User needs and requirements

Adapted by dr Kristina Lapin

Overview

- The importance of requirements

- Different types of requirements

- Data gathering for requirements

- Data analysis and presentation

- Personas

- Task description: Scenarios

                   Use Cases

                   Essential use cases

- Task analysis: HTA

# What, how and why?

What needs to be achieved?

1. Understand as much as possible about users, task, context
2. Produce a stable set of requirements

How can this be done?

- Data gathering activities
- Data analysis activities
- Expression as 'requirements'
- All of this is iterative

What, how and why?

- Why bother?

  Requirements definition is the stage where failure occurs most commonly
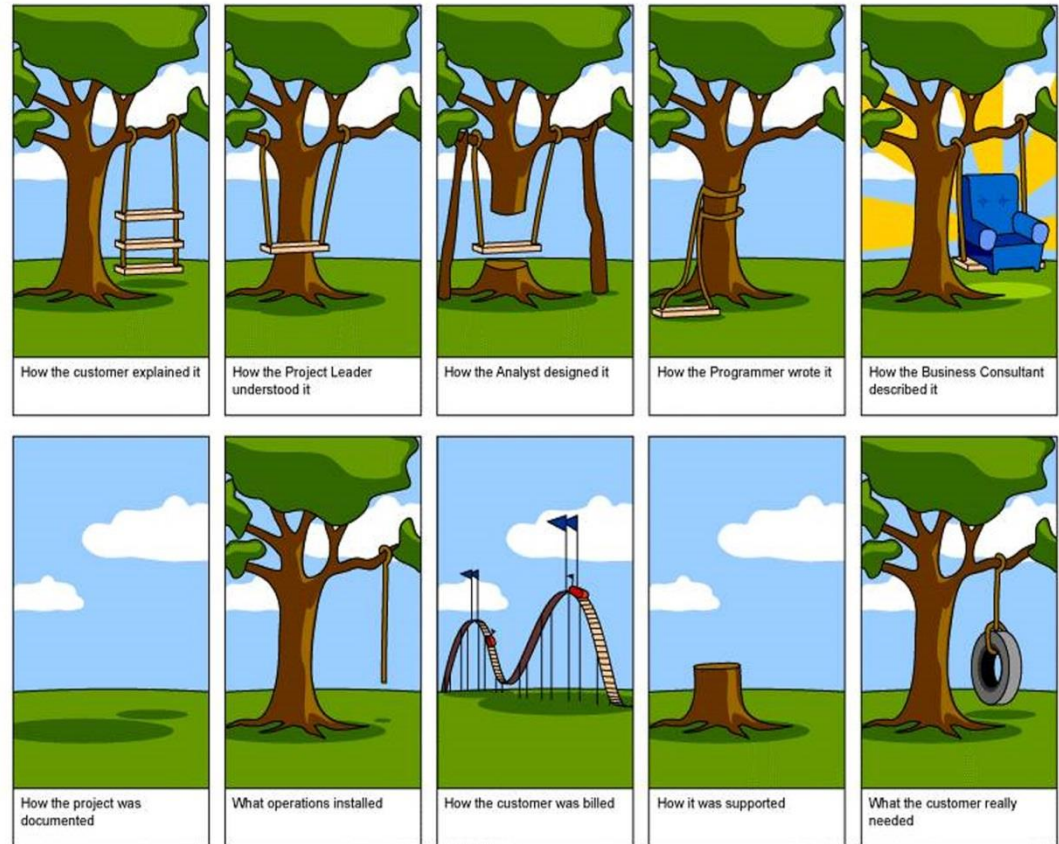
Getting requirements right is <u>crucial</u>

Establishing requirements

- What do users want? What do users 'need'?

    Requirements need clarification, refinement, completion, re-scoping

    Input: Requirements document (maybe)
    Output: stable requirements

- Why 'establish'?

    Requirements arise from understanding users' needs
    Requirements can be justified & related to data

Volere shell

Requirement #: **75**   Requirement Type: **9**   Event/use case #: **6**

Description: **The product shall issue an alert if a weather station fails to transmit readings.**

Rationale: **Failure to transmit readings might indicate that the weather station is faulty and needs maintenance, and that the data used to predict freezing roads may be incomplete.**

Source: **Road Engineers**

Fit Criterion: **For each weather station the product shall communicate to the user when the recorded number of each type of reading per hour is not within the manufacturer's specified range of the expected number of readings per hour.**

Customer Satisfaction: **3**   Customer Dissatisfaction: **5**

Dependencies: **None**   Conflicts: **None**

Supporting Materials: **Specification of Rosa Weather Station**

History: **Raised by GBS, 28 July 99**

Volere requirements template

PROJECT DRIVERS

1. The Purpose of the Product
2. The Stakeholders

PROJECT CONSTRAINTS

3. Mandated Constraints
4. Naming Conventions and Definitions
5. Relevant Facts and Assumptions

FUNCTIONAL REQUIREMENTS

6. The Scope of the Work
7. Business Data Model and Data Dictionary
8. The Scope of the Product
9. Functional and Data Requirements

NON-FUNCTIONAL REQUIREMENTS

10. Look and Feel Requirements
11. Usability and Humanity Requirements
12. Performance Requirements

13. Operational and Environmental Requirements
14. Maintainability and Support Requirements
15. Security Requirements
16. Cultural and Political Requirements
17. Legal Requirements

PROJECT ISSUES

18. Open Issues
19. Off-the-Shelf Solutions
20. New Problems
21. Tasks
22. Migration to the New Product
23. Risks
24. Costs
25. User Documentation and Training
26. Waiting Room
27. Ideas for Solutions

Different kinds of requirements

- Functional:

  – What the system should do

- (Non-functional: security, response time...)

- Data:

  – What kinds of data need to be stored?

  – How will they be stored (e.g. database)?

