

# User Centered Design

## [12] Advanced Topics

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# Advanced Topics

- Adoption
- Agile
- Aesthetics
- Multimodal systems
- Pervasive computing
- Collaborative applications
- Persuasive interfaces

# **UCD and Adoption**

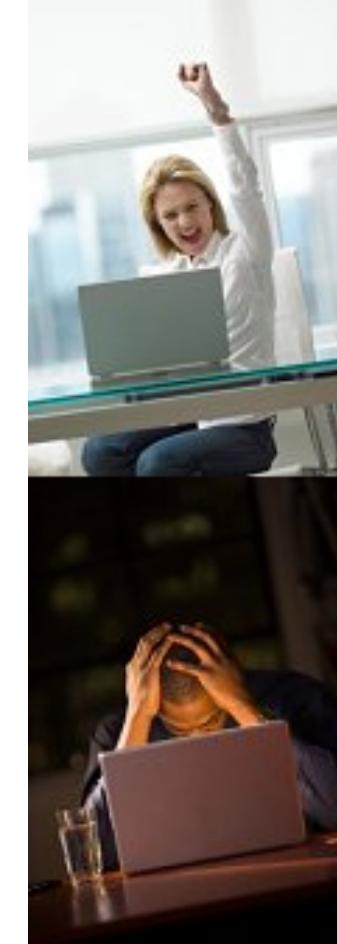
# UCD and Adoption

- Adoption

- The act of accepting with approval; favorable reception. To make one's own.
- => buying

- Abandonment

- The act of giving something up; desertion.



# UCD and Adoption

## 3 Stages of Adoption

### 1. Enthusiast

- don't care how hard/easy a technology is to use
- innovation is key
- price usually not an issue

### 2. Professional

- user isn't always buyer
- reliable, consistent, useful, usable, reasonably priced

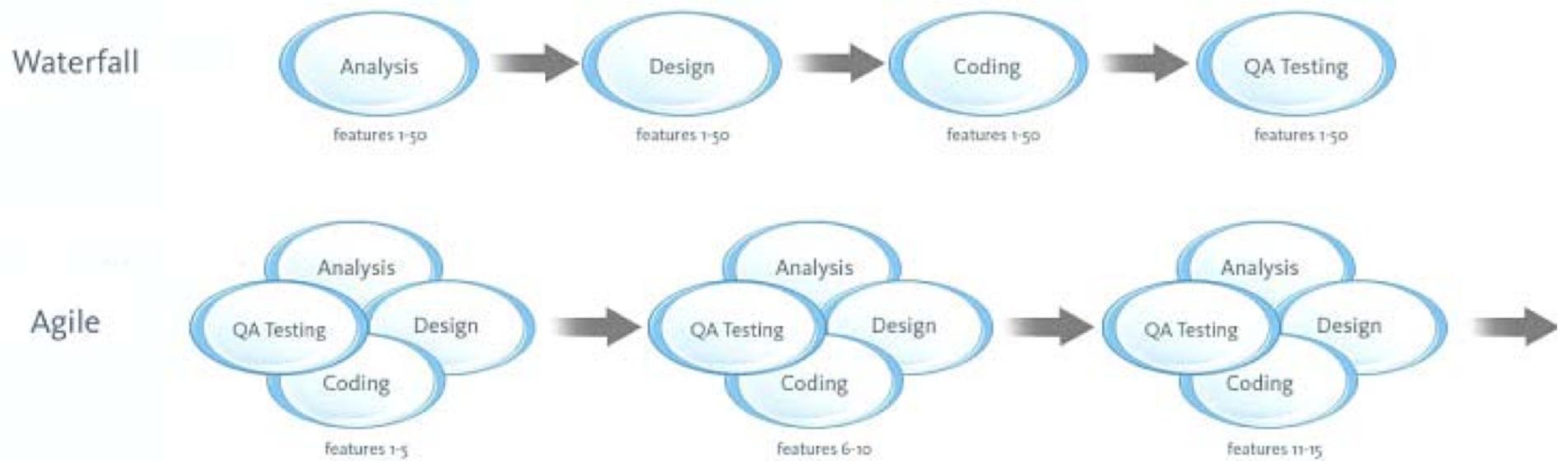
### 3. Consumer

- less interested in technology, more interested in what it can do
- don't want to spend much time learning
  - ✓ if it's hard to use they won't buy it
- enjoyment and aesthetics more important

3 stages as proposed by David Liddle in Designing Interactions, Bill Moggridge, MIT Press, 2007

