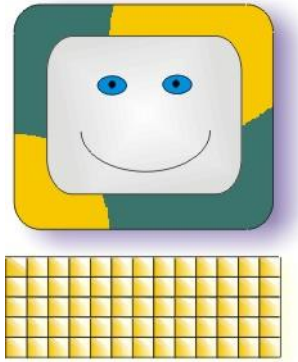
Projektas *Informatikos ir programų sistemų studijų programų kokybės gerinimas (VP1-2.2-ŠMM-07-K-02-039)*

Understanding and conceptualizing interaction design

2 lecture

dr Kristina Lapin



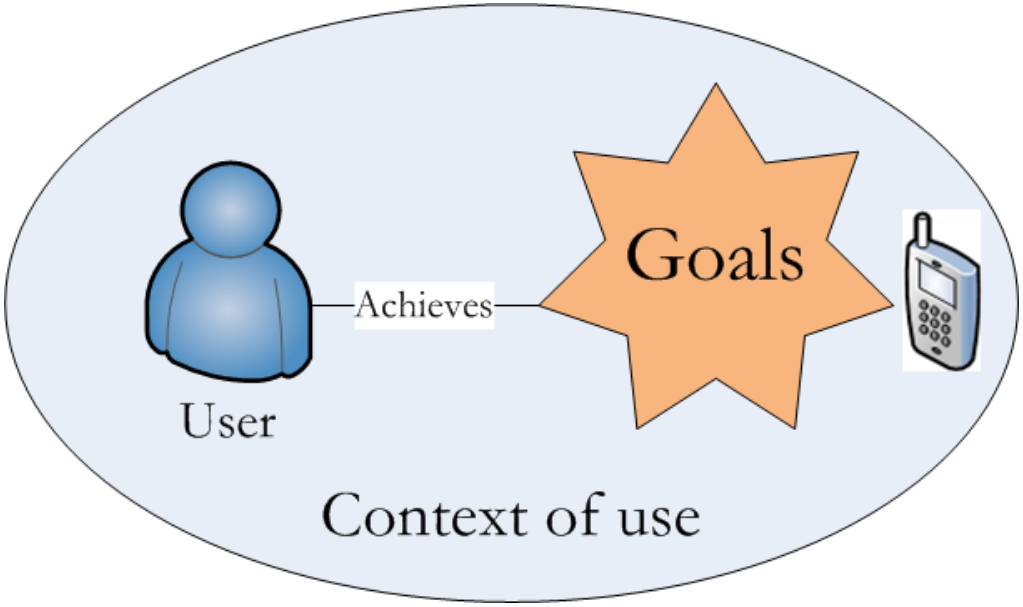
Outline

- Explain what is meant by the problem space.
- Explain how to conceptualize interaction.
- Describe what a conceptual model is and how to begin to formulate one.
- Discuss the use of interface metaphors as part of a conceptual model.
- Outline the core interaction types for informing the development of a conceptual model.
- Introduce paradigms, visions, theories, models, and frameworks informing interaction design.

Recap

- HCI has moved beyond designing interfaces for desktop machines
- About extending and supporting all manner of human activities in all manner of places
- Facilitating user experiences through designing interactions
    - Make work effective, efficient and safer
    - Improve and enhance learning and training
    - Provide enjoyable and exciting entertainment
    - Enhance communication and understanding
    - Support new forms of creativity and expression

