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integration of web accessibility courses

Case-based training material for the integration of web accessibility in IT education

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Authors:
− Lisa Sällvin, Jimmy Åhlander – Mittuniversitetet, Sundsvall
− Christophe Strobbe, Gottfried Zimmermann – Hochschule der Medien, Stuttgart
− Federica Imperiale, Marina Ribaudo – Università degli Studi di Genova
− Sara Kjellstrand – Funka, Stockholm
− Frida Sandberg - International Association of Accessibility Professionals (IAAP)

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Introduction

Web accessibility is very much a discipline that combines theory with practice. On the one hand, mastering the subject involves understanding the principles and reasoning behind accessibility and its relation to user experiences. On the other hand, applying accessibility in practice involves learning specific techniques and developing the ability to analyse scenarios and apply the principles in a given context.

This is why both theoretical and problem-based learning is needed when teaching accessibility.

One effective way of introducing problem-based learning is to use case study material. In this context, the IWAC project has developed and tested a selection of case studies designed to teach how to apply theoretical knowledge and competences related to web accessibility in different professional contexts. The objective is to give the students an opportunity to put the theory into practice, and to stimulate reflection and discussion around complex real-life cases that they may face in their professional life. This document provides descriptions of the cases that can either be adapted or used as they are in teaching.

Structure of the document
The document contains two types of case exercises. The first three cases are longer case studies that have been adapted to different strands of ICT education programmes. The first case is oriented towards UX design, the second for STEM studies, and the third for human-computer interaction courses.
The last section includes a structure for and examples of mini cases that can be used in different types of courses.

All cases are constructed to create interest and empathy, as well as to encourage personal decision-making. The material has been tested in pilot trainings at each of the partner universities, and later reviewed and adjusted depending on the results of the pilot trainings. The mini case material has been tested online with members of the branch organisation IAAP.

Target audience
In line with the objectives of the project and the accompanying outputs, the cases have primarily been conceived for teachers and programme managers who design and or deliver education and training in IT-related subjects at the higher education level.

However, the cases and the methodology for mini cases can also be applied in other educational contexts such as professional ICT training, such as in vocational education and training (VET) courses and life-long learning processes. It can also as be used as complementary material for self-studies on accessibility, for example in the context of certification.

The project partners therefore hope that the case studies and mini cases will be of interest to anyone interested in accessibility in the broad sense.

1 Case 1: Accessible customer journey

The context of this exercise is learning how to design services and products that meet the needs of users with different abilities. The case can for example be used when learning about accessibility and user needs in the context of a course for UX designers

What follows is a description of how to run the case from a stepwise view. In the example provided, the customer journey is focused on getting a new passport, and the case is described from the viewpoint of a user with visual impairments. However, the structure of the case can be adapted in various ways to accommodate for different user needs or customer journeys.

The case has been developed for use in a 2-hour lesson on-site. It involves both individual reflections and group discussions. The exercise is performed in several steps:

- Step 1: Warm-up: Create a customer journey from the students' own perspectives.
- Step 2: Work with a pre-determined case to adapt the customer journey to users with disabilities.
- Step 3: Introduce personas and a true story scenario
- Step 4: Adjust the customer journey.
- Step 5: Share the result to other students.

1.1 Step 1 – warm up, 10 min

Warm up – individually sketch out a customer journey you have experience with that contains both digital contact with a government agency or a company and something physical, e.g. a meeting or a product.
Use a template. Example: dental visit, ordering a new credit card, buying food online, getting a Covid-19 test.

While sketching out the customer journey bases on your own experience, use your knowledge of accessibility principles to highlight and think about accessibility barriers that you would be likely to encounter yourself during the journey.

1.2 Step 2 – Work with a predetermined case, 30 min

Work in groups. Use sticky notes, paper and a wall or whiteboard.
Problem/need: A passport has expired and a new one is needed for an upcoming trip.

- Consider which interactions are required (digital, physical), before, during and after.

- Consider the emotional aspects during the ”journey”.

1.3 At this stage of the exercise, continue to use your own experience and needs in terms of accessibility in mind. Discuss in the group whether you have noticed different obstacles or opportunities along the journey based on your own individual needs. Step 3 – Acquire more perspectives, 45 min

Now that you have developed a feeling for the customer journey from your own perspective it is time to introduce other user perspectives.

This can be done using for example inclusive personas. The IWAC Handbook includes a description of how to use personas, and links to where you can find inclusive personas and user journeys to work from.