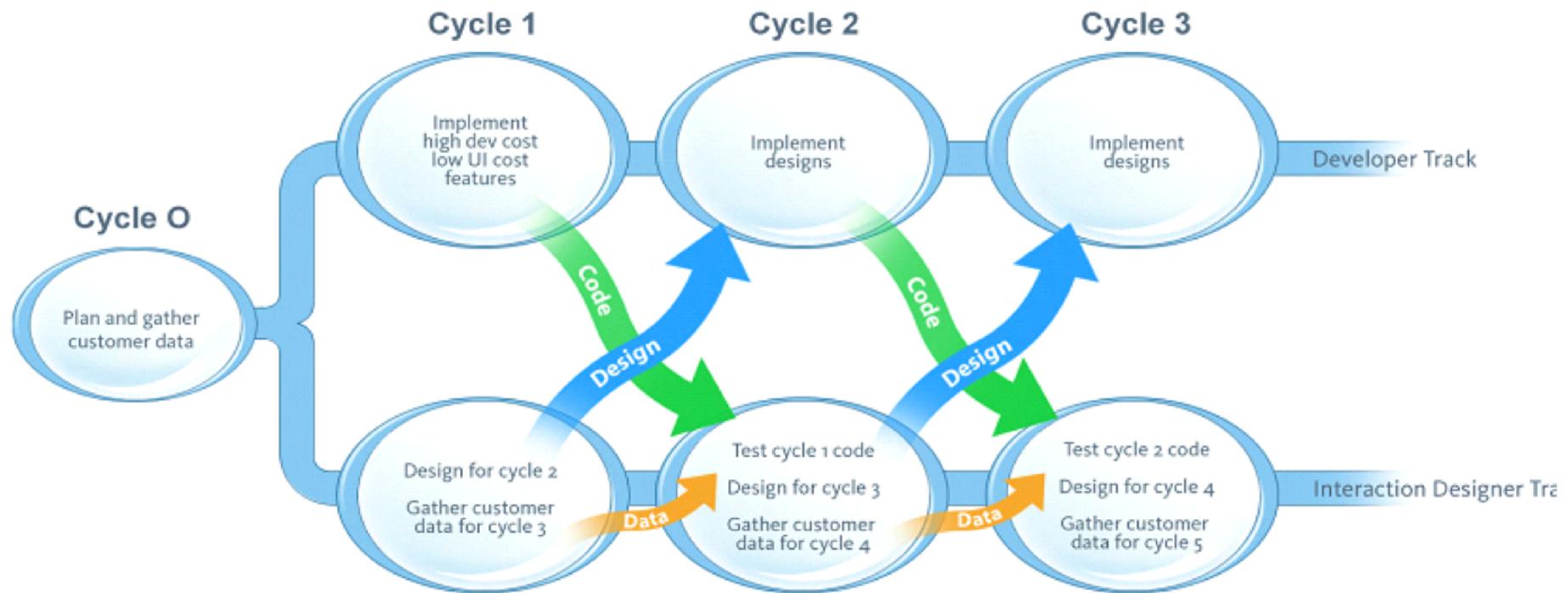
# **UCD and Agile**

# UCD and Agile



- Agile
  - Lots of short iterations (sprints of 2-4 weeks) to develop small numbers of features, once features are done, they're not touched again
- UCD
  - Lots of iterations of the same features until you get it right
  - Work on whole system at the same time

