Appt Accessibility Handbook

Appt Foundation

Jan Jaap de Groot & Paul van Workum

Acknowledgements

Download the digital version of this handbook at:
appt.li/handbook

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Preface

The world around us is becoming increasingly digital. Every person has the right to participate equally in society. The use of apps has become an important part of this. Therefore, it's essential that apps are accessible to everyone.

Inaccessible apps exclude many people. In the digital world, it is difficult to get help when you are stuck. Worldwide, more than 1 billion people with disabilities benefit from accessible apps.

This handbook provides concrete tools to make apps accessible, so that governments, companies, and app developers do not have to reinvent the wheel.

Our knowledge base (appt.org) and our app (appt.li/app) contain hundreds of in-depth articles.

We are collectively committed to a future in which all apps are accessible. We hope this handbook not only provides you with valuable insights and knowledge, but also inspires you to make your app accessible!

Appt Foundation
Jan Jaap de Groot, Paul van Workum and Johan Huijkman

"Everyone benefits from accessibility"

"Just in The Netherlands alone, millions of people live with some form of disability. This includes disabilities present from birth and those developed later in life, such as (color) blindness, deafness, or spasms. Additionally, there is a growing number of elderly people who, for example, experience declining vision or hearing.

It's important that these people can continue to participate in a society that is becoming increasingly more digital. They should be able to maintain their independence through digital platforms like mobile apps. Therefore, app developers need to take the diverse needs of these target groups into account.

Initially, this might be a challenge. What are these needs? And what do you need to consider to make an app accessible? To answer these questions, guidelines have been developed. This handbook offers solutions. It explains these guidelines in understandable language.

The beauty of making an app accessible is that the app becomes more understandable and user-friendly for everyone. For example, good color contrast is also beneficial when the sun shines on your phone. And subtitles in videos are useful when you cannot turn on the sound.

Start making your app accessible today and let this potentially new customer group become your new ambassadors!"

Jeroen de Vrind
Senior iOS Developer

"Accessibility is doing good business"

"Accessibility isn't just good for business, it's doing good business. It opens doors for countless users, empowering them to achieve their full potential. Accessibility guidelines provide a clear roadmap to building quality applications. They outline exactly what makes software work for everyone.

Android is becoming one of the world's most popular operating systems. It's not just in phones, but also in cars, kiosks, and even music boxes. Making these tools accessible invites more people into the public domain and empowers them to thrive. We could enable the next Stephen Hawking, Frida Kahlo, or Helen Keller.

The open source nature of Android has allowed developers like myself to create enhanced tools like the "Android Ally Plugin". This tool uses the source code of the Android screen reader to make the development of accessible apps easier.

Additionally, accessibility can provide inspiration for the next wave of digital experiences. Apps like Voice Control and TalkBack are powerful tools eliminating restrictions to what people can achieve in the digital world. They provide new features, such as hands-free usage or keyboard accessibility, which can be applied to new use cases, such as driving mode or remote controls.

By embracing accessibility, we build more than apps, we build a more empowered future. Aim to break down barriers together and unlock the potential of everyone."

Quintin Balsdon
Senior Android Developer

"For the professional of the future, accessibility is a given"

"The mission of the Accessibility Foundation is an inclusive society that is accessible to everyone. Accessible websites and apps are an essential part of this.

Working together with the Appt Foundation and others, we encourage and help organizations with accessibility. Making all websites and apps accessible is a huge task, and we can't do it alone. The world needs many more professionals with knowledge about accessibility. One of the solutions is to ensure that the professional of the future knows what accessibility is.

With our program "Accessibility in Curriculum", we aim to ensure that all students will learn what accessibility is during their studies. We do this by embedding accessibility in the learning objectives of national education programs. But also by working with teachers to incorporate accessibility into existing curricula. This handbook is one of the building blocks in such a curriculum.

We would like to thank Bartiméus Fonds and SIDN Fonds for financially making our Accessibility in Curriculum program possible. Thanks to the Appt Foundation for compiling and publishing this handbook. Only together we can make the dream, 'for the professional of the future, accessibility is a given', a reality."

Arja Boer
Project Manager Accessibility in Curriculum

1. Introduction

This handbook consists of three parts.

