

Topic 5: Discovering Requirements (Part 1)

SECV2113 Human-Computer Interaction

**Faculty of Computing
Universiti Teknologi Malaysia**

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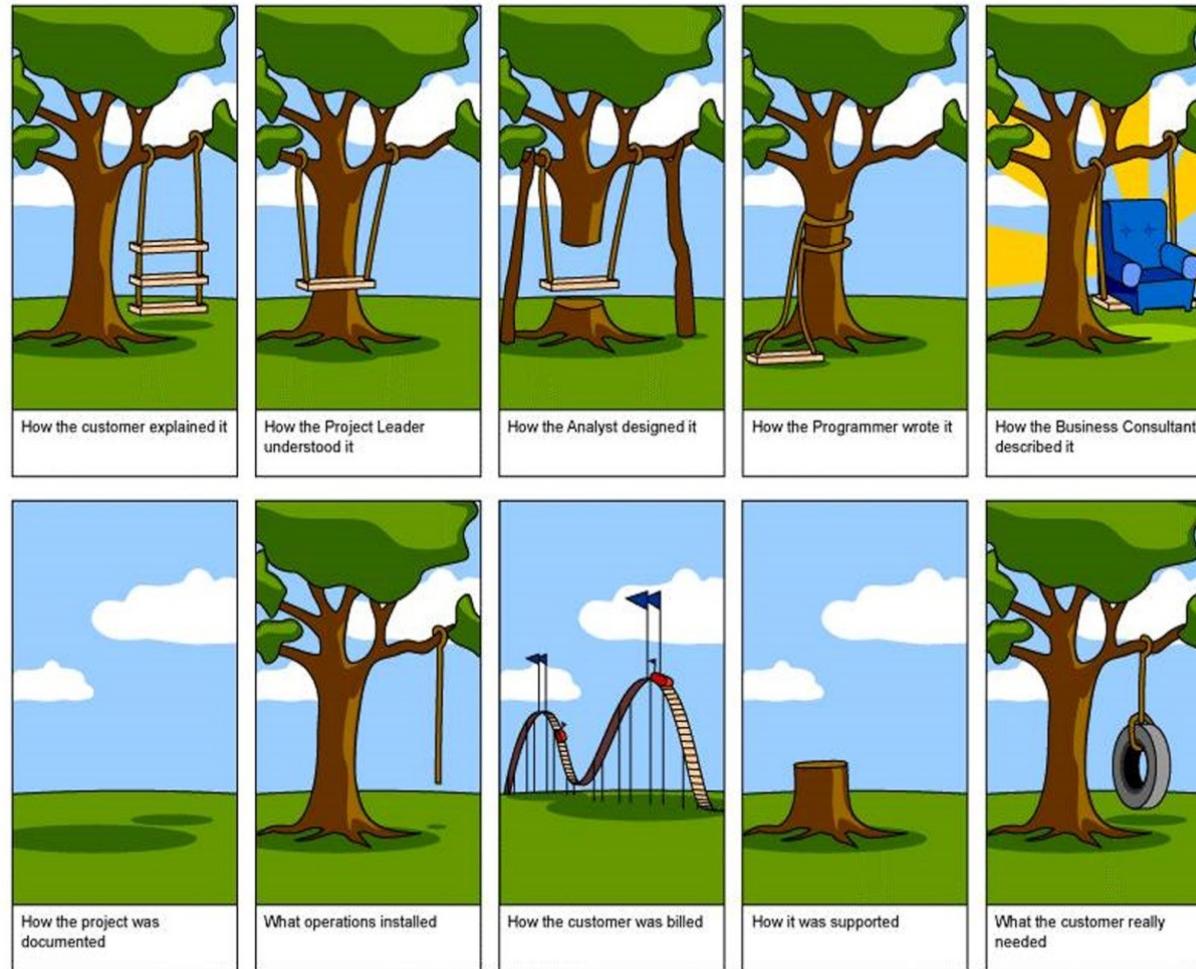
**WHAT, HOW,
& WHY?**

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What, How?

