Requirements and design patterns for an accessible video conferencing tool

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Introduction

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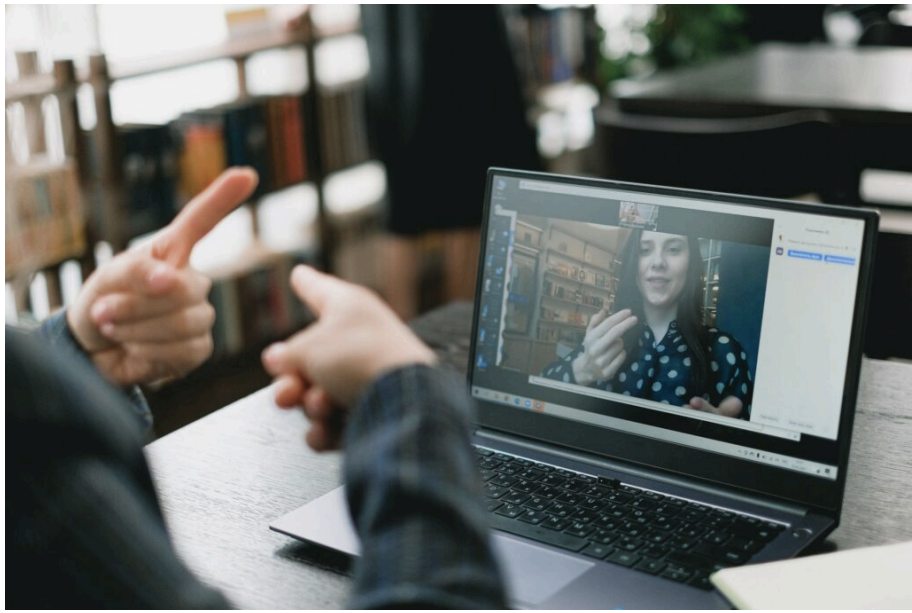
- Video conferencing tools have been imposed on many different areas of our day-to-day lives.
- Since the beginning of the COVID pandemic, its use has increased, for example in online work.
- These tools should be an instrument of integration in the digital society, however not all people can access them.



Introduction

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- These tools are not currently accessible to people with disabilities who face barriers preventing them from fully using them.
- To make these tools accessible:
  - Standards
  - User-Centered Design approach

Introduction

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- Designers and developers must apply accessibility standards, but is it an easy task?
  - Lack of knowledge and training.
  - Many documentation.

=> Designers and developers don't know how to create accessible video conferencing tools.

Contribution

- As a solution:

1. Accessibility requirements
2. Design patterns.
   - Preliminary user tests are presented to validate the suitability and usefulness of the design patterns proposal.

Related Work Background

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- Accessibility standards
  - Web Content Accessibility Guidelines (WCAG)
  - User Agent Accessibility Guidelines (UAAG)
  - Accessibility requirements for ICT products and services (European standard EN 301 549)

EN 301 549 V3.2.1 (2021-03)

Related Work

- Comparative analysis articles on videoconferencing platforms have increased [1] [2] [8] [9]
- Domains: health [10] [11], education [12] [13]
- Accessibility for specific disability groups: blind [14], taking into account cognitive aspects [15].
- Previous works in accessible players: design based on models [16][17], accessibility requirements based on standards [18][19].

Contribution
Accessibility requirements

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- A list of 34 accessibility requirements is proposed based on EN 301549: 2022 and the guidelines offered by WCAG 2.2 and UAAG 2.0.
- This list of requirements or checklist can be used in the analysis and design phase as well as in the evaluation phase.

CODE	NAME	DESCRIPTION	USERS	WCAG 2.2	UAAG 2.0	UNE-EN 301 549
1.1.1	Alternative text	An alternative text should be provided for any non-text information to be changed to other forms the person needs, such as large print, braille, speech, symbols or more straightforward language.	[visual]/[any]	1.1		9.1.1.1
1.2.1	Alternative for audio and video	An alternative audio/video that presents the equivalent information for the content must be provided.	[visual]/[any]	1.2.1		9.1.2.1
1.2.2	Alternative synchronized content	Synchronization between audio and video tracks must be ensured over the full range of playback speeds required.	[visual]/[any]		2.10.4	
1.2.3	Caption for pre-recorded content	Captions must be provided for pre-recorded audio content.	[auditory]/[any]	1.2.2		9.1.2.2
1.2.4	Live caption	Captions must be provided for all live audio/video content.	[auditory]/[any]	1.2.4		9.1.2.4
1.2.5	Sign language	Sign language interpretation must be provided for all prerecorded audio content.	[auditory]/[any]	1.2.6		
1.3.1	Structured information and relationships	The information must be presented in a structured way and offer an easy understanding through the presentation	[cognitive]/[any]	1.3.1		9.1.3.1
1.3.2	Orientation	It must be ensured that the content does not restrict its display and operation on a single screen, either portrait or landscape orientation.	[cognitive]/[any]	1.3.4		9.1.3.4
1.3.3	Videoconference screen size	It must be ensured that the user can change the size of the media player viewport.	[visual]/[any]		1.8.8	
1.4.1	Use of colour	It must be ensured that colours are not the only way to convey information, indicate an action or	[visual]/[any]	1.4.1		9.1.4.1

