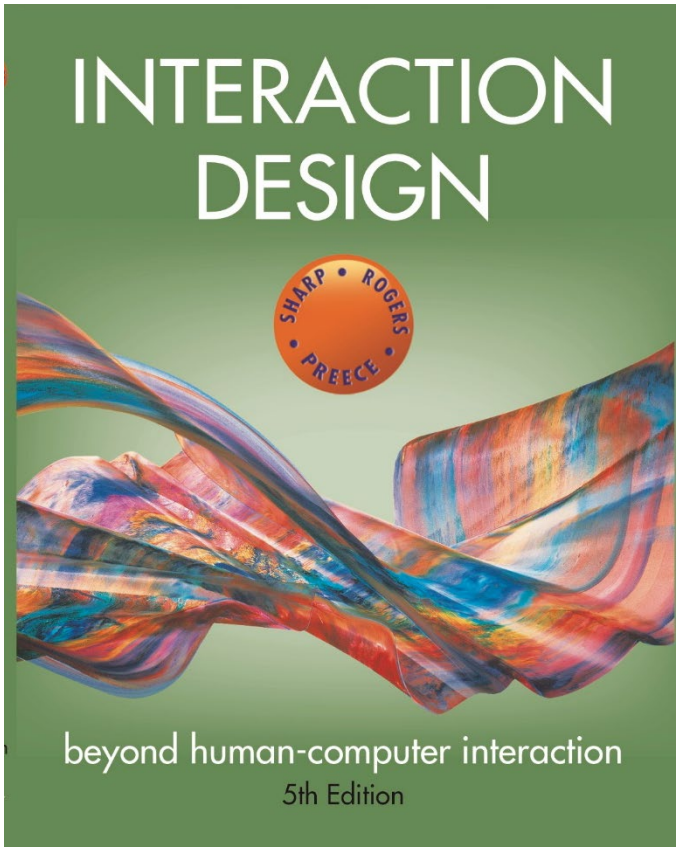
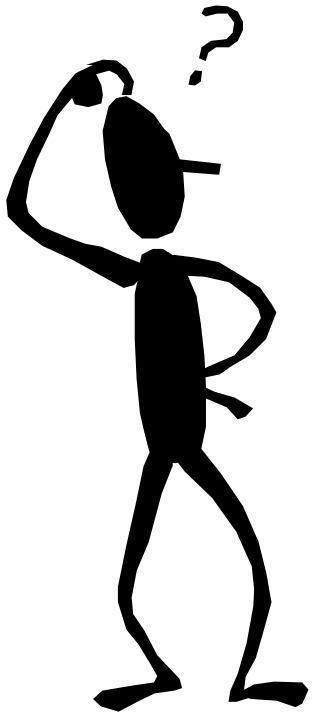