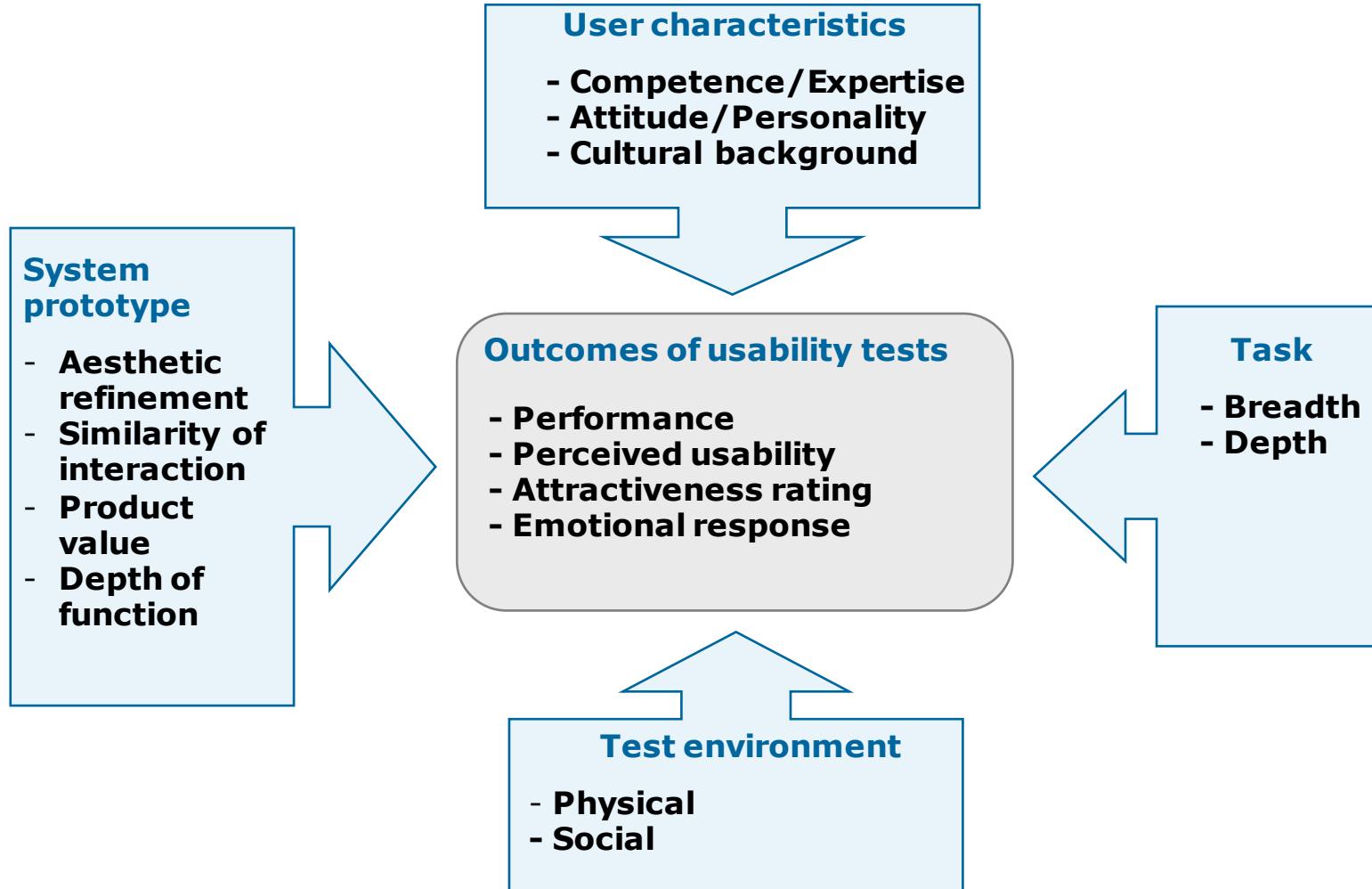
# UCD and Agile



# **UCD and Aesthetics**

From “*What is beautiful is usable?, Aesthetics and other factors that influence the outcomes of usability tests*”, **Andreas Sonderegger & Jürgen Sauer**, Department of Psychology, University of Fribourg (CH).

# Factors influencing test outcomes



Sauer, Seibel & Rüttinger (2010)

# UCD and Aesthetics

- Influence of design aesthetics in single session usability testing
  - What is beautiful is good (Dion & Berscheid, 1974)

