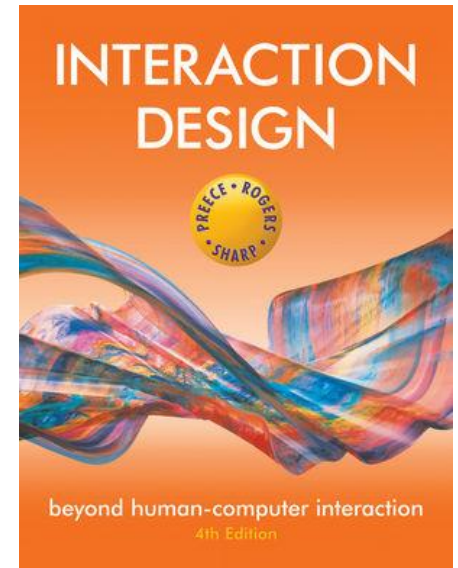
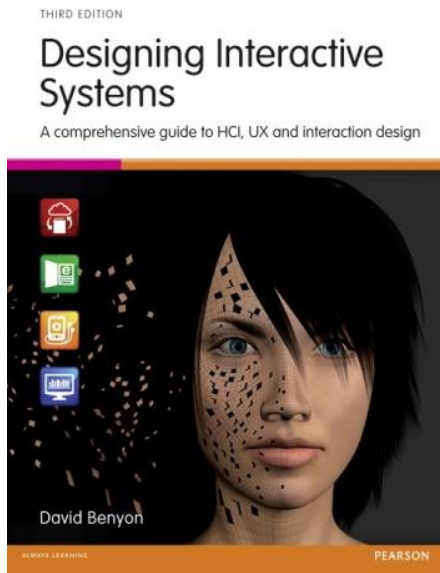




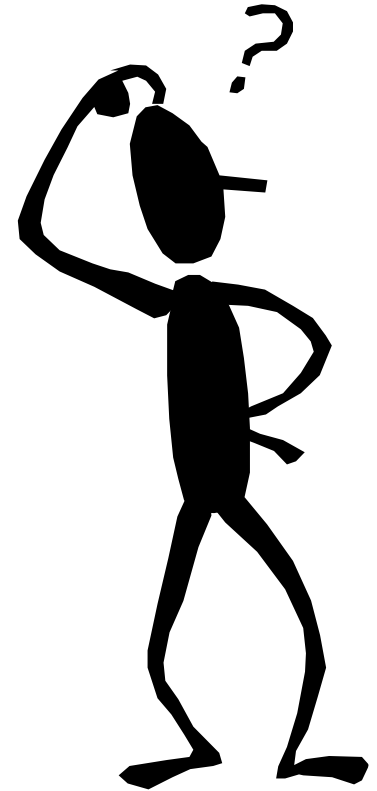
Lecture 7

THE PROCESS OF INTERACTION DESIGN

Adapted by dr Kristina Lapin

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

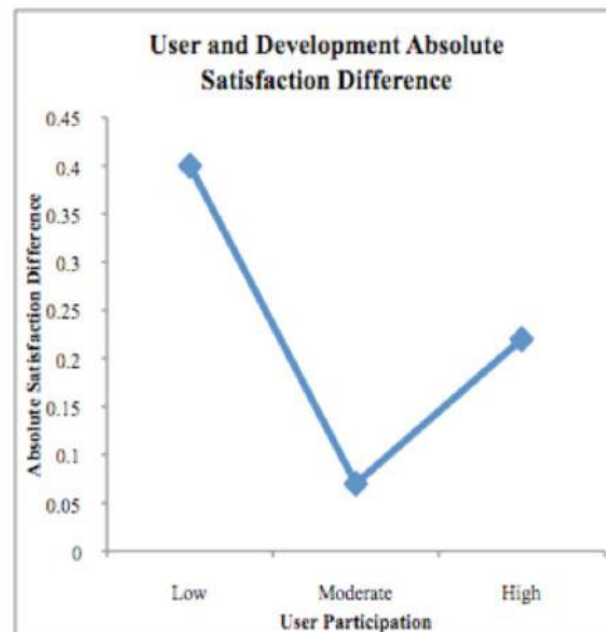
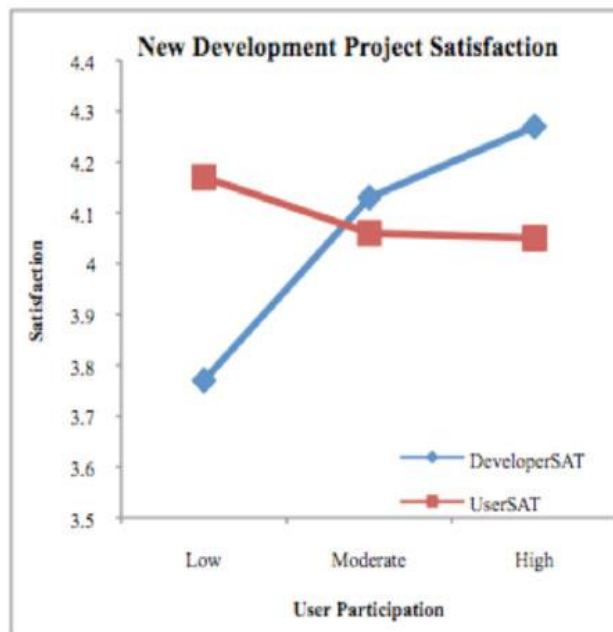
- Expectation management
 - Realistic expectations
 - No surprises, no disappointments
 - Timely training
 - Communication, but no hype
- Ownership
 - Make the users active stakeholders
 - More likely to forgive or accept problems
 - Can make a big difference to acceptance and success of product

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?