Different kinds of requirements

Environment or context of use:

- physical: dusty? noisy? vibration? light? heat? humidity? …. (e.g. ATM)

- social: sharing of files, of displays, in paper, across great distances, synchronous, privacy for clients

- organisational: hierarchy, IT department's attitude and remit, user support, communications structure and infrastructure, availability of training
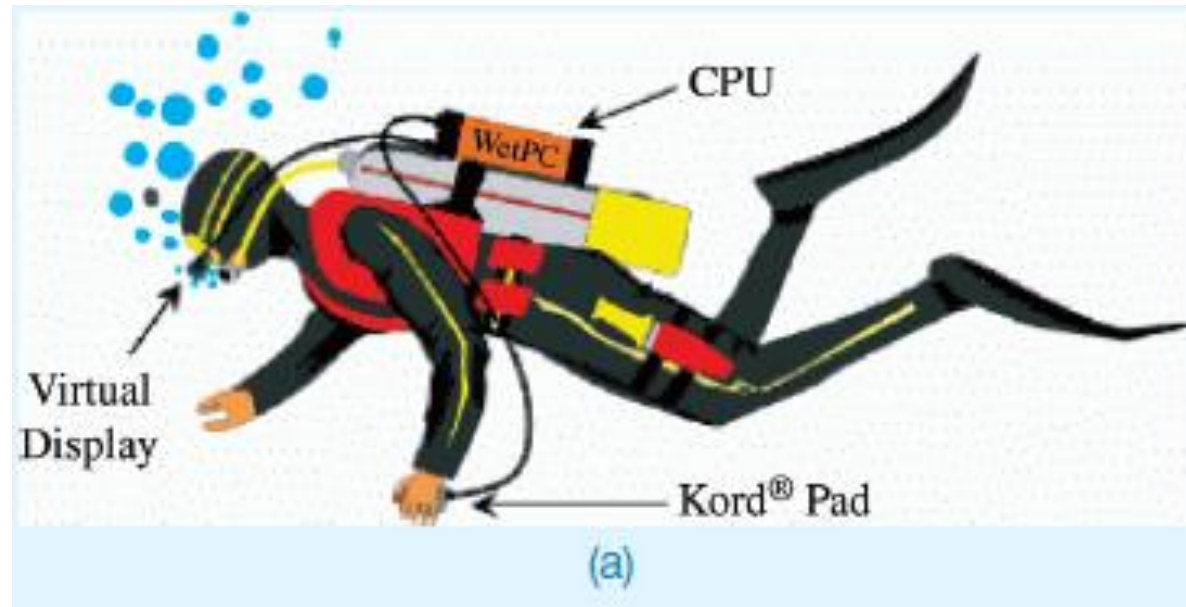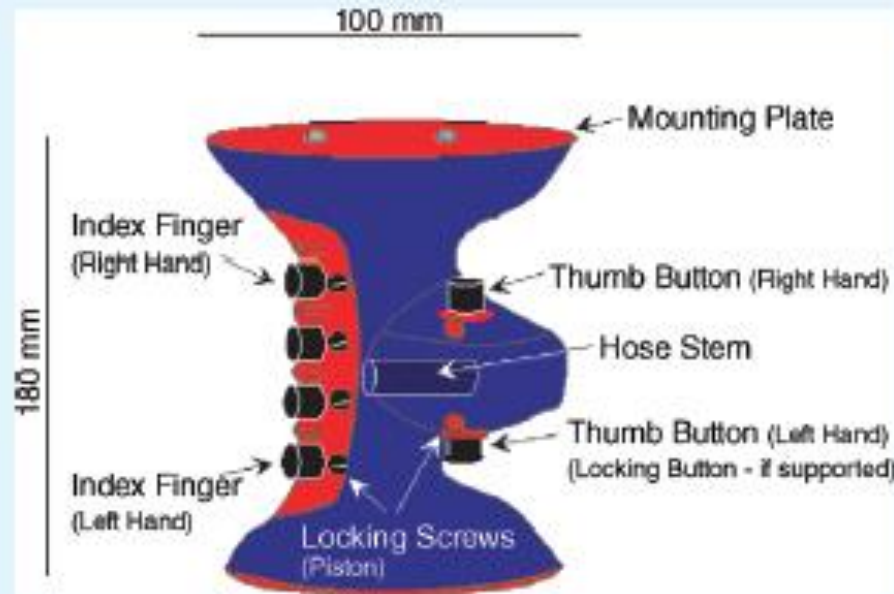
Underwater computing

Figure 10.2 (a) The components of WetPC's underwater computer.

Source: Reproduced by permission of WetPC Pty Ltd. http://www.wetpc.com.au/WetPC.

Underwater computing

Figure 10.3 (a) The KordGrip interface and (b) the KordGrip in use underwater
Source: (a) Reproduced by permission of WetPC Pty Ltd (b) Reproduced by permission of the Australian Institute of Marine Science.

Different kinds of requirements

Users: Who are they?

    – Characteristics: nationality, educational background, attitude to computers

    – System use: novice, expert, casual, frequent

        – Novice: prompted, constrained, clear

        – Expert: flexibility, access/power

        – Frequent: short cuts

        – Casual/infrequent: clear menu paths

What are the users' capabilities?

Humans vary in many dimensions:

- – size of hands may affect the size and positioning of input buttons

- – motor abilities may affect the suitability of certain input and output devices

- – height if designing a physical kiosk

- – strength - a child's toy requires little strength to operate, but greater strength to change batteries

- – disabilities (e.g. sight, hearing, dexterity)

NAME: Vivica Parker

AGE: 32

OCCUPATION: Journalist

PROFILE:
Born in Washington, DC
Lives and works in New York City
  (far from family)
Lives by herself in a small apartment
Has a driver's license
Calls parents and older brother on
  weekends
Works for an online art magazine and
  is currently in charge of writing a
  blog about graffiti. In order to do
  that she needs to do the following
  tasks:

- Walk/drive around the city
- Take pictures
- Talk with artists and keep record of that info (place, time, people)
- Work day/night
- Share the collected information with editor and magazine's readers

To do her job, usually carries note-
books, camera and cell phone to
keep in touch with her editor.

"This is what I need in order to do my job."

