Lecture 7
THE PROCESS OF INTERACTION DESIGN
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Overview

• What is involved in Interaction Design?
  – Importance of involving users
  – Degrees of user involvement
  – What is a user-centered approach?
  – Four basic activities

• Framework for needs analysis: PACT

• Some practical issues
  – Who are the users?
  – What are ‘needs’?
  – Where do alternatives come from?
  – How to choose among alternatives?
  – How to integrate interaction design activities in other lifecycle models?
What is involved in Interaction Design?

• It is a process:
  – a goal-directed problem solving activity informed by intended use, target domain, materials, cost, and feasibility
  – a creative activity
  – a decision-making activity to balance trade-offs

• Generating alternatives and choosing between them is key

• Four approaches: user-centered design, activity-centered design, systems design, and genius design
  Saffer (2010)
Design approaches

1. User centered design
   – The users know best what they need and they are the designer's source of knowledge
   – The role of the designer - translate users' needs and goals to the design decisions

2. Activity-centred design
   – Highlights the activities surrounding the task
   – The user is still important but more the activities are analysed instead of needs and objectives
Design approaches

• System design
  – A structured, rigorous and holistic design approach
  – Highlights a context
  – appropriate for complex systems

• Rapid expert design (genius design)
  – Based on the experience of a designer
  – User’s role - to evaluate the designer’s ideas
    • the user is not involved to a design process itself
Importance of involving users

• Expectation management
  – Realistic expectations
  – No surprises, no disappointments
  – Timely training
  – Communication, but no hype

• Ownership
  – Make the users active stakeholders
  – More likely to forgive or accept problems
  – Can make a big difference to acceptance and success of product
Degrees of user involvement

• Member of the design team
  – Full time: constant input, but lose touch with users
  – Part time: patchy input, and very stressful
  – Short term: inconsistent across project life
  – Long term: consistent, but lose touch with users

• Newsletters and other dissemination devices
  – Reach wider selection of users
  – Need communication both ways

• User involvement after product is released

• Combination of these approaches
Research on user involvement

- The benefits of the user study outweigh the costs (Kujala et al., 2000).
- Other results are more ambiguous Subramanyam et al (2010)
Research on user involvement

- User involvement can have a negative impact on the project (Heinbokel et al, 1996):
  - Users generate complex ideas halfway through the project and wants to include them too late.
  - In some cases, users are afraid of losing their jobs and running unconstructive.
  - Users are unpredictable and understanding design principles require significant changes in almost the last moment.
  - User-conceit may lead to stress and cause unnecessary conflict.

- Designing multimedia systems, to high user influence can suppress the innovative solutions.
What is a user-centered approach?

User-centered approach is based on:

– Early focus on users and tasks:
  • directly studying cognitive, behavioral, anthropomorphic & attitudinal characteristics

– Empirical measurement:
  • users’ reactions and performance to scenarios, manuals, simulations & prototypes are observed, recorded and analysed

– Iterative design:
  • when problems are found in user testing, fix them and carry out more tests
Some practical issues

• Who are the users?
• What do we mean by ‘needs’?
• How to generate alternatives
• How to choose among alternatives
• How to integrate interaction design activities with other lifecycle models?
Who are the users/stakeholders?

• Not as obvious as you think:
  – those who interact directly with the product
  – those who manage direct users
  – those who receive output from the product
  – those who make the purchasing decision
  – those who use competitor’s products

• Three categories of user (Eason, 1987):
  – primary: frequent hands-on
  – secondary: occasional or via someone else
  – tertiary: affected by its introduction, or will influence its purchase
Who are the stakeholders?

- Suppliers
- Local shop owners

Managers and owners

Check-out operators

Customers
What do we mean by ‘needs’?

• Users rarely know what is possible
• Users can’t tell you what they ‘need’ to help them achieve their goals
• Instead, look at existing tasks:
  - their context
  - what information do they require?
  - who collaborates to achieve the task?
  - why is the task achieved the way it is?
• Envisioned tasks:
  - can be rooted in existing behaviour
  - can be described as future scenarios
Activities and technologies

Requirements

Activities in contexts

People

Opportunities

Technologies
User needs analysis

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
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 that 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 for 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
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

2D and 3D printers

Flexible organic light-emitting diode

Haptic technologies
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 design problem with PACT

• User needs is a right mix
  – of technologies
  – to support activities
  – being undertaken by people
  – in different contexts
Four basic activities in Interaction Design

1. Establishing requirements
2. Designing alternatives
3. Prototyping
4. Evaluating
A simple interaction design lifecycle model

Exemplifies a user-centered design approach

Figure 9.3 A simple interaction design lifecycle model
Figure 1 — Interdependence of human-centred design activities
User centered design (UCD)

Image from the Ergonomen.ch
How to integrate interaction design in other models

• Integrating interaction design activities in lifecycle models from other disciplines needs careful planning

• Several software engineering lifecycle models have been considered

• Integrating with agile software development is promising
  – it stresses the importance of iteration
  – it champions early and regular feedback
  – it handles emergent requirements
  – it aims to strike a balance between flexibility and structure
A simple interaction design lifecycle model

Exemplifies a user-centered design approach
Star model

Implementation
Task analysis, function analysis
Evaluation
Developing the prototype
implementation
Conceptual presentation
formal representation

(Hartson ir Hix, 1989)
How to integrate interaction design lifecycles with SE models

• Lifecycle models from other disciplines
• Agile software development promising
  – have development and design running in separate tracks
  – maintain a coherent vision of the interface architecture
The usability engineering lifecycle

(D. Deborah J. Mayhew & Associates 2011)
Agile development

[Diagram showing Agile development process with stages such as Kickoff, Sprint Planning, Demo, Dev, Test, Deployment (optional) repeated for N cycles.]

SOME PRACTICAL ISSUES
How to generate alternatives

• Humans stick to what they know works

• But considering alternatives is important to ‘break out of the box’

• Designers are trained to consider alternatives, software people generally are not

• How do you generate alternatives?

  — ‘Flair and creativity’: research and synthesis

  – Seek inspiration: look at similar products or look at very different products
IDEO TechBox

• Library, database and website all-in-one

• Contains physical gizmos for inspiration
The TechBox

04_ Each drawer resembles a bento box

05_ The curator keeps order

06_ All the entries are tagged

07_ It really is used daily

08_ Two demonstrations units on top
How to choose among alternatives

- Evaluation with users or with peers, e.g. prototypes
- Technical feasibility: some not possible
- Quality thresholds: Usability goals lead to usability criteria set early on and check regularly
  - safety: how safe?
  - utility: which functions are superfluous?
  - effectiveness: appropriate support? task coverage, information available
  - efficiency: performance measurements
  - learnability: is the time taken to learn a function acceptable to the users?
  - memorability: can infrequent users remember how to achieve their goal?
Testing prototypes to choose among alternatives
Summary

Four basic activities in the design process

1. Establishing requirements
2. Designing alternatives
3. Prototyping
4. Evaluating

User-centered design rests on three principles

1. Early focus on users and tasks
2. Empirical measurement using quantifiable & measurable usability criteria
3. Iterative design
References

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