Chapter 11

DISCOVERING REQUIREMENTS

Overview

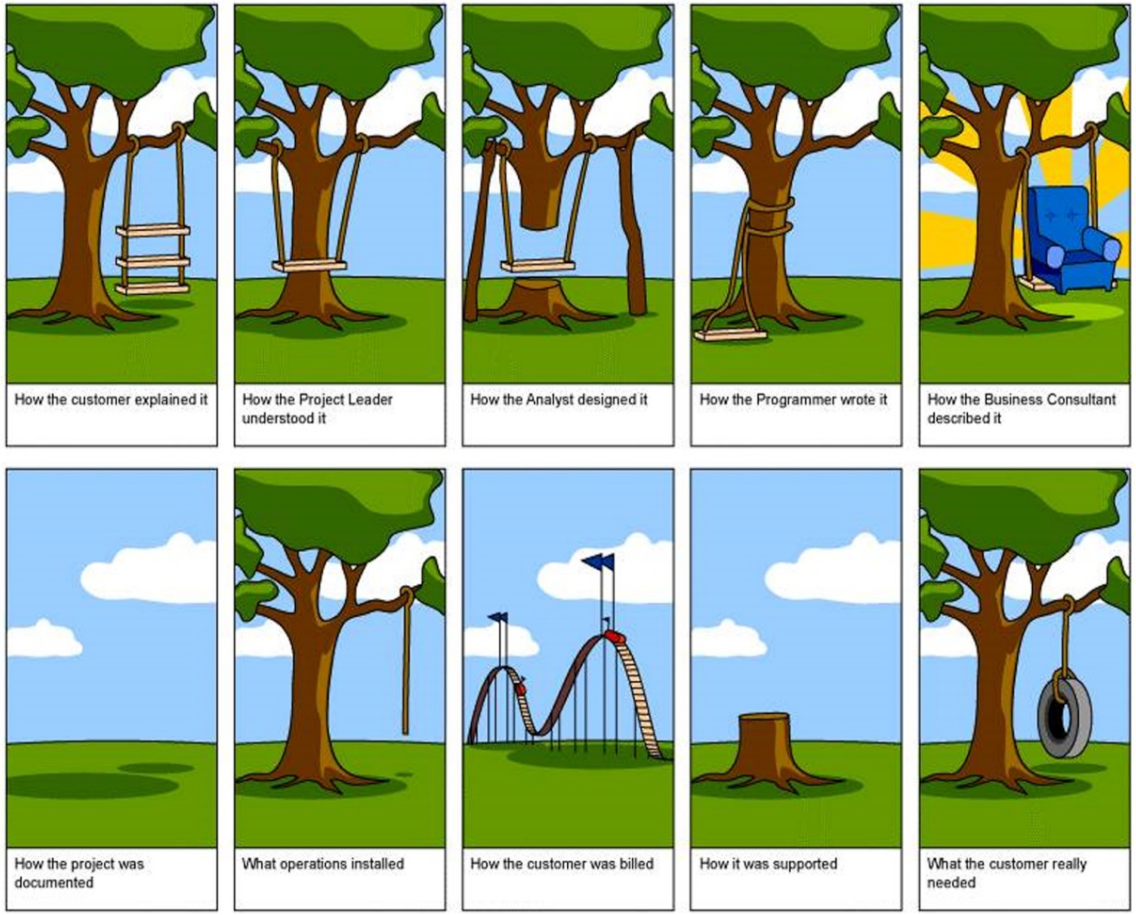
- The importance of requirements
- Different types of requirements
- Data gathering for requirements
- Bringing requirements to life
  - Personas
  - Scenarios
- Capturing interaction with user cases



What, how and why?

- What is the purpose of the requirements activity?
  - Explore the problem space
  - Establish a description of what will be developed
- How to capture requirements once discovered
  - In prototypes or operational product
  - Through structured or rigorous notations
  - Different capturing mechanisms emphasize and de-emphasize different aspects

Why bother?



Requirements activity is the stage where miscommunication occurs most commonly

What are requirements?

- A statement about an intended product that specifies what it is expected to do or how it will perform
- Different forms and different levels of abstraction
- User stories (most prevalent in agile development contexts)
- Format:

  As a <role>, I want <behavior> so that <benefit>

- Example user stories for a travel organizer might be:

  As a <traveler>, I want <to save my favorite airline for all my flights> so that <I will be able to collect air miles>

  As a <travel agent>, I want <my special discount rates to be displayed to me> so that <I can offer my clients competitive rates>

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**

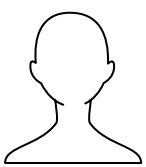
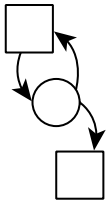
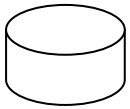
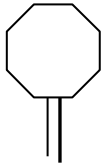
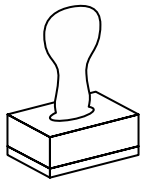
Dependencies: **None** Conflicts: **None**

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

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

Volere

The seven product dimensions

						
User	Interface	Action	Data	Control	Environment	Quality Attribute
Users interact with the product	The product connects to users, systems, and devices	The product provides capabilities for users	The product includes a repository of data and useful information	The product enforces constraints	The product conforms to physical properties and technology platforms	The product has certain properties that qualify its operation and development

Source: Gottesdiener and Gorman (2012), p.58. Used courtesy of Ellen Gottesdiener

Different kinds of requirements

- Functional:
  - What the system should do
- Data:
  - What kinds of data need to be stored?
  - How will they be stored (for example, database)?