INTERESTS:
Amateur theater actress since she was 23
Travel and merge in different cultures
Architecture

ACTIVITIES:
Did research on ancient Egyptian architecture
Member of the Art Society of NY

TECH EXPERIENCE:
Basic knowledge about operating systems
Uses the Internet frequently either for personal or
  business purposes

TECH ATTITUDE:
Always open to new technology, but she feels
  annoyed with complex applications and discards
  them very often
Tends to feel numb using the latest high-tech
  gadgets and needs time to get used to them

GOALS & SITUATED BLOGGING NEED:
Needs to keep track of her location and time when
  she (a) finds and photographs graffiti and street
  art for her blog and (b) conducts audio inter-
  views of artists and enthusiasts
Needs to have a quick way of keeping track of
  content gathered from separate locations in
  order to post articles before editorial deadlines

PERSONAS AND SCENARIOS

Personas

- Capture a set of user characteristics (user profile)

- Not real people, but synthesised from real users

- Should not be idealised

- Bring them to life with a name, characteristics, goals, personal background

- Develop a small set of personas with one primary

Personas

- Personas are concrete representations of the different types of people that the system or service is being designed for.

- Indicate aims, meaningful activities

- Designers create personas so that they can envisage whom they are designing for.

Example Persona

BACKGROUND
- 15, Female
- Ongoing Private Education
- Ambitious
- Comfortable using technology to communicate

MOTIVATIONS
- Keeping in touch with her network
- Fashion/street cred
- Keeping up with peers.

FRUSTRATIONS
- Sad people trying to be 'friends' on Facebook
- Having to be in bed @ 11pm
- Being swamped in friends updates
- Missing important status updates

€ CAPLIN

Ginnie

Receives private tutoring in Maths and English as these are not her strong subjects. Enjoys playing for the school's 2nd teams for netball and Lacrosse and is good at art.

She loves recording her favourite shows: ER and Sun Valley High on Sky+ and spends some of her time on her Laptop that Daddy bought her watching videos on YouTube, downloading music, keeping up to date with her friends on Facebook and chatting via MS IM to her cousin who is at University in Leeds.

She loves Ugg boots and Abercrombie & Fitch and uses the Internet to shop and find the cheapest prices.

"I want to easily hook up with my friends whilst watching TV"

Mari

– age 23
– aerobics instructor
– training seriously for first marathon
– her usual training partner has moved away
– she leads a wild social life and tends to burn the candle at both ends
– she's got a targeted schedule
– companion is very proactive in pace making and motivation

1. She's set up a long-term schedule with her HFC to enable her to run her first marathon in under 4 hours.
2. This includes target goals such as what times she should be running long distances by which stage of the regime.
3. The HFC adapts to maintain the regime when Mari's social circumstance impacts her ability to train.
4. If she runs too far or too fast the companion will advise that this may have a negative impact on her training and may result in potential injury.
5. Explicit instructions in real time run ('ok, now we're gonna push hard for 2 minutes….ok, well done, let's take it easy for the next 5….etc.')
6. The HFC has access to her social schedule (through social companion?) and suggests going to a party the night before a long run may not be a great idea.
7. At the actual marathon her HFC becomes a motivating force and gives her real-time advice (eg, 'there's a hill coming up, pace yourself', it knows this from a run plug-in she bought for the HFC).

[2] D. Beyon. chapter 3. Personas and scenarios
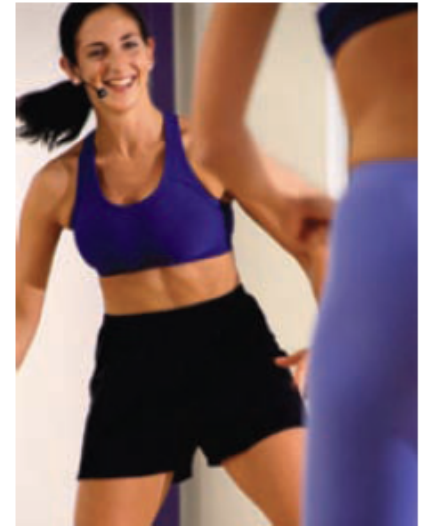
The types of personas

- Goal-directed persona
- Role directed persona
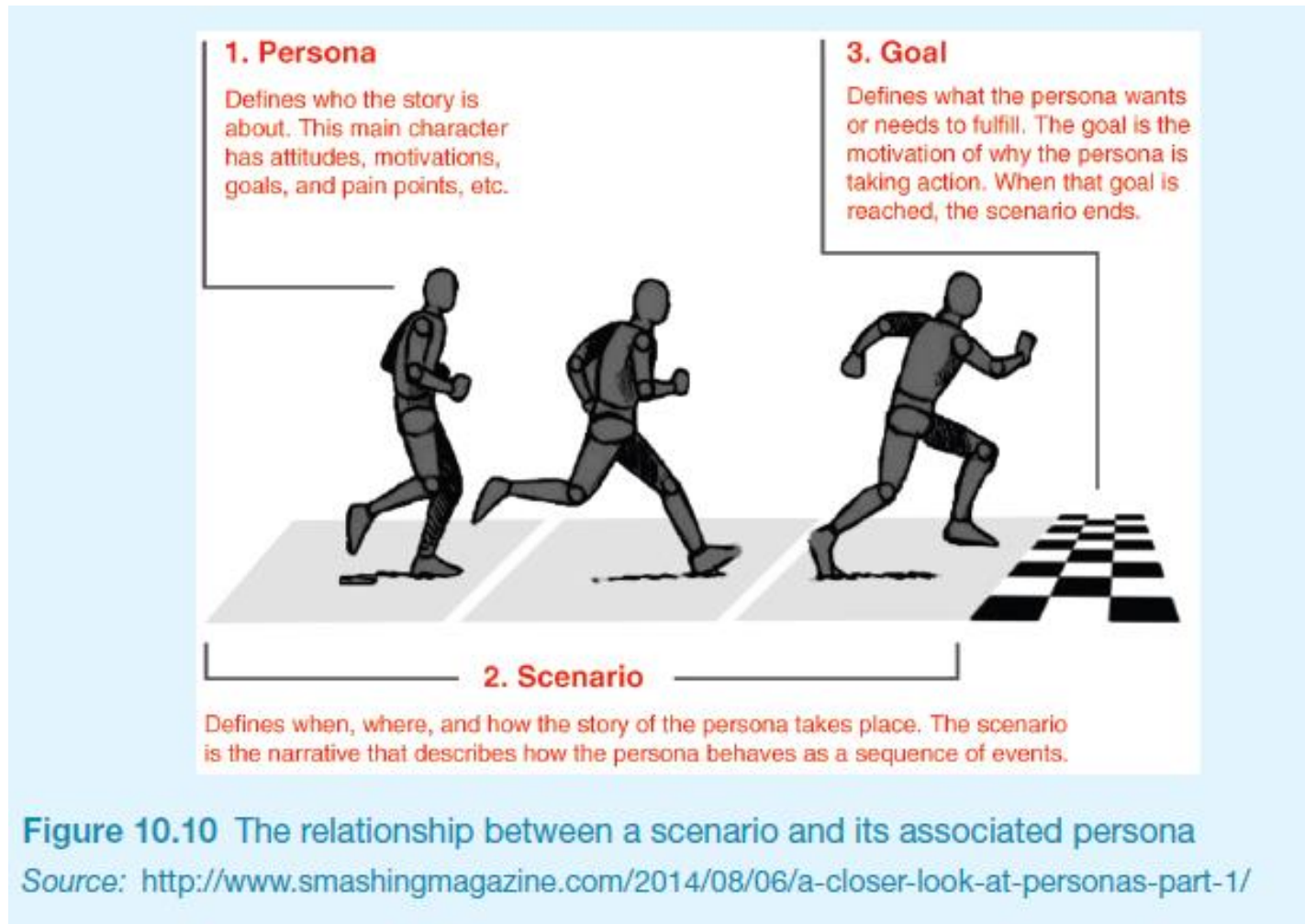- Egaging persona
- Fictional persona