1. **Disabilities and Features**
   An explanation of the different types of disabilities that people experience and information about the available accessibility features to use apps.

2. **Legislation and Guidelines**
   An overview of relevant laws and a simplified explanation of the guidelines, to understand when an app is accessible.

3. **Approach**
   A practical approach to create accessible apps with guidance for designers, developers and testers.

Disclaimer

The authors of this handbook are fully aware of their task to provide as reliable a publication as possible. Nevertheless, they accept no liability for any inaccuracies that may occur in this publication. It is possible that certain context is missing and/or the explanation does not fully correspond with the source. For a thorough understanding, always consult the official source directly.

2. Disabilities

Disability occurs when a particular task isn't suitable for someone's abilities. This can be caused by personal traits or environmental factors.

Some disabilities are permanent, such as being blind or deaf. Other disabilities are temporary, like a broken finger. Additionally, there are situational disabilities; for example, it is not acceptable to play sound in certain situations.

It is estimated that there are 1.3 billion people with a permanent disability worldwide. They represent 16% of the global population. This percentage is expected to increase. Nearly half of the people over the age of 60 have one or more disabilities.

All people have the right to access apps equally. Accessibility is not a feature which can be toggled on or off. Accessibility should be woven into every stage of design, development and testing.

Commit to building accessible apps. Do this for the people for whom it is necessary. And for your future self, who is likely to have a disability.

> "I'm not disabled, the world disables me."
>
> Darice de Cuba

Hearing Impairments
Deaf and hard of hearing

Worldwide, 430 million people have hearing loss, of which 70 million are deaf. They have difficulty perceiving sound and depend on alternatives, such as subtitles.

Cognitive Impairments
Dyslexia, ADHD, and memory loss

People with cognitive impairments have problems with remembering, concentrating, or reading. People with ADHD are more easily distracted. People with dyslexia have difficulty reading. Worldwide, 240 million people worldwide have dyslexia.

Mobility Impairments
Amputation, paralysis, spasm, or rheumatism

There are various physical and motor impairments that affect the use of apps. Input via touch is not always possible and alternative input through buttons or a keyboard is necessary.

Visual Impairments
Blind and visually impaired

Worldwide, 295 million people are severely visually impaired. They have difficulty perceiving the visual content in apps. 43 million people are blind and cannot perceive visual content at all.

Speech Impairments
Stuttering, lisping, mutism

Worldwide, 19 million people have speech impairments, such as stuttering and lisping. It can be difficult for them to execute voice commands.

Age-related Impairments
Hearing, cognitive, mobility, visual and speech impairments

Worldwide, 442 million people have impairments caused by aging. Decreased hearing and vision, slower learning, and a decline in motor skills are common. This group is expected to grow significantly.

More information about the disabilities is available at:
appt.li/disabilities

3. Features

Features are available to use apps in alternative ways. For some people with a disability, these features are essential. For others, it reduces the barriers they experience.

Commonly used features include: text scaling, dark mode, screen reader, voice control, switch control, and external keyboard.

Text Scaling
People with a visual impairment

As many as 1 in 4 users have opted for a larger text size. Visually impaired people may have difficulty reading small letters. Text in apps must support scaling to at least 200%. Apps must scale all characters and they must remain fully visible. Therefore, it is necessary that each screen contains a 'ScrollView' to allow scrolling.

Dark Mode
People sensitive to light

Supporting dark mode enables users to use the app with a dark background. Around 30% of all users prefer dark mode. A light background can even cause problems for people who are sensitive to light. Furthermore, people with a concussion can benefit from dark mode.

Screen Reader
People with a visual impairment

A screen reader reads out everything displayed on the screen. This way you can use apps, even if you are blind or have low vision. By using gestures you can navigate through apps and perform actions. Swipe left to go to the previous element. Swipe right to go to the next element. Double tap to activate an element. The screen reader is needed to find many of the possible accessibility issues.