Different kinds of requirements

Environment or context of use:

Physical: dusty? noisy? vibration? light? heat? humidity? …. (for example, in a hospital)

Social: collaboration and co-ordination, data sharing, distributed, synchronous or asynchronous, privacy

Organizational: user support, communications structure and infrastructure, availability of training

Technical: On what technologies will it run or need to be compatible?

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**: shortcuts
  - **Casual/infrequent**: clear menu paths
- User profile

Different kinds of requirements

- Usability goals
- User experience goals
- Different products have different requirements and may be implemented in different ways, for example, trustworthiness

Usable security

How to make security robust without detracting from user experience

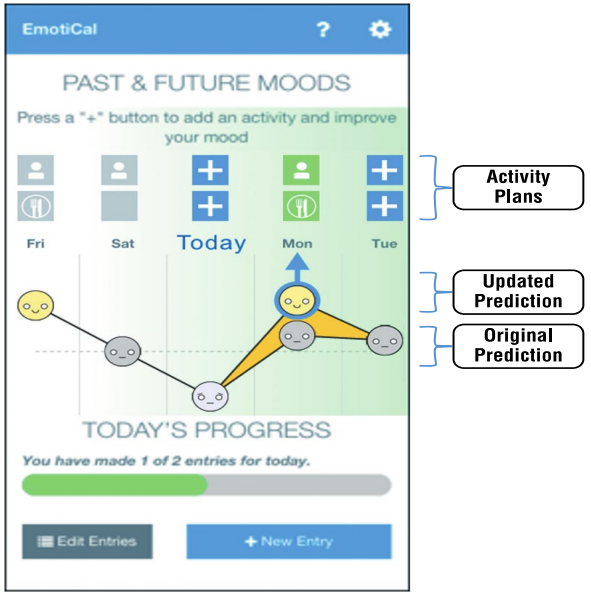
- If the usability of security is ignored, then security mechanisms will be circumvented
- Passwords as an example
  - Too much advice about how to choose a password
  - Coping strategies may compromise security

Data gathering for requirements

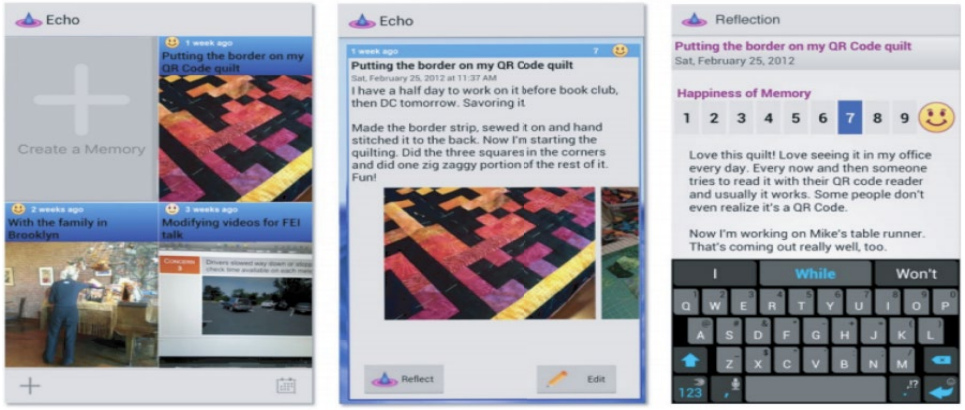
- Interviews, observation, and questionnaires
- Studying documentation:
  - Procedures and rules are often written down in manuals
  - Good source of data about the steps involved in an activity and any regulations governing a task
  - Not to be used in isolation
  - Good for understanding legislation and getting background information
  - No stakeholder time, which is a limiting factor for other techniques
- Researching similar products:
  - Good for prompting requirements

