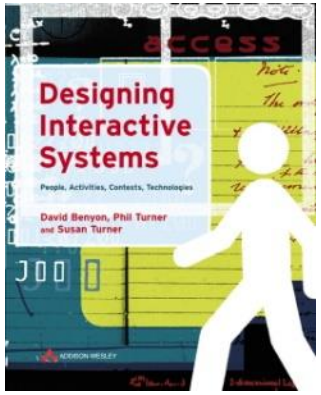
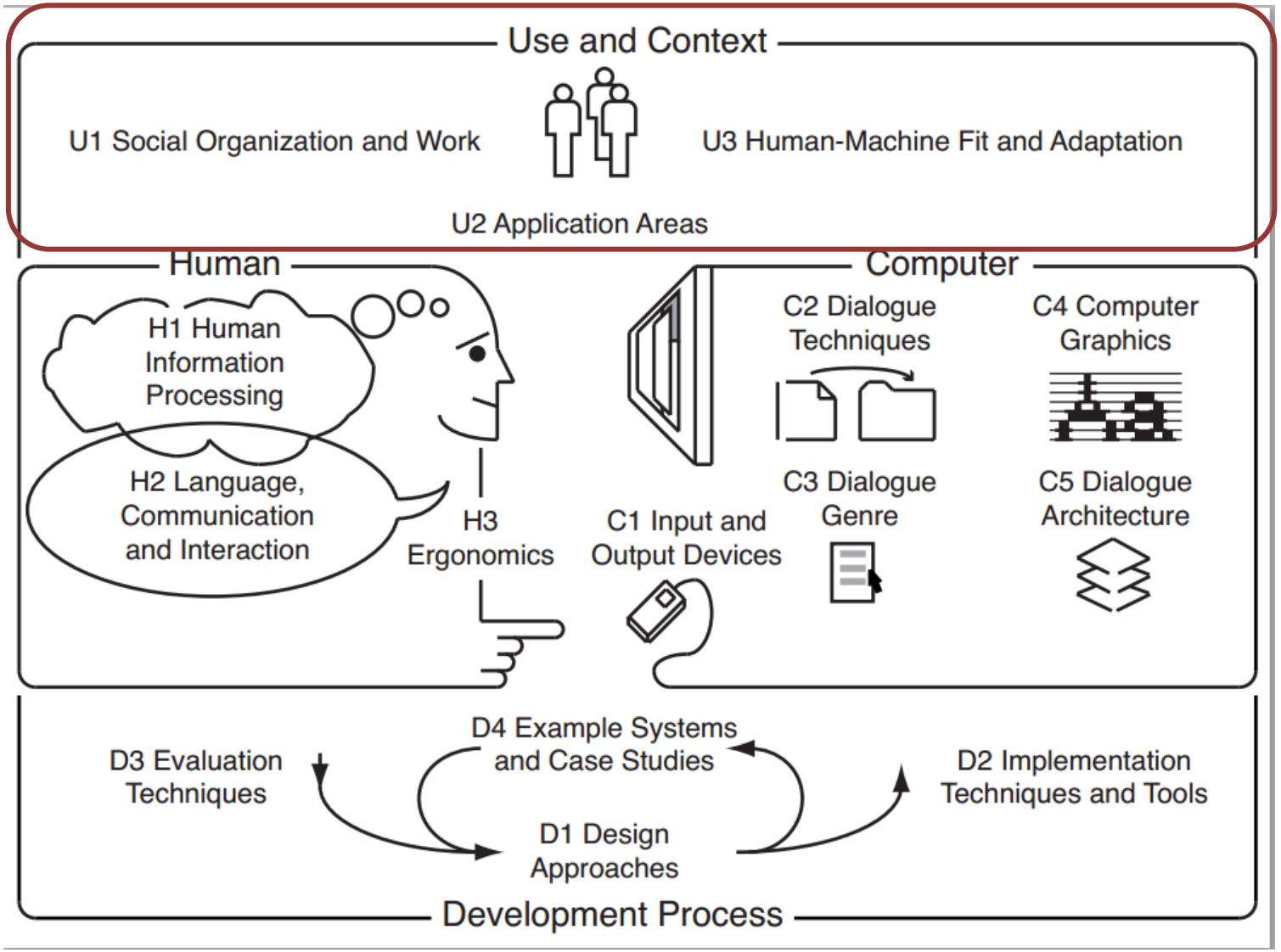


Context of use analysis: PACT

Dr Kristina Lapin

Human Computer Interaction

Aims


Use and Context
U1 Social Organization and Work
U3 Human-Machine Fit and Adaptation
U2 Application Areas
Human
H1 Human Information Processing
H2 Language, Communication and Interaction
H3 Ergonomics
Computer
C1 Input and Output Devices
C2 Dialogue Techniques
C3 Dialogue Genre
C4 Computer Graphics
C5 Dialogue Architecture
D3 Evaluation Techniques
D4 Example Systems and Case Studies
D1 Design Approaches
D2 Implementation Techniques and Tools
Development Process