Learn to use the screen reader at: screenreader.app

Voice Control
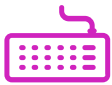## People with a mobility impairment

With voice control, it's possible to operate an app with your voice. This is a very important feature for users with a mobility impairment. Labels or numbers can be shown which allow users to control elements. For example, you can say, 'Tap back', 'Show labels' or 'What can I say' to control an app. Unfortunately, voice control is not available in all languages yet.

Switch Control
People with a motor impairment

People with a severe motor impairment use switch control to operate apps. Switch control works with internal or external switches. Internal switches are, for example, the camera. External switches are physical aids, like a physical button or joystick. Operation can be done, for example, by blinking the eyes or pressing buttons.

External Keyboard
People with a mobility impairment

With an external keyboard, it's possible to control your device. For people with a mobility impairment, it may be difficult or even impossible to operate an app with a touchscreen. Also, for blind people, the keyboard is useful for navigating and typing faster. The external keyboard is an important tool for testing the accessibility of apps. Ensure that the app is fully operable with an external keyboard. Other features such as switch control and voice control will also function better as a result.

More information about the features is available at:
appt.li/features

4. Legislation

Every country has its own legislation on accessibility. In many countries, this legislation refers to the Web Content Accessibility Guidelines (WCAG).

UN Convention on the Rights of Persons with Disabilities
1.3 billion people with disabilities

Most countries in the world have signed the UN Convention on the Rights of Persons with Disabilities. The convention promotes, protects, and ensures the human rights of people with disabilities.

Europe
80 million people with disabilities

In Europe, the Web Accessibility Directive (WAD) applies to governments and the European Accessibility Act (EAA) to the businesses. Both refer to the EN 301 549 standard. This standard includes a chapter specifically on software, including mobile apps. Version 3.2.1 of EN 301 549 refers to 44 success criteria of WCAG 2.1. More than 80 million people with disabilities in Europe benefit from this legislation.

United States

60 million people with disabilities

In the United States, Section 508 and the Americans with Disabilities Act (ADA) apply. Section 508 requires federal governments to make their mobile apps accessible. The ADA applies to all entities, organizations, public, private, and nonprofit except for federal governments. The ADA demands equal access to all goods, services, information, and communication. THe latest rule. The legislation refers to the Web Content Accessibility Guidelines.

More information about the legislation is available at:
appt.li/legislation

5. Guidelines

The international standard for digital accessibility is the Web Content Accessibility Guidelines (WCAG). The guideline was initially written for websites, but is also applicable to apps.

The current version, WCAG 2.2, consists of 4 principles, 13 guidelines, and 86 success criteria. The success criteria are divided into three levels: A, AA, and AAA. Generally, organizations strive to meet levels A and AA.

Principles	1. Perceivable				2. Operable					3. Understandable			4. Robust
Guidelines	1.1	1.2	1.3	1.4	2.1	2.2	2.3	2.4	2.5	3.1	3.2	3.3	4.1
Success Criteria Level A	1.1.1	1.2.1	1.3.1	1.4.1	2.1.1	2.2.1	2.3.1	2.4.1	2.5.1	3.1.1	3.2.1	3.3.1	4.1.1
		1.2.2	1.3.2	1.4.2	2.1.2	2.2.2		2.4.2	2.5.2		3.2.2	3.3.2	4.1.2
		1.2.3	1.3.3		2.1.4			2.4.3	2.5.3		3.2.6	3.3.7	
								2.4.4	2.5.4				
Success Criteria Level AA		1.2.4	1.3.4	1.4.3				2.4.5	2.5.7	3.1.2	3.2.3	3.3.3	4.1.3
		1.2.5	1.3.5	1.4.4				2.4.6	2.5.8		3.2.4	3.3.4	
				1.4.5				2.4.7				3.3.8	
				1.4.10				2.4.11					
				1.4.11									
				1.4.12									
				1.4.13									
Success Criteria Level AAA		1.2.6	1.3.6	1.4.6	2.1.3	2.2.3	2.3.2	2.4.8	2.5.5	3.1.3	3.2.5	3.3.5	
		1.2.7		1.4.7		2.2.4	2.3.3	2.4.9	2.5.6	3.1.4		3.3.6	
		1.2.8		1.4.8		2.2.5		2.4.10		3.1.5		3.3.9	
		1.2.9		1.4.9		2.2.6		2.4.12		3.1.6			
								2.4.13					

On the following pages, we provide a brief explanation for each principle, guideline, and success criterion at level A and AA.