Contribution
Accessibility requirements

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Contribution
Design Patterns

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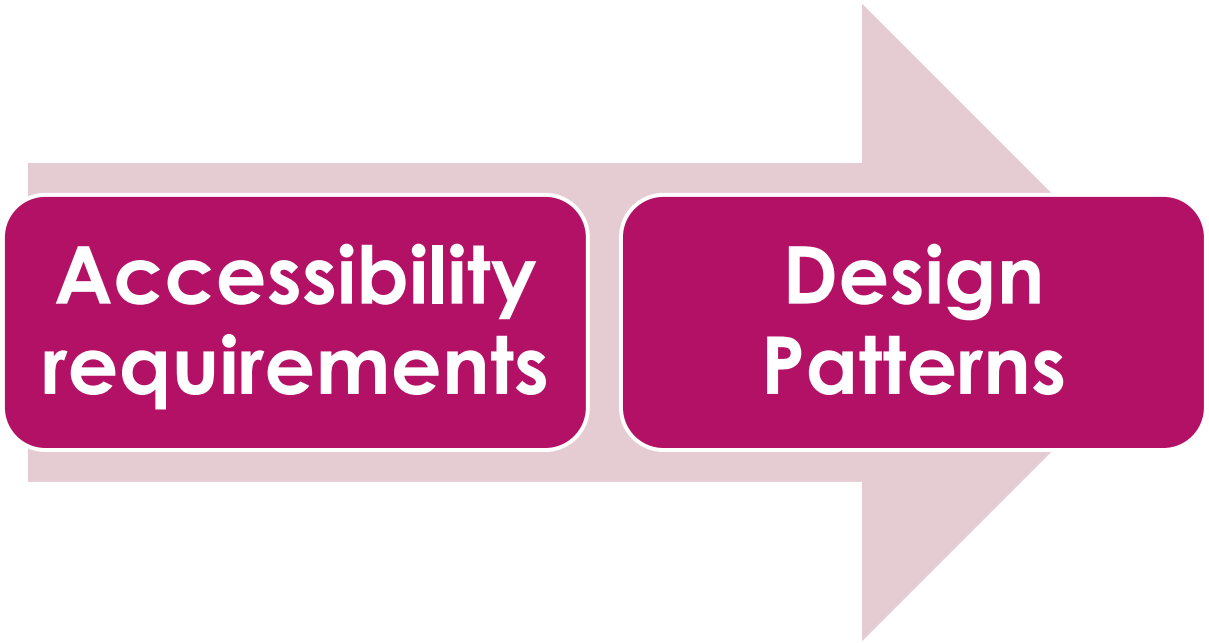

- 10 design patterns
  Structure:
  - Problem
  - Solution
  - Requirements
  - Mockup

Design Patterns

P1 - Alternative to information way: Subtitling.