Outline

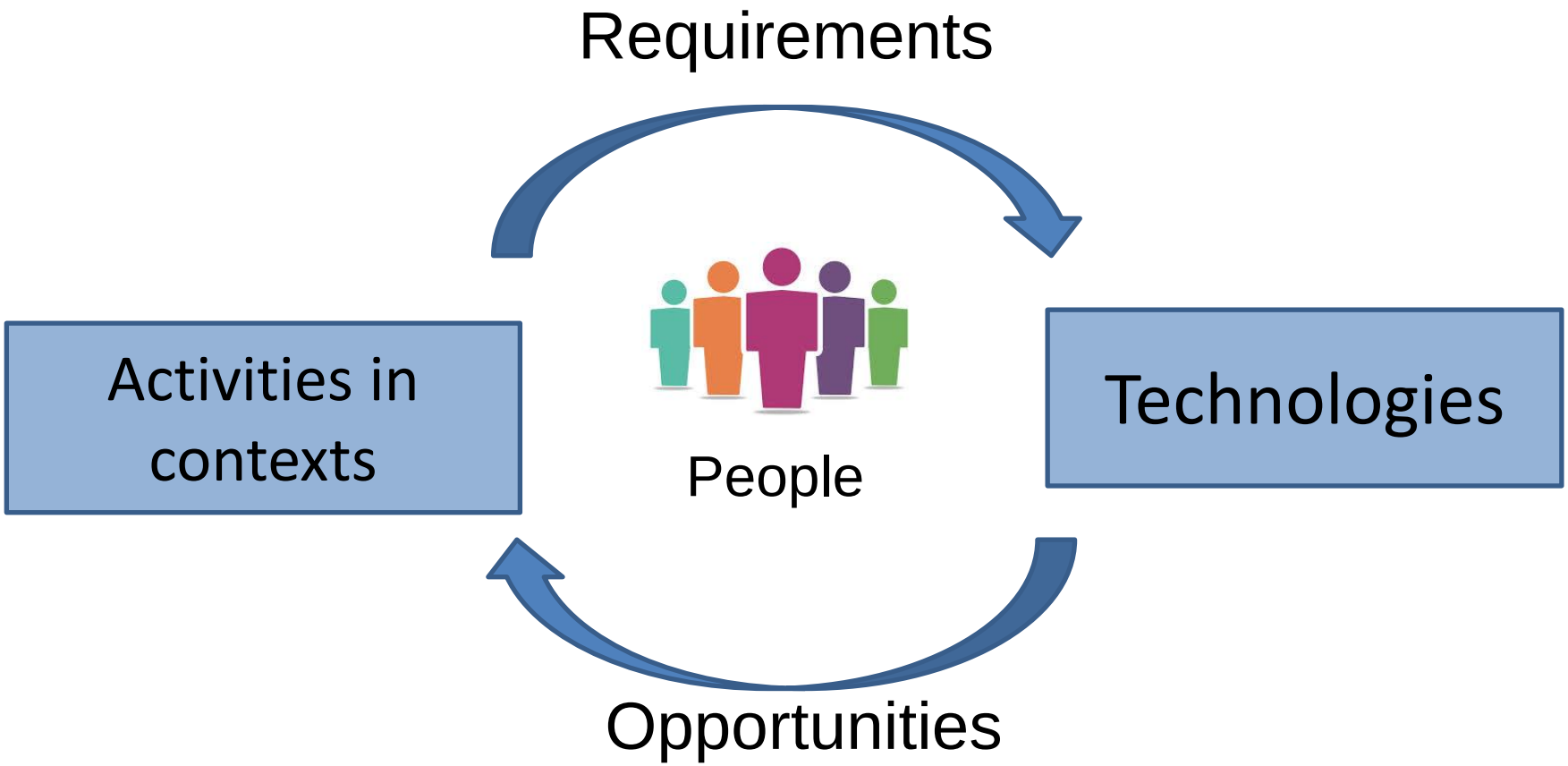
- Universal usability
- Activities and technologies
- The main characteristics of people
  - relevant to designing interactive systems
- The main issues of activities
  - and the contexts in which they occur
- The key features of interactive technologies

Recall from the 2nd lecture: Context of use (ISO 9241-11:2018)

- Context of use is combination of
  - **users**, **goals** and **tasks**, **resources**, and **environment**.
- Note 1 to entry: The “environment” in a context of use includes the technical, physical, social, cultural and organizational environments.
- The context of use is a major source of information for establishing requirements and an essential input to the design process‘ (ISO/IEC 25010:2010 p.11)

How advanced technologies changed the phoning activity?

Activities and technologies



PACT analysis

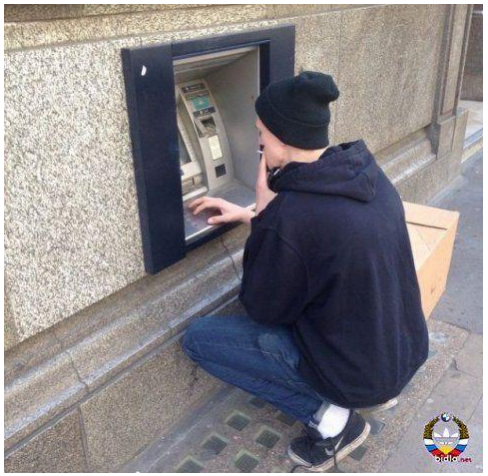
- **P**eople
- **A**ctivities
- Contexts
- **T**echnologies

Variations in physical abilities and physical workplaces

- Basic data about human dimensions comes from research in *anthropometry*
- There is no average user, either compromises must be made or multiple versions of a system must be created
- Physical measurement of human dimensions are not enough, take into account dynamic measures such as reach, strength or speed

Physical differences

- Physical characteristics: height, weight, size
- Senses: sight, hearing, touch



Source of images: [An innocent visit to a Thailand ATM sparks a new meme]