- What is the purpose of the **requirements activity**?
 - Explore the problem space
 - Establish the design challenge to be addressed
- How can requirements **be captured once discovered**
 - In prototypes or operational product
 - Through structured or rigorous notations
 - Criteria to show when requirements are fulfilled
 - Different physical and digital representations emphasise and de-emphasise different aspects

Why are requirements important?



Requirements activity is the stage where miscommunication occurs most commonly

WHAT ARE REQUIREMENTS?

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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** (prevalent in agile development contexts)
- Format:

As a <role>, I want <behavior> so that <benefit>
- Example user stories for a travel organiser 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

Copyright © Atlantic Systems Guild

Different kinds of Requirements

- **Functional:**
 - What the system should do
- **Data:**
 - What kinds of data need to be stored?
 - What are the characteristics of the data?

Different kinds of Requirements (Cont.)

- 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
 - **Support:** user support, communications structure and infrastructure, availability of training
 - **Technical:** on which technologies will it run or with which it needs to be compatible?

Different kinds of Requirements

(Cont.)

- User characteristics — Who are they?
 - **Characteristics:** educational background, personal circumstances, abilities or skills
 - **System use:** novice, expert, casual, frequent
 - **Novice:** prompted, constrained, clear
 - **Expert:** flexibility, access/power
 - **Frequent:** shortcuts
 - **Casual/infrequent:** clear menu paths
 - User profile

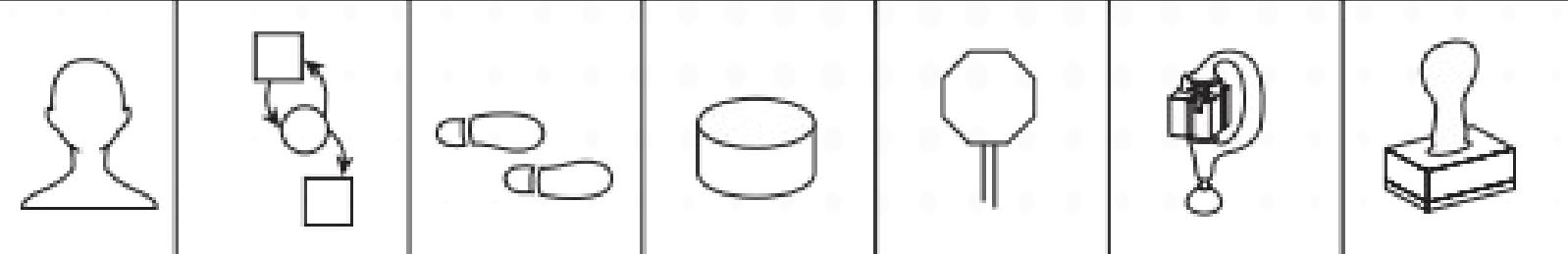
Different kinds of Requirements (Cont.)

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

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
 - What might **affect usable security**
 - Making security mechanisms visible or not
 - Sonification of password strength
 - Good design may have undesirable effect on security

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

DATA GATHERING FOR REQUIREMENT S

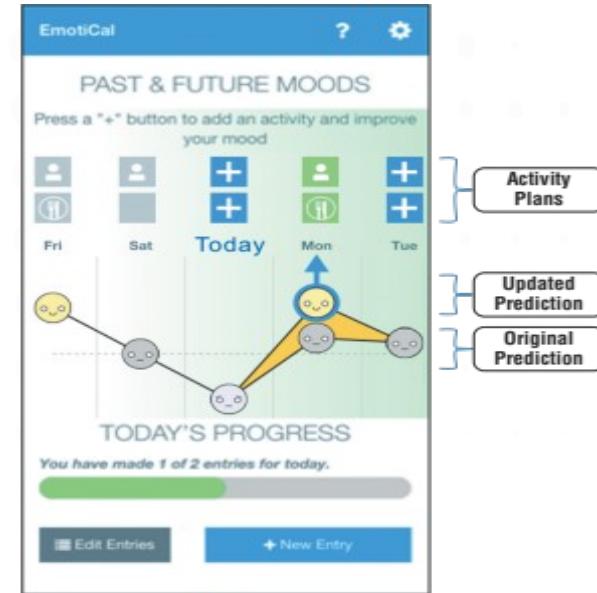
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Data Gathering for Requirements