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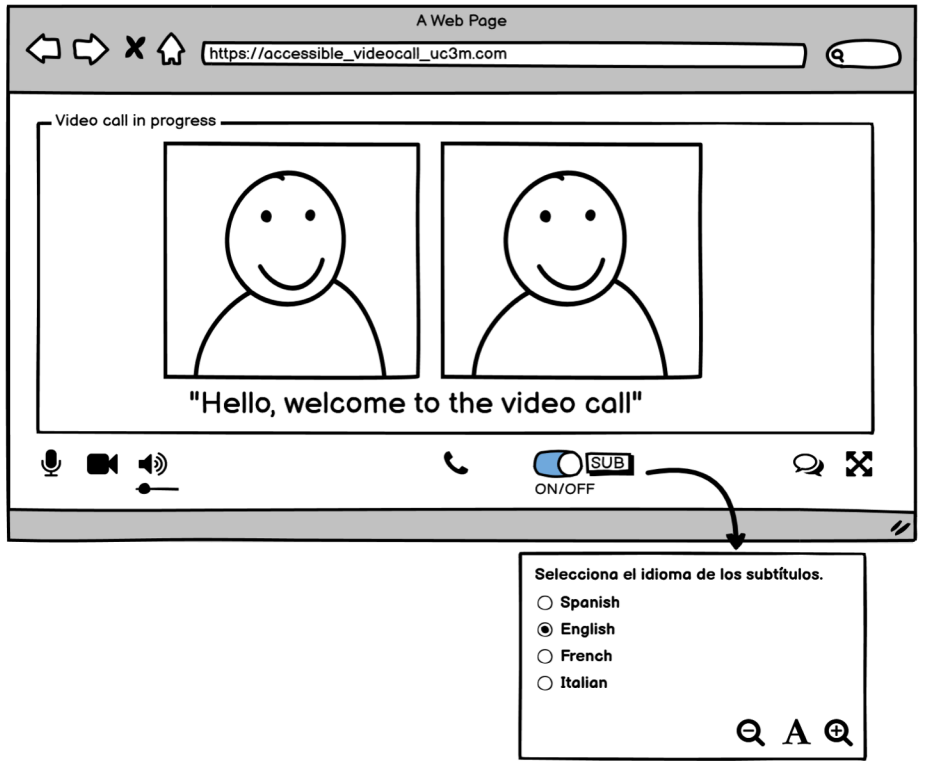
- **Problem**: A video call offers a transmission of information through a language; this language is usually orally expressed and received by users through hearing, which can be a barrier for people with hearing impairment.
- **Solution:** Offer the user the possibility to set up subtitles for the deaf that transcribe the audio played during the video call. These subtitles can be activated or deactivated during the call. They will be saved if the video call is recorded and synchronized with the audio of the video call. Moreover, the user is allowed to enlarge the text to facilitate the visualization of the information.
- **Requirements:** 1.1.1, 1.2.1, 1.2.2, 1.2.3, 1.2.4 and 1.4.4.



Design Patterns

P1 - Alternative to information way: Subtitling.

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- Include subtitles to avoid accessibility barriers for people with hearing disabilities.
  - These subtitles can be provided by a person who subtitles, or through an automatic process.
  - It must be able to be turned on or off.
  - It should be possible to change the size of the text.
  - If the meeting is recorded, these subtitles must be stored and synchronized with the video.

Design Patterns

P2 - Alternative to information way: Sign Language view

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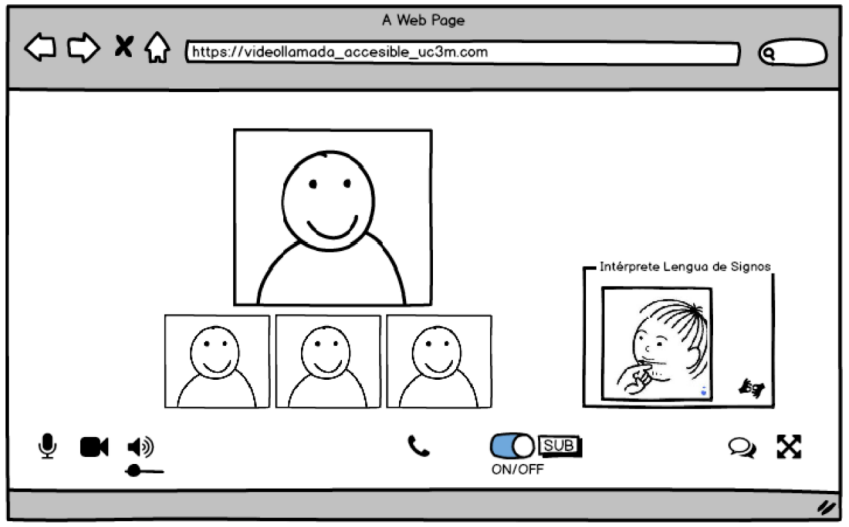
- Provide sign language for deaf or people with hearing loss who require sign language.
  - A window for an interpreter must be provided.
  - This window must always be visible and differentiated from the rest.
  - This window must adapt to the orientation of the screen or its dimension.