Scenarios and Personas

1. Persona

Defines who the story is about. This main character has attitudes, motivations, goals, and pain points, etc.

3. Goal

Defines what the persona wants or needs to fulfill. The goal is the motivation of why the persona is taking action. When that goal is reached, the scenario ends.

2. Scenario

Defines when, where, and how the story of the persona takes place. The scenario is the narrative that describes how the persona behaves as a sequence of events.

Figure 10.10 The relationship between a scenario and its associated persona
Source: http://www.smashingmagazine.com/2014/08/06/a-closer-look-at-personas-part-1/
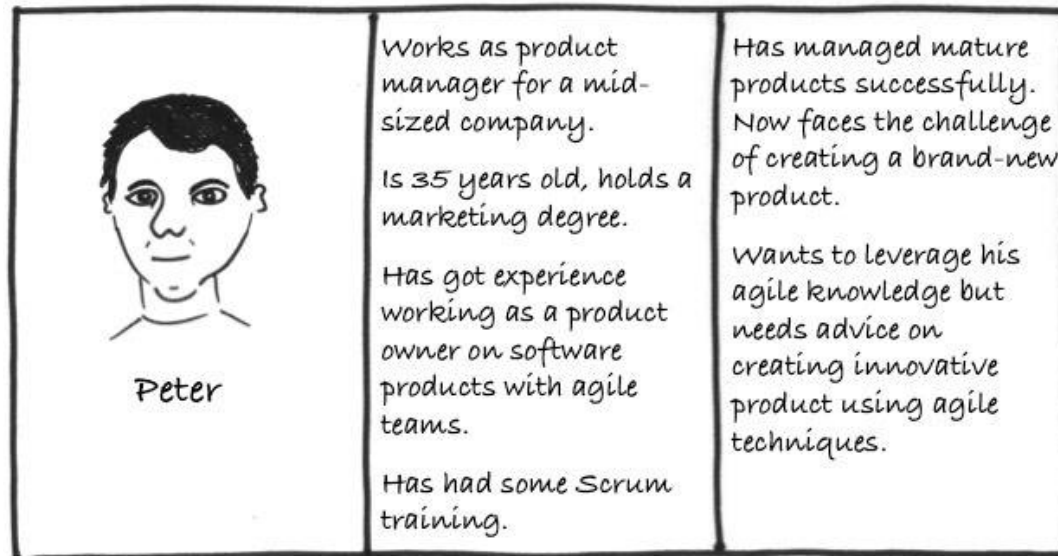
Role persona

- reflects the part that users play in their organizations or wider lives
- Where will the product be used?
- What's this role's purpose?
- What business objectives are required of this role?
- Who else is impacted by the duties of this role?
- What functions are served by this role?

Engaging personas

- incorporate both goal and role directed personas
  - examine the emotions of the user, their psychology, their backgrounds and make them relevant to the task in hand

Peter

Works as product manager for a mid-sized company.

Is 35 years old, holds a marketing degree.

Has got experience working as a product owner on software products with agile teams.

Has had some Scrum training.

Has managed mature products successfully. Now faces the challenge of creating a brand-new product.

Wants to leverage his agile knowledge but needs advice on creating innovative product using agile techniques.

https://www.interaction-design.org/ux-daily/48/four-different-perspectives-on-user-personas

Fictional Personas

- Emerges from the experience of the UX design team

- Designer makes assumptions based on the past interactions with the user and products to deliver a picture of what, perhaps, typical users look like.