Usability objectives



Users

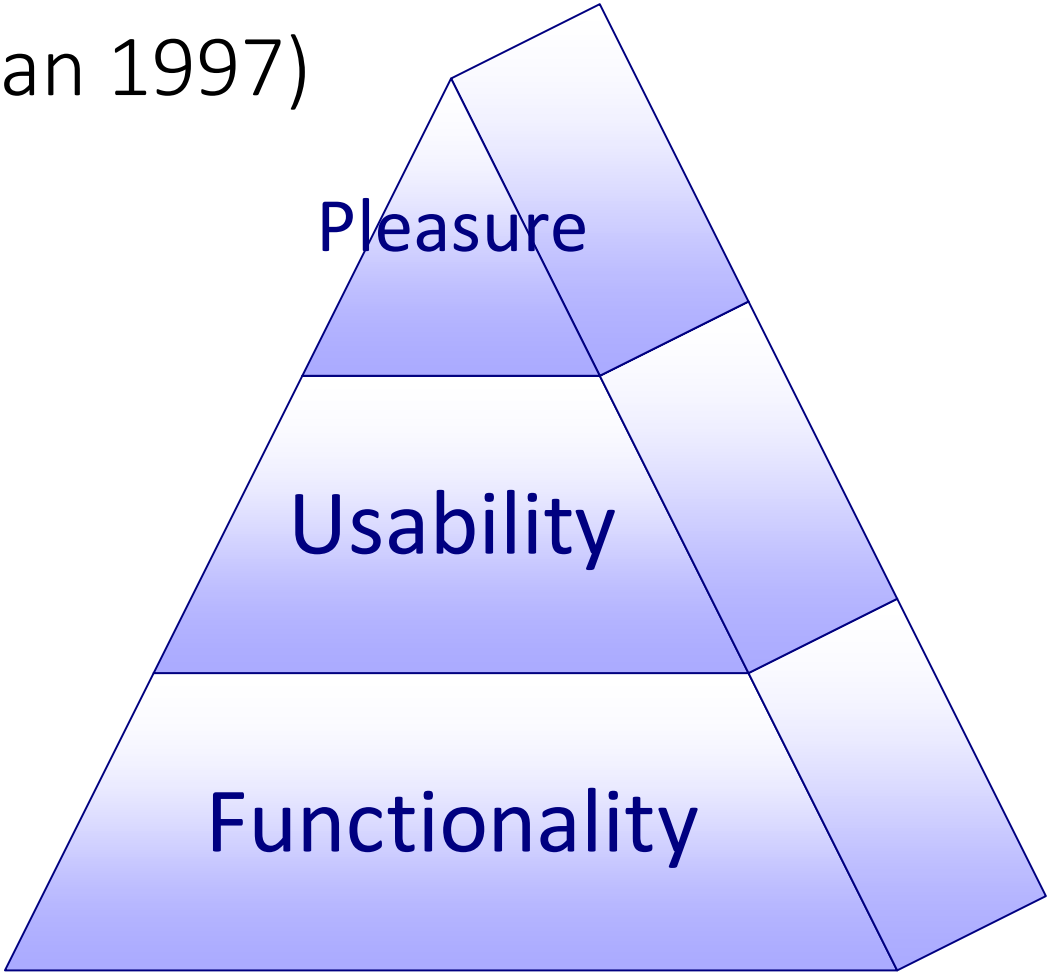
Tasks

Measures from business goals

ISO 9241

Mayhew, 1999

User needs (Jordan 1997)

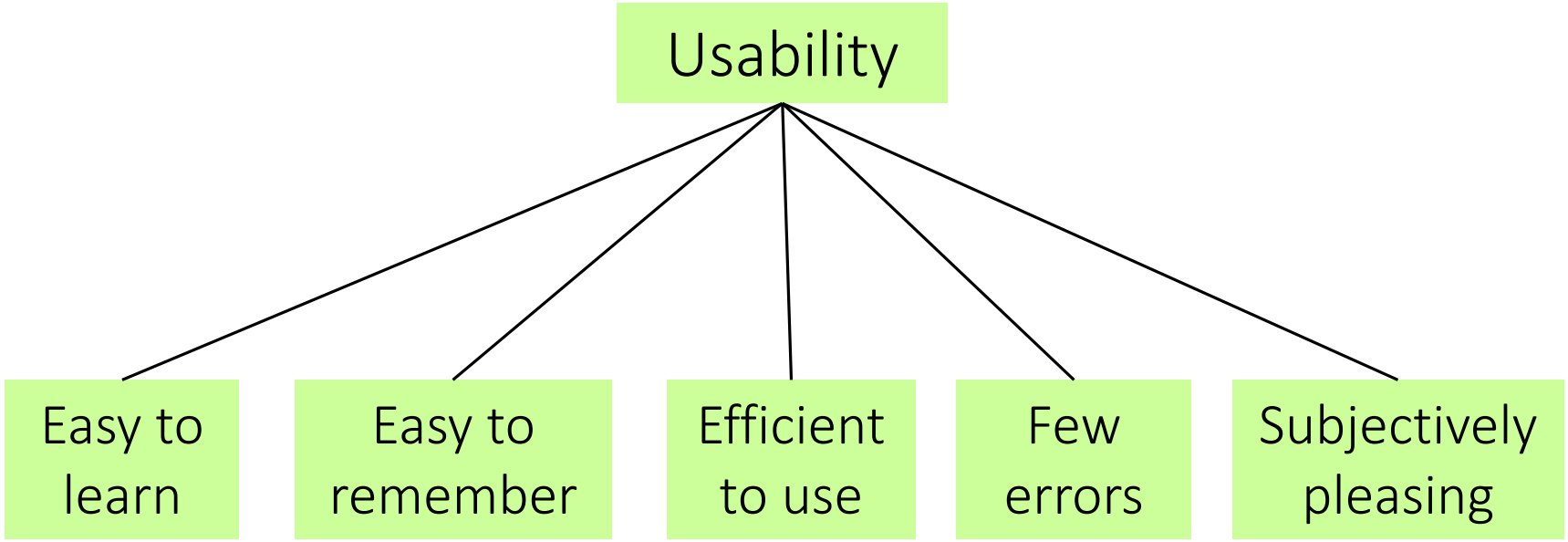


Jordan P.W. Products as personalities. Contemporary Ergonomics 1997, S.A. Robertson (Ed.), Taylor&Francis, London 1997

Definition of usability

- ISO 9241-11
- The extent to which a product can be used
  - by **specified users**
  - to achieve **specified goals**
  - with **effectiveness**, **efficiency** and **satisfaction**
  - in **a specified context of use**.