Design Patterns

P3 - Configuration: Sensory characteristics

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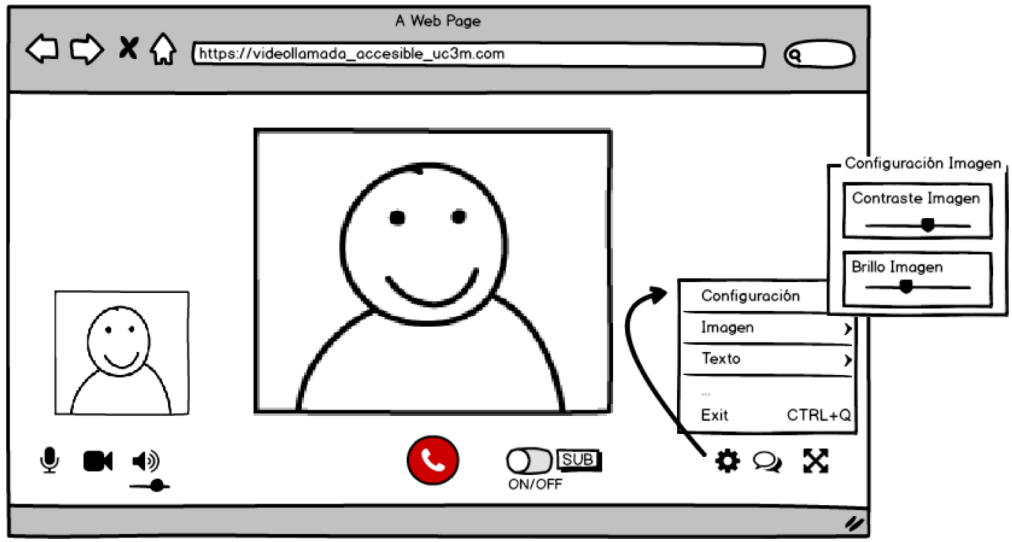
- Features such as the contrast, brightness, and color of the image used can cause accessibility barriers for people with vision-related disabilities.
  - A menu setting must be provided.
  - It should allow modifying the contrast, brightness of the image, style, and size of the text font.



Design Patterns

P4 - Audio control and interactions

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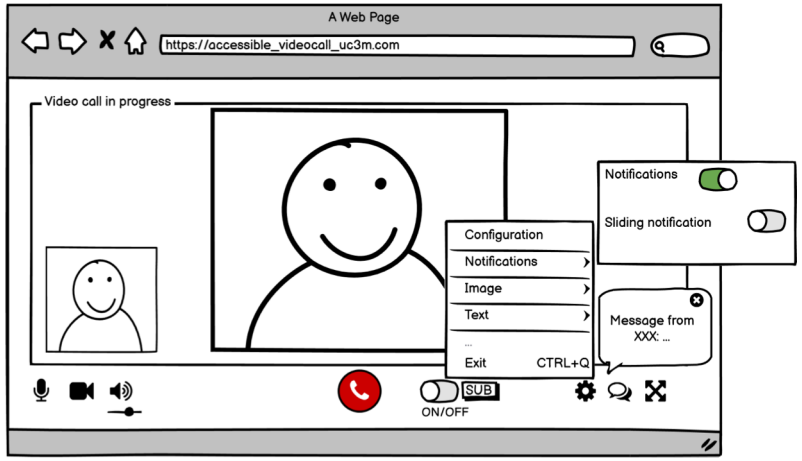
- There are interactions that can interrupt the user's attention and concentration during the video call, such as inadequate audio volume, sliding notifications, or blinking.
  - The interface will not include flashing elements that may annoy users.
  - A setting menu must be provided. It must include
    - an audio control mechanism to adjust the volume according to the user's preferences.
    - settings to disable notifications.



Design Patterns

P5 - Components and significance

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- A lack of knowledge regarding the components in the interface can cause a loss of context for the user during the video call.
  - The interface must show information about its components, allowing the user to see the different possibilities of selecting that component without losing sight of the previous options.
  - Labels shall be included to clarify the action of interactive elements such as buttons.
  - Links must be clear and concise to indicate their purpose.
  - Users must know where they are or what action they are performing.

Design Patterns

P6 - Configuration. Input/Output

- A video call can be inaccessible if it is not easy to change its input and output for both audio and image.
- Provide an easy-to-use user preferences settings menu that allows choosing audio and image input and output options (if the user needs to use an assistive tool, microphone, speaker, or camera).
- These changes must be persistent over time.

Design Patterns

P7 - Actions status.