Variations in physical abilities and physical workplaces (continued)

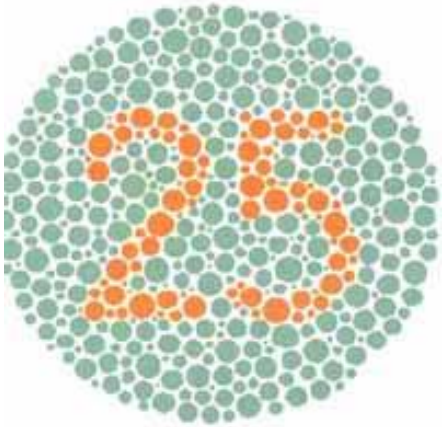
- Screen-brightness preferences vary substantially, designers customarily provide a knob to enable user control
- Account for variances of the user population's sense perception
  - Vision: depth, contrast, color blindness, and motion sensitivity
  - Touch: keyboard and touchscreen sensitivity
  - Hearing: audio clues must be distinct
- Workplace design can both help and hinder work performance

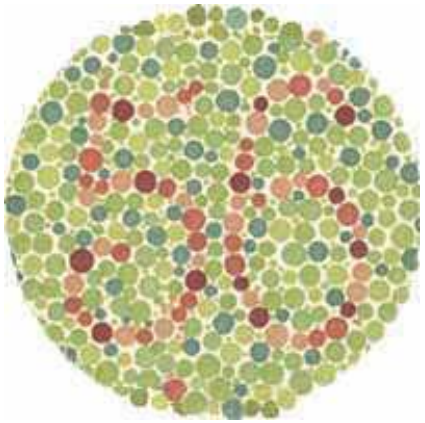
Variations in physical abilities and physical workplaces (concluded)

- The standard *ANSI/HFES 100-2007 Human Factors Engineering of Computer Workstations* (2007) lists these concerns:
  - Work-surface and display-support height
  - Clearance under work surface for legs
  - Work-surface width and depth
  - Adjustability of heights and angles for chairs and work surfaces
  - Posture – seating depth and angle; back-rest height and lumbar support
  - Availability of armrests, footrests, and palmrests

Physical differences

- Colour blindness
  - inability to distinguish red and green colours affects ~8% males
- Short-sightedness, long-sightedness
- Hearing and finger dexterity impairements
- 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

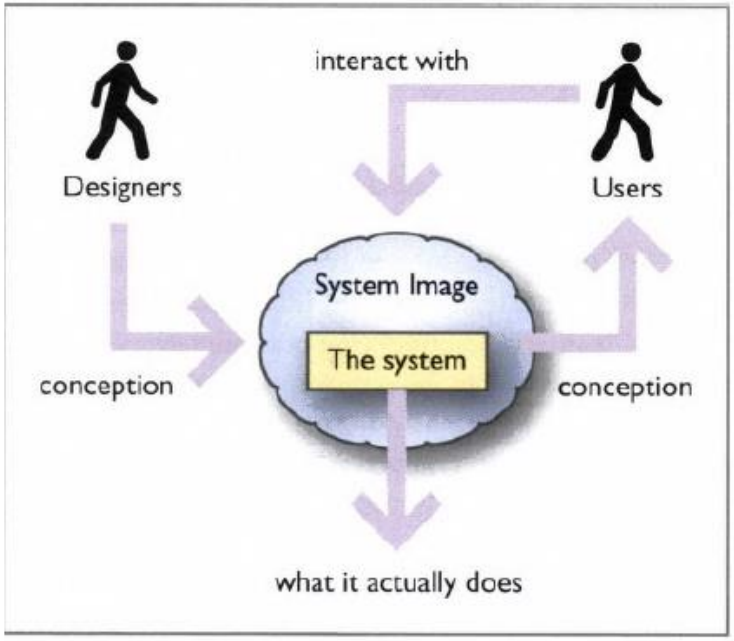
Diverse cognitive and perceptual abilities

- The human ability to interpret sensory input rapidly and to initiate complex actions makes modern computer systems possible
- The journal *Ergonomics Abstracts* offers this classification of human cognitive processes:
  - Long-term and semantic memory
  - Short-term and working memory
  - Problem solving and reasoning
  - Decision making and risk assessment
  - Language communication and comprehension
  - Search, imagery, and sensory memory
  - Learning, skill development, knowledge acquisition, and concept attainment

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

Mental model

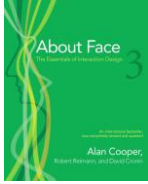


Norman's system image
(Benyon, 2013, p. 31)