- An initial sketch of user needs rather than a detailed portrait

USER NEEDS

User needs analysis

1. Analyse context of use:
   - users, activities and contexts
   - how do they solve their problems now?

2. Identify user goals:
   - What do your users want and need?

3. Define business goals:
   - What do the users need to do for this Web site or application to be a viable investment?

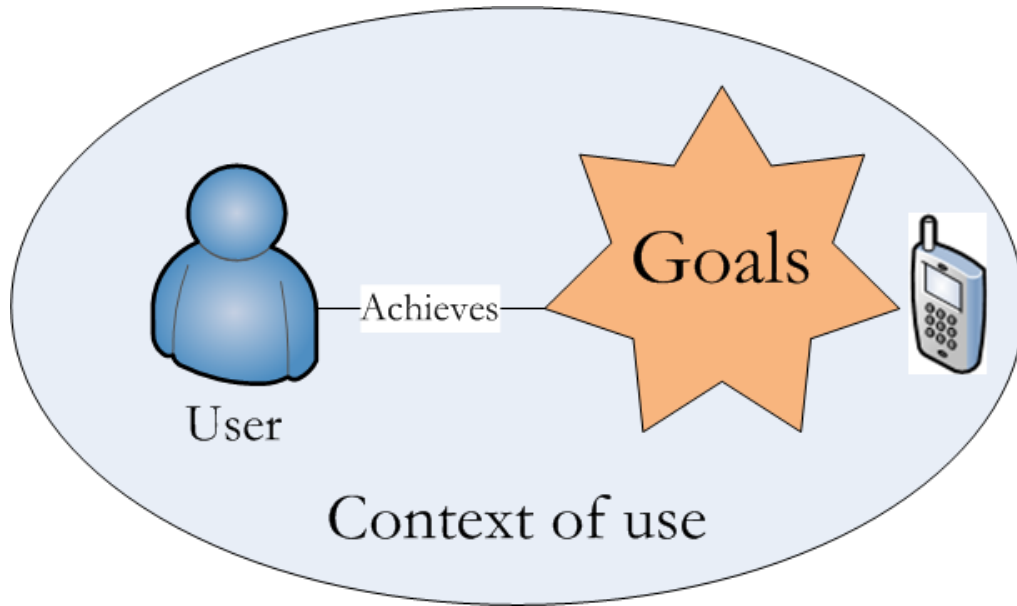# User needs analysis

4. Set the usability objectives:

  – To what extent does the site need to satisfy both the user and the business goals?

  – How do we measure success?

5. Identify the design constraints:

  – Define the budget, the timeline, the project team.

6. Define functional specifications

Usability objectives

Users

Tasks

Usability measures

ISO 9241

Mayhew, 1999

Usability goals

- Effective to use
- Efficient to use
- Safe to use
- Have good utility
- Easy to learn
- Easy to remember how to use

User experience goals

Desirable aspects

satisfying	helpful	fun
enjoyable	motivating	provocative
engaging	challenging	surprising
pleasurable	enhancing sociability	rewarding
exciting	supporting creativity	emotionally fulfilling
entertaining	cognitively stimulating	

Undesirable aspects

boring	unpleasant
frustrating	patronizing
making one feel guilty	making one feel stupid
annoying	cutesy
childish	gimmicky

Examples of usability objectives

Category	Examples of Specific Objectives
Learning time/ task time	Users will be able to use this site the first time without any training First-time users will be able to find their topic of interest within two minutes of visiting the site; expert users (five or more visits) will be able to find 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 goals - usability - UI

Business goal	Usability aspect	User interface solutions
Grow the business by getting more new users to adopt the offered service	Improve the learnability	• Progressive tooltips • Wizards to get people started
Reduce support costs	Reduce and prevent errors	• Formatting information for text fields • Error message enhancements • Diagnostic features
Inspire loyalty among existing users	Reduce navigational requirements	• Shortcuts to frequency 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.

ANALYZING TASKS

Task descriptions

- Scenarios
  - an informal narrative story, simple, 'natural', personal, not generalisable

- Use cases
  - assume interaction with a system
  - assume detailed understanding of the interaction

- Essential use cases
  - abstract away from the details
  - does not have the same assumptions as use cases

Example: How skinput might be used

Bramat has just finished his daily 4 mile run. He likes listening to music while he exercises, and has been playing his favorite pieces. The new skinput technology is great as he can focus on the running while scrolling through the available tracks, skipping through them with a simple tap of his fingers. He comes in exhausted and flops down on his favorite seat. With a flick of his fingers he turns off his music player and opens the palm of his hand to reveal the television remote control panel, graphically projected on his skin. He taps on a button to choose the station for the program he wants, adjusts the volume with a few more taps, and sits back to watch. Feeling hungry, he walks to his kitchen, opens his palm once again and sees a list of recipes possible given the items in his fridge. With another hand gesture, his palm turns into a telephone keypad, from where he can invite a friend over for dinner.

Example: How skinput might be used

- [Skinput prototype](#)
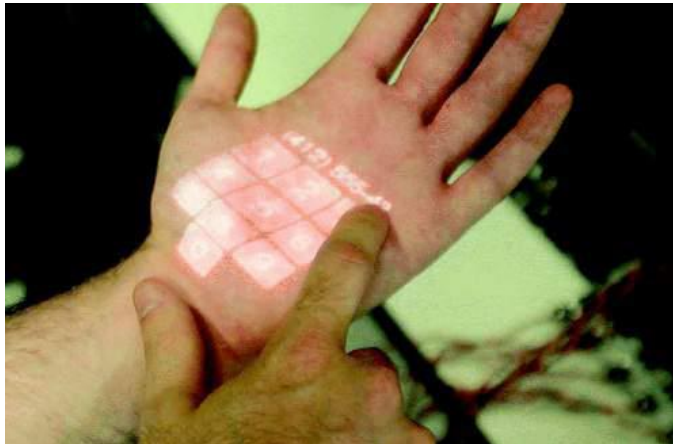
Source: Reproduced by permission of Chris Harrison

Scenarios

- Scenarios are stories about people undertaking activities in contexts using technologies.

[2] D. Beyon. chapter 3. Personas and scenarios.

1. The user is moving from a standard view of their photos to a search mode. This is a **voice** driven function.

2. Here the user narrows down the field by establishing a search parameter again by voice. Note that the user could search for any metadata parameter or combination of parameters that the system has established. Indeed the system could proactively suggest additional ones.

3. Having used voice to establish the smaller field, the user now applies **touch** to quickly flick through the pictures. Additional touch functionality could include scaling, cropping or editing.