Usability attributes



(Nielsen, 1993, 2010)

Nielsen's principles vs. ISO 9241

Nielsens principles

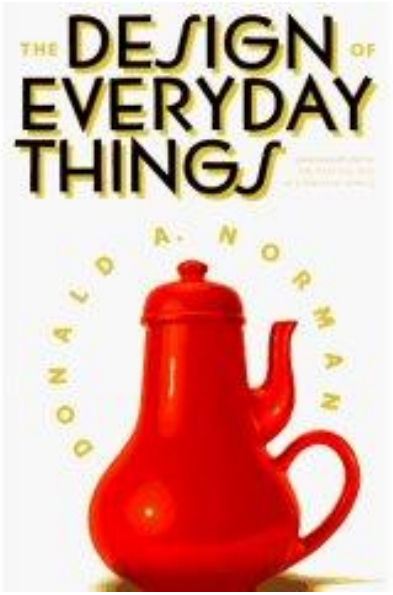
1. Learnability
2. Efficiency of use
3. Memorability
4. Few and noncatastrophic errors
5. Satisfaction

ISO 9241

A. Effectiveness
B. Efficiency
C. Subjective satisfaction

Norman's usability principles

- Visibility
- Constraints
- Mapping
- Consistency
- Feedback
- Affordance



Norman, Donald A. (2002). *The Design of Everyday Things*. New York: Basic Books.

Product acceptance by Nielsen

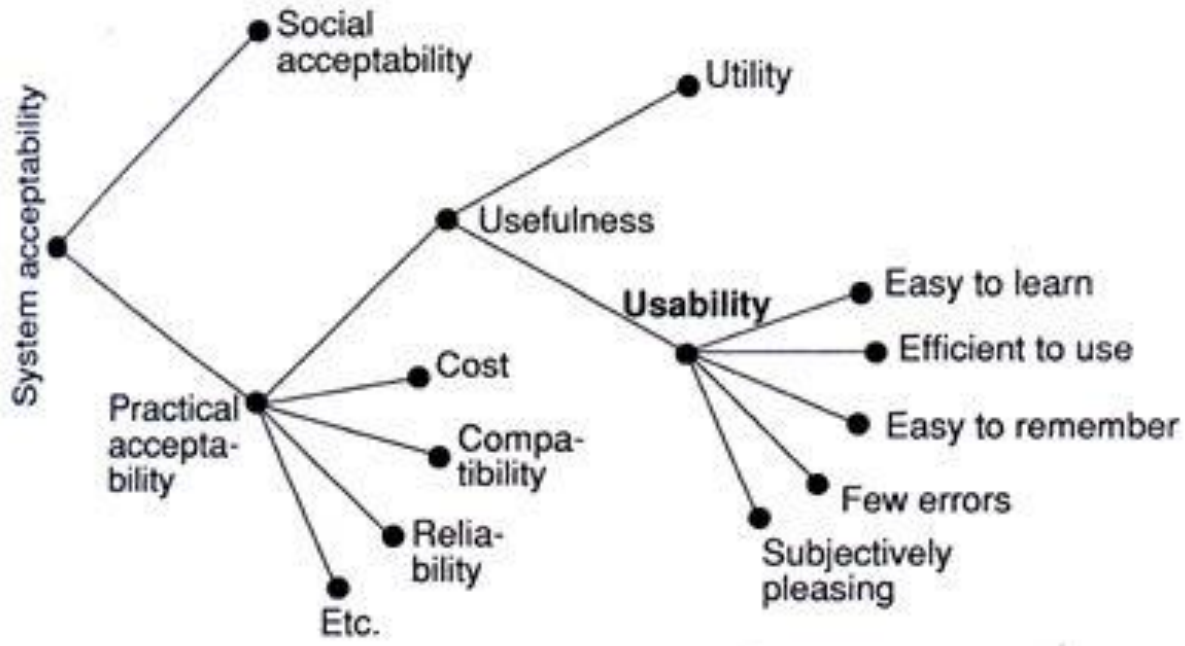


Figure 1 *A model of the attributes of system acceptability.*

[Usability of Interactive systems]

Business Goal	User Experience Goal	Functions to Support Goals
Grow the business by getting more new users to adopt our service	Improve the learnability	Progressive tooltips
		Wizards to get people started
Reduce support costs	Reduce/prevent errors	▪ Formatting information for text fields
		▪ Error message enhancements
		▪ Diagnostic features
Inspire loyalty among existing users	Reduce navigational requirements	▪ Shortcuts to frequently used content or features

Tom Brinck, Darren Gergle, and Scott D. Wood. User needs analysis. In *User Experience Re-Mastered*. Morgan Kaufman, 2010, Chapter 2.