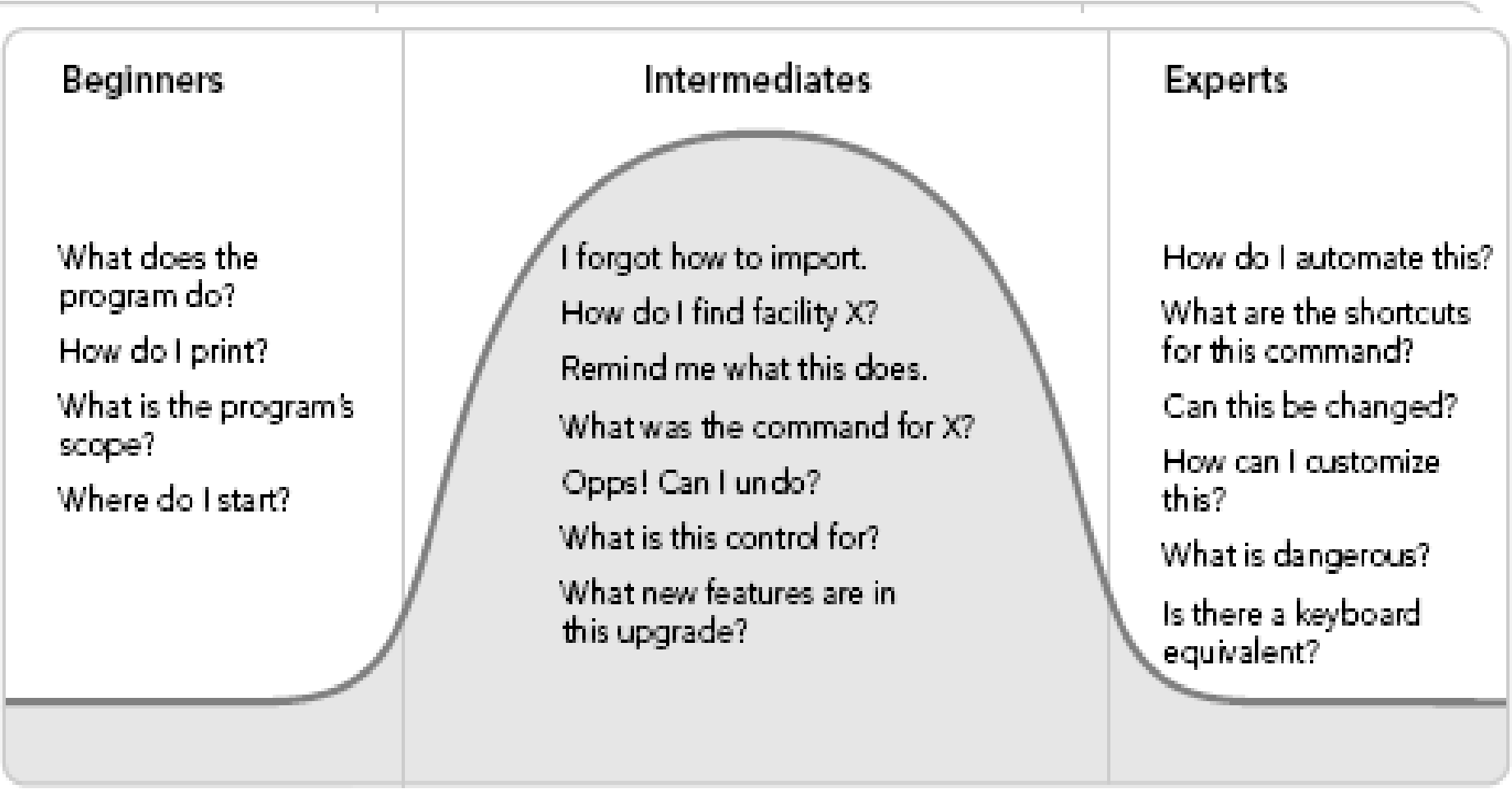
- The understanding and knowledge of using IT
  - Helps to make predictions about consequences about our actions
  - Incomplete
    - people understand some parts better that others
  - Unstable
    - people can forget details
- Develops through interacting with systems

Determine user's skill levels

- "Know thy user"
- Age, gender, physical and cognitive abilities, education, cultural or ethnic background, training, motivation, goals and personality
- Design goals based on skill level
  - Novice or first-time users
  - Knowledgeable intermittent users
  - Expert frequent users
- Multi-layer designs



Different experience levels



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.

Cultural and international diversity

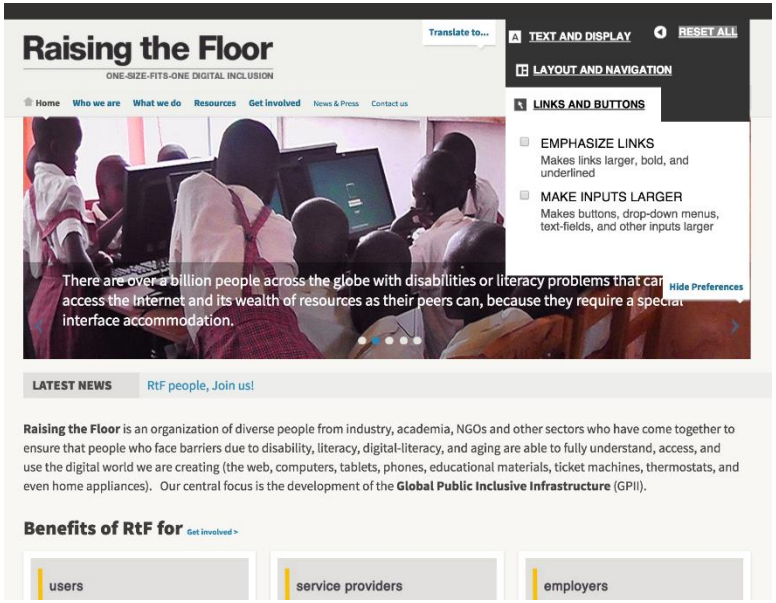
- Designing for cell phones can open the door to a wider audience, e.g. in developing countries where:
  - feature phones often are the only way to access the internet
  - literacy may be an issue
  - users have very low monthly limits on the data volume they can use

Universal Usability

- **Universal usability = usability + accessibility**
- Accessibility refers to the design of products and environments for people with disabilities
- The ultimate goal: addressing the needs of ***all users*****.**
- As a profession, we will be remembered for how well we meet our users' needs.
- The huge international consumer market in mobile devices has **raised the pressure for designs that are universally usable.**

Universal Usability (example)

- The website of “Raising the Floor” includes universal accessibility features such as options for emphasizing the links or making buttons larger, offering several font sizes, contrast, text descriptions of photos, translation services, etc. (https://raisingthefloor.org/our-community/overview).