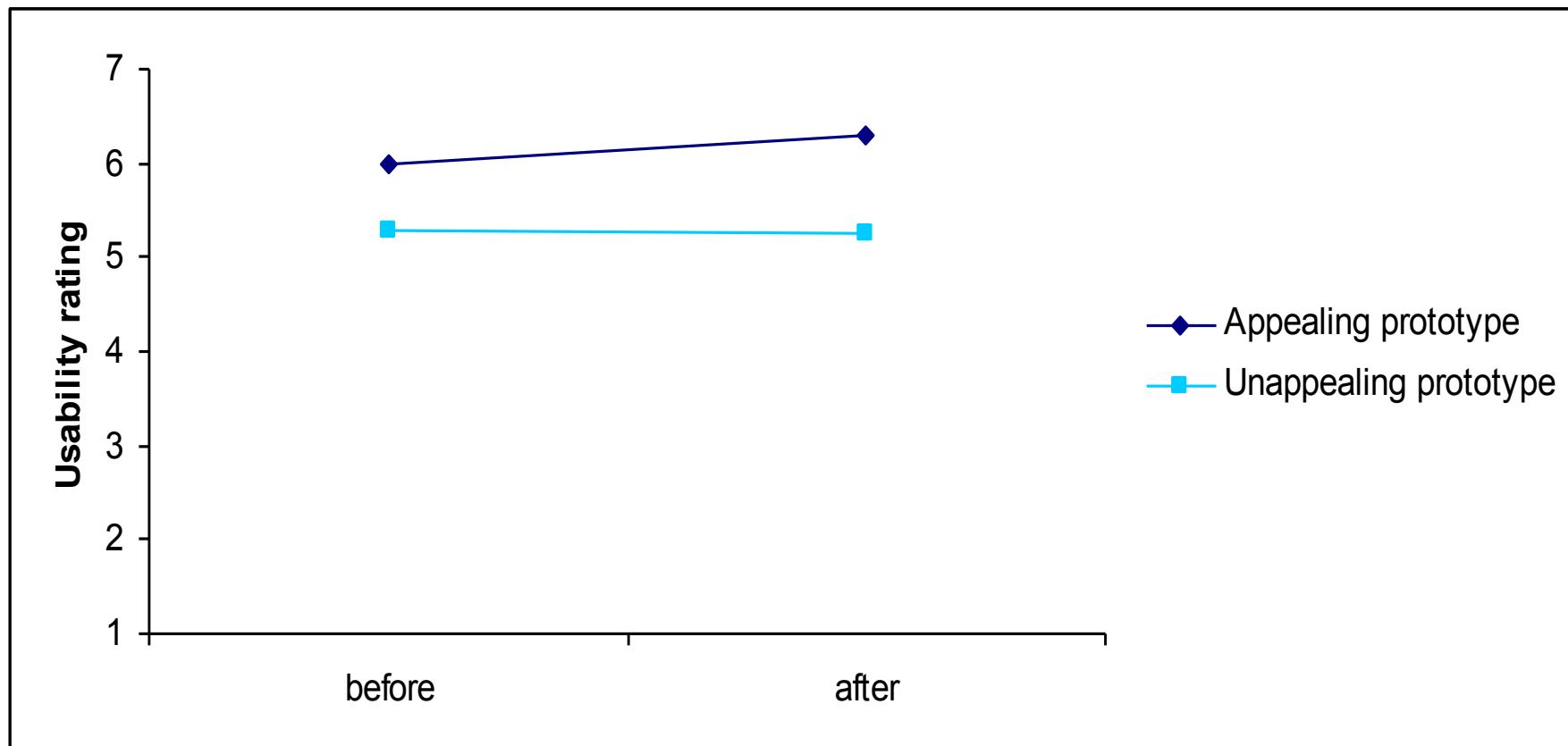


- Experiment
  - ✓ 2 x 2 mixed design
  - ✓ IVs
    - Aesthetics: appealing vs. unappealing design
    - Before vs. after product usage
  - ✓ DVs
    - Performance, attractiveness, subjective usability
  - ✓ Participants: N = 60 (52% ♀, M = 14.2 yrs) adolescents



# UCD and Aesthetics

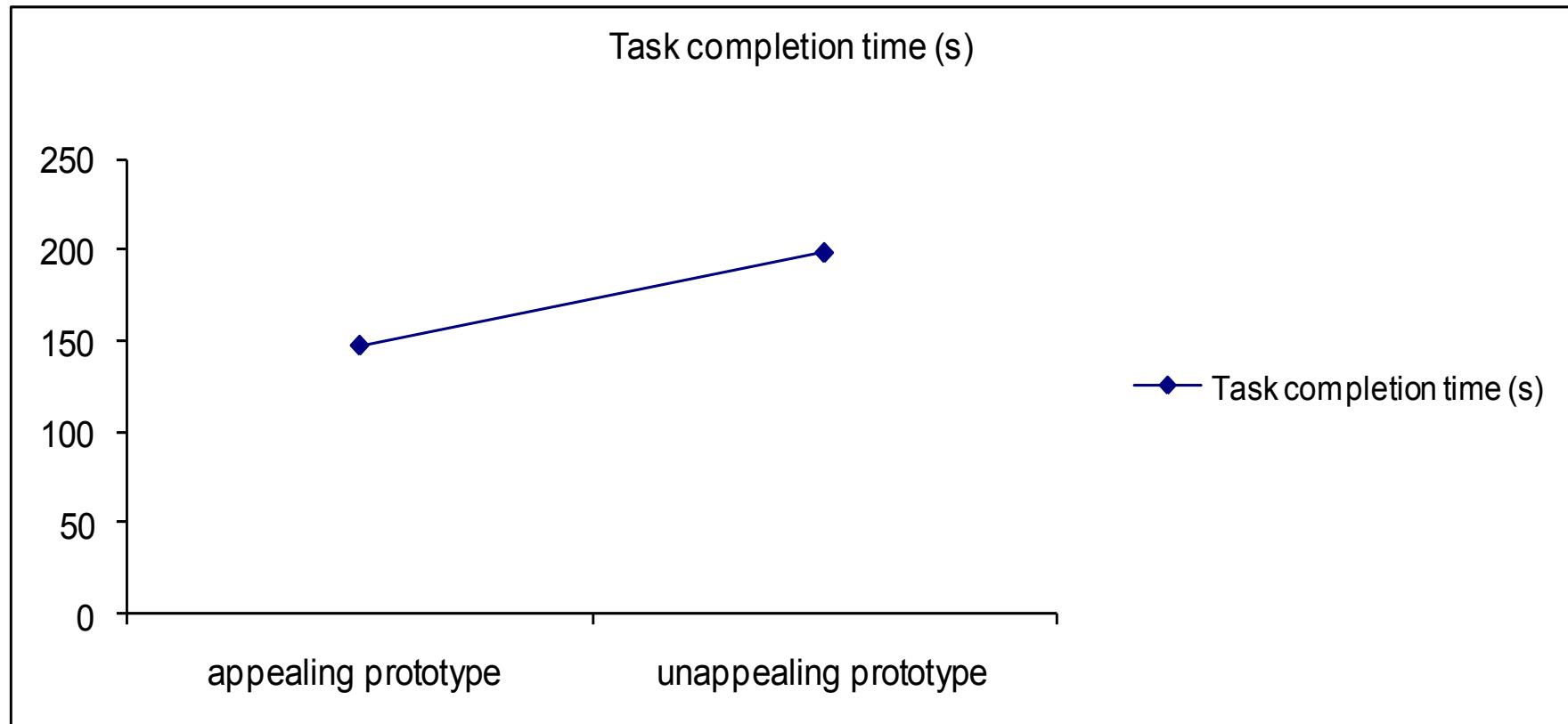
- Influence of aesthetics on usability ratings