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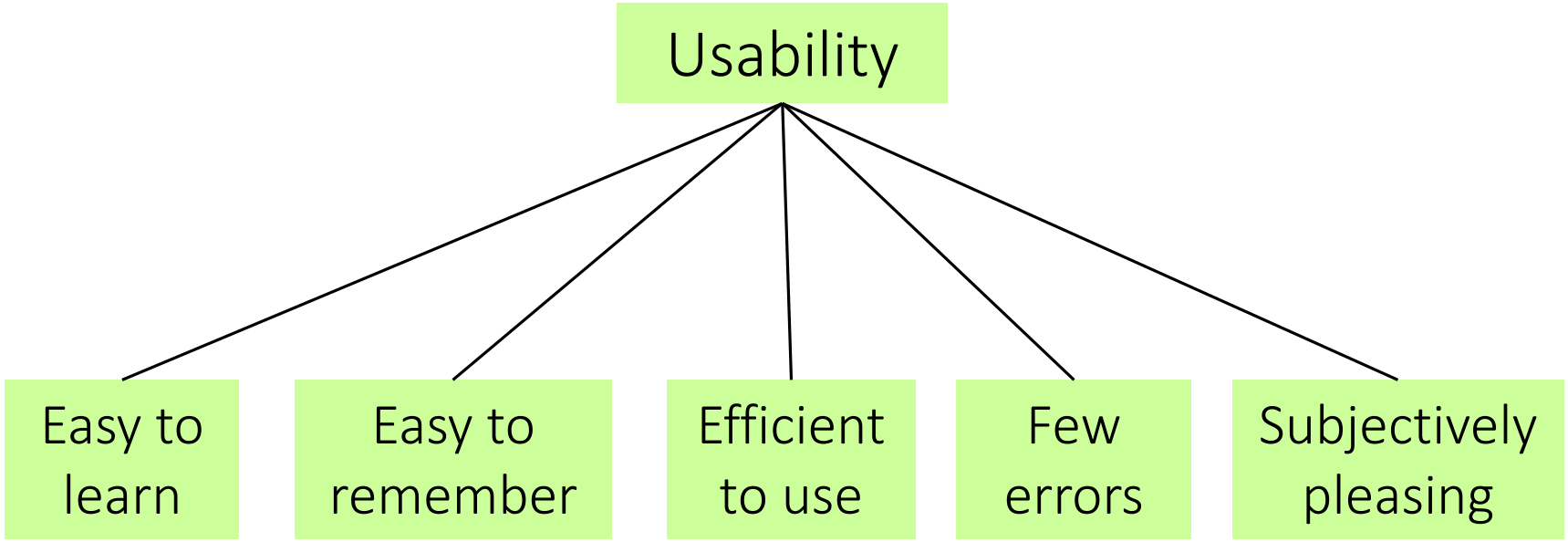
Usability for desktop applications

ISO 9241 outlines 3 measurable attributes

- Effectiveness:
  - Accuracy and completeness with which users achieve specified goals;
- Efficiency:
  - Resources expended in relation to the accuracy and completeness with which users achieve goals;
- Satisfaction:
  - Freedom from discomfort, and positive attitudes towards the use of the product.

Usability attributes



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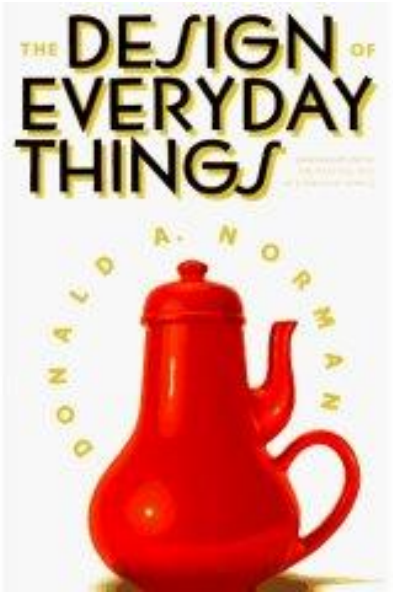