Universal usability: design for all including users with disabilities

- Designers must plan early to accommodate users with disabilities
- Early planning is more cost efficient than adding on later
- Businesses must comply with the "Americans With Disabilities Act" for some applications
- Growing world-wide support, for example:
  - European Union Mandate 376 will require procurement and development of accessible technologies by EU governments (http://www.mandate376.eu/)
  - United Nations Convention on the Rights of Persons with Disabilities (CRPD), an international human rights agreement (http://www.un.org/disabilities/convention/conventionfull.shtml)

Users with Disabilities (concluded)

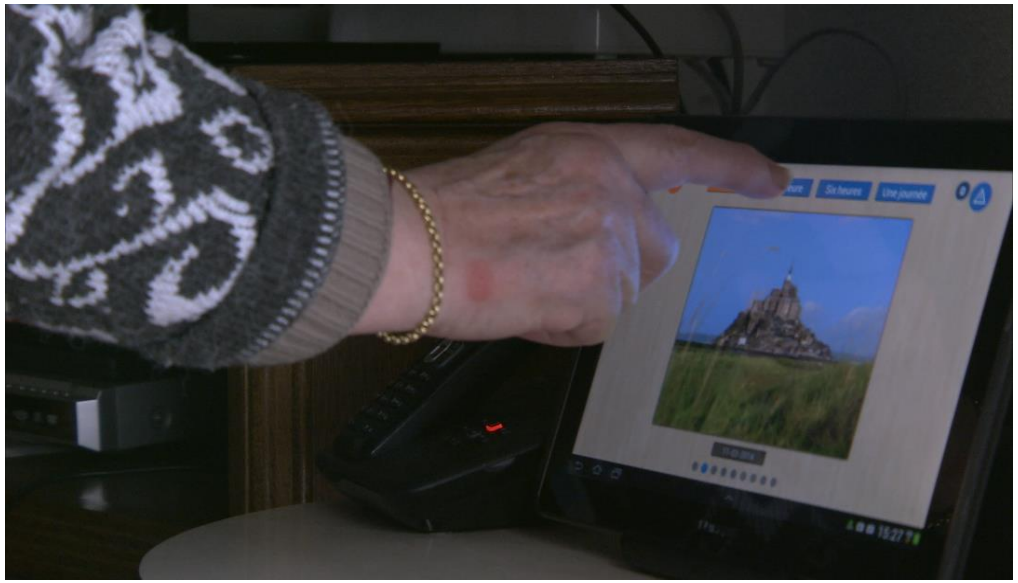
- A user with disability is using a television with the help of assistive technology

Older adult users

- Including the elderly is fairly easy
- As the world's population ages, designers in many fields are adapting their work to serve older adults, which can benefit all users
- Designers should allow for variability within their applications via settings for sound, color, brightness, font sizes, etc. with less distracting animation

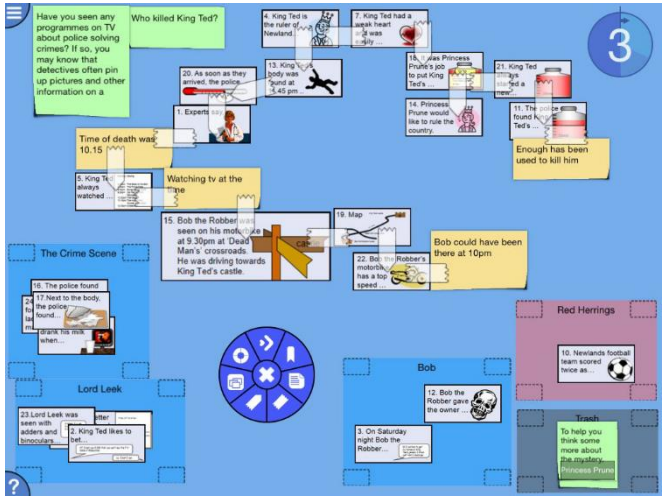
Older adult users (concluded)

- HomeAssist is an assisted living platform for older adults, installed in homes in Bordeaux, France
- The tablet is used to show alerts (e.g. when the front door was left opened) and reminders, but also to run a slide show of photographs when not in use (http://phoenix.inria.fr/research-projects/homeassist)



Children

- Using Digital Mysteries on a tablet, two elementary school children work together to read information slips, group them and create a sequence to create an answer to the question "Who killed King Ted?"
  - The blue pop-up pie menu allows the selection of tools.
  - A larger tabletop version allows larger groups to collaborate. (www.reflectivethinking.com)



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

Activity for you

- Which user characteristics are important for the ticket selling machine?
  - Physical, psychological, social
- Is motivation to use high?