4. Having found the photo they want to send, the user now combines speech with touch to indicate that the gesture of flicking to the left means email that specific image to the user's uncle.
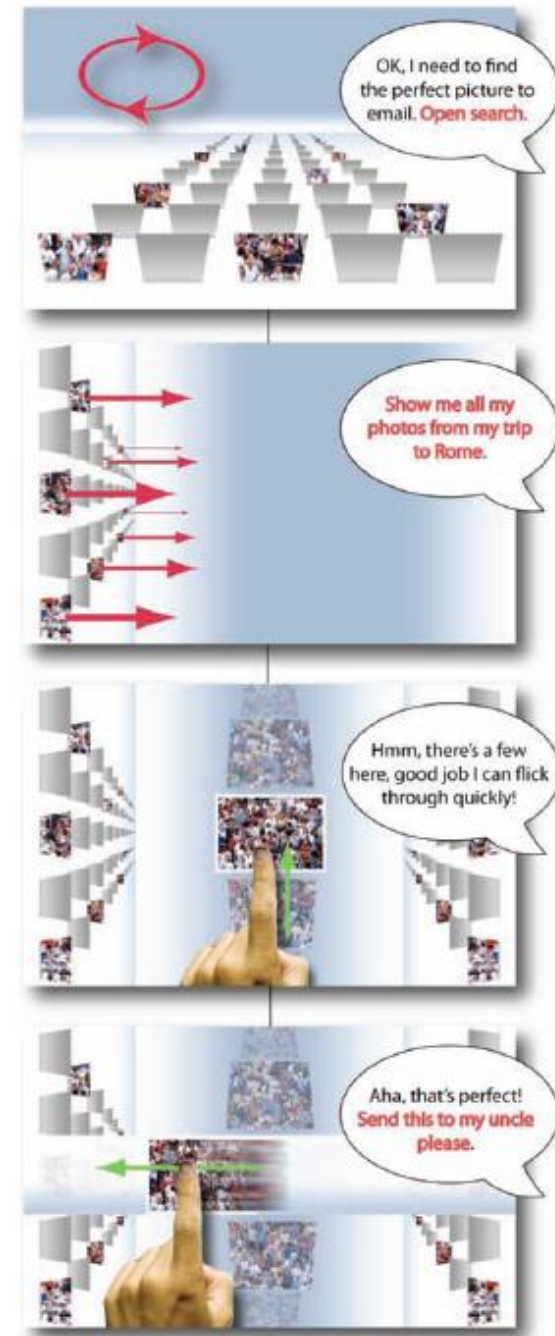
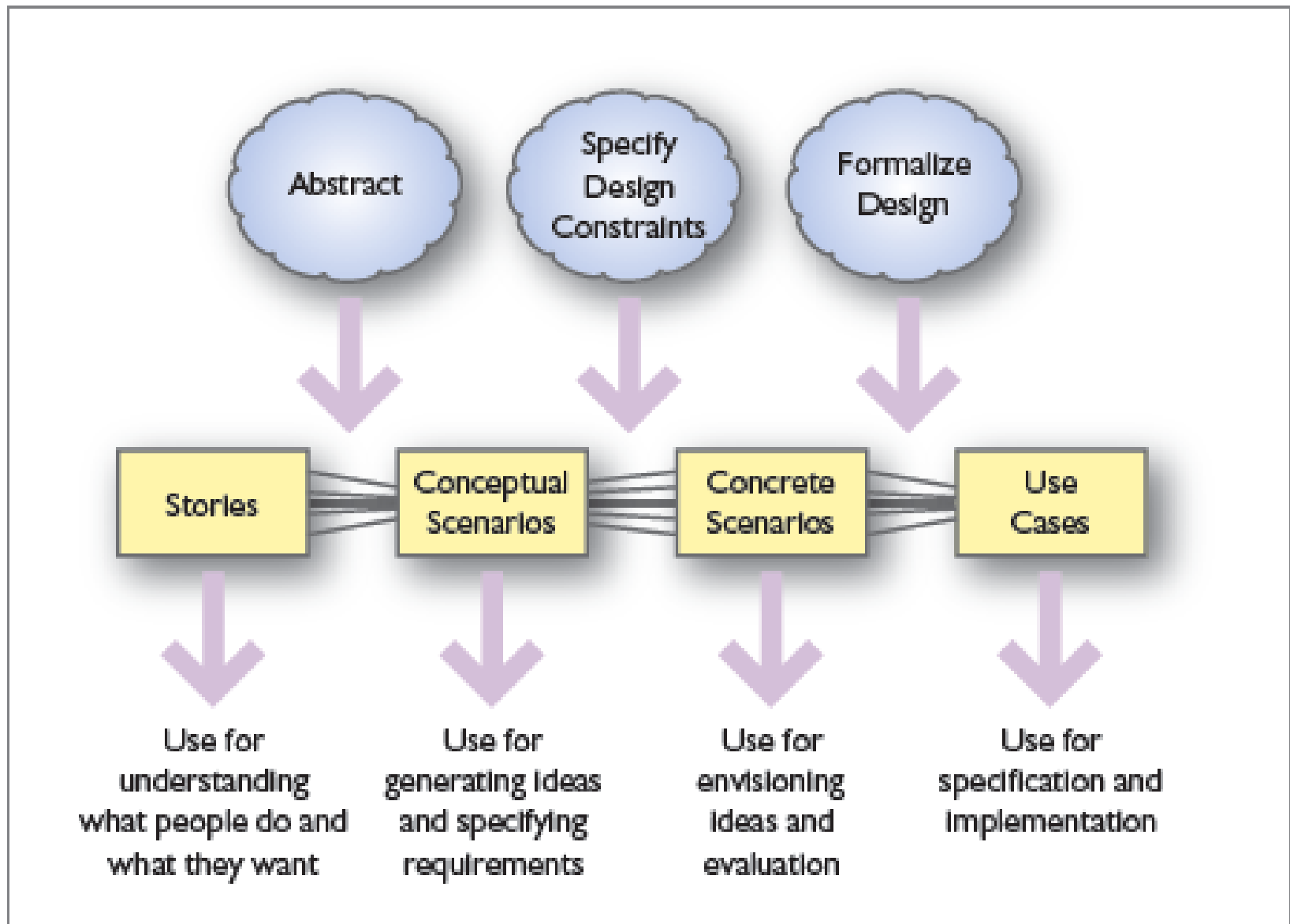**Figure 3.7** An scenario of multimodal interaction with a Photo Companion

Figure 3.10 Scenarios throughout design

[1] p.65

Scenario for travel organizer

"The Thomson family enjoy outdoor activities and want to try their hand at sailing this year. There are four family members: Sky (10 years old), Eamonn (15 years old), Claire (35), and Will (40). One evening after dinner they decide to start exploring the possibilities. They all gather around the travel organizer and enter their initial set of requirements – a sailing trip for four novices in the Mediterranean. The console is designed so that all members of the family can interact easily and comfortably with it. The system's initial suggestion is a flotilla, where several crews (with various levels of experience) sail together on separate boats. Sky and Eamonn aren't very happy at the idea of going on vacation with a group of other people, even though the Thomsons would have their own boat. The travel organizer shows them descriptions of flotillas from other children their ages and they are all very positive, so eventually, everyone agrees to explore flotilla opportunities. Will confirms this recommendation and asks for detailed options. As it's getting late, he asks for the details to be saved so everyone can consider them tomorrow. The travel organizer emails them a summary of the different options available."