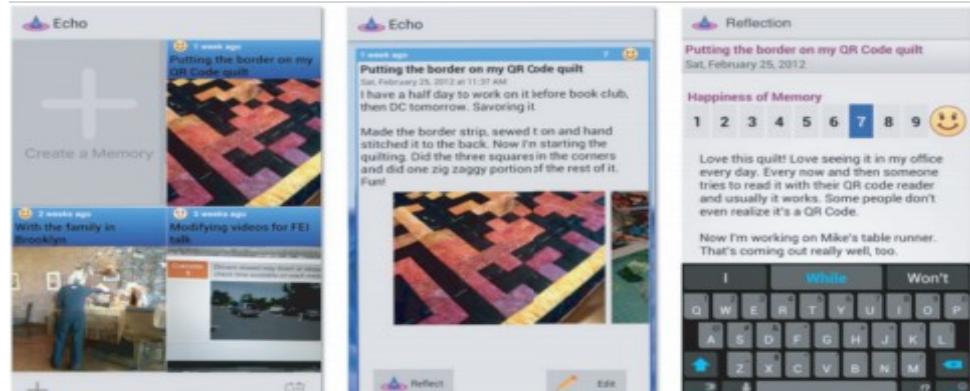
- Interviews, observation, and questionnaires
- Studying documentation:
 - Procedures and rules are often written down in manuals
 - Good source of data about the steps involved in an activity and any regulations governing a task
 - Not to be used in isolation
 - Good for understanding legislation and 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 focus groups:*** ship's maneuvering system
- ***Questionnaire, focus group, design probe, and user study:*** smart meters for power consumption and privacy

Using Probes with Stakeholders

- **Many types of probe:**
 - Designed to prompt stakeholders into action
 - For researchers to learn about participants
 - All rely on data logging: automatic or manual
- **Design probe:**
 - Form relates specifically to particular question and context
- **Cultural probe:**
 - Participants asked to answer questions using postcards, maps, camera, photo album, and diary
- **Technology probe:**
 - A working prototype placed in an in-the-wild context
- **Provocative probe:**
 - Designed to challenge existing norms and attitudes

Contextual Inquiry

- Part of Contextual Design, and used on its own to discover 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 participant, wherever they are, and seeing what they do as they do it
 - **Partnership:** Participant & interviewer explore participant's life together
 - **Interpretation:** Observations interpreted by participant & interviewer together
 - **Focus:** Project focus guides what should be paid attention to

Contextual Inquiry (Cont.)

- 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

- Alex Osborn's (1930s) **four rules:**
 - Quantity over quality
 - Criticisms should be withheld
 - Encourage out-of-the-box thinking
 - Combine, refine and improve ideas
- Brainstorming requires **careful facilitation**

BRINGING REQUIREMENT S TO LIFE

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Bringing Requirements to Life

- Augmenting the basic requirements expressed as stories, in Volere template, or in other form
- **Personas**
 - Characterises someone who might use the product, not specific people
- **Scenarios**
 - An informal narrative story, simple, 'natural', personal, and not generalisable