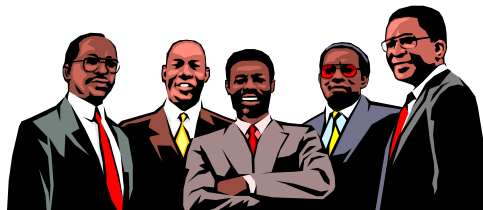
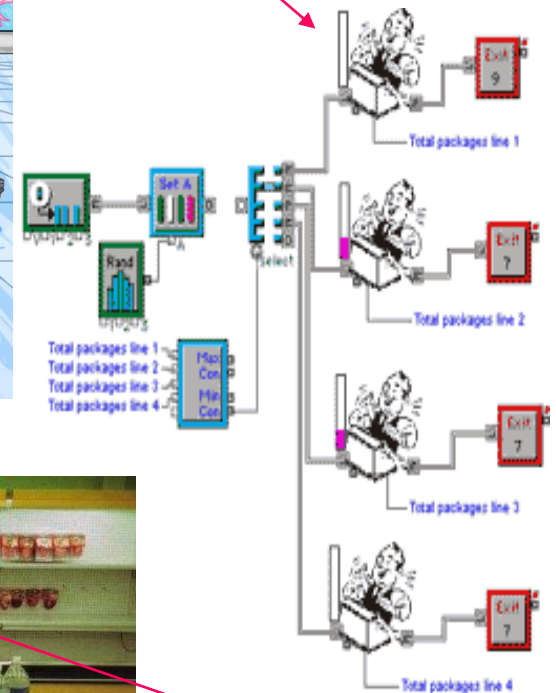
- Not as obvious as you think:
 - those who interact directly with the product
 - those who manage direct users
 - those who receive output from the product
 - those who make the purchasing decision
 - those who use competitor's products
- Three categories of user (Eason, 1987):
 - primary: frequent 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



Check-out operators



Managers and owners

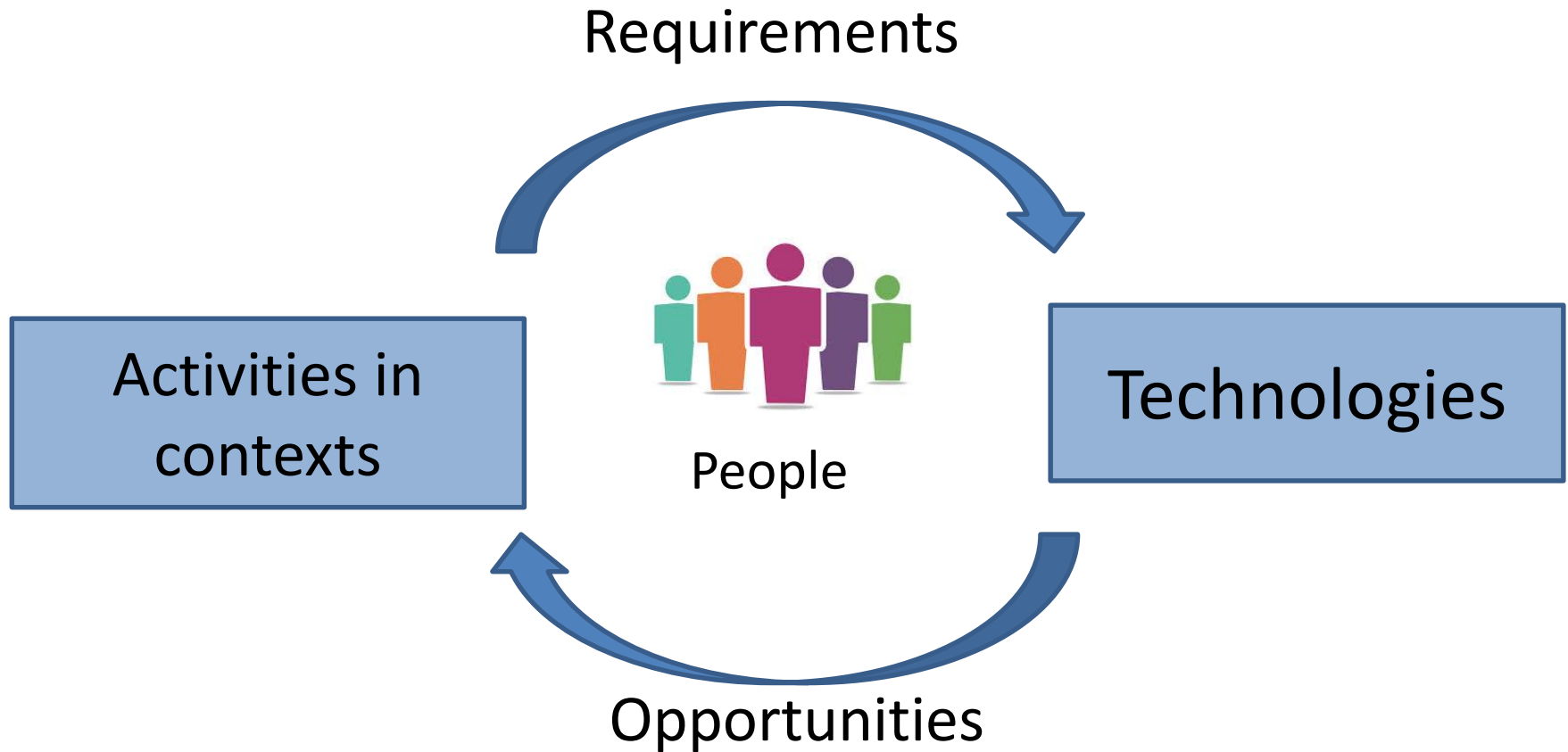


Customers

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





User needs analysis

PACT
analysis

- **P**eople
- **A**ctivities
- **C**ontext of use
- **T**echnologies

Physical differences

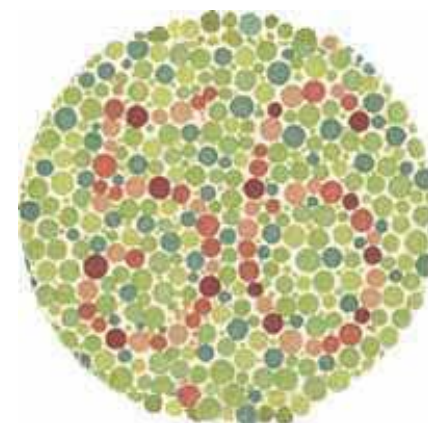
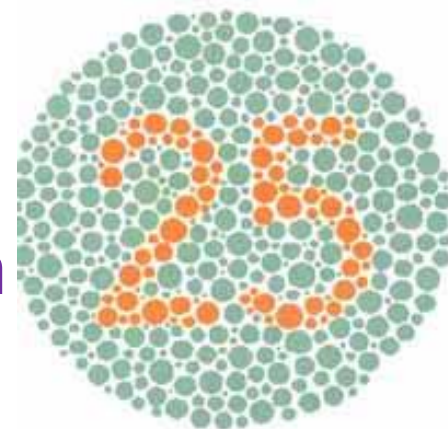
- Physical characteristics: height, weight
- Senses: sight, hearing, touch, smell, taste