Combining data gathering

Direct observation, indirect observation, interviews, diaries, and surveys



(a)



(b)

Source: Hollis et al (2017), Figure 1. Used courtesy of Taylor and Francis

Combining data gathering

- *Diaries and interviews*: multiple information devices
- *Interviews, think aloud evaluation, questionnaire, evaluation of working prototype*: memory aid for traumatic brain injury
- *Studying documentation, evaluating other systems, user observation, and group interviews*: ship's maneuvering system
- *Ethnographic study, interviews, usability tests, and user participation*: tabletop user interface for genomic data

Using probes to engage with users

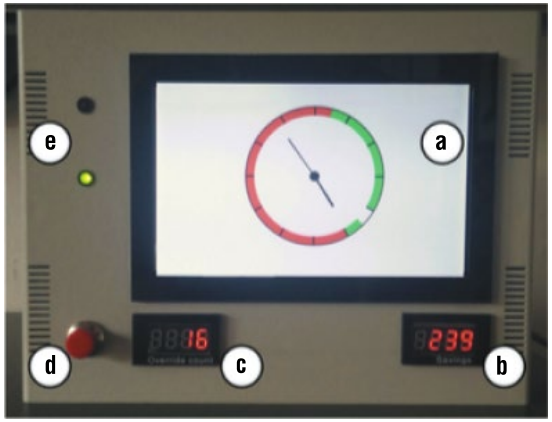
- Many types of probe:
  - Designed to prompt users into action
  - For researchers to learn about users
- Cultural probe:
  - Wallet containing postcards, maps, camera, photo album, and diary
  - Participants asked to answer questions using wallet contents
- Design probe:
  - Form relates specifically to particular question and context, for example, Top Trumps probe

Source: Wallace et al. (2013) Figure 6. Reproduced with permission of ACM Publications.

Using probes to engage with users

- Technology probe:
  - Toolkits, mobile phone apps, sensor-based monitoring, for example, M-Kulinda to alert participants about unexpected movement at home.
- Provocative probe:
  - Technology probe designed to challenge norms and attitudes, for example, the Box to challenge domestic laundry practices

Source: Raptis et al. (2017). Reproduced with permission of ACM Publications.



a) electricity status – 12 hour forecast, b) savings account, c) override button presses, d) override button, and e) electricity status at the moment

Contextual Inquiry

- Part of Contextual Design, but also used on its own to gather requirements
- One-on-one field interviews (contextual interviews)
  - 1.5 to 2 hours long
  - Focus on daily life at home or work relevant to the project
  - Uses a model of master (participant) and apprentice (researcher)
- Four main principles:

  Context: Going to the user, wherever they are, and seeing what they do as they do it

  Partnership: User and interviewer explore user's life together

  Interpretation: Observations interpreted by user and interviewer together

  Focus: Project focus to understand to what should be paid attention

Contextual Inquiry

- Interview guided by “cool concepts” divided into two groups
- Joy of life concepts:
  - How products make our lives richer and more fulfilling
  - Accomplish, connection, identity, and sensation
- Joy of use concepts:
  - Describe impact of using the product
  - Direct in action, the hassle factor, and the learning delta
- Interview in four parts
  - Overview, transition, main interview, and wrap-up
- Following interview, interpretation session
  - Contextual design models are created or consolidated
  - Most relevant models are chosen by team, out of 10 suggested

Brainstorming for innovation

- Include participants from a wide range of disciplines, with a broad range of experience
- Don't ban silly stuff
- Use catalysts for further inspiration
- Keep records. Capture every idea, without censoring
- Sharpen the focus
- Use warm-up exercises and make the session fun