Scenarios and Personas

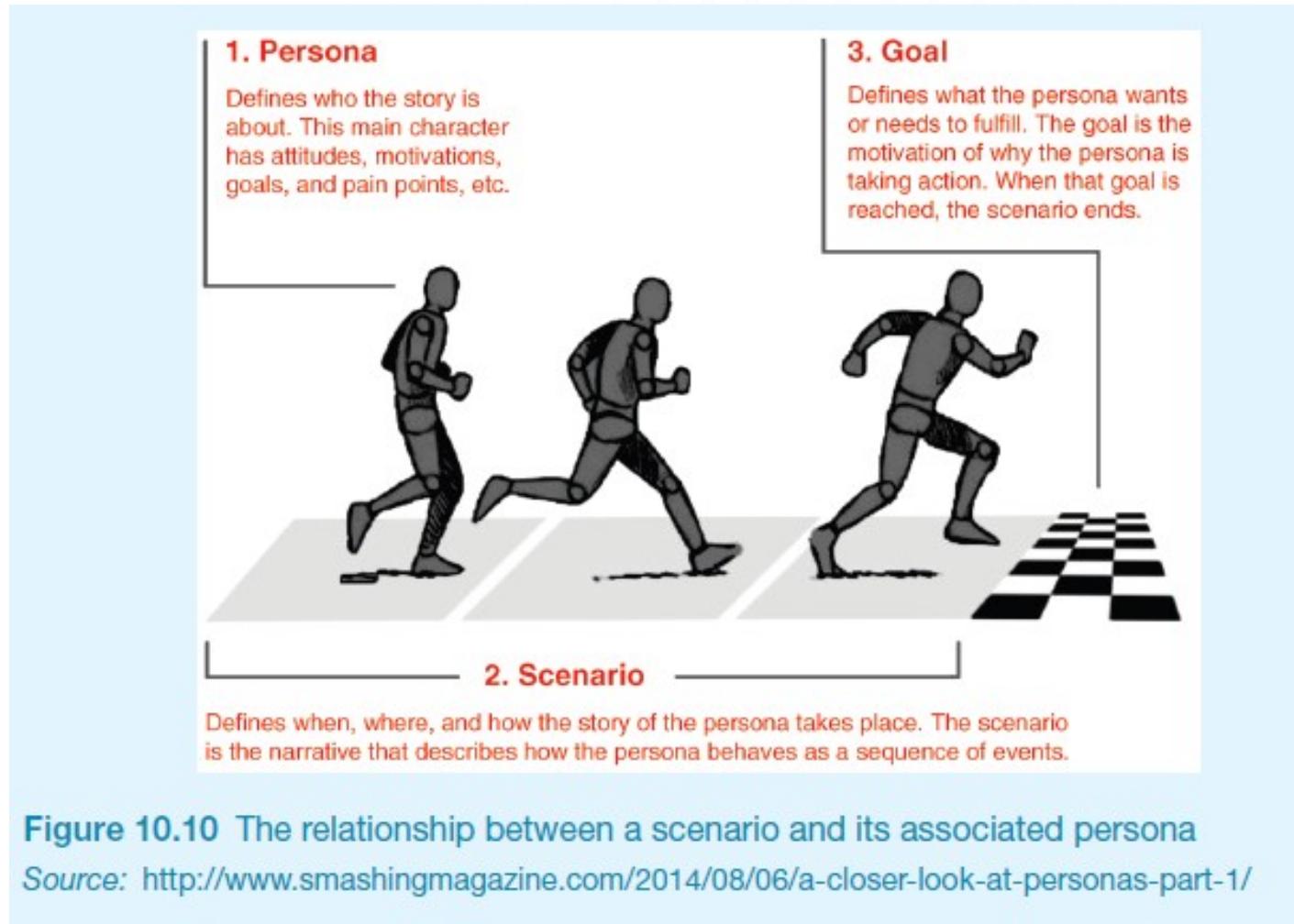


Figure 10.10 The relationship between a scenario and its associated persona

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

Personas

- Capture a set of **user characteristics (user profile)**
- Synthesised from **real people** based on research
- Typical, not idealised
- 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

Lena, 50

Lena works in London as a civil servant. She lives with her partner in a commuter town, and they both own a car.