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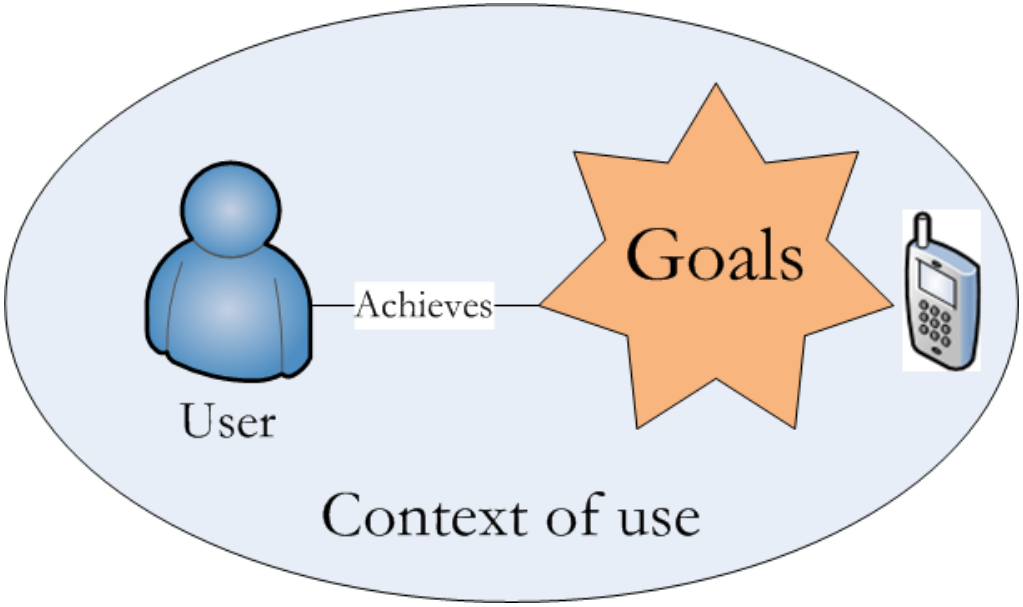
Usability objectives



Users

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Mayhew, 1999

Examples of usability objectives

Category	Examples of Specifi c Objectives
Learning time/ task time	Users will be able to use this site the fi rst time without any training First-time users will be able to fi nd their topic of interest within two minutes of visiting the site; expert users (fi ve or more visits) will be able to fi nd a topic within 30 seconds
Number of errors	Users will not visit more than three incorrect pages (on average) in completing a task Users will make no fatal errors at least 99 percent of the time (such as entering an incorrect credit card or shipping address)
Subjective impressions	On a scale of 1 (really appealing) to 7 (really unappealing), users will rate the site at least a 2.5
Accomplished tasks	At least 75 percent of users who add an item to a shopping cart will complete a purchase At least 95 percent of users who complete their credit card information will complete a purchase
Revisits	At least 50 percent of registered users will return to the site at least once per month

Business Goal	User Experience Goal	Functions to Support Goals
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Understanding the problem space

- What do you want to create?
- What are your assumptions?
- Will it achieve what you hope it will?

What is an assumption?

- taking something for granted when it needs further investigation
  - e.g. people will want to watch TV while driving

Combined GPS and TV system available in Korea

A screen shot taken from HP's vision of the future, CoolTown

What is a claim?

- stating something to be true when it is still open to question
  - e.g. a multimodal style of interaction for controlling GPS — one that involves speaking while driving — is safe

A framework for analyzing the problem space

- Are there problems with an existing product or user experience? If so, what are they?
- Why do you think there are problems?
- How do you think your proposed design ideas might overcome these?
- If you are designing for a new user experience how do you think your proposed design ideas support, change, or extend current ways of doing things?

Activity

- What are the assumptions and claims made about 3D TV?

Assumptions: realistic or wish-list?

- People would not mind wearing the glasses that are needed to see in 3D in their living rooms — reasonable
- People would not mind paying a lot more for a new 3D-enabled TV screen — not reasonable
- People would really enjoy the enhanced clarity and color detail provided by 3D — reasonable
- People will be happy carrying around their own special glasses — reasonable only for a very select bunch of users

Benefits of conceptualizing

- Orientation
  - enables design teams to ask specific questions about how the conceptual model will be understood
- Open-minded
  - prevents design teams from becoming narrowly focused early on
- Common ground
  - allows design teams to establish a set of commonly agreed terms

From problem space to design space

- Having a good understanding of the problem space can help inform the design space
  - e.g. what kind of interface, behavior, functionality to provide
- But before deciding upon these it is important to develop a conceptual model

Conceptual model

- A conceptual model is:
  - “a high-level description of how a system is organized and operates” (Johnson and Henderson, 2002, p 26)

- Enables
  - “designers to straighten out their thinking before they start laying out their widgets” (p 28)