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

Physical differences

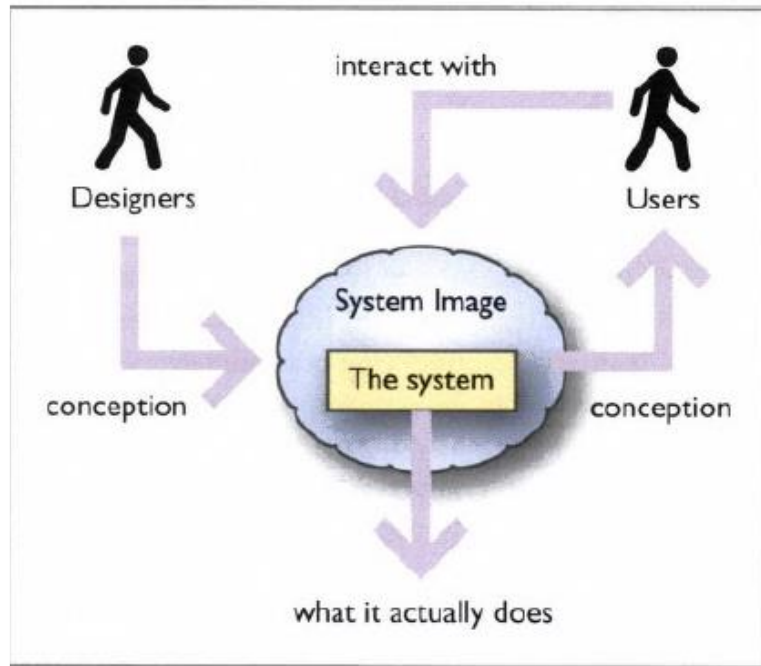
- Colour blindness
 - inability to distinguish red and green colours affects ~8% males
- Short-sightedness, long-sightedness
- Hearing and finger dexterity impairments
- Large fingers vs small buttons



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



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

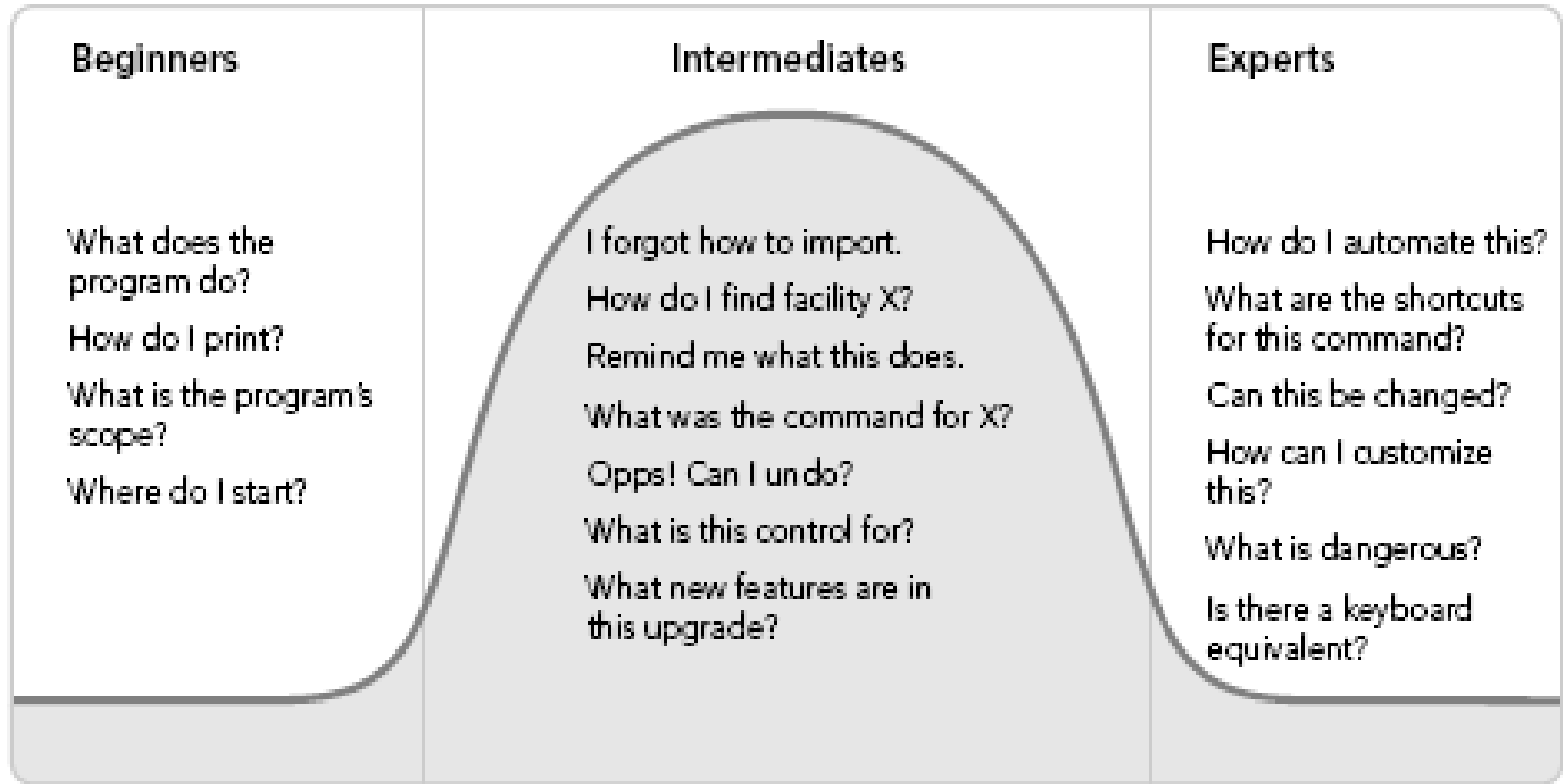
- The understanding and knowledge of using IT
 - Incomplete
 - people understand some parts better than others
 - unstable
 - people can forget details
- Develop through interacting with systems