Summary of users characteristics

- Essential aspects
  - Demographics
    - Age, occupation, gender (if relevant), disabilities
  - Motivation to learn new technologies
  - Used information technology and devices
  - IT usage skill level

PACT analysis

- People
- Activities
- **C**ontexts
- **T**echnologies

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
  - Duration: how long the computerized activity takes?
  - Time pressure: quiet or busy
  - Single or continuous actions
    - Can be interrupted? If Yes – let user find their place after interruption
  - Acceptable response time

Activities

- Cooperation
  - One or more users?
  - For collaborative activities
    - Awareness
      - How group members are aware of what other group members are already done
    - Coordination
      - How group members coordinate their actions in computerized activity
    - Communication
      - how group members communicate while acting in computerized activity

Activities

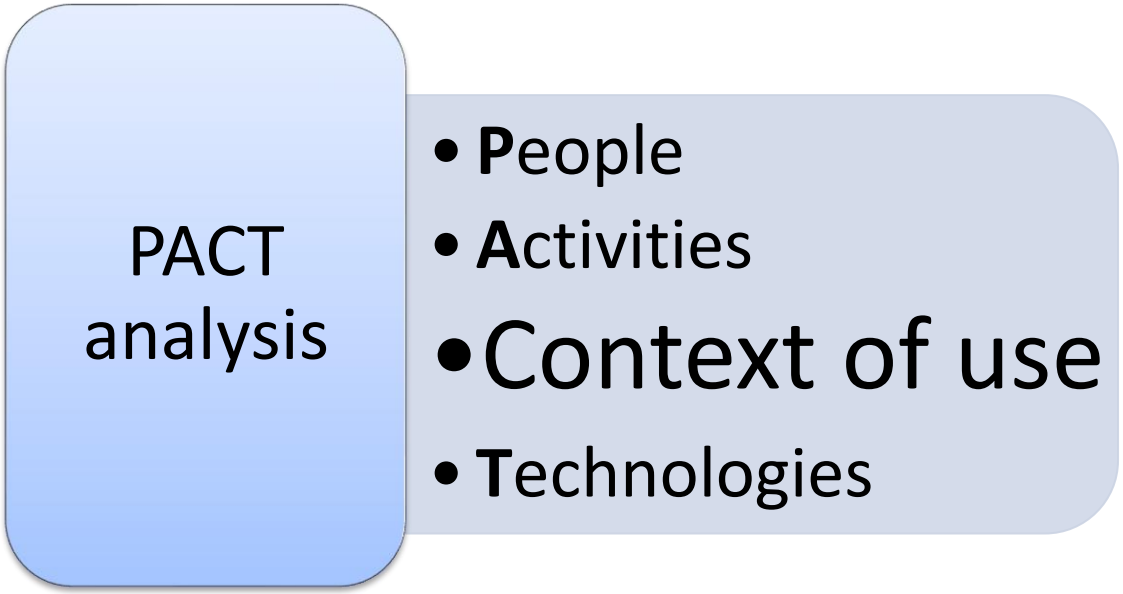
- Complexity
  - Well-defined task
    - can be accomplished by steo by step design
  - for a vague activity people have to be able
    - to browse around
    - see different types of information
    - move from one think to another
    - …

Activities

- Safety-critical aspects
  - any mistake could result in 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

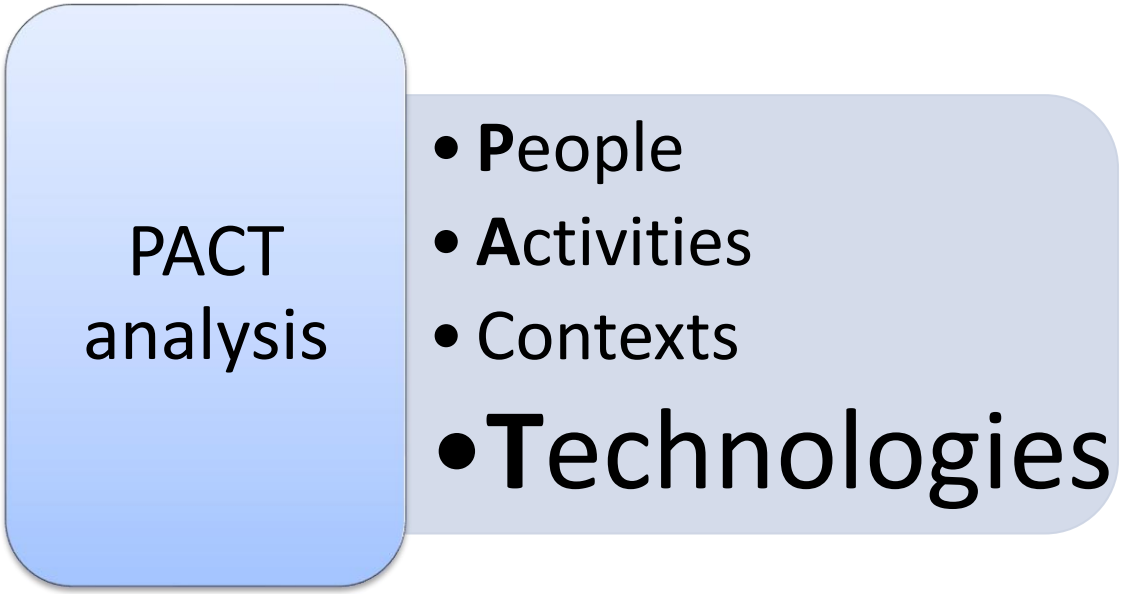
- Environment in which activity happens
- Physical environment
  - temperature, humidity, atmospheric pressure, lightlevels, noise, ..