Use case for travel organizer

1. The system displays options for investigating visa and vaccination requirements.

2. The user chooses the option to find out about visa requirements.

3. The system prompts user for the name of the destination country.

4. The user enters the country's name.

5. The system checks that the country is valid.

6. The system prompts the user for her nationality.

7. The user enters her nationality.

8. The system checks the visa requirements of the entered country for a passport holder of her nationality.

9. The system displays the visa requirements.

10. The system displays the option to print out the visa requirements.

11. The user chooses to print the requirements.

Alternative courses for travel organizer

Some alternative courses:

6. If the country name is invalid:
    6.1 The system displays an error message.
    6.2 The system returns to step 3.

8. If the nationality is invalid:
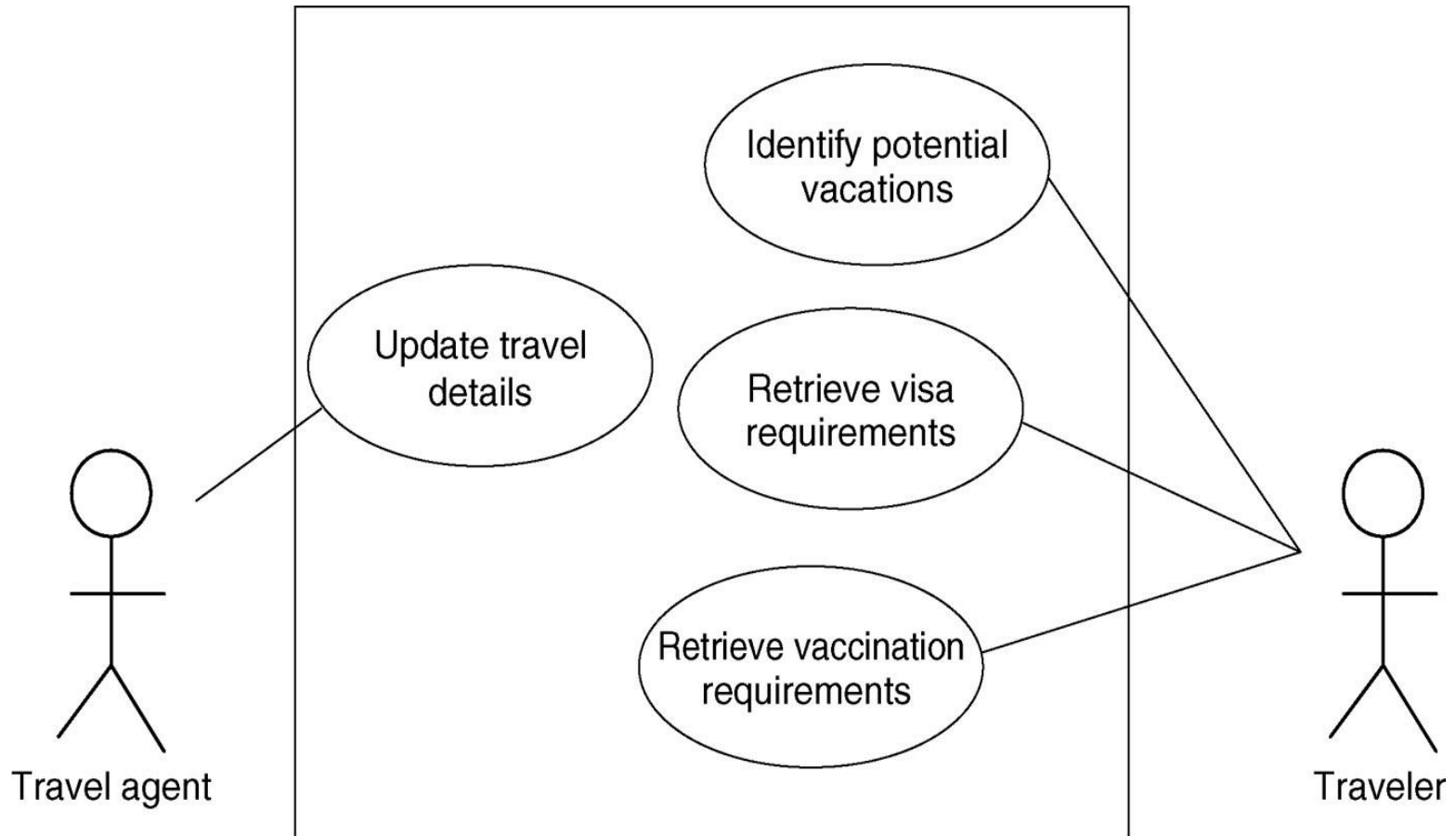   8.1 The system displays an error message.
    8.2 The system returns to step 6.

9. If no information about visa requirements is found:
    9.1 The system displays a suitable message.
    9.2 The system returns to step 1.

Example use case diagram for travel organizer

Example essential use case for travel organizer

retrieve Visa

USER INTENTION	SYSTEM RESPONSIBILITY
find visa requirements	request destination and nationality
supply required information	
	obtain appropriate visa info
obtain copy of visa info	
	offer info in different formats
choose suitable format	
	provide info in chosen format

Task analysis

- Task descriptions are often used to envision new systems or devices

- Task analysis is used mainly to investigate an existing situation

- It is important not to focus on superficial activities

  - What are people trying to achieve?

  - Why are they trying to achieve it?

  - How are they going about it?

- Many techniques, the most popular is Hierarchical Task Analysis (HTA)

Hierarchical Task Analysis

- Involves breaking a task down into subtasks, then sub-sub-tasks and so on. These are grouped as plans which specify how the tasks might be performed in practice

- HTA focuses on physical and observable actions, and includes looking at actions not related to software or an interaction device

- Start with a user goal which is examined and the main tasks for achieving it are identified

- Tasks are sub-divided into sub-tasks

Example Hierarchical Task Analysis

0. In order to buy a DVD

1. locate DVD

2. add DVD to shopping basket

3. enter payment details

4. complete address

5. confirm order

plan 0:   If regular user do 1-2-5.
                If new user do 1-2-3-4-5.