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

- 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 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?
 - alphanumeric 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

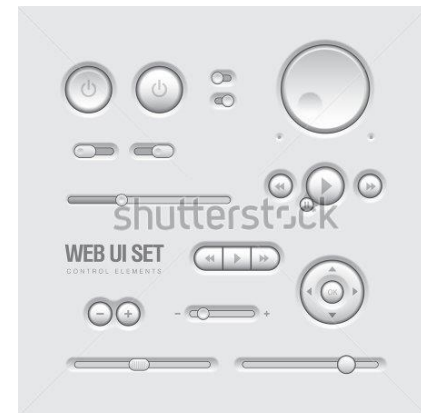


PACT
analysis

- **P**eople
- **A**ctivities
- Context of use
- **T**echnologies

Technologies

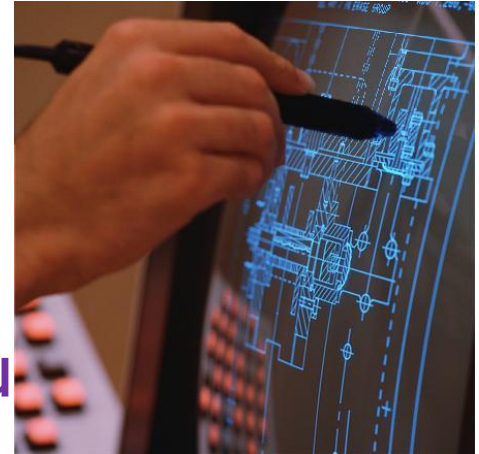
- Input devices
 - switches and buttons facilitate instructions
 - take up space
 - for alphanumerical input - keyboards