( $F = 9.8$ ;  $df = 1, 57$ ;  $p < .01$ )

# UCD and Aesthetics

- Influence of aesthetics on performance measures



( $F = 8.9$ ;  $df = 1, 57$ ;  $p < .01$ )

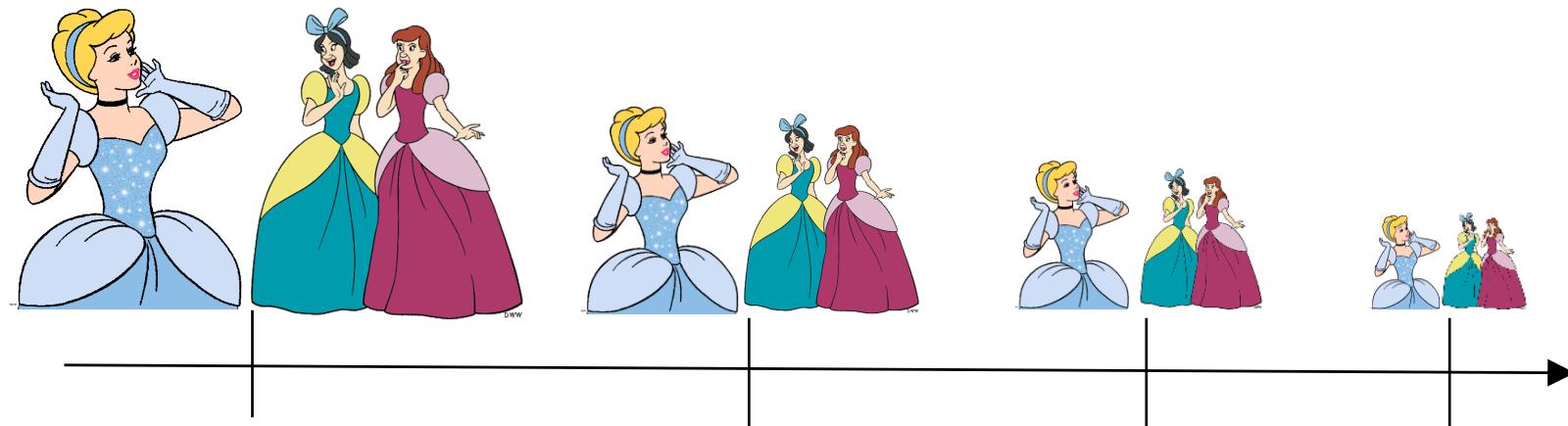
# UCD and Aesthetics

- Discussion and implications

- What is beautiful is good
  - ✓ also for adolescents
  - ✓ also for different cultures
  - ✓ also with regard to performance measures
  - ✓ before as well as after product experience
- Implications
  - ✓ Product development
  - ✓ Usability evaluation practice

# UCD and Aesthetics

- Influence of design aesthetics in multi-session usability testing
  - From Sonderegger A., Zbinden G., Uebelbacher A. and Sauer J. (2012). The influence of product aesthetics and usability over the course of time: a longitudinal field experiment. *Ergonomics*, 55(7), 713-730.



