Interactive system design

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2 lecture
Human Computer Interaction
Aims

• Activities and technologies
• The main characteristics of people
  – relevant to designing interactive systems
• The main issues of activities
  – and the contexts in which they occur
• The key features of interactive technologies
Activities and technologies

Requirements

Activities in contexts

People

Opportunities

Technologies
PACT analysis

- People
- Activities
- Context of use
- Technologies
Physical differences

• Physical characteristics: height, weight
• Senses: sight, hearing, touch, smell, taste

Source of images: An innocent visit to a Thailand ATM sparks a new meme
Physical differences

• Colour blindness
  – inability to distinguish red and green colours affects ~8% males

• Short-sightedness, long-sightedness

• Hearing and finger dexterity impairments

• Large fingers vs small buttons
Ergonomics

• The term was coined in 1948 to describe the study of the relationships between people and their environment.

• Multidisciplinary discipline includes
  – the working environment
  – safety issues
  – anatomy and physiology
  – psychology
Psychological differences

• Different spatial abilities
  – Good ability help easier navigate in websites
  – Designers should design for people with poor ability
    • Provide good signs and clear directions
  – Language differences
  – Cultural differences
Mental model

- The understanding and knowledge of using IT
  - Incomplete
    - people understand some parts better than others
  - unstable
    - people can forget details
- Develop through interacting with systems

Norman’s system image (Benyon, 2013, p. 31)
Social differences

• the reason for use technologies
  – The goals and motivations in using technology
• Beginner, intermediate and expert users
• Motivations to learn and use particular system
  – beginner needs to be guided
  – experts use a system regularly and learn all sorts of details
  – intermediate need to remember how to use
USER NEEDS ANALYSIS: PERSONAS AND SCENARIOS
Different experience levels

Beginners
What does the program do?
How do I print?
What is the program’s scope?
Where do I start?

Intermediates
I forgot how to import.
How do I find facility X?
Remind me what this does.
What was the command for X?
Opps! Can I undo?
What is this control for?
What new features are in this upgrade?

Experts
How do I automate this?
What are the shortcuts for this command?
Can this be changed?
How can I customize this?
What is dangerous?
Is there a keyboard equivalent?

Beginners

• Need extra help from the program until they became intermediates
• They may not recall from use to use exactly which command is needed to act on a particular object,
  – but they will definitely remember the relationships between objects and actions.
Intermediates

• need access to tools.
  – They don’t need scope and purpose explained to them because they already know these things
  – tooltips

• know how to use reference materials.
  – They are motivated to dig deeper and learn, as long as they don’t have to tackle too much at once
Experts

• demand faster access to their regular working set of tools, which may be quite large.
  – want shortcuts to everything
• seek to learn more and to see more connections between their actions and the product’s behavior and representation.
• appreciate new, powerful features.
PACT analysis

- People
- Activities
- Context of use
- Technologies
Activities

• Temporal aspects
• Cooperation
• Complexity
• Safety-critical
• The nature of content
Activities

• Temporal aspects
  – frequency
    • Frequent tasks – easy to do
    • Infrequent tasks – easy to learn or remember how to do
  – Time pressure
    • Quiet or busy
  – Single or continuous actions
    • Can be interrupted?
      – If Yes – let user find their place
  – Acceptable response time
Activities

• Cooperation
  – One or more users?
  – For collaborative activities
    • Awareness
    • Coordination
    • Communication
Activities

• Complexity
  – Well-defined task
    • can be accomplished by step by step design
  – for a vague activity people have to be able
    • to browse around
    • see different types of information
    • move from one think to another
    • ...
Activities

• Safety-critical aspects
  – any mistake could result in an injury or serious accident
  – designers must pay attention to ensuring that mistakes do not have a serious effect

• Designers must
  – think what happens when people make mistakes and errors
  – design for that circumstances
Activities: Content

• Data requirements
  – What is input?
    • large/modest/small amount of required data?
  – How to input?
  – What is output?
    • alphanumerical data, video records, other media

• good content:
  – accurate, up to date, relevant, good presented
PACT analysis

- People
- Activities
- Context of use
- Technologies
The physical context

• Environment in which activity happens
• Physical environment
  – temperature, humidity, atmospheric pressure, lightlevels, noise, ..
Social contexts

• Social environment
  – privat issues
  – individual or group activity
Organisational contexts

• Changes in technologies alter communication and power structures
• Automation can have affects
  – such as deskilling
PACT analysis

- People
- Activities
- Context of use

Technologies
Technologies

• Input devices
  – switches and buttons facilitate instructions
    • take up space
  – for alphanumerical input – keyboards
QWERTY keyboard

- 1868
- Christopher Latham Sholes
- solved the jams when the keys were struck
- 150 words per min
QWERTY layout

Without SHIFT
Technologies

• Input devices
  – touch screens
  – pointing devices, e.g. mouse, stylus
  – trackball
  – joystick

Microsoft surface
Technologies

• Input devices
  – gestures
  – QR codes

Microsoft Kinect
Output technologies

Flexible organic light-emitting diode

Haptic technologies

2D and 3D printers
Communication

• Between people and between devices
  – Bandwidth and speed are critical
  – Wired with fibre-optic cables
    • The fastest communication
  – Wireless, wifi
    • quite limited in range
    • need to be within a few metres
    • 4G fast and wide coverage
  – Bluetooth, NFC
Content

- Good content
  - accurate, up to date, relevant and well presented
- Characteristics of the data influence input methods
  - Barcodes – for data that does not change often
  - Touchscreens – for a few options to choose from
  - Speech input
    - if there is no noise and few commands to enter
Scoping the problem with PACT

• Right mix
  – of technologies
  – to support activities
  – being undertaken by people
  – in different contexts
Example: access to university laboratories

• People
  – students, lecturers, technicians

• Activities
  – enter some form of security clearance and open the door

• Contexts
  – indoor activity, people may carry books, in a crowd,

• Technologies
  – small amount of data has to be entered quickly
  – the output must be clear
  – accessible for people in wheelchairs
Summary

• People: physical, psychological and usage
• Activities: temporal, cooperation, complexity, safety-critical, content
• Contexts: physical, social, organizational
• Technologies: input, output, communication and content
• Undertaking a PACT analysis of a situation is a useful way of scoping a design problem.
Readings