Social contexts

- Social environment
  - privat issues
  - individual or group activity
    - For group activity the organisational context must be considered

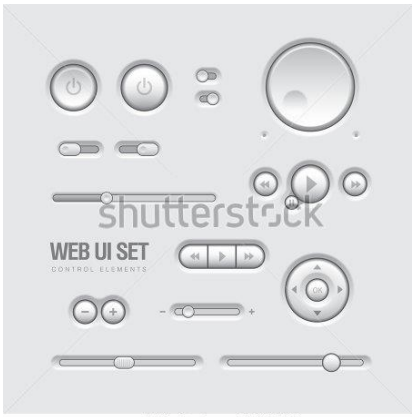
Organisational contexts

- Changes in technologies alter communication and power structures
  - whether group members have equal or different rights
- Automation can have affects such as deskilling
  - Therefore, the level of automation must be considered for safety-critical systems


PACT analysis
• People
• Activities
• Contexts
• Technologies

Technologies

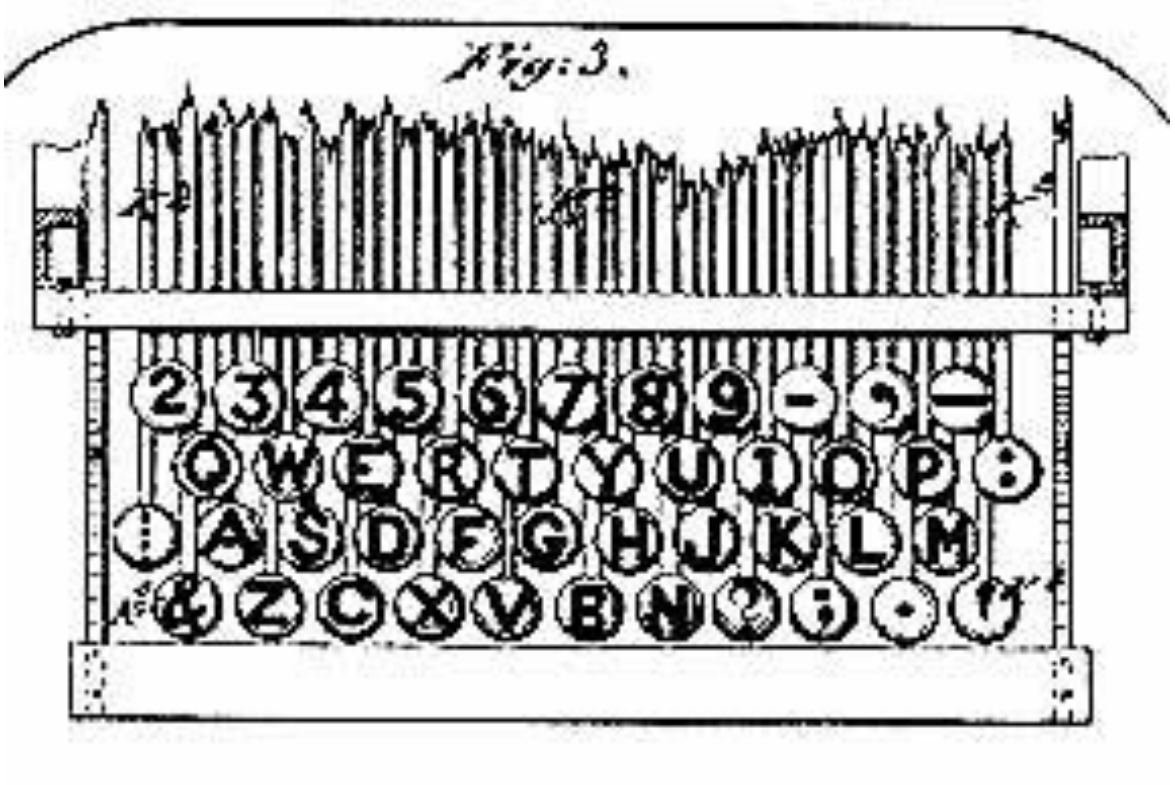
- Input devices
  - switches and buttons facilitate instructions
    - take up space
  - for alphanumerical input – keyboards



QWERTY keyboard

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

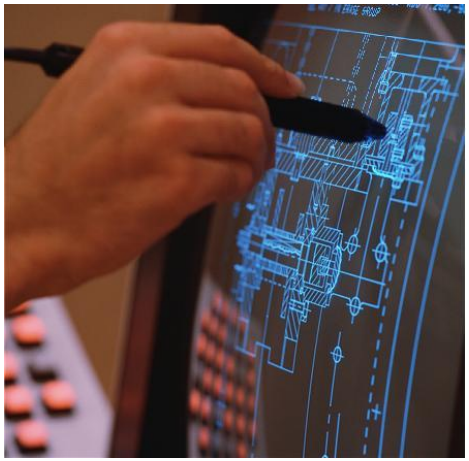
QWERTY layout



Without SHIFT

Technologies

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



Microsoft surface

Technologies

- Input devices
  - gestures
  - QR codes

Microsoft Kinnect

Output technologies

Flexible organic light-emitting diode

2D and 3D printers

Haptic technologies

Accommodating hardware and software diversity

- Three of the main technical challenges will be:
  1. Producing satisfying and effective Internet interaction on high-speed (broadband) and slower (dial-up and some wireless) connections
  2. Responsive design enabling access to web services from large displays (3200 × 2400 pixels or larger) and smaller mobile devices (1024 × 768 pixels and smaller)
  3. Supporting easy maintenance of or automatic conversion to multiple languages