www.shutterstock.com · 114427102

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



2D and 3D printers

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

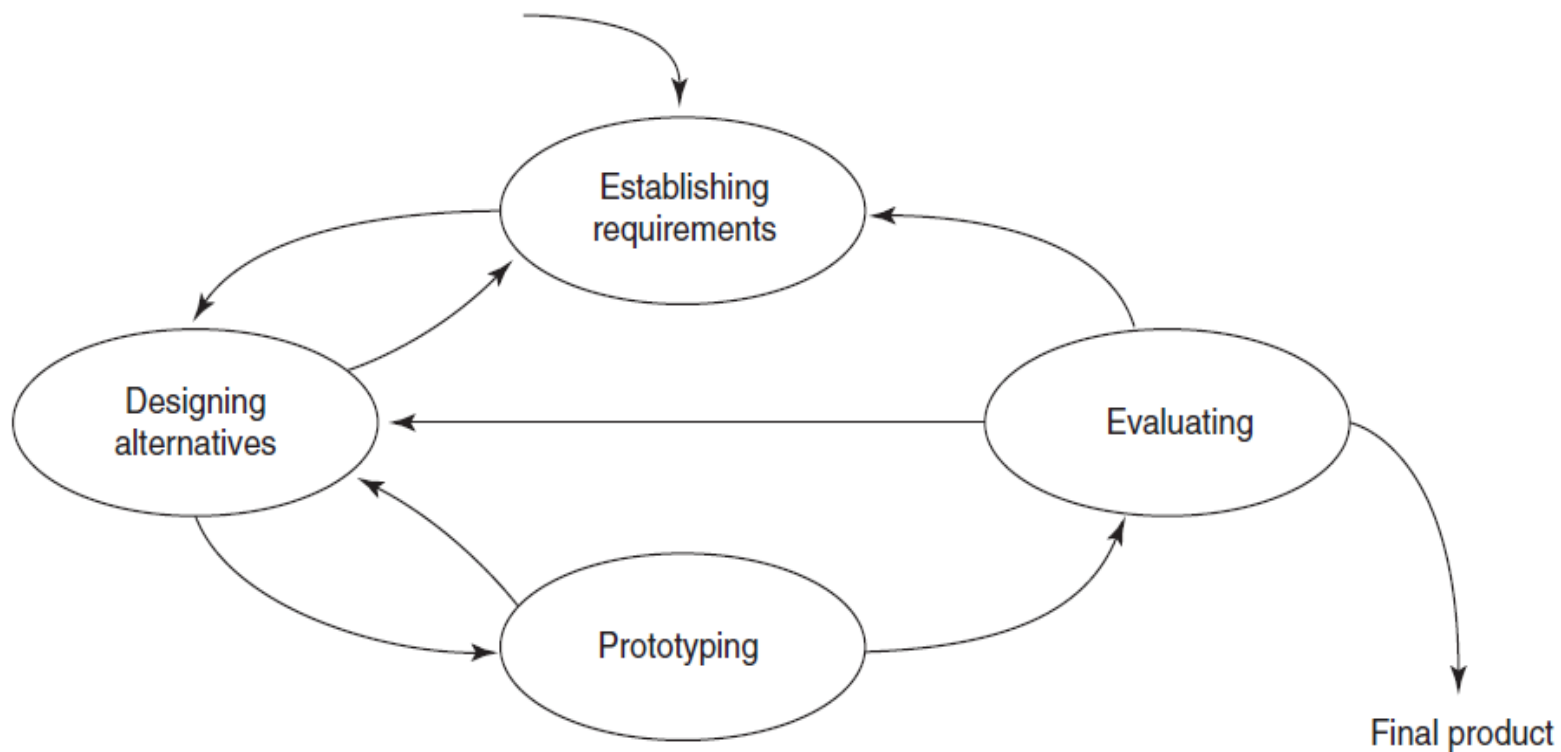


Figure 9.3 A simple interaction design lifecycle model

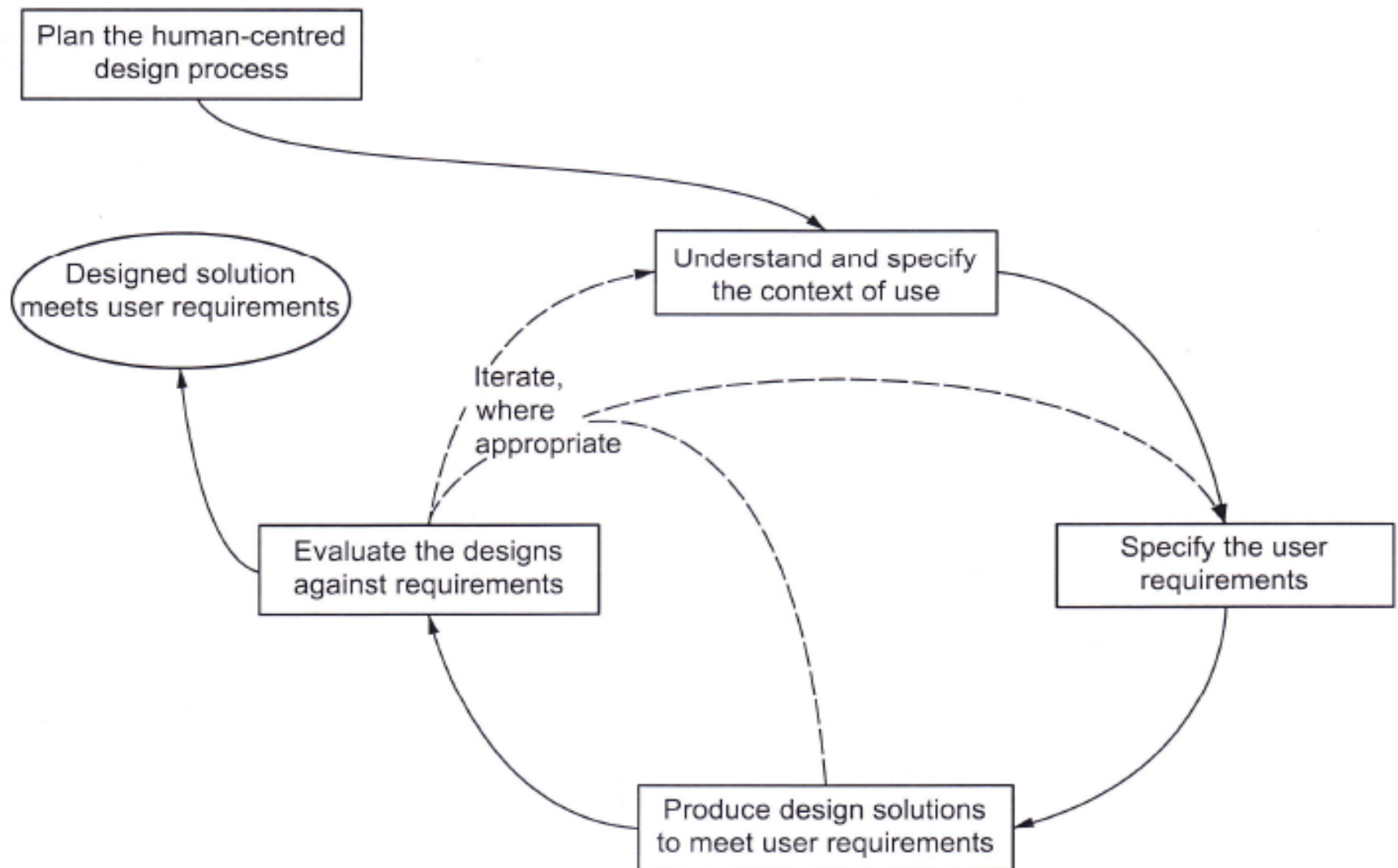


Figure 1 — Interdependence of human-centred design activities

User centered design (UCD)