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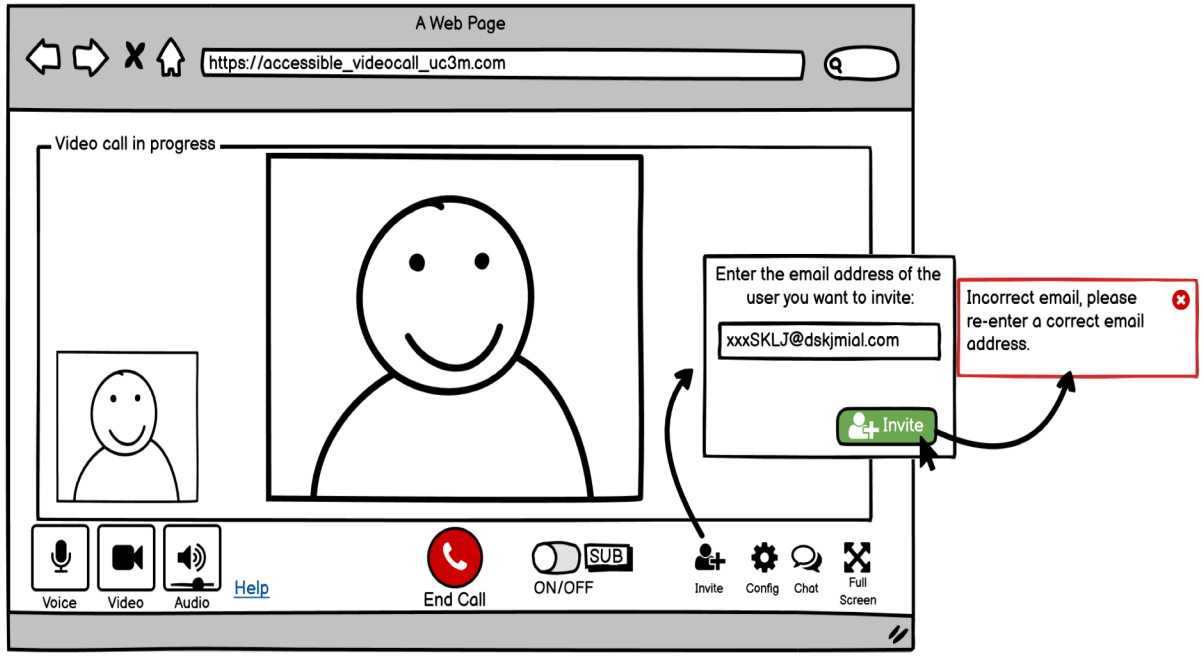
- Each action performed by the user must display a label o message clearly stating and confirming the correct execution.
- In case of a user error, the user must be informed and guided on how to correct this error.



Design Patterns

P8 - Identification and enlargement of the elements

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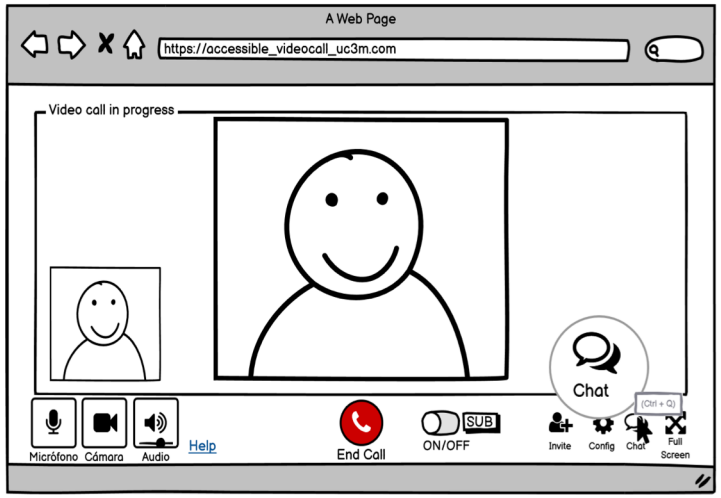
- A visually impaired user may present accessibility barriers if components, buttons, or messages are too small.
- Users with cognitive disabilities may also present barriers if they cannot identify the elements due to their size.
  - The elements of the interface must show an adequate size.
  - Also, a mechanism must be provided to activate the enlarge and zoom option by hovering the mouse over an interactive element.