# UCD and Aesthetics

## ■ Method

- Field experiment
- 2 x 2 x 3 between subjects design with repeated measures (time sampling)
- IVs
  - ✓ Design aesthetics: positive vs. negative
  - ✓ [Usability: good vs. bad]
- DVs
  - ✓ Perceived usability, attractiveness, emotions, performance
- Participants: N = 60 (50% female,  $M = 23.8$ )
- Duration: 14 days (28 measurement points)

# UCD and Aesthetics



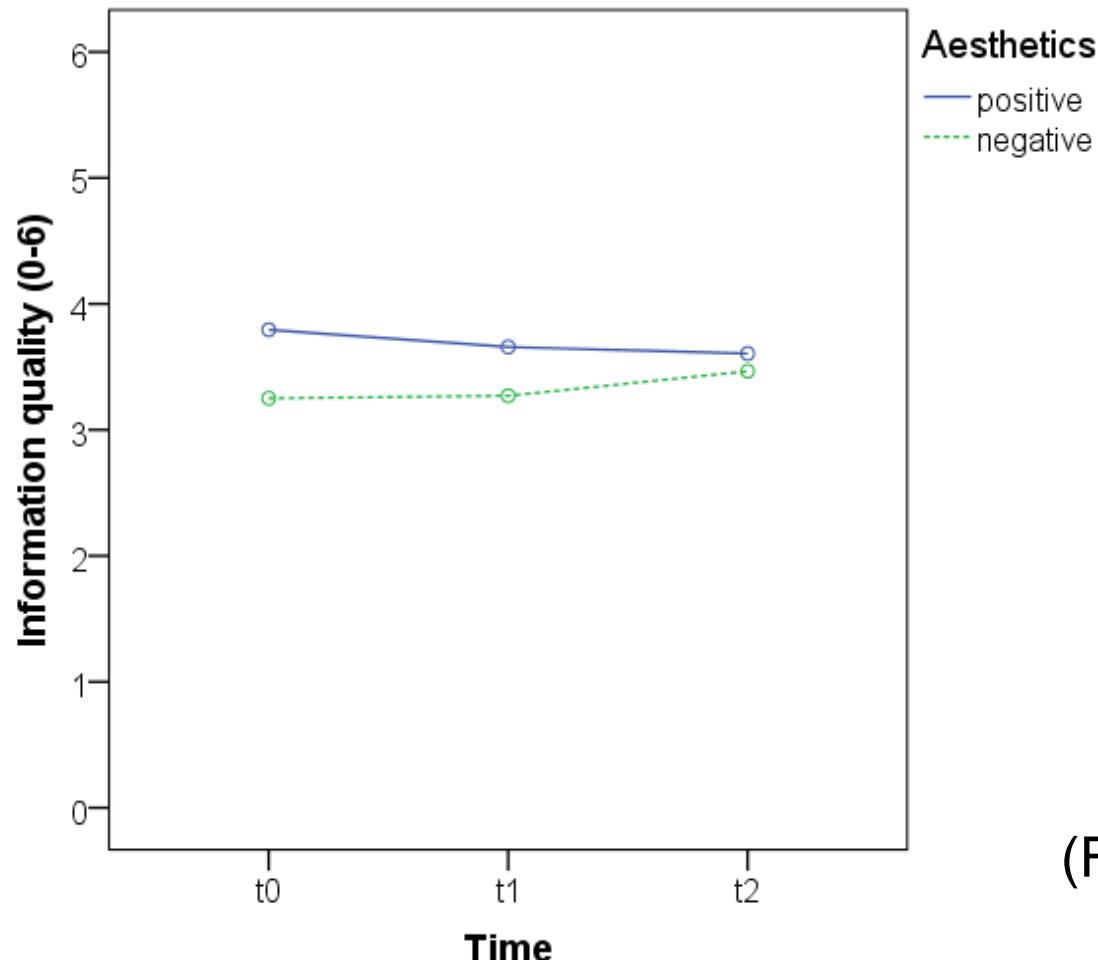
# UCD and Aesthetics

- Results at  $t_0$ 
  - Classical aesthetics ( $t = 2.6$ ,  $df = 58$ ,  $p < .01$ )
  - Perceived usability ( $t = 3.0$ ,  $df = 58$ ,  $p < .05$ )



