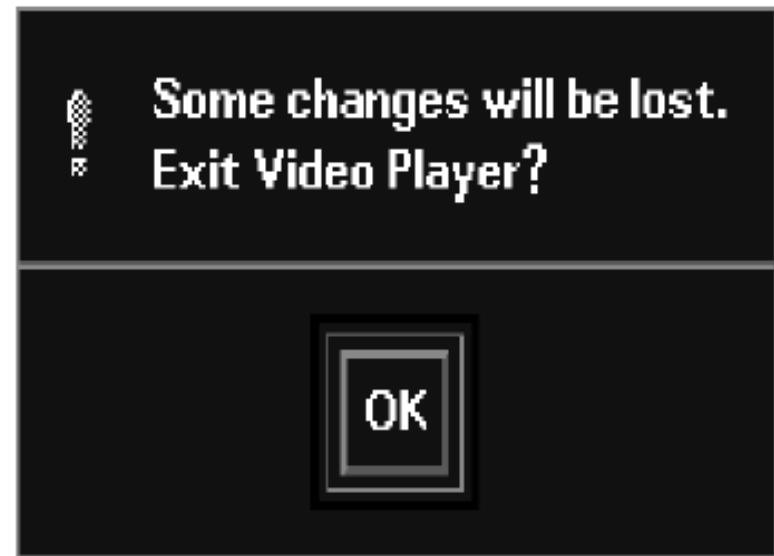
Why is the TiVo remote so much better designed?

- Peanut shaped to fit in hand
- Logical layout and colour-coded, distinctive buttons
- Easy to locate buttons

Possible Usability Issues?



How it appears to a child



How do you cancel?

What to design

Need to take into account:

- Who the users are
- What activities are being carried out
- Where the interaction is taking place

Need to optimize the interactions users have with a product

- So that they match the users' activities and needs

Identifying the Requirements of an Interface's Design

How to gather data from customers

- How to elicit information from the customer when they're not sure what they need
- Understanding why they want what they're asking for

An important aspect of software engineering

Understanding users' needs

Need to take into account what people are good and bad at

Consider what might help people in the way they currently do things

Think through what might provide quality user experiences

Listen to what people want and get them involved

Use tried and tested user-centred methods

Above All Else...

Know the User!

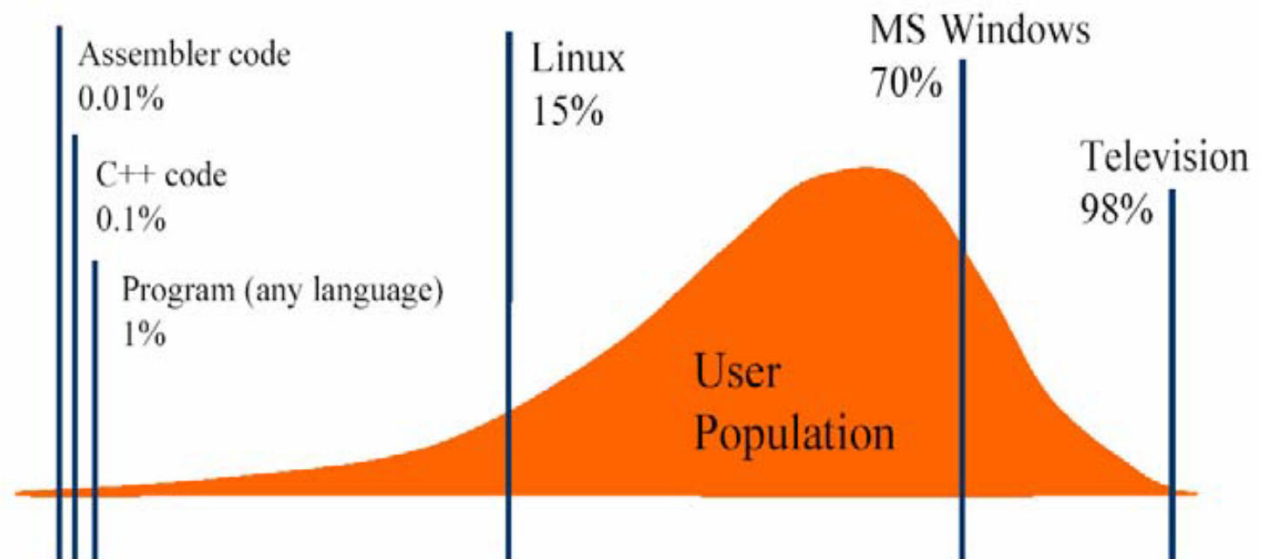
- Physical & cognitive abilities (& special needs)
- Personality & culture
- Knowledge & skills
- Motivation