Design Patterns
P9 - Clear and accessible authentication

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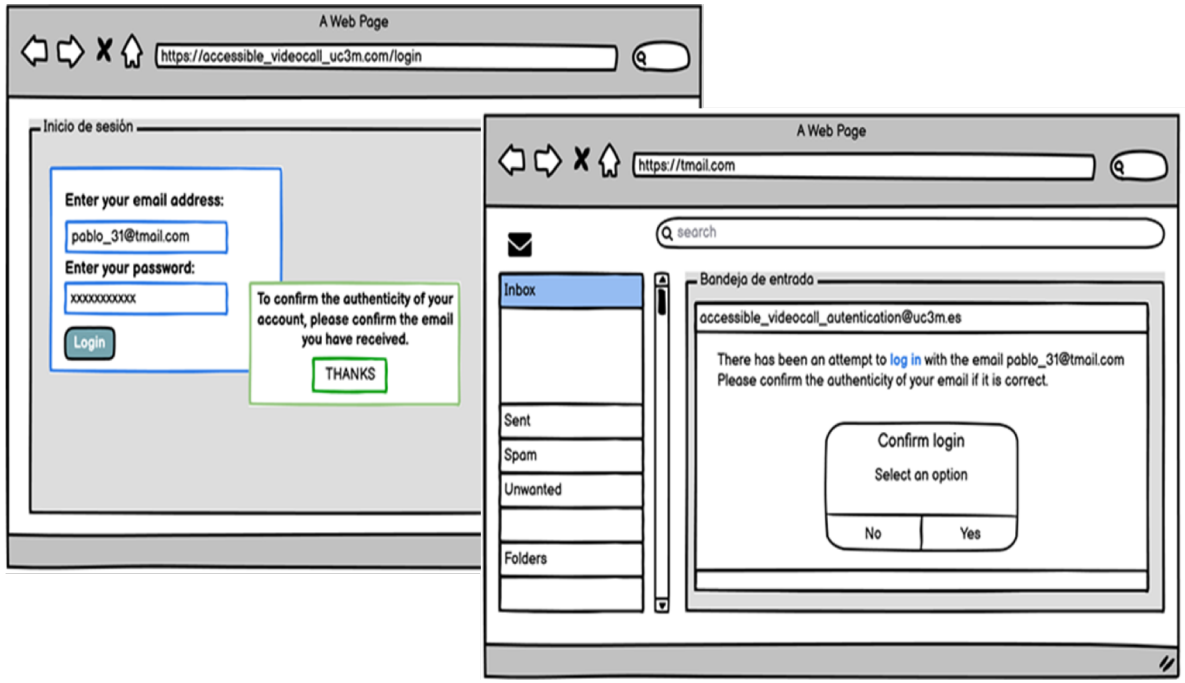
- The interface will provide an account authentication system to ensure security.
- Account authentication should be simple.



Design Patterns

P10 - Accessible documentation.

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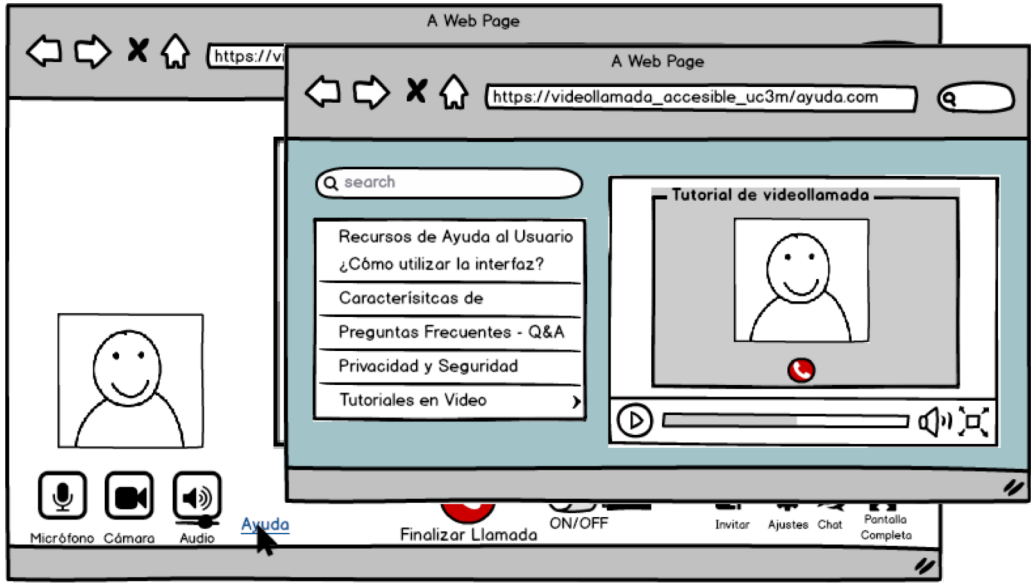
- The user may need information and documentation on the accessibility features of the interface.
  - A "Help" link should be included to provide accessible documentation.
  - In addition, providing human assistance will also be valuable.