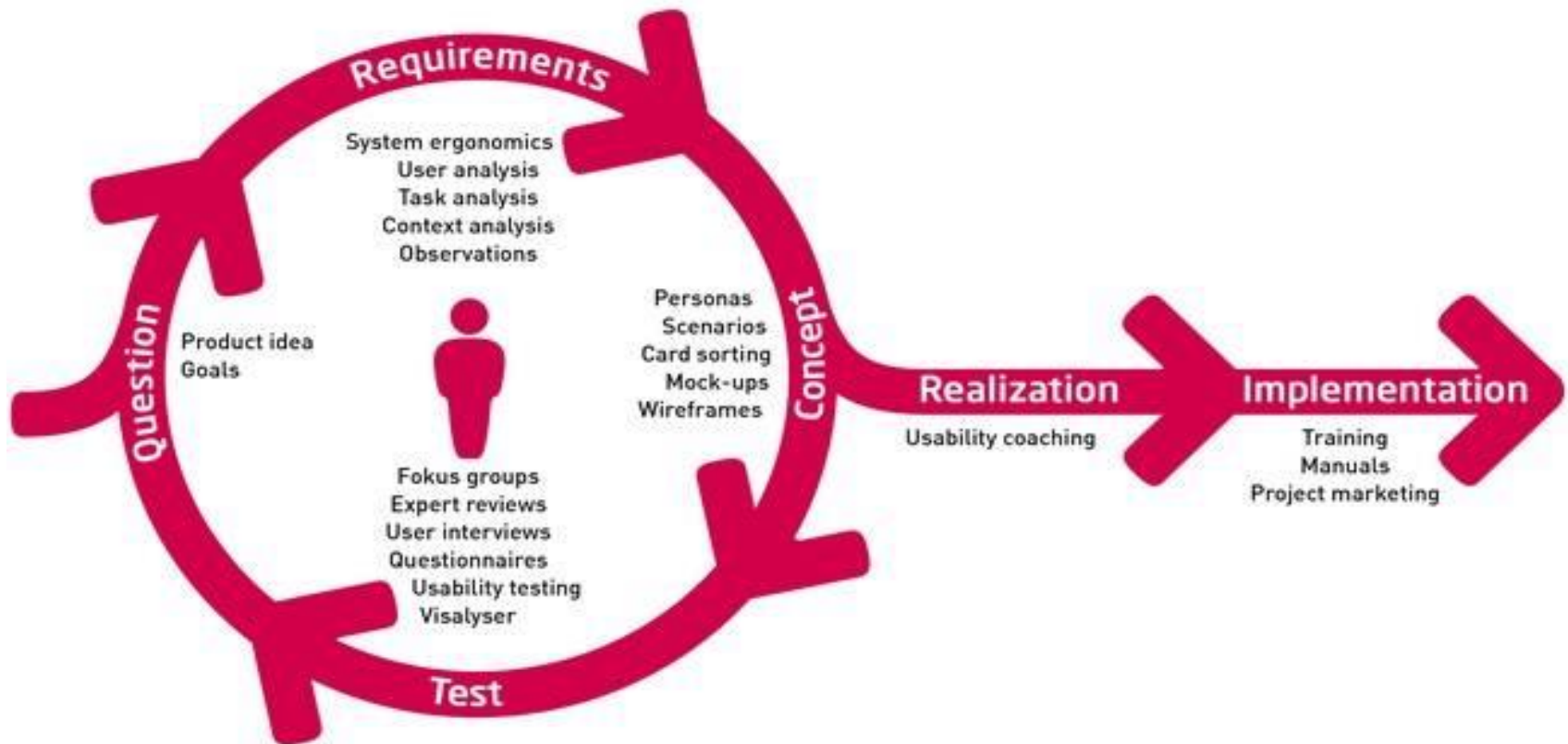
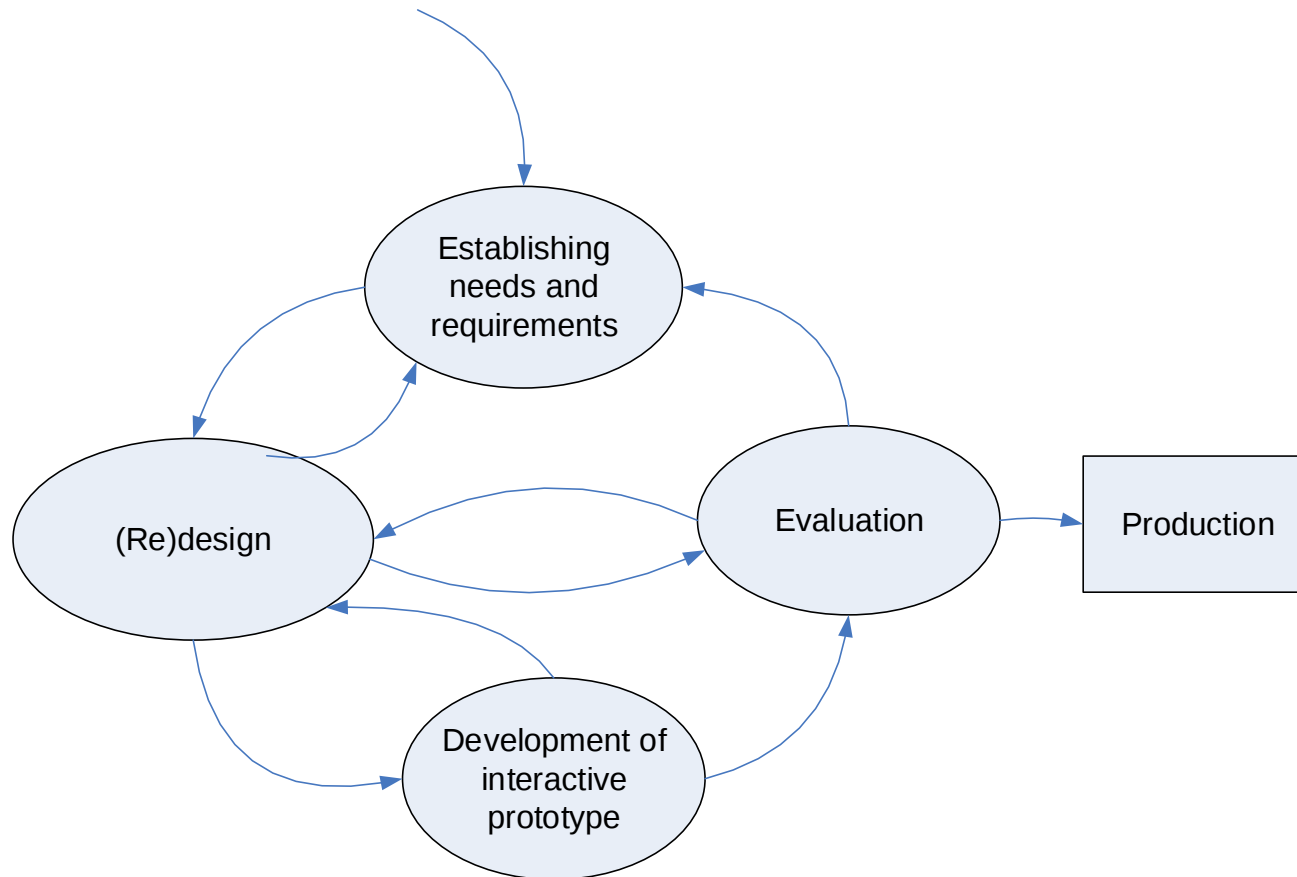


Image from [the Ergonomen.ch](http://theErgonomen.ch)