Two Fatal Mistakes:

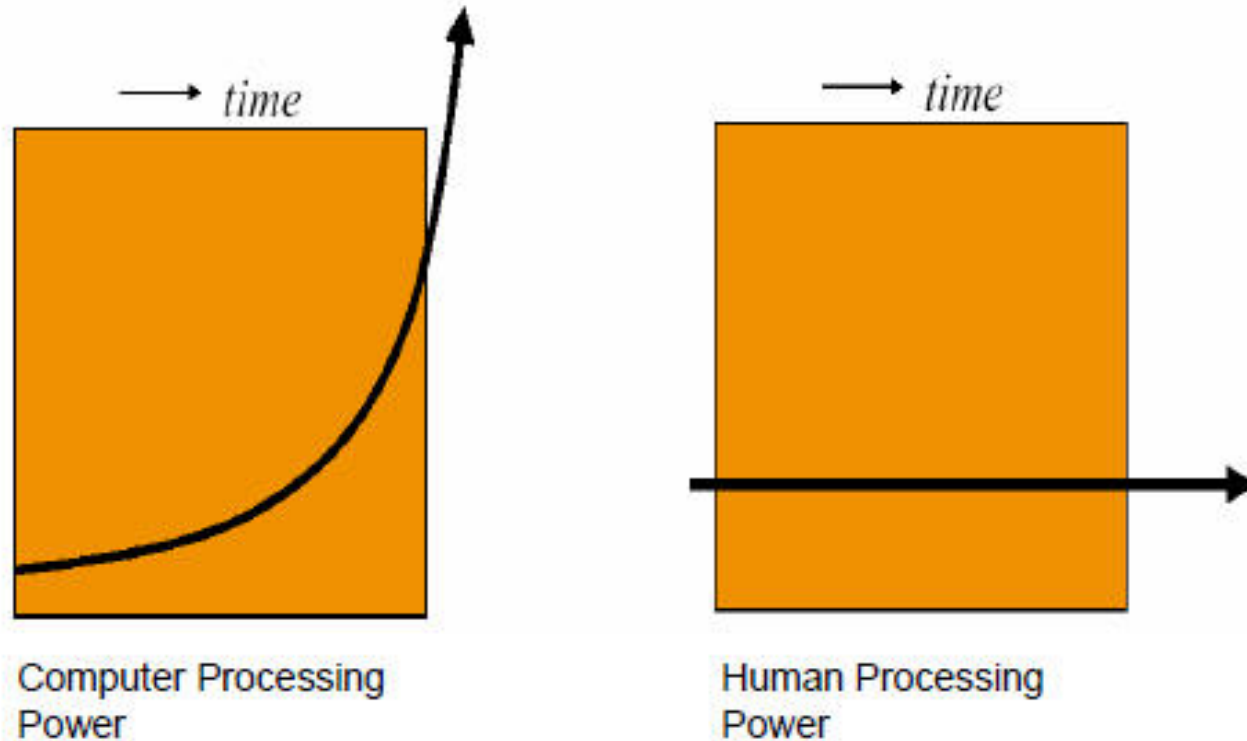
1. Assume all users are alike
2. Assume all users are like the designer

Usable for Whom?

Each example is “usable” by that portion of the user population to the left of vertical line.



Don Norman's Observation



Individual Differences

For whom do you design?

Everyone? Impossible

Average? Excluding half audience

95%? Still may miss a lot

Can't accommodate everyone



Individual Differences

Designers are not representative of the user population for whom they are designing

Don't expect users to think or act like you

People vary in both physical attributes and mental/cognitive attributes

Cultural Differences

5/21/2012 versus 21/5/2012?

- Which should be used for international services and online forms?

Activity and Context

How does making a call differ when using a:

- Cell phone
- Public phone box?