Design patterns evaluation

- Are these design patterns suitable?
- A preliminary study was conducted to validate the suitability and usefulness of the design patterns proposal.

Design patterns evaluation Participants

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8 web designers and developers.

	Web design Experience	Accessibility Knowledge
User 1	4	4
User 2	2	4
User 3	4	5
User 4	1	2
User 5	2	3
User 6	3	3
User 7	4	4
User 8	1	2

Design patterns evaluation
Stimuli and method

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- **Method:** Survey with four questions asking for feedback about the suitability of the proposed design patterns.
- **Stimuli:** Document describing the patterns.
- **Questions:**
  - Do you find the patterns easy to understand?
  - How useful would these patterns be if you had to build an accessible video call app design?
  - Considering the documentation of the WCAG and EN 301 549 standards, do you think that this collection of design patterns is a good and agile tool or resource for designers?
  - Make the comments you consider relevant.

Design patterns evaluation Results

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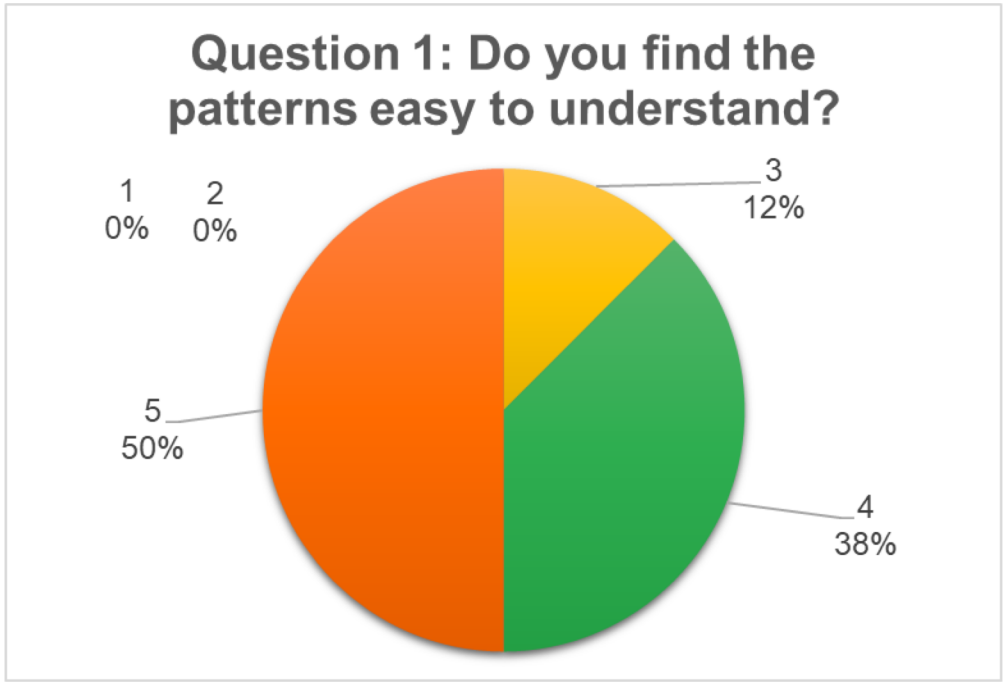