Components

- Metaphors and analogies
  - understand what a product is for and how to use it for an activity
- Concepts that people are exposed to through the product
  - task–domain objects, their attributes, and operations (e.g. saving, revisiting, organizing)
- Relationship and mappings between these concepts

First steps in formulating a conceptual model

- What will the users be doing when carrying out their tasks?
- How will the system support these?
- What kind of interface metaphor, if any, will be appropriate?
- What kinds of interaction modes and styles to use?

  always keep in mind when making design decisions how the user will understand the underlying conceptual model

Conceptual models

- Many kinds and ways of classifying them
- We describe them in terms of core activities and objects
- Also in terms of interface metaphors

Interface metaphors

- Conceptualizing what we are doing, e.g. surfing the web
- A conceptual model instantiated at the interface, e.g. the desktop metaphor
- Visualizing an operation,
  - e.g. an icon of a shopping cart for placing items into

Interface metaphors

- Interface designed to be similar to a physical entity but also has own properties
  - e.g. desktop metaphor, web portals
  - Can be based on activity, object or a combination of both
- Exploit user's familiar knowledge,
  - helping them to understand 'the unfamiliar'
- Highlights the essence of the unfamiliar activity,
  - enabling users to leverage of this to understand more aspects of the unfamiliar functionality

Material Metaphors

- The card is a very popular UI
- Why?: Has familiar form factor
- Material properties are added, giving appearance and physical behavior, e.g. surface of paper

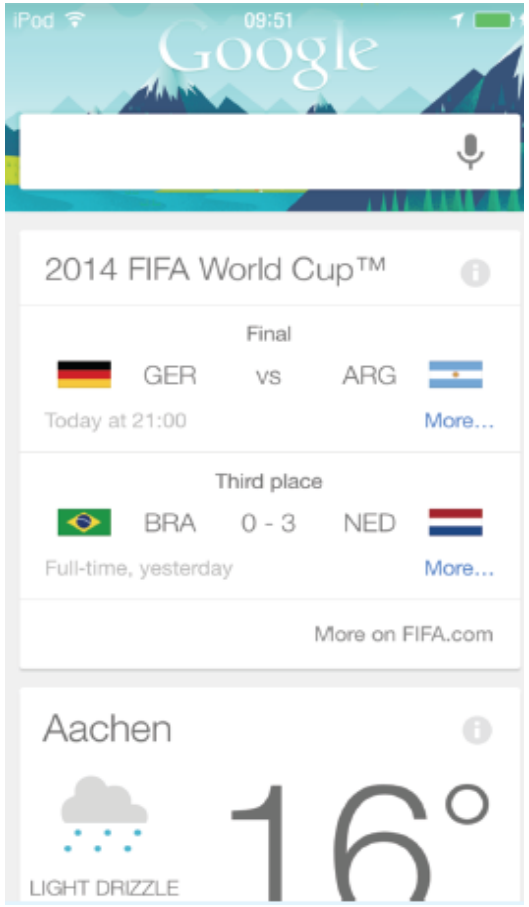


Figure 2.5 Google Now Card

Source: Google and the Google logo are registered trademarks of Google Inc., used with permission. http://www.google.com/design/spec/material-design/introduction.html

Benefits of interface metaphors

- Makes learning new systems easier
- Helps users understand the underlying conceptual model
- Can be very innovative and enable the realm of computers and their applications to be made more accessible to a greater diversity of users

Problems with interface metaphors

- Break conventional and cultural rules
  - e.g. recycle bin placed on desktop
- Can constrain designers in the way they conceptualize a problem space
- Conflict with design principles
- Forces users to only understand the system in terms of the metaphor
- Designers can inadvertently use bad existing designs and transfer the bad parts over
- Limits designers' imagination in coming up with new conceptual models

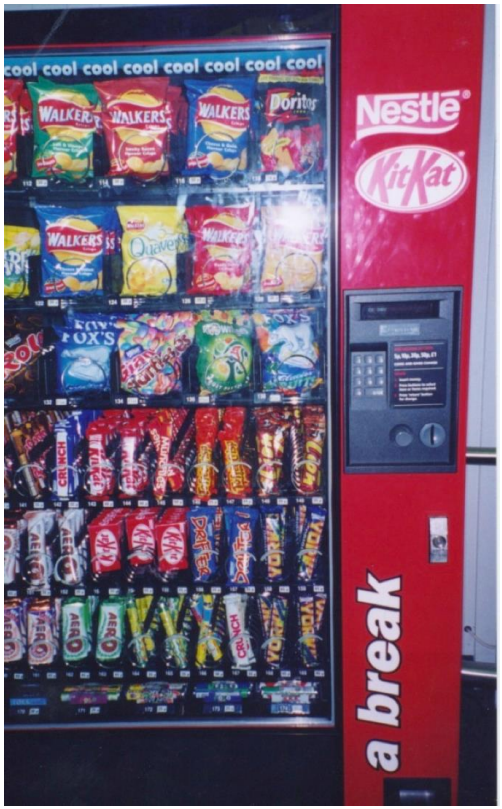
Interaction types

- Instructing
  - issuing commands and selecting options
- Conversing
  - interacting with a system as if having a conversation
- Manipulating
  - interacting with objects in a virtual or physical space by manipulating them
- Exploring
  - moving through a virtual environment or a physical space