Bringing requirements to life

- Augmenting the basic requirements expressed as stories, in Volere template, or in other form
- Personas
  - Rich descriptions of typical users, not specific people
- Scenarios
  - An informal narrative story, simple, ‘natural’, personal, and not generalizable

Personas

- Capture a set of user characteristics (user profile)
- Synthesized from real people based on user research
- Typical, not idealized
- Bring to life with name, characteristics, goals, and personal background
  - Relevant to product under development
- Good persona helps designer with design decisions and reminds team about who will use the product
- Develop a small set of personas with one primary

Example Persona #1

CAPLIN

Ginnie

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

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.

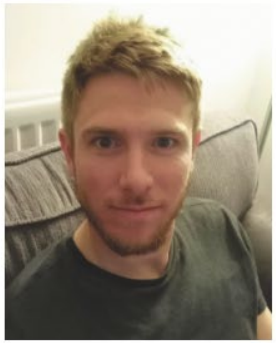
She loves recording her favourite shows: ER and Sun Valley High on Sky+ and spends some of her time on her Laptop that Daddy bought her watching videos on YouTube, downloading music, keeping up to date with her friends on Facebook and chatting via MS IM to her cousin who is at University in Leeds.

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"

Example Persona #2

Family traveler



"I want a travel organiser that will offer me a range of potential vacations that suit our needs"

Age: 35
Work: Plumber
Family: Married, two children

Personality

Introvert	Extrovert
Thinking	Feeling
Sensing	Intuition

Organised | Practical | Expects high standard

Goals

- To book comprehensive travel quickly
- To find a trip that meets the needs of the whole family
- To feel supported and guided from the beginning of the booking experience right to the end.

Frustrations

- Wasting time filling in forms
- Too much irrelevant information
- Existing systems tend to be too diverse and complicated

Bio

Will loves to take his family on adventure holidays to explore new challenges. His children, Sky (8) and Eamonn (15) are old enough to take part in several sporting activities and he wants to make the most of this before they no longer want to go on trips with him and his wife, Claire. He likes the fact that choosing travel options is so much easier than it used to be, but is frustrated by the many different sources and disjointed options that this can result in. He wants a travel organiser that can provide clear support for family holidays while offering as wide a choice as possible.

Motivation

Price
Comfort
Choice

Favourite destinations

Developed using [Xtensio Templates]

Scenario for group travel organizer

“The Thomson family enjoy outdoor activities and want to try their hand at sailing this year. There are four family members: Sky (8 years old), Eamonn (12 years old), Claire (32), and Will (35). One evening after dinner they decide to start exploring the possibilities. They want to discuss the options together but Claire has to visit her elderly mother so will be joining the conversation from her mother’s house down the road. As a starting point, Will enters an idea they had been discussing over dinner – a sailing trip for four novices in the Mediterranean. The system supports users to log on from different locations and use different devices so that all members of the family can interact easily and comfortably with it wherever they are. 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 Thomson’s 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.”

Scenarios

- May be textual descriptions, animations, audio or video
- Example animation scenarios

Source: Keirnan et al. (2015), Figure 1. Reproduced with permission of ACM Publications.