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

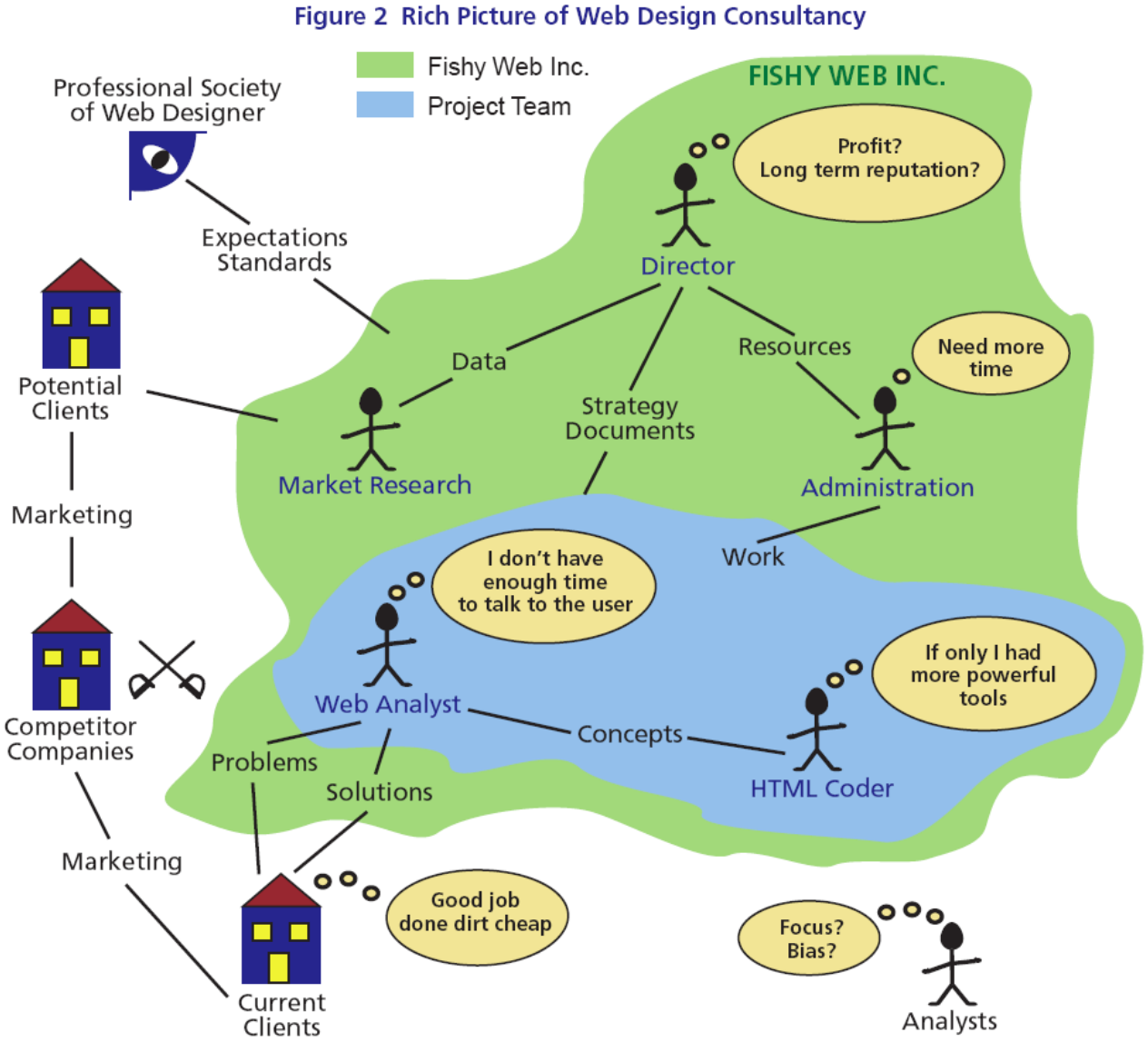
Example: access to university laboratories

- 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

Context of use analysis outcome – a conceptual design

- A conceptual design answers to question: What?
  - **what** information and functions are needed for the system to achieve its purpose
  - **what** someone will have to know to use the system.
- Important: clear conceptualization of a design solution and how that conceptualization will be communicated to people
  - User story, rich picture (example on the next slide)
  - Use-cases, entity-relationship models
  - Site maps, navigation maps

Conceptualization of needs: rich picture



Why go to this length?

- Help designers:
  - understand how to design interactive products that fit with what people want, need and may desire
  - appreciate that one size does not fit all

    e.g., teenagers are very different to grown-ups
  - identify any incorrect assumptions they may have about particular user groups

    e.g., not all old people want or need big fonts
  - be aware of both people's sensitivities and their capabilities

Summary

- People: physical and psychological peculiarities
- 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.

References

- David Benyon, Phil Turner, Susan Turner. **Designing Interactive Systems: People, Activities, Contexts, Technologies.** Addison Wesley, 2019
  chapter 2: PACT framework (Available in MIF library)
- Alan Cooper, Robert Reimann, David Cronin, Christopher Noessel. **About Face: The Essentials of Interaction Design, 4th Edition,** Wiley, 2014.
- David Benyon, Phil Turner, Susan Turner. **Designing Interactive Systems: People, Activities, Contexts, Technologies.** Addison Wesley, 2019
- ISO 9241-11:2018 Ergonomics of human-system interaction — Part 11: Usability: Definitions and concepts