1. Instructing

- Where users instruct a system and tell it what to do
  - e.g. tell the time, print a file, save a file
- Very common conceptual model, underlying a diversity of devices and systems
  - e.g. word processors, VCRs, vending machines
- Main benefit is that instructing supports quick and efficient interaction
  - good for repetitive kinds of actions performed on multiple objects

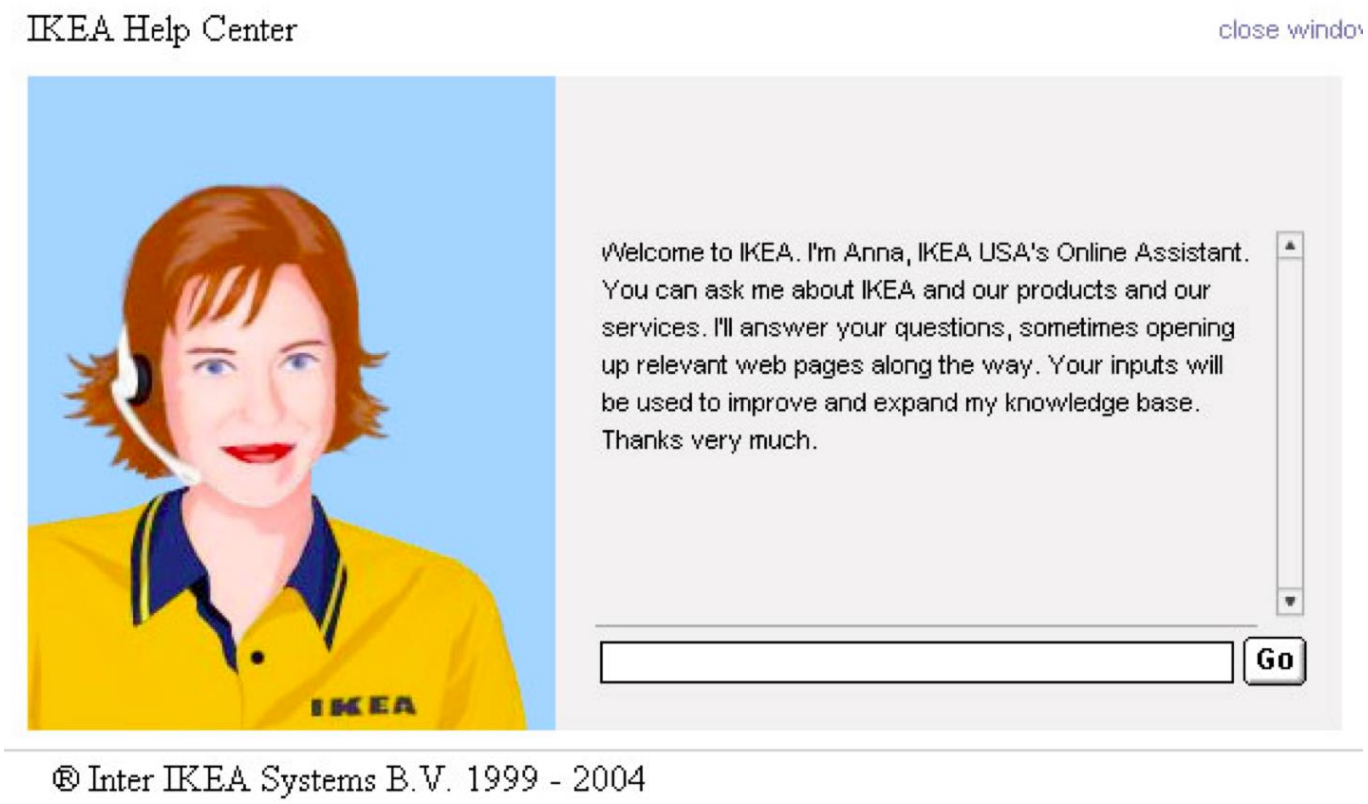
Which is easiest and why?



2. Conversing

- Underlying model of having a conversation with another human
- Range from simple voice recognition menu-driven systems to more complex ‘natural language’ dialogs
- Examples include timetables, search engines, advice-giving systems, help systems
- Also virtual agents, toys and pet robots designed to converse with you

Would you talk with Anna?