Scenarios and personas

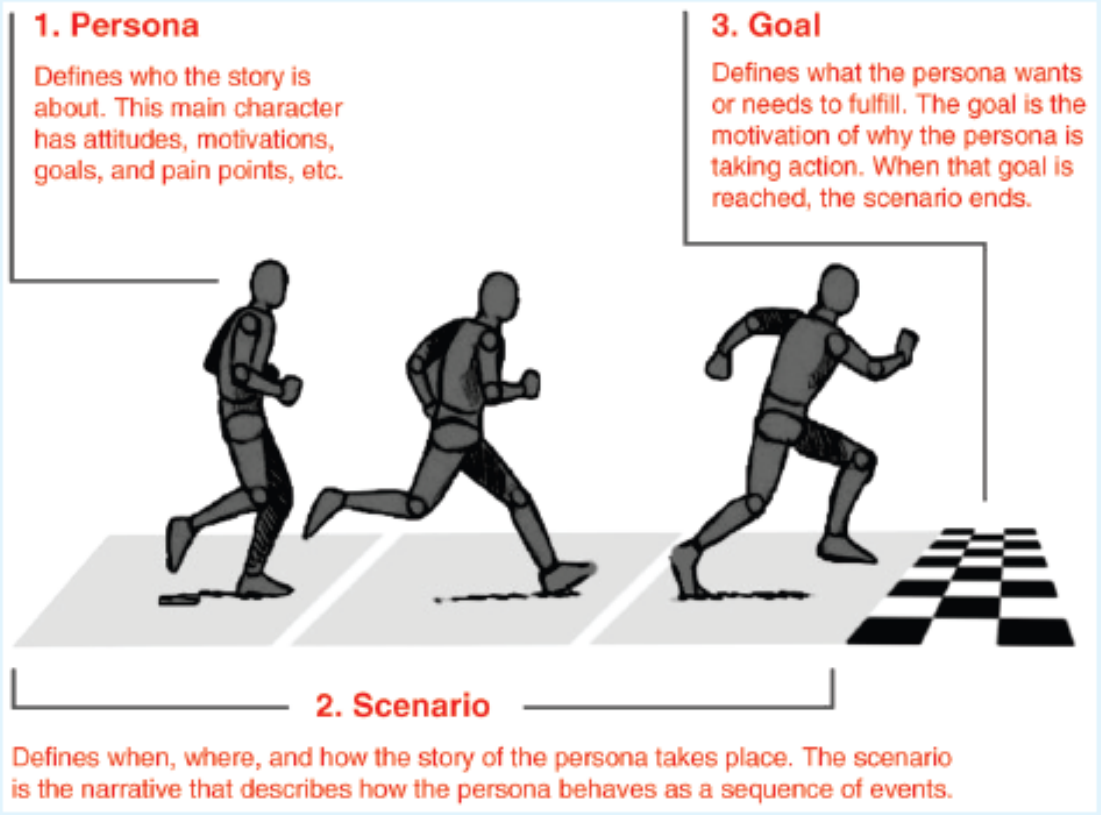


Figure 10.10 The relationship between a scenario and its associated persona

Source: http://www.smashingmagazine.com/2014/08/06/a-closer-look-at-personas-part-1/

Design fiction

- Communicate a vision with future technologies
- Fictional world in which ethics, emotions, and context can be explored without concrete constraints
- Examples:
  - Privacy and surveillance
  - Exploring ethics
- Scenarios are about “overcoming the monster,” while design fiction is about “quest”

Use cases

- Focus on functional requirements and capture interaction
- Can be used in design or to capture requirements
- Use cases are step-by-step descriptions of interactions
- Two styles:
  - Essential use cases: division of tasks, no implementation detail
  - Use case with normal and alternative courses: more detail

Example essential use case for travel organizer

RetrieveVisa

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

Note: The user intention and system responsibility are offset vertically, showing a sequence of interactions

Use case for travel organizer

1. The product asks for the name of the destination country
2. The user provides the country's name
3. The product checks that the country is valid
4. The product asks the user for their nationality
5. The user provides their nationality
6. The product checks the visa requirements of that country for a passport holder of the user's nationality
7. The product provides the visa requirements
8. The product asks whether the user wants to share the visa requirements on social media
9. The user provides appropriate social media information

Alternative courses for travel organizer

Some alternative courses:

4. If the country name is invalid:

    4.1: The product provides an error message

    4.2: The product returns to step 1

6. If the nationality is invalid:

    6.1: The product provides an error message

    6.2: The product returns to step 4

7. If no information about visa requirements is found:

    7.1: The product provides a suitable message

    7.2: The product returns to step 1

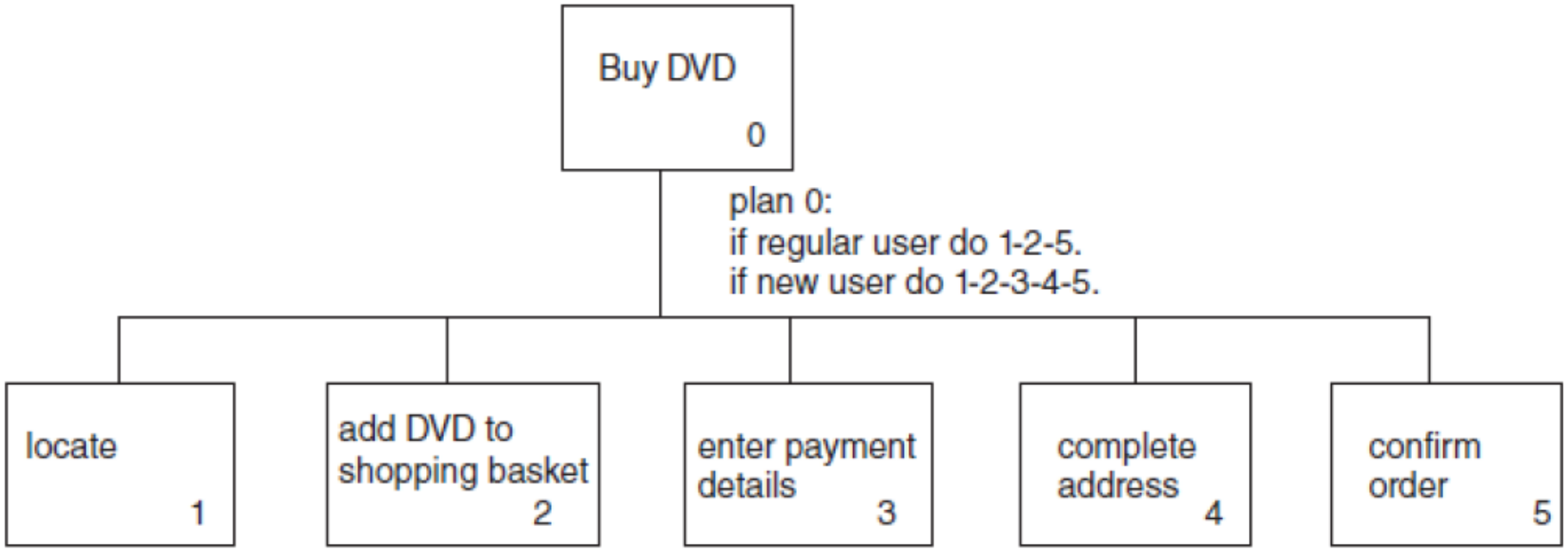
Task Analysis

- Task descriptions are often used to envision new systems or devices
- Task analysis is used mainly to investigate an existing situation
  - What are people are trying to achieve?
  - Why are they trying to achieve it?
  - How are they going about it?
- One of the most popular approach is the **Hierarchical Task Analysis (HTA)**