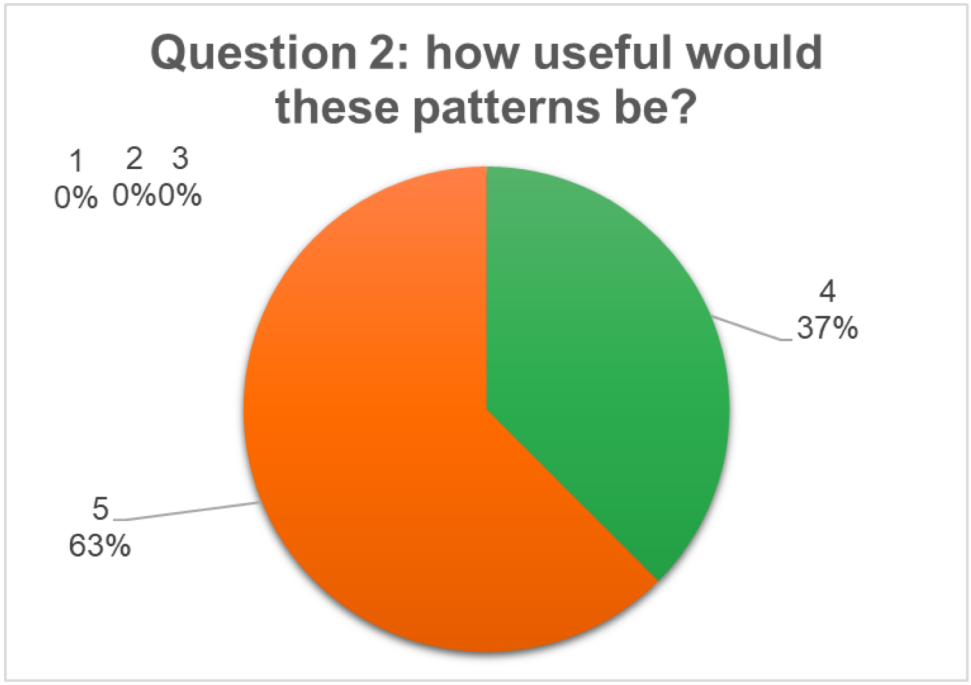
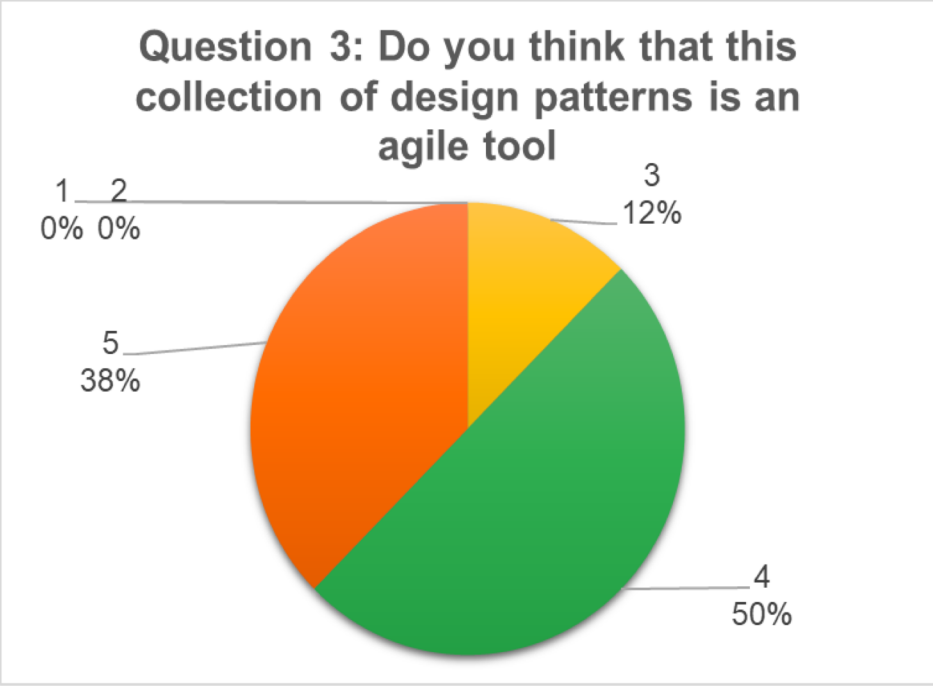




Design patterns evaluation Results



Question 4: Comments

- Missing more specific requirements for video conferencing tool interactions with keyboard-only users.
- Incorporate a requirement to provide caption storage.
- The patterns are beneficial for the Web but would be very difficult to extrapolate and apply to mobile devices.

Conclusions

- Lack of accessibility in videoconferencing platforms.
- Lack of accessibility knowledge in designers and developers
- Contribution:
  - Requirements, design patterns, and their evaluation.
- Evaluation results
  - Patterns are useful and helpful documentation
  - It is necessary to incorporate requirements more oriented to keyboard access users such as the blind.
  - They are difficult to extrapolate to a mobile scope

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- https://access2meet.uc3m.es/

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Work in progress

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- Prototypes with limited functionality have been designed.
- They will be evaluated with users without and with disabilities in Spain, and with older people in the UK.