More information about the guidelines is available at: appt.li/guidelines

Perceivable
Principle 1

Users must be able to perceive the content of apps. For example, someone who is blind cannot see the interface. Deaf users cannot hear information. Ensure that information is perceivable in an alternative way for users with disabilities.

T Text Alternatives
Guideline 1.1

All content must also be described as text. Text can be displayed visually, auditory or in braille. This allows users to convert information into a form that suits their needs.

Non-text Content
Success Criterion 1.1.1 • Level A

Ensure that alternative text is available for all non-text content. This includes images, icons and graphs. Describe the meaning of this content. Blind people use their screen reader to read out this description. Alternative text can also be useful for anyone who is unsure about the meaning of non-text content.

Read more at: appt.li/1.1.1

Time-based Media

Guideline 1.2

Everyone should have access to media, such as audio and video. People who are deaf cannot hear what is being said. People who are blind cannot see what is shown on images. By providing a transcript, subtitles and/or audio description, anyone can perceive media.

Audio-only and Video-only (Prerecorded)

Success Criterion 1.2.1 • Level A

Ensure a transcript is provided when information is only conveyed by audio or images. With podcasts, the information is conveyed only through audio. People who are deaf cannot hear what is being said. In animation films, the information is often only conveyed through images. People who are blind cannot see the images.

Read more at: appt.li/1.2.1

Captions (Prerecorded)
Success Criterion 1.2.2 • Level A

Ensure captions are provided for all videos with sound. People who are hard of hearing, deaf or deafblind depend on captions to understand what is being said. Captions are also useful for anyone who is temporarily unable to perceive sound, for example inside a quiet zone.

Read more at: appt.li/1.2.2

Audio Description or Media Alternative (Prerecorded)
Success Criterion 1.2.3 • Level A

Ensure a transcript or audio description is provided for videos where you can't hear what is displayed. The content can then be read in case of a transcript, or heard in case of audio description.

Read more at: appt.li/1.2.3

Captions (Live)
Success Criterion 1.2.4 • Level AA

Ensure real-time captions are available for all live videos with audio. This allows people who need subtitles to directly access the spoken information.

Read more at: appt.li/1.2.4

AD))) Audio Description (Prerecorded)
Success Criterion 1.2.5 • Level AA

Ensure audio description is available when important information is shown which you cannot hear. This can be done by offering an extra audio track. This allows people who are blind or have difficulty processing visual information to also understand the content.

Read more at: appt.li/1.2.5

Adaptable
Guideline 1.3

Content on the screen must be adaptable to the needs of users. By exposing the structure and information to assistive technologies, it can be presented in different ways. For example, headings are indicated visually but should also be marked for screen reader users.

Info and Relationships
Success Criterion 1.3.1 • Level A

Ensure that the information and relationships on the screen are not just conveyed visually.

Information on the screen must be conveyed to assistive technologies. For example, make sure that headings are not only bold, but also marked as headings in the code.

Relationships on the screen must be indicated to assistive technologies. Elements in a list must be navigable one by one. Elements in a table must be navigable by rows and columns.

Read more at: appt.li/1.3.1

Meaningful Sequence
Success Criterion 1.3.2 • Level A

Ensure that the order which assistive technologies follow accurately reflects the meaning of the content. Elements that belong together must be presented together. Otherwise, users may misunderstand the content.

Read more at: appt.li/1.3.2

Sensory Characteristics
Success Criterion 1.3.3 • Level A

Ensure instructions can be understood by everyone. Instructions that use only shape, size, location, orientation or audio are not understandable for everyone. For example, people who are blind cannot see shapes. Combine multiple properties to allow everyone to understand instructions.

Read more at: appt.li/1.3.3

Orientation
Success Criterion 1.3.4 • Level AA

Ensure that content on the screen rotates with the orientation of the device. All screens of an app must be usable in all orientations. Users in wheelchairs sometimes have their device mounted in a fixed position. More words fit on the screen in landscape mode, useful for users with a larger font size.