Consider the kinds of user, type of activity and context of use



HCI: Multidisciplinary Nature

Kinds of Design

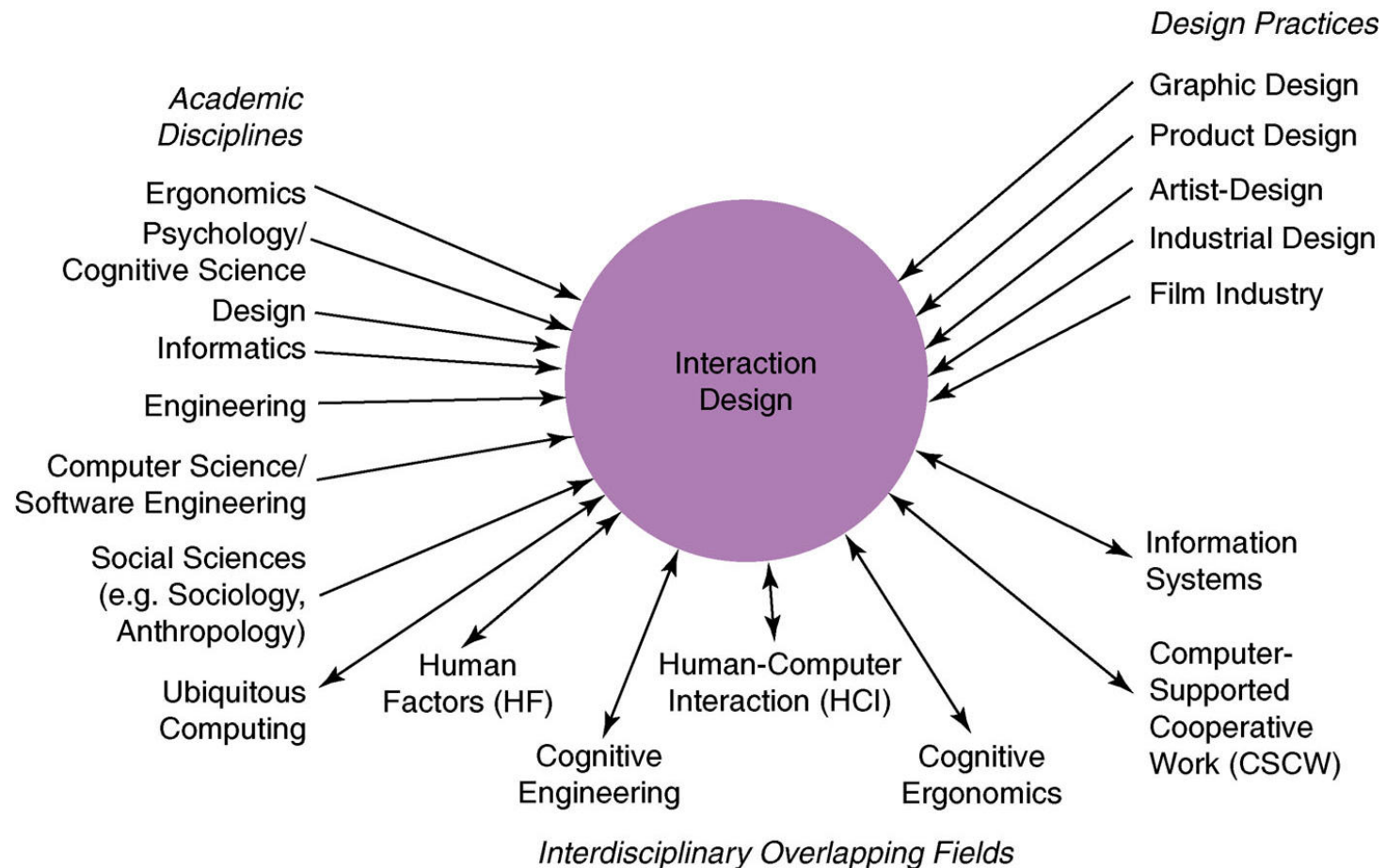
Number of other terms used emphasizing what is being designed, e.g.

- user interface design, software design, user-centred design, product design, web design, experience design (UX)

Interaction design is the umbrella term covering all of these aspects

- fundamental to all disciplines, fields, and approaches concerned with researching and designing computer-based systems for people

HCI and interaction design



Relationship between ID, HCI and other fields

Academic disciplines contributing to ID:

- Psychology
- Social Sciences
- Computing Sciences
- Engineering
- Ergonomics
- Informatics

Relationship between ID, HCI and other fields

Design practices contributing to ID:

- Graphic design
- Product design
- Artist-design
- Industrial design
- Film industry

Relationship between ID, HCI and other fields

Interdisciplinary fields in interaction design:

- HCI
- Ubiquitous Computing
- Human Factors
- Cognitive Engineering
- Cognitive Ergonomics
- Computer Supported Co-operative Work
- Information Systems

Working in multidisciplinary teams

Many people from different backgrounds involved

Different perspectives and ways of seeing and talking about things

Benefits

- more ideas and designs generated

Disadvantages

- difficult to communicate and progress forward the designs being create



What do professionals do in the ID business?

interaction designers - people involved in the design of all the interactive aspects of a product

usability engineers - people who focus on evaluating products, using usability methods and principles

web designers - people who develop and create the visual design of websites, such as layouts

information architects - people who come up with ideas of how to plan and structure interactive products

user experience designers (UX) - all the above, may also carry out field studies to inform the design of products