# UCD and Aesthetics

- Influence of aesthetics over time on perceived usability



( $F = 6.8$ ;  $df = 1, 57$ ;  $p < .05$ )

# **UCD and Aesthetics**

- Discussion and implications
  - Influence of aesthetics may be a methodological artefact and disappears over time
  - Single-session usability evaluations are not advisable when subjective measures are taken

# **UCD and Multimodal Systems**

# UCD and Multimodal Systems

- What are they:
  - Interfaces that allow for interaction using naturally occurring forms of language and behaviour and incorporate at least one recognition-based technology (speech, pen, vision etc)
  - Involve 2 or more combined user inputs
    - ✓ Mouse
    - ✓ Keyboard
    - ✓ Speech
    - ✓ Pen
    - ✓ Touch
    - ✓ Gesture
    - ✓ Gaze
    - ✓ Head and body movement
  - And provide multimedia system output

# UCD and Multimodal Systems

## ■ Advantages

- Flexible use of input modes
  - ✓ Modality more suited to type of information
  - ✓ Can use combinations of modalities
  - ✓ Can alternate between modalities depending on circumstances
- Better for diverse user groups
  - ✓ Can more easily suit different needs, which can't always be predicted in advance
- Can accommodate changing conditions
  - ✓ E.g. use in mobile contexts
- General preference to interact multimodally (not domain-specific)
- Improved efficiency – sometimes up to 4x faster

# **UCD and Multimodal Systems**

- Advantages

- Lower cognitive load
- Better error handling
  - ✓ Can avoid errors
  - ✓ Can more easily recover from errors
  - ✓ Can use mutual disambiguation
  - ✓ Should have complimentary + duplicate functionality

- But... large differences in individual interaction patterns

- Unimodal vs. multimodal
- Which mode to use and when
- Sequential vs. simultaneous interaction.

# UCD and Multimodal Systems

- Typical questions you could try to answer
  - Is my multimodal application usable?
  - Which modalities do users prefer?
  - Are the modalities appropriate for the task?
    - ✓ bad example: controlling the mouse movements with voice!
  - Which combinations of modalities give the best results?
- But...they're not that different from other interfaces
  - You can apply all the methods presented in the class but methods must be suitable for the modality
    - ✓ E.g: Think aloud with speech interface won't work
  - Wizard of Oz evaluations are particularly useful for early stages

# **UCD and Pervasive Computing**

# **UCD and Pervasive Computing**

- Pervasive (ubiquitous) computing implies...
  - Human-computer interaction moving away from desktops
    - ✓ mobile and changing environments
  - A mapping shift
    - ✓ one human-to-one computer -> one human-to-many computers
  - An enriched environment
    - ✓ sensors, context-awareness, smart support etc.
  - A paradigm shift
    - ✓ explicit interaction -> implicit interaction
      - based on contextual information

# **UCD and Pervasive Computing**

- How do we design for interfaces that...
  - Allow different types of input and output
    - ✓ Input: haptic, tangible, kinetic
    - ✓ Output: graphic, auditory, haptic, ...
  - Are used
    - ✓ by different types of people
    - ✓ in different contexts
    - ✓ in different environments
  - Allow passive or active interaction
  - Might be invisible

# UCD and Pervasive Computing

## ■ Requirements

- No longer have a constrained environment/context of use
  - ✓ device moves into new context
  - ✓ context around a device changes
  - ✓ don't know beforehand **all** of the services/devices that will use your system
  - ✓ user might have multiple devices
  - ✓ single device might be used by multiple users
  - ✓ don't know which external resources might be available
    - risk redundancy
    - risk relying on technologies that aren't there

# UCD and Pervasive Computing

## ■ Requirements

- User activity is continuous
  - rarely a clear beginning and end
    - ✓ designer can't assume a common start and end point -> requires greater flexibility and simplicity
  - interruptions are expected
    - ✓ user's attention will switch between different things more often
  - multiple activities happen at once
    - ✓ should be at least loosely coordinated
- Technology more transparent
  - users not aware of what it does or can do
    - ✓ harder to ask them what they want
- Potential goes beyond a single or small group of tasks

# **UCD and Pervasive Computing**

- Design

- What role will the user play in the system?
  - frequency of user involvement
  - severity/understandability of consequences if something goes wrong
  - reliability
  - acceptability of automating behaviour
- Have to consider complex factors such as
  - context awareness
  - coordination
  - privacy
- Invisibility of computers
  - how will you send notifications and error messages?
  - how will you get input and give feedback?
  - how will you get help in decision making?