To be able to get in depth discussions on the user needs, it is recommended that at this stage only one persona would be added. In the testing of the case during the IWAC project, a persona with visual impairments was chosen. Continue working on your case in your previous groups. Refine your customer journey based on one of the personas.

If possible, consider introducing a true story from a person with disabilities to enhance the discussion on user needs. This can be done by inviting a person with disabilities to share a story, or by using material found on the web. In the testing of the case during the IWAC project, the team use a story shared on twitter that describes the customer journey experienced by a blind person getting a new passport

Objective of the step: Refine your customer journey based on what you learned from the story.

1.4 Step 5 - Include more disabilities and other non-norms, 15 min

Ask the students to think further outside the norms to broaden their perspectives and challenge their customer journey. Does it matter if you are, e.g.: a child, an elderly, person using a wheelchair, left-handed person, a person traveling by bicycle or bus, a person hard of hearing, etc.

1.5 Step 6 – Present to the other groups, 10 min/group

To learn from each other, the students will present their customer journeys to one or more other groups.

Image 1 and 2: Students working in groups with the inclusive customer journey case study.

2 Case 2: Make complex images and mathematical formulas accessible

2.1 Case description by the University of Genoa

Author: Marina Ribaudo

Types of activities: lectures and teamwork

Learning goals: Starting from a basic knowledge of web accessibility for the images, students will

1. learn how to write descriptions for STEM images to make them accessible,
2. learn some basic tools to make mathematical formula accessible.

Duration: 3 hours per workshop

Required preparation: Lecture and/or literature review about the accessibility of STEM content.

In this document you will find the overall descriptions for workshop 1 and workshop 2, as well as the instructions students received for workshop 1.

2.2 Workshop 1: Making STEM images accessible on the web

Lecture: Starting from an overview of different types of images (like those described for instance on the W3C web page Images Concepts) the participants to this activity will ask themselves the question “if there is no description, what will the user miss?”

They will read guidelines, see examples, discover tools to provide multiple ways for users to interact with complex images, including equations, graphs, and other notation and learn how to describe them so that the corresponding texts will reveal their relevant content to the users with visual impairments. This is fundamental to guarantee that blind users/students have access to the same content of their sighted peers.

Teamwork: Groups of students will receive some images, and they will add alternative texts. Then, the alternative texts, without the images, will be exchanged among groups so that each student will be able to experience what blind students “see”. This will allow them to evaluate the quality of the produced alternative texts.

2.3 Workshop 2: Make mathematical formulas accessible on the web

Lecture: Basics on Latex will be provided to write simple mathematical formulas, and then MathJax will be presented together with other tools that allow to make maths accessible.

Teamwork: Students will use the proposed tools to make accessible some formula provided by the instructor and will perceive the difficulty of math understanding for the blind. Each group will prepare a short elevation pitch to explain to the other groups what they have learnt in the activity.

2.4 Instructions to students on accessibility issues for complex images

Note for teachers: the images have not been included in this material, since they should be chosen by the teacher on the basis of what topics the students are working on in other courses they have in parallel.

Part 1: From images to descriptions (2 hours)

Suggestions for the lecture can be found at the following pages:

"Images must have text alternatives that describe the information or function represented by them. This ensures that images can be used by people with various disabilities. This tutorial demonstrates how to provide appropriate text alternatives based on the purpose of the image..."

(Source: Images Tutorials (WAI Web Accessibility))

"When adding an Alt Text it's important to keep it concise (around of 140 characters) yet descriptive. With a 140-character limit, it is unnecessary to start the Alt Text with "image of", "graph of", "photo of", etc. A screen reader will recognize the file as an image and let the user know for you. It's not required that an Alt Text is under 140 characters, but a screen reader will stop reading the text after 140 characters. If an image can't be described in 140 characters, it's considered a complex image and recommended to add a description of the image as a caption or link to a page with the full details of the image. In this instance, you still need to add an Alt Text, however, the Alt Text should describe the general point of the image."

(Source Alt text (Grand Valley State University))

In the first part of this activity, after reading the W3C pages, especially those on complex images, students will be asked to describe some images (5 images in the experiment done in class).

The images should be in different categories to experiment with different ways in their descriptions and in the following reconstructions.

The outcome of this activity is a text file (called “descriptions.txt” in the experiment done in class) where, for each image, students had to provide:

1. the alt-text of the image (max 140 characters);

2. the long description (max 840 characters);

3. the time required to describe the image.

To count characters it is possible to use online tools like OnlineTextTool.