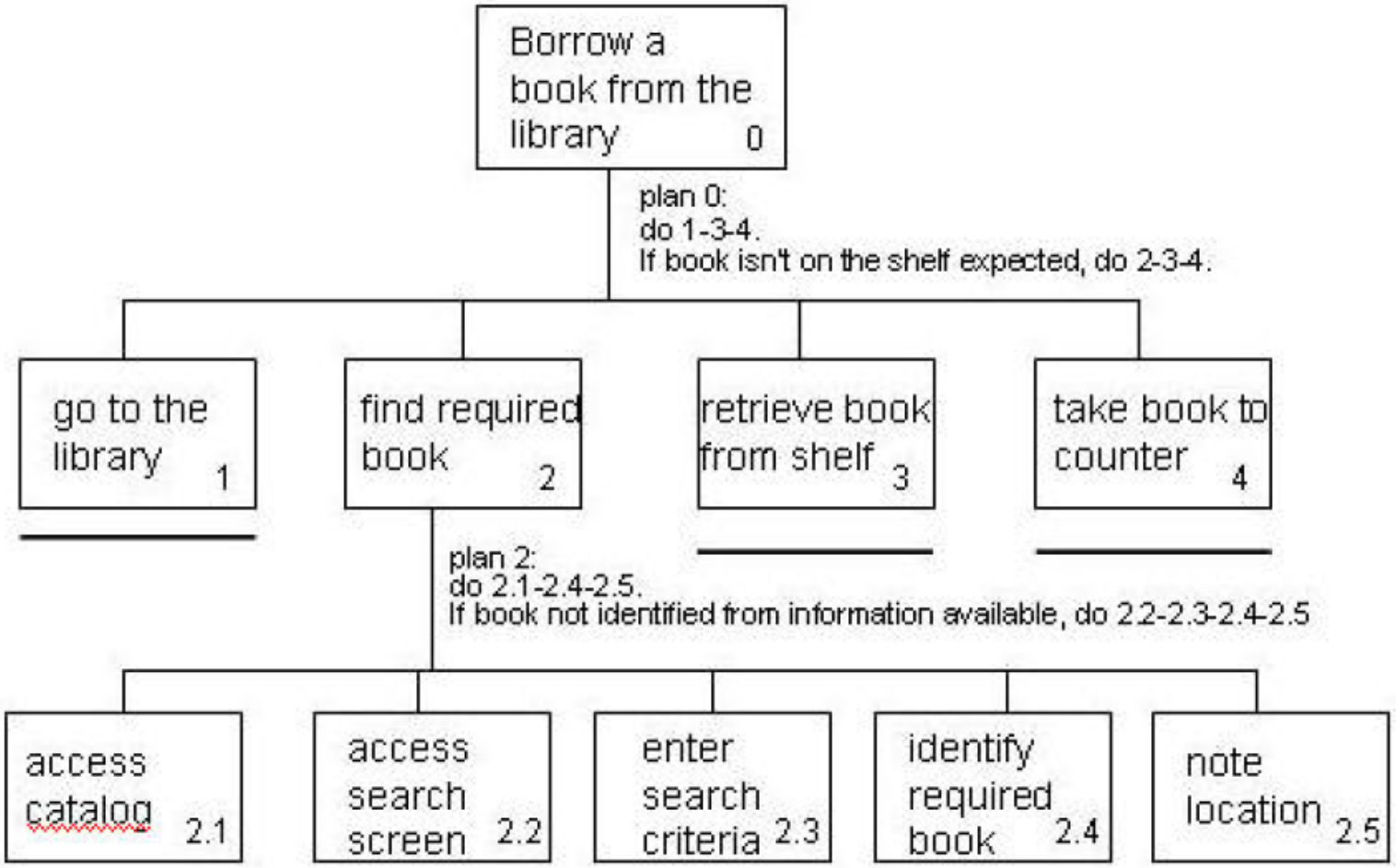
Hierarchical Task Analysis

- Involves breaking a task down into subtasks, then sub-tasks, and 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 task for achieving it are identified.**

Hierarchical Task Analysis



Hierarchical Task Analysis



Summary

- A requirement is a statement about an intended product that specifies what it is expected to do or how it will perform.
- Articulating requirements avoids miscommunication and supports technical developers and users to contribute.
- Different kinds of requirements: functional, data, environmental (context of use), user characteristics, usability goals, and user experience goals.
- Requirements data gathering uses: questionnaires, interviews, observation, studying documentation, and similar products
- Scenarios are a story-based narrative to explore existing behavior, potential of new products, and futuristic visions of use.
- Personas capture characteristics of typical users that are relevant to the product under development.
- Scenarios and personas together bring requirements to life.
- Use cases capture details about an existing or imagined interaction between users and the product.