She commutes to London by train, taking an early morning service which takes over an hour. She leaves the house early and often doesn't get home until after 7pm. She drives 15 minutes to the station and usually arrives 5 minutes before the train departs. It costs a lot to park there everyday, but there are no buses direct from her house to the station.

Lena enjoys her job but finds that she is often so busy travelling from one meeting to another that she is left with little time to complete work. At the weekends, she and her partner drive to the countryside to go walking or to visit friends.

Lena has two Android smartphones – one provided by her employer and one for personal use. She has an Apple laptop for business use. It has to go everywhere with her as it contains confidential files. She is always relieved if there is a charger available in the taxi so she can make sure her laptop is charged.

Travel & Transport

Top 3 modes of transport	Top 3 reasons for taxi usage
Train	Business
Shared car	Leisure
Taxi	Holidays

Willingness to share a taxi

Technology and Income

Technology acceptance
Openness to experience
Budget

"I wish there was a cheaper way of getting to the station – parking is so expensive and often very limited – but the car is so convenient"

"I often wonder how taxi drivers choose their routes – I feel uneasy when they don't follow their satnav"

 ServCity

Figure 5. Example persona "Lena." Photo by [RODNAE Productions](#) from [Pexels](#).

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

Innover	Extrovert
Thinking	Feeling
Sensing	Intuition

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

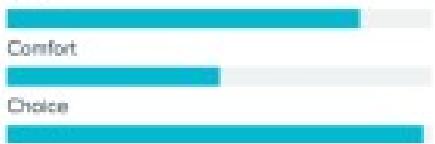
- Wasting time filling in forms
- Too much irrelevant information
- Existing systems tend to be too diverse and complicated

Bio

Will loves to take his family on adventure holidays to explore new challenges. His children, Sky (8) and Eamonn (5) 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

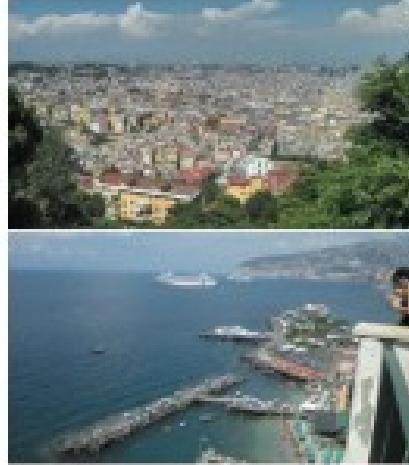
Price



Comfort

Choice

Favourite destinations



Developed using Xtensio Templates

Scenario for Group Travel Organiser

"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 messages them a summary of the different options available."

Scenarios

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



Source: Tommy Nilsson, et al (2020) Visions, Values, and Videos: Revisiting Envisionings in Service of UbiComp Design for the Home, DIS '20: Pages 827–839
ACM Publications.

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”

CAPTURING INTERACTION USING USE CASES

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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 Organiser

retrieveVisa

USER INTENTION

Find visa requirements

Supply required information

Obtain copy of visa info

Choose suitable format

SYSTEM RESPONSIBILITY

Request destination and nationality

Obtain appropriate visa info

Offer info in different formats

Provide info in chosen format

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

Use Case for Travel Organiser

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 Organiser

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

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, supports technical developers and allows stakeholders to contribute.
- **Different kinds of requirements:** functional, data, environmental (context of use), user characteristics, usability goals, and user experience goals.
- **Scenarios** are a story-based narrative to explore existing behavior, potential of new products, and futuristic visions of use.
- **Personas** capture realistic profiles of people who might use the product and are synthesized from data gathering.
- **Scenarios and personas** can be used together throughout the product lifecycle.
- **Use cases** capture details about an existing or imagined interaction between users and the product.