# UCD and Pervasive Computing

- Design

- Look and feel a little different in each set of components, platforms and/or devices
  - ✓ consistently use one style
    - limits hardware/software choices
  - ✓ make up your own to go on top
    - takes a lot of time and effort
- Devices (mobile devices,) might
  - ✓ be physically different
    - touch vs. keypad input
  - ✓ have different technologies available
    - accelerometer, light reading etc

# UCD and Pervasive Computing

## ■ Evaluation

- Set of representative users can be hard to define
- Tasks and use cases aren't necessarily defined in detail
  - ✓ how do you compare things that are similar but not exactly the same?
  - ✓ tasks and use cases can be rare in 'real-life' test situations
  - ✓ hard to emulate variable 'real-life' environment in a lab
- Harder to ensure privacy during evaluation
- May not have all of the components available
  - ✓ system can be **very** distributed
  - ✓ not all components developed in-house & available at same time
  - ✓ embedded systems may not have a user interface
- Might be dependent on external infrastructure
  - ✓ mobile phone networks etc.

# **UCD and Collaborative Applications**

# UCD and Collaborative Applications

- How do you know who's interacting and where?
  - Synchronous vs. asynchronous
  - Co-located or remote
- Multiuser
  - Simultaneous or one-at-a-time?
  - How many users?
  - Distractions and interruptions?
  - Awareness? Anonymity?
  - Who controls what when?
- Need to consider
  - Social and group dynamics, not just individual behaviour
    - ✓ Friends, co-workers, formal and informal hierarchies,
  - Possibly conflicting goals

# UCD and Collaborative Applications

- Need a critical mass to be useful
- Can result in activities that break social taboos, threaten existing organizational structures or demotivate users
- Conferencing tools (voice, video, text)
  - Poor backchannel communication
    - ✓ Example workaround: IM chat during video/audio conferences
  - Paralinguistic cues missing
    - ✓ Less socializing and small talk -> less social integration
  - Delays
    - ✓ Disruptive for effective communication
    - ✓ Need social protocols or mike-passing

# **UCD and Persuasive Interfaces**

# **UCD and Persuasive Interfaces**

- What they are:
  - Interfaces that try to change people's attitudes and behaviour
    - ✓ Persuasion: a non-coercive attempt to change attitudes and behaviours
- Some key domains
  - Commerce – buying and branding
  - Education, Learning and Training
  - Environmental conservation
  - Preventative health care
  - Fitness
  - Disease management

# UCD and Persuasive Interfaces

- Can happen at two levels

- Macrosuasion – when the technology is designed specifically for persuasion
  - Microsuasion: when smaller persuasive elements are incorporated into a larger interface to achieve other goals

- Functional Triad

- Computer as tool
    - ✓ Change attitudes and behaviour by increasing a person's ability or making something easier to do
      - E.g. providing tailored information, triggering decision-making
  - Computer as media
    - ✓ Use simulation of experiences to persuade
      - E.g. cause/effect, environments, objects
  - Computer as social actor
    - ✓ Computers that provide social support, model attitudes and behaviours, leverage social rules and dynamics

# UCD and Persuasive Interfaces

## ■ Credibility

### ➤ Composed of

- ✓ Trustworthiness: perceived goodness or morality
- ✓ Expertise: perceived knowledge and skill

### ➤ When it matters in HCI

- ✓ When computers act as a knowledge repository
- ✓ When computers instruct or tutor users
- ✓ When computer report measurements
- ✓ When computers report on work performed
- ✓ When computer report about their own state
- ✓ When computers run simulations
- ✓ When computers render virtual environments

# Conclusions

- User-centered design needs to consider more than just technology + physiological and cognitive constraints
  - Context can be quite broad – geography, culture etc
    - ✓ Need to consider the role of the technology
  - User reactions may be influenced by unconscious behaviours or preferences
  - Human reactions and preferences change over time
    - ✓ What will the lifespan of your technology be?
- Can use methods from this course to investigate all of these aspects as well, but analysis of the results might rely more on disciplines such as psychology, sociology, marketing etc.

# Conclusions

- New technologies and new interaction paradigms might mean
  - New ways of applying existing UCD methods
  - Creation of new or hybrid methods to deal with new challenges
  - New sets of constraints to investigate and consider in future designs
- Good news
  - basic ideas and principles from this course still apply!

# **Don't forget...**

- ...to register for the exam between Dec. 3<sup>rd</sup> 2018 and Jan. 11<sup>th</sup> 2019 on Academia
- to write the UCD exam on
  - Wednesday, February 5<sup>th</sup> 2019, 10h-12h in room A230
  - 1 A4 double-sided hand-written (not photocopied) cheat-sheet is allowed

# References

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