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

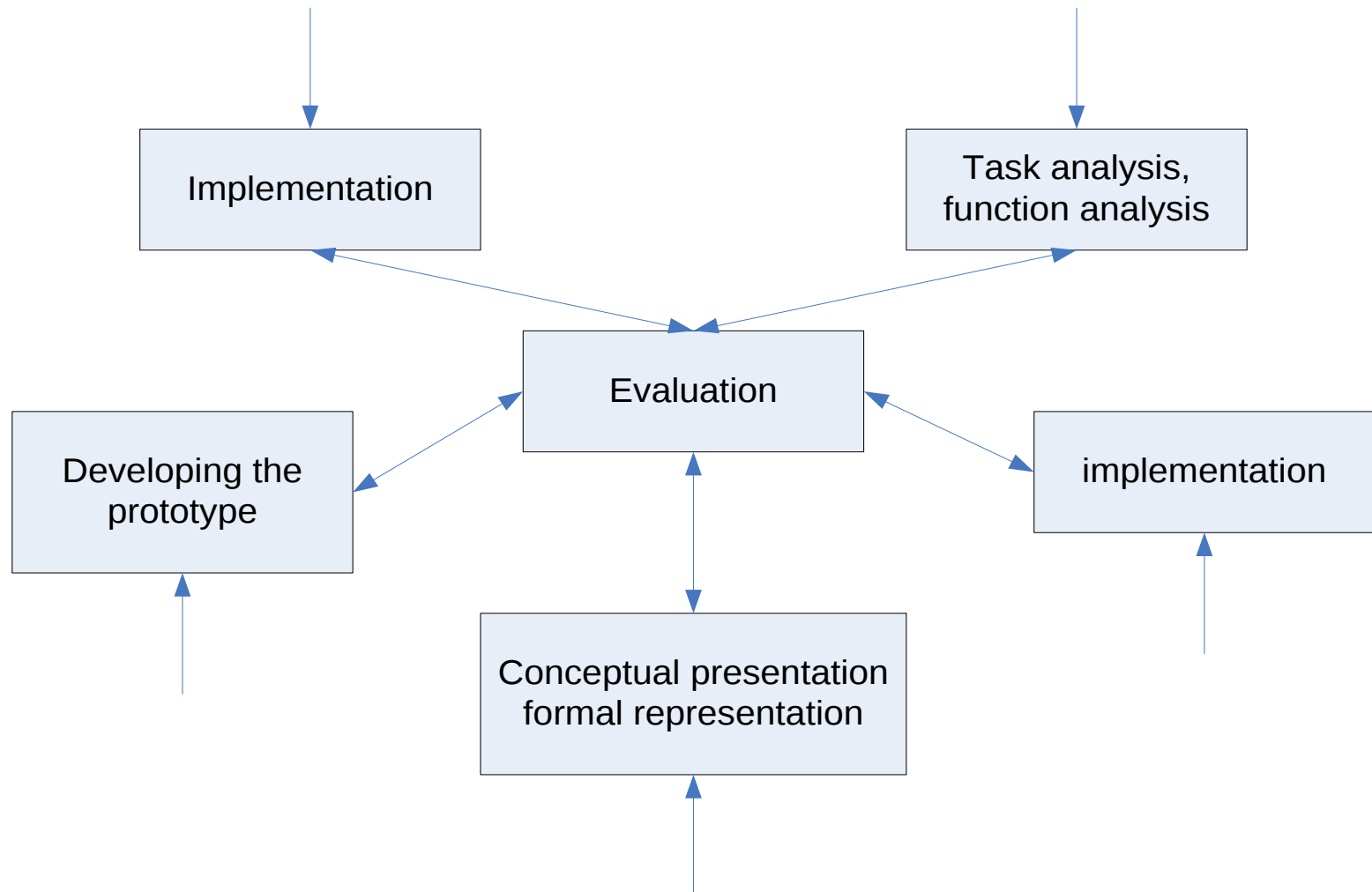
A simple interaction design lifecycle model



Exemplifies a user-centered design approach

Star model

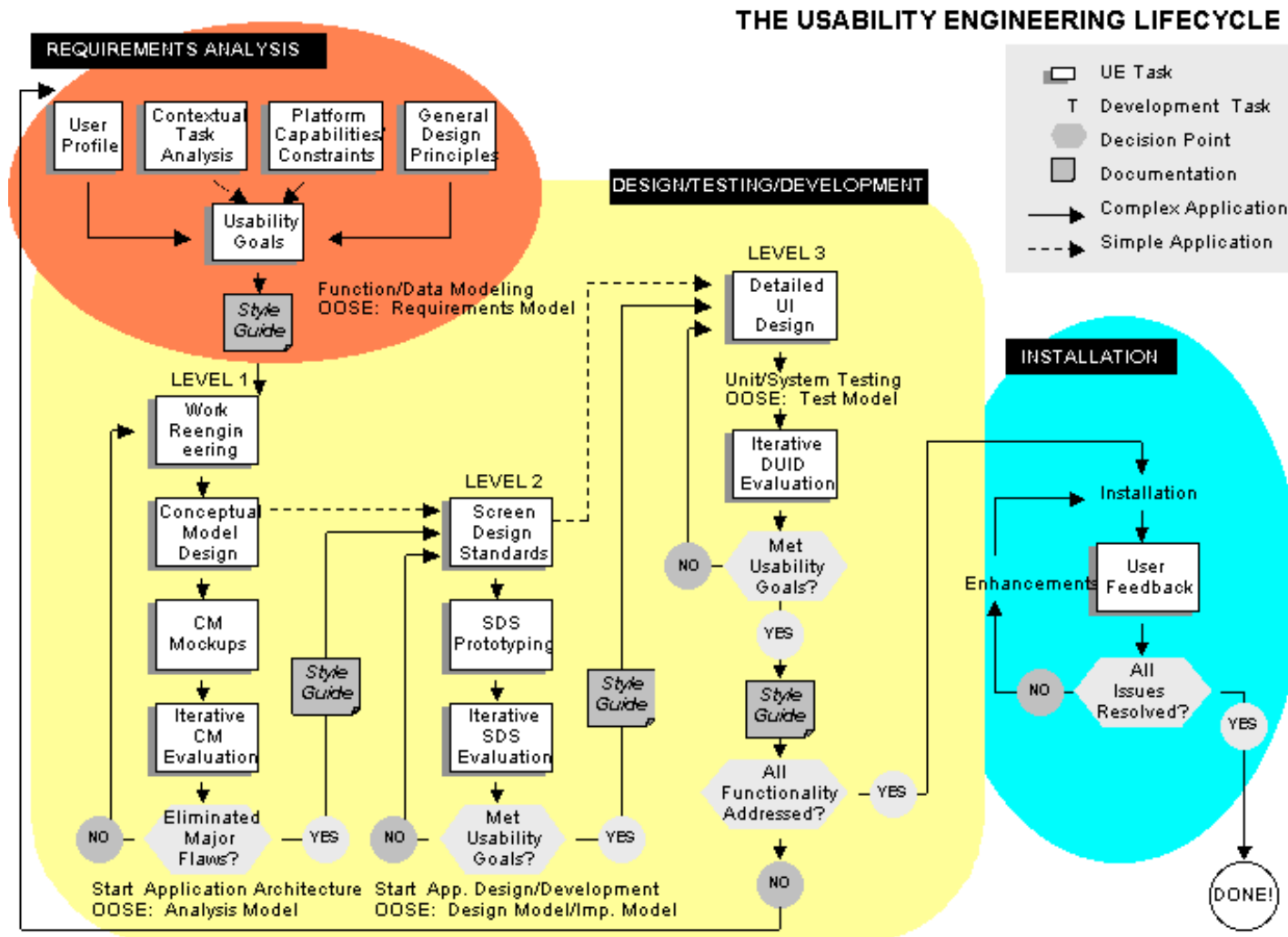
(Hartson ir Hix, 1989)