Read more at: appt.li/1.3.4

Identify Input Purpose

Success Criterion 1.3.5 • Level AA

Ensure it is clear what information is expected from users inside input fields. Set the correct input type to allow auto-completion, e.g. for e-mail addresses. This is faster for everyone and reduces errors for users with disabilities.

Read more at: appt.li/1.3.5

Distinguishable
Guideline 1.4

Content must be easy to distinguish. Above all, it should be easy to distinguish the foreground from the background. Text must have sufficient contrast, needs to support scaling and must not be omitted or shortened anywhere. Users should be able to stop sound if it disturbs them.

Use of Color
Success Criterion 1.4.1 • Level A

Ensure color is not the only way information is conveyed. Not everyone can perceive color. For example, include shape in your instructions, such as a green check mark or red cross. And inside a legend of a map, use numbers in addition to color, to allow people who are color blind to find what they are looking for.

Read more at: appt.li/1.4.1

Audio Control
Success Criterion 1.4.2 • Level A

Ensure that audio which lasts longer than three seconds can be paused or stopped. This is important for people who have difficulty concentrating. In addition, the screen reader is difficult to use when other audio is playing.

Read more at: appt.li/1.4.2

Contrast (Minimum)
Success Criterion 1.4.3 • Level AA

Ensure that the contrast ratio between the text color and background color is at least 4.5:1. For bold and large text, a contrast ratio of 3:1 is sufficient. By maintaining these ratios, visually impaired and color blind users can usually read the text well. In addition, this makes an app easier for everyone to use, for example outside in the sun.

Read more at: appt.li/1.4.3

Resize Text
Success Criterion 1.4.4 • Level AA

Ensure that text can scale. Users set their preferred font size in the system settings. This is especially important for visually impaired users because they might not be able to read the text otherwise. In addition, scaled text may not be truncated, overlap other text or become unreachable.

Read more at: appt.li/1.4.4

Images of Text
Success Criterion 1.4.5 • Level AA

Ensure images are not used to display text. Text in an image often scales to a limited extent or not at all. Use plain text to allow the text to scale based on the user's preferences.

Read more at: appt.li/1.4.5

Reflow
Success Criterion 1.4.10 • Level AA

Ensure content can be reached without having to scroll in two directions at the same time. This can cause users to lose their orientation on the screen. Providing horizontally and vertically scrollable content on one screen is permitted, but the content may only scroll in one direction at a time.

Read more at: appt.li/1.4.10

Non-text Contrast
Success Criterion 1.4.11 • Level AA

Ensure that content on the screen has a contrast ratio of at least 3:1. This includes graphical elements such as icons, input fields and the focus indicator. Also ensure that selected elements are clearly recognizable. Visually impaired and color blind users need to be able to distinguish content. This makes apps easier to use for everyone, for example outside in the sun.

Read more at: appt.li/1.4.11

Text Spacing
Success Criterion 1.4.12 • Level AA

Ensure there is enough space between paragraphs, letters and words. People with dyslexia can read faster as a result. People who are visually impaired can also read the text more easily. White space can also help people with a cognitive impairment to distinguish parts from each other.
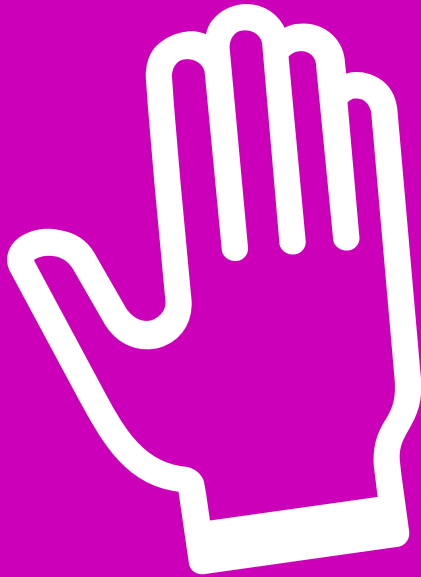
Read more at: appt.li/1.4.12

Content on Hover or Focus

Success Criterion 1.4.13 • Level AA

Ensure that content shown after hover or focus can be hidden. Content must remain visible until the reason for the hover or focus disappears. In addition, users need to be able to dismiss the content.