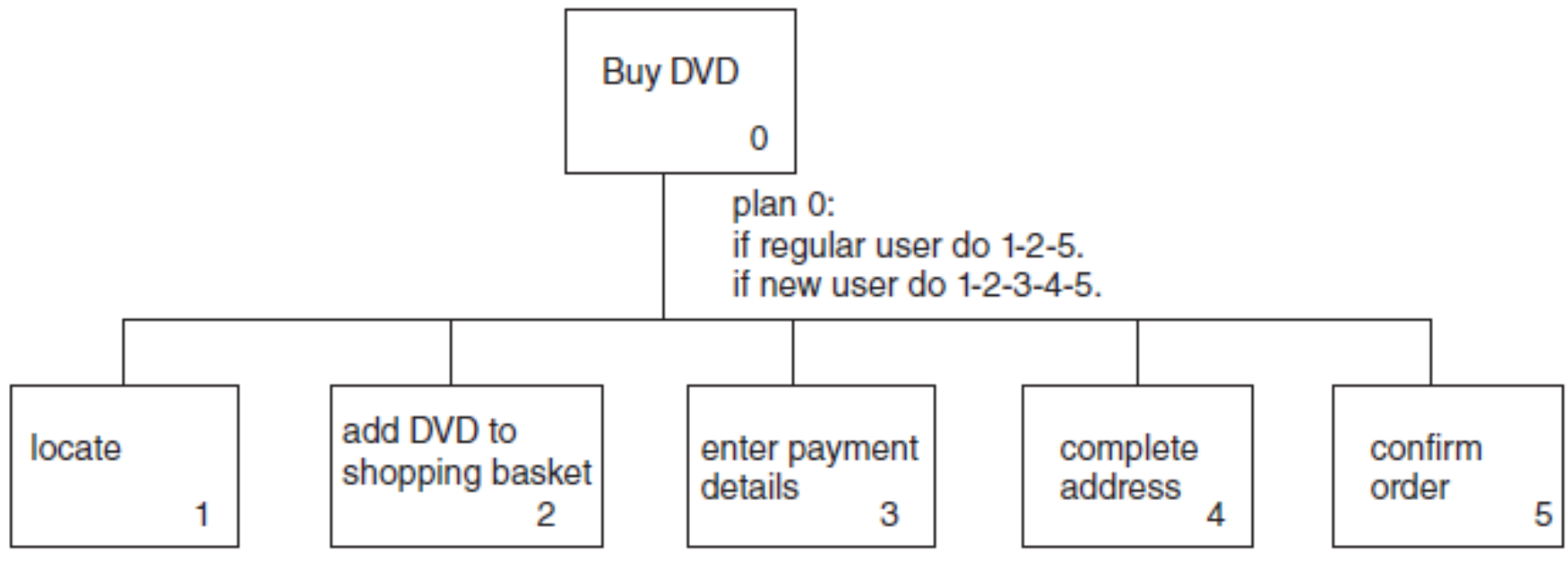# Example Hierarchical Task Analysis (graphical)

Figure 10.15 A graphical representation of the task analysis for buying a DVD

DATA GATHERING FOR REQUIREMENTS

Data gathering for requirements

- Interviews:

  – Props, e.g. sample scenarios of use, prototypes, can be used in interviews

  – Good for exploring issues

  – Development team members can connect with stakeholders

- Focus groups:

  – Group interviews

  – Good at gaining a consensus view and/or highlighting areas of conflict

  – But can be dominated by individuals

Data gathering for requirements

- Questionnaires:

  - Often used in conjunction with other techniques

  - Can give quantitative or qualitative data

  - Good for answering specific questions from a large, dispersed group of people

- Researching similar products:

  - Good for prompting requirements

Data gathering for requirements

- Direct observation:

  – Gain insights into stakeholders' tasks

  – Good for understanding the nature and context of the tasks

  – But, it requires time and commitment from a member of the design team, and it can result in a huge amount of data

- Indirect observation:

  – Not often used in requirements activity

  – Good for logging current tasks

Data gathering for requirements

Studying documentation:

- Procedures and rules are often written down in manuals

- Good source of data about the steps involved in an activity, and any regulations governing a task

- Not to be used in isolation

- Good for understanding legislation, and getting background information

- No stakeholder time, which is a limiting factor on the other techniques

Some examples

Figure 10.5 A cultural probe package

Source: B. Gaver, T. Dunne and E. Pacenti (1999): "Cultural Probes" from *Interactions* 6(1) pp.21–29. ©1999 Association for Computing Machinery, Inc. Reprinted by permission.

Cultural probes

Some examples

Ethnographic study, interviews, usability tests, and user participation

(a)　　　　　　　　　　　　　　　　(b)

Figure 10.6 (a) Exploring mouse gene expression using G-nome Surfer 2.0 (b) G-nome Surfer Pro displaying the chromosome visualizations, an aligned sequence, and publications

Source: Shaer *et al* (2012) The design, development, and deployment of a tabletop interface for collaborative exploration of genomic data, *International Journal of Human–Computer Interaction* 70, 746–764. ©2012 Association for Computing Machinery, Inc. Reprinted by permission.

Contextual Inquiry

- An approach to ethnographic study where user is expert, designer is apprentice

- A form of interview, but
    - at users' workplace (workstation)
    - 2 to 3 hours long

- Four main principles:

    - Context: see workplace & what happens

    - Partnership: user and developer collaborate

    - Interpretation: observations interpreted by user and developer together

    - Focus: project focus to understand what to look for

Data gathering guidelines

- Focus on identifying the stakeholders' needs

- Involve all the stakeholder groups

- Involve more than one representative from each stakeholder group

- Use a combination of data gathering techniques

- Support the process with props such as prototypes and task descriptions

Data interpretation and analysis

- Start soon after data gathering session

- Initial interpretation before deeper analysis

- Different approaches emphasize different elements e.g. class diagrams for object-oriented systems, entity-relationship diagrams for data intensive systems

Summary

- Getting requirements right is crucial

- There are different kinds of requirement, each is significant for interaction design

- The most commonly-used techniques for data gathering are: questionnaires, interviews, focus groups, direct observation, studying documentation and researching similar products

- Scenarios, use cases and essential use cases can be used to articulate existing and envisioned work practices.

- Task analysis techniques such as HTA help to investigate existing systems and practices