Part 2: From descriptions to drawings (1 hour)

In the second part of this activity students will get the descriptions of the images as written by class mates and are asked to draw them without seeing them. This will allow students to understand what it means to interpret the content of an image knowing only its description. For the activity to make sense, the students should not share their images with classmates, and they should not use Google to find them online.

Each student will receive one text file with the descriptions of some images and should draw them. They can use paper and pen or a drawing tool.

Drawings should be saved in PNG files with a reasonable size, for example 800X600 pixels, a README.txt file can be added with the information on the time needed to draw each picture.

As a last activity, some images are shown in class by comparing the original ones and the drawings. Finally, an online survey can be administered to get some feedback.

3 Case 3: Setting up a computer for two users with different disabilities

3.1 Case description by Stuttgart Media University

Author: Christophe Strobbe (Hochschule der Medien / Stuttgart Media University)

This is an exercise for students who are getting an introduction to various types of disabilities and to the assistive technologies and compensation strategies required by these disabilities. It comes in two versions: a fundamental version and an advanced one. In the fundamental version, the goal is to make students investigate assistive technologies and accessibility features more thoroughly than in an exercise in which they present one of the stories to the rest of the class (which is a useful preliminary exercise). In the advanced version, the goal is to spur discussion on the current limitations of assistive technologies and accessibility features.

The exercise is probably best used as a follow-up to an introductory lecture or exercise. For example, as a first exercise, students may be asked to introduce a persona or a fictitious description of a person with a disability. In this first exercise, the focus would be on becoming familiar with the disability, the assistive technologies and the compensation strategies used by this fictitious person. This may be done by asking students to present this information to each other (co-teaching). Any kind of inclusive personas can be used for the exercise. For the purpose of developing and testing the cases within the IWAC project, the nine day-in-the-life stories from the MOOCAP project[1] were used as input for this exercise. More information about the use of personas can be found in the IWAC handbook. The follow-up exercise would be based on the same material that was chosen for the first exercise and go one step further. In this second exercise, students choose two of the day-in-the-life stories or personas from the first exercise, and come up with a set-up for a PC or a mobile device that would allow the two personas or fictional persons to work together. This is considerably more challenging than describing a set up for just a single person, since not all assistive technologies, accessibility features and mitigation strategies work equally well for each disability. Some combinations of personas or fictitious persons may work better than others, so the lecturer or teacher may want to assign certain combinations rather than let the students decide. If the lecturer wants the focus of the exercise to be on potential solutions, the combinations of personas would be chosen to make the exercise more feasible. If the lecturer wants the focus of the exercise to be on the limitations of

[1] A day in the life of …: https://moocap.gpii.eu/?page_id=33

assistive technologies and accessibility features, they may propose more difficult combinations of personas or disabilities.

The exercise can be done in small teams if the number of students is higher than the number of combinations of day-in-the-life stories defined for the exercise. If the group is small, each student can focus on a single combination. However, the exercise is easier to complete if the team has students that have previously introduced the individual day-in-the-life stories that are now combined in this follow-up exercise.

Using the MOOCAP day-in-the-life stories, the following pairings would be easy:

• Monika (elderly) and Alexander (colour vision deficiency)

• Monika (elderly) and Mary (mobility and dexterity problems)

• Monika (elderly) and Anna (dyslexia)

• Alexander (colour vision deficiency) and Anna (dyslexia)

• Lars (deaf) and Susan (hard of hearing)

The following pairings would be more interesting due to similarities in either disabilities or assistive technologies:

• Carole (blind) and Maria (macular degeneration)

• Tom (speech impairment, cerebral palsy) and Mary (mobility and dexterity problems)

The following combinations would be more challenging due to diverging needs with regard to assistive technologies. Some of these combinations of user stories may be used to trigger discussions about new types of assistive technologies, accessibility features or APIs that would need to be developed to allow more efficient communication between the given types of user groups. Some scenarios require improvements in AI or machine learning, so when the students present the results of their discussion to the entire class, this may also be used as a starting point for discussions about AI ethics.

• Carole (blind) and Anna (dyslexia). These stories represent user groups with very different requirements when using speech-synthesis: blind users tend to rely on speech-synthesis voices that can be speeded up to at least 500 words per minute, whereas dyslexic users prefer a normal speech rate and a natural-sounding voices over the high speed and robotic voices typically used by screen-reader users.