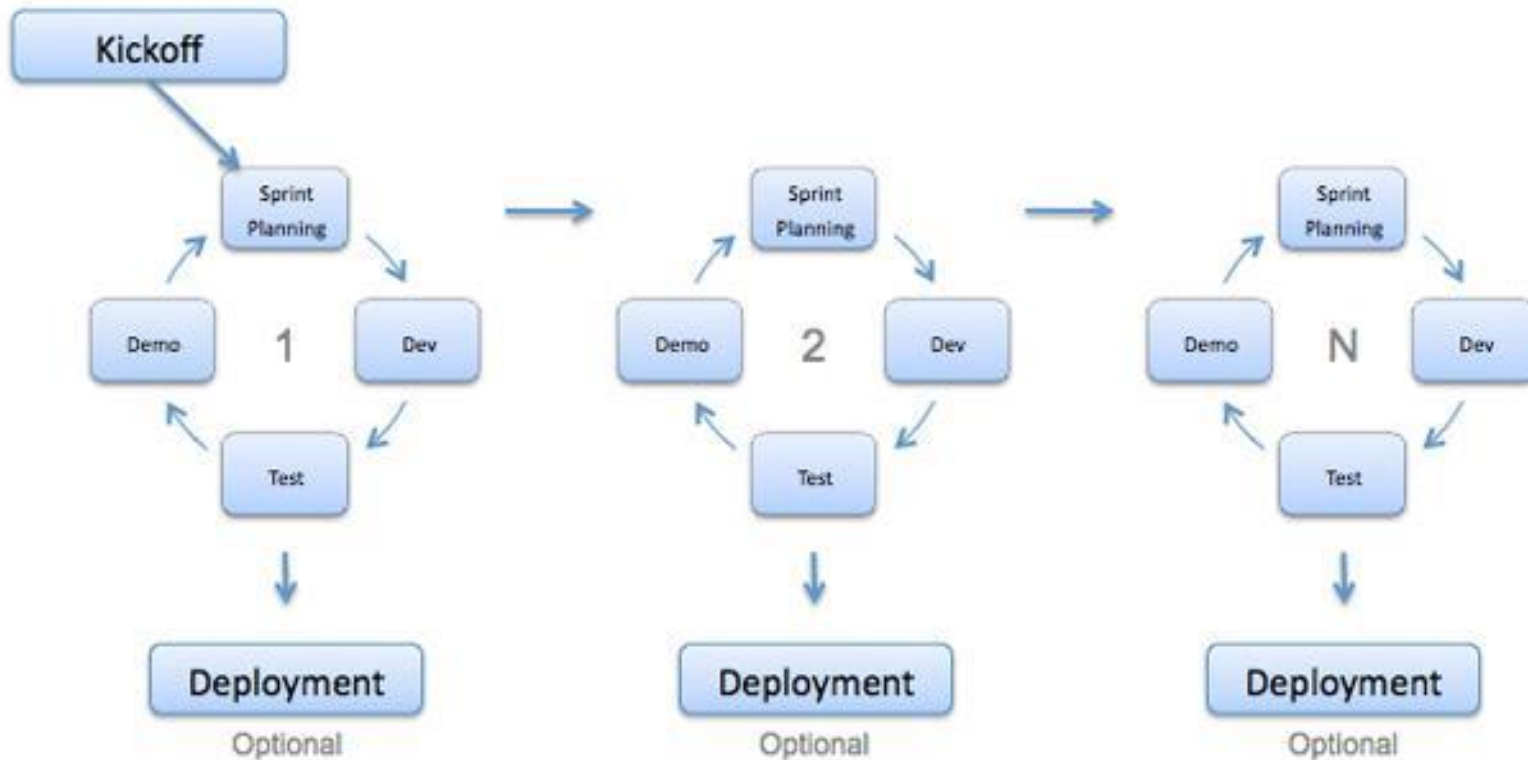
How to integrate interaction design lifecycles with SE models

- 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



Agile development



<http://istqbexamcertification.com/what-is-agile-model-advantages-disadvantages-and-when-to-use-it/>

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



01_ The Tech Box is centrally located



02_ An item on the intranet website



03_ The drawers are sorted by categories

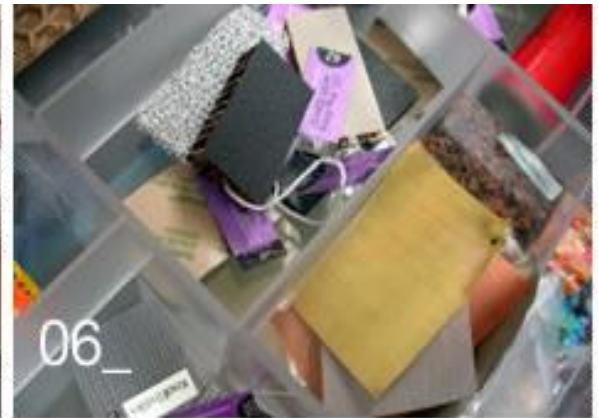
The TechBox



Each drawer resembles a bento box



The curator keeps order



All the entries are tagged



It really is used daily



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

- Preece J., Sharp H., Rogers Y., Interaction Design: Beyond Human-Computer Interaction, 4th Edition, Wiley, 2015.
- Saffer Dan, Designing for Interaction: Creating Smart Applications and Clever Devices, New Riders, 2010. [Google books](#)
- David Benyon, Phil Turner, Susan Turner. **Designing Interactive Systems: People, Activities, Contexts, Technologies.** Addison Wesley, 2005, 2014. chapter 2: PACT framework
- [Aaron Cooper.](#) "How should we integrate User Experience in Agile and Scrum?", 2017
- Desirée Sy. [Adapting Usability Investigations for Agile User-centered Design.](#) Journal of Usability Studies, vol. 2, is. 3, 2007, pp. 112-132