Pros and cons of conversational model

- Allows users, especially novices and technophobes, to interact with the system in a way that is familiar
  - makes them feel comfortable, at ease and less scared
- Misunderstandings can arise when the system does not know how to parse what the user says

3. Manipulating

- Involves dragging, selecting, opening, closing and zooming actions on virtual objects
- Exploit's users' knowledge of how they move and manipulate in the physical world
- Can involve actions using physical controllers (e.g. Wii) or air gestures (e.g. Kinect) to control the movements of an on screen avatar
- Tagged physical objects (e.g. balls) that are manipulated in a physical world result in physical/digital events (e.g. animation)

Direct Manipulation

- Shneiderman (1983) coined the term, came from his fascination with computer games at the time
  - Continuous representation of objects and actions of interest
  - Physical actions and button pressing instead of issuing commands with complex syntax
  - Rapid reversible actions with immediate feedback on object of interest

Why are DM interfaces so enjoyable?

- Novices can learn the basic functionality quickly
- Experienced users can work extremely rapidly to carry out a wide range of tasks, even defining new functions
- Intermittent users can retain operational concepts over time
- Error messages rarely needed
- Users can immediately see if their actions are furthering their goals and if not do something else
- Users experience less anxiety
- Users gain confidence and mastery and feel in control

What are the disadvantages with DM?

- Some people take the metaphor of direct manipulation too literally
- Not all tasks can be described by objects and not all actions can be done directly
- Some tasks are better achieved through delegating
  - e.g. spell checking
- Can become screen space ‘gobblers’
- Moving a mouse around the screen can be slower than pressing function keys to do same actions

4. Exploring

- Involves users moving through virtual or physical environments

- Physical environments with embedded sensor technologies
  - Context aware

Which conceptual model is best?

- Direct manipulation is good for ‘doing’ types of tasks, e.g. designing, drawing, flying, driving, sizing windows
- Issuing instructions is good for repetitive tasks, e.g. spell-checking, file management
- Having a conversation is good for children, computer-phobic, disabled users and specialized applications (e.g. phone services)
- Hybrid conceptual models are often employed, where different ways of carrying out the same actions is supported at the interface - but can take longer to learn

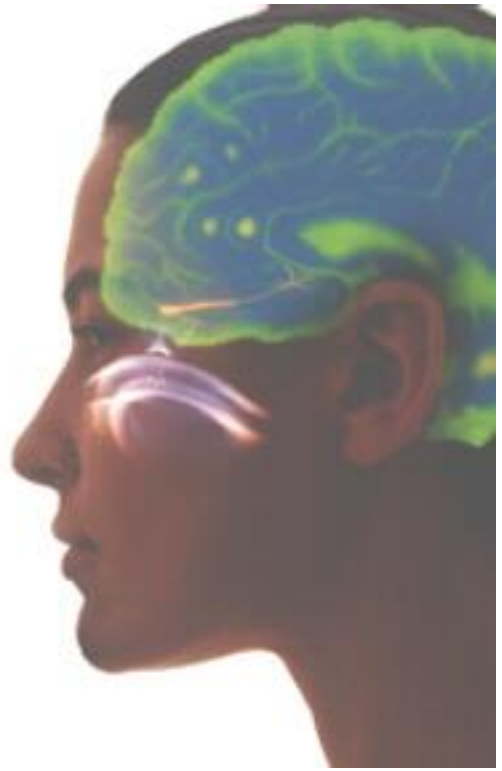
Conceptual models: interaction and interface

- Interaction type:
  - what the user is doing when interacting with a system, e.g. instructing, talking, browsing or other
- Interface type:
  - the kind of interface used to support the mode, e.g. speech, menu-based, gesture

Many kinds of interface types available…

- Command
- Speech
- Data-entry
- Form fill-in
- Query
- Graphical
- Web
- Pen
- Augmented reality
- Gesture

  (for more see chapter 6)



Which interaction type to choose?

- Need to determine requirements and user needs
- Take budget and other constraints into account
- Also will depend on suitability of technology for activity being supported
- This is covered in course when designing conceptual models

Problem space analysis

- Define assumptions and claims
  - communicating with stakeholders
- Describe
  - the current user behavior in the computerized activity
  - problems that could be solved
  - Opportunities for improvements
- Define the conceptual model of the future product using the interaction types

Summary

- Important to have a good understanding of the problem space
- Fundamental aspect of interaction design is to develop a conceptual model
- Interaction modes and interface metaphors provide a structure for thinking about which kind of conceptual model to develop
- Interaction styles are specific kinds of interfaces that are instantiated as part of the conceptual model

References

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