• Carole (blind) and Lars (deaf). These stories represent user groups that rely on different modalities for communication: blind persons rely on speech (including speech synthesis) or Braille (or both), whereas deaf persons rely on sign language or, to a lesser extent, text. Efficient communication in each user's preferred modality would require significant improvements in sign-language recognition (for conversion into synthetic speech or Braille) and sign-language translation (using sign-language avatars that are significantly more natural than the current generation).

The remainder of this chapter contains two assignment descriptions: one for the easier type of exercises and one for the more challenging one. The assignment descriptions assume that the lecturer or teacher assigns specific combinations to specific groups of students. The example tasks are intended to help students focus on concrete actions that they can test with specific assistive technologies or accessibility features instead of vaguely speculating on what might work. Lecturers can and should adapt the assignment descriptions to fit their needs if they organise the exercise in a different way. They may also wish to add instructions on the document formats the students can use and where and how the solution should be submitted.

3.2 Assignment: Helping Two Persons with Different Disabilities Work Together

The ERASMUS+ project MOOCAP (MOOC Accessibility Partnership) created day-in-the-life stories for nine fictitious persons with various disabilities or special needs. Each of these persons faces different challenges in their daily life and they use different assistive technologies and compensation strategies to deal with them. Imagine that two of these persons need to work together on a specific task, such as

- looking for a university to apply to: finding information such as available degree programs, application deadlines, tuition fees and distance from home, and ranking selected universities in a spreadsheet program based on these criteria;
- finding a new smartphone to replace an older one: finding information such as display size, weight, camera, CPU speed, connectivity, sensors and operating system, and ranking selected devices in a spreadsheet program based on the chosen criteria;
- finding a service provider to host a website: finding information such as available operating systems, level of support, available bandwidth and price per month, and ranking selected service providers based on these criteria.

You will be assigned a combination of two fictitious persons and describe what combinations of assistive technologies or accessibility features they need so they can accomplish one of the above tasks together using the same device (a computer, tablet or smartphone). Don't forget that specific settings may need to be adapted as well, for example the reading speed in a text-to-speech engine or the magnification level in a magnifier. Describe these assistive technologies, accessibility features and settings and explain why they are needed to fit the needs of these two persons working together.

3.3 Assignment: Helping Two Persons with Different Disabilities Work Together (Advanced)

The ERASMUS+ project MOOCAP (MOOC Accessibility Partnership) created day-in-the-life stories for nine fictitious persons with various disabilities or special needs. These stories are not strictly speaking personas, because they were not based on research in specific user groups to create them. Instead, they are based on the knowledge that each partner in the MOOCAP project already had.

Each of these persons faces different challenges in their daily life and they use different assistive technologies and compensation strategies to deal with them. Imagine that two of these persons need to work together on a specific task, such as

looking for a university to apply to: finding information such as available degree programs, application deadlines, tuition fees and distance from home, and ranking selected universities in a spreadsheet program based on these criteria;

finding a new smartphone to replace an older one: finding information such as display size, weight, camera, CPU speed, connectivity, sensors and operating system, and ranking selected devices in a spreadsheet program based on the chosen criteria;

finding a service provider to host a website: finding information such as available operating systems, level of support, available bandwidth and price per month, and ranking selected service providers based on these criteria.

You will be assigned a combination of two fictitious persons and describe what combinations of assistive technologies or accessibility features (or combinations of these) they need so they can accomplish one of the above tasks together using the same device (a computer, tablet or smartphone). Don't forget that specific settings may need to be adapted as well, for example the reading speed in a text-to-speech engine or the magnification level in a magnifier.

You will find that due to the differences in each person's needs, finding a suitable setup can be challenging. Try to find a combination of assistive technologies, accessibility features and settings that might work and explain why they are needed to fit the needs of these two persons working together. If or when the proposed combination does not work well for either person, discuss what type of development would be needed to create a more suitable setup: would this require a new type of assistive technology, advances in machine learning or something else? Describe your findings so they can be discussed in class.

4 Mini Cases: Problem-based exercises to complement teaching of accessibility user needs

4.1 Introduction to Mini Cases

A key part of mastering accessibility in theory and practice is to be able to understand what difference accessible services and products make for the users. This is why it is beneficial to introduce problem-based exercises centred around user needs on different levels in the education. The case-studies presented in the first three chapters are more time-consuming and there are practical preparations involved.
Another example of practical exercises that involve user scenarios is shown in the MOOC on accessibility from a user perspective produced in the IWAC project. The MOOC exercises are available from the Erasmus + results platform.

Another way to integrate problem-based learning elements in the teaching is to develop and make use of mini cases. These are shorter exercises that presents a specific scenario where the student need to solve an accessibility problem from the perspective of a particular group of users.

The exercises are designed to be feasible for the students to do on their own, but they can also be the basis for group discussions.

The most important feature of a mini case is that the exercise should be framed as a narrative centred around a concrete problem of accessibility to solve in a real-life situation. The narratives can build on actual or fictitious scenarios. Likewise to the case-studies, the purpose of the activity is not only asking the students about facts on a topic but also invites to reflection and practical decision-making.

4.2 Structure of a mini case

Within the IWAC project, a structure was developed for designing a mini case on web accessibility. The purpose of the structure is to provide guidance for teachers on how to develop mini cases adapted for teaching principles of accessibility from a user perspective.
According to the structure, the mini case should:

- Focus on a problem-based scenario
- Use a concentrated format. Ideally, the description of the mini case should be contained within the limits of half a page up to 1 page (maximum 500 words)
- Be focused on a user experience: There is a person in the centre that has a problem to solve.
- Be related to the topic taught (e.g. UX design, human-computer interaction, development techniques)
- Inspire reflection through questions such as what the underlying problem is, why did the problem appear and what caused it, what caused the problems, are there some underlying assumptions behind the problem, what decision needs to be made
- Clearly state whether it is a finished case with a fix answer, or an open-ended case with several possible answers
- Be accompanied by proposed solutions, to be discussed after the student has tried on the mini case on their own.

To test the structure, a few examples of mini cases have been developed within the IWAC project under the lead of project partners Funka, experts in accessibility, and the Nordic branch of the International Association of Accessibility Professionals (IAAP). They have been tested with members of IAAP and persons looking to get certified as professionals in accessibility. The exercises have been designed to be used both in teaching, and as a learning material for professionals seeking to be certified professionals in accessibility or web accessibility.

4.3 Mini case 1

This case is a contribution to the project from the IAAP member Alena Nikolaeva in Spain.

This scenario is real, and the underlying problem describes the experience of a blind developer who is unable to book a flight fast enough through a popular website.

Luckily, the problem can quickly be debugged , by removing aria-hidden="true" from the calendar picker so that it is apparent that some dates have a special CSS class applied.

The exercise includes several problems that the user is experiencing on a website while booking his flight.

It includes several aspects that a student can develop in his/her answer such as:

- usage of visual-only indicators
- elements are hidden from the screen readers
- skip-links
- debugging skills

while putting himself/herself in the shoes of the user.

Case description

A user with visual impairment (significant blindness) is trying to book a flight for a family of three by using a keyboard and a screen reader. He is tabbing through the navigation items, introduces dates, the destination, and clicks the "Search button". He gets "No flights are available" again and again. It's clear that he is unable to "see" what flights are available on what dates because the indicator of the flight on the calendar is only visual (green dot near the day number). So he must repeat the process again and again until the date, the destination and the flight give him any result. We also know that the calendar itself is hidden from the screen reader.

Imagine, if you are the user and you have some web development knowledge, how could you start to solve this issue in order to see which days are having flights you are interested in?

4.4 Mini case 2

This is an open-ended case that can be adapted to include more precise elements of problem-solving. The example is designed to provide inspiration rather than as a fixed scenario to implement as it is. The context of the case is technical. It is therefore recommended for use primarily in a course for developers.

Case description

A developer receives a complaint from a screen reader user that they cannot access a webpage with a registration form. The developer checks the webpage again from what they perceive is a user perspective, by scrolling down with the mouse and clicking on the form. The form seems to work properly.

- Why is the developer not perceiving that there is a problem?
- Why is it that the screen reader user cannot access the webpage?
- Is there a way for developer to check this, without using a screen reader?

- More advanced question: What are possible solutions that the developer can apply to fix the problem?

4.5 Mini case 3

This mini case is designed to be used for teaching about principles of accessibility and how to integrate web accessibility on an organisational basis. It does not concern the implementation of accessibility from a technical perspective, but rather organisational aspects, including public procurement. The case can for example be used in introduction courses that look at accessibility from a broader perspective.

Description

A new employee at a large public organization in a European country is tasked with organizing an online event for the employees using the newly procured conference system. It turns out that several employees cannot fully participate because of variety of accessibility issues. When the employee goes to their superior with the problem, the supervisor answers that they thought the employees had assistive technologies that would solve the issue for them and that this is not the responsibility of the organization.

- What should have been done in the procurement process in order to avoid the problems with the conference system?
- Can the reasoning of the supervisor be explained through the lens of a disability model, and in that case which one?