Read more at: appt.li/1.4.13

Operable
Principle 2

Users must be able to operate apps with the technologies they use. Ensure functionality is not only operable via touch. People who use a screen reader, voice control, switch control, external keyboard or other assistive technologies should also be able to operate apps.

Keyboard Accessible
Guideline 2.1

Users must be able to operate all functionality of apps with a keyboard interface. There should be no places where you get stuck when using assistive technologies. This includes the screen reader, voice control, switch control and external keyboard.

Keyboard
Success Criterion 2.1.1 • Level A

Ensure that all functionality in an app can be used via the keyboard interface. This includes external keyboard, screen reader, switch control and voice control. Visually impaired people use a screen reader. People with a motor disability use switch control and voice control.

Read more at: appt.li/2.1.1

No Keyboard Trap

Success Criterion 2.1.2 • Level A

Ensure users of the keyboard interface do not get stuck. Users might not be able to close pop-ups, menus and overlays. Many assistive technologies do not support clicking next to an element. You must include a close button which assistive technologies can activate.

Read more at: appt.li/2.1.2

Character Key Shortcuts

Success Criterion 2.1.4 • Level A

Ensure that shortcuts cannot be accidentally activated when using assistive technologies. Many assistive technologies emulate keystrokes to perform actions. Users might accidentally activate shortcuts. Make it possible to change or disable shortcuts.

Read more at: appt.li/2.1.4

Enough Time

Guideline 2.2

Users must be able to complete tasks in the time they require. Users with disabilities or those who use assistive technologies often need more time to complete tasks. Filling in data takes much longer when using switch control. People who are visually impaired need more time to read. It should therefore be possible to extend time limits and pause distracting content.

Timing Adjustable

Success Criterion 2.2.1 • Level A

Ensure everyone has enough time to complete tasks. People with disabilities might need more time to navigate through a screen. Operating an app with assistive technologies is often slower compared to touch. People with learning disabilities, dyslexia and cognitive impairments might also need more time. If there are time limits, users need to be able to adjust the time limit. It's best to avoid time limits.

Read more at: appt.li/2.2.1

Pause, Stop, Hide

Success Criterion 2.2.2 • Level A

Ensure it is possible to pause, stop or hide moving elements on the screen. Users may have difficulty using apps with moving elements. For example, flashing content makes it harder for people with attention disorders to stay focused.

Read more at: appt.li/2.2.2

Seizures and Physical Reactions

Guideline 2.3

Apps should be safe for everyone to use. Some people can have a seizure because of flashing images. People are often only aware of this condition after having their first seizure.

Three Flashes or Below Threshold

Success Criterion 2.3.1 • Level A

Ensure no more than three flashes per second are shown anywhere in the app. This can cause an epileptic seizure. Trigger warnings are often missed, especially by people who cannot read, such as children.

Read more at: appt.li/2.3.1

Navigable
Guideline 2.4

Users must be able to navigate to the information they are looking for. It should be clear where you are and where you can go. Headings are important to understand the structure of a screen. Avoid unusual features because this can be confusing.

Bypass Blocks
Success Criterion 2.4.1 · Level A

Ensure content which is repeated on multiple screens can be skipped. This is especially important for users of assistive technologies. With assistive technologies you usually navigate through the screen per element. It takes a lot of time if you have to navigate through the entire menu on each screen.

Read more at: appt.li/2.4.1

Page Titled
Success Criterion 2.4.2 • Level A

Ensure each screen has a clear title. The title tells users what screen they are on and what they can do. This information is useful for all users to know. And is especially important for people with cognitive disabilities.

Read more at: appt.li/2.4.2

Focus Order
Success Criterion 2.4.3 • Level A

Ensure assistive technologies use a logical focus order when navigating. The order of navigating a screen is usually from left to right, from top to bottom. Make sure assistive technologies use an equivalent focus order.

Read more at: appt.li/2.4.3

Link Purpose (In Context)
Success Criterion 2.4.4 • Level A

Ensure the purpose of each link is clear. Users can request a list of links. The link and its surrounding text should indicate where you will navigate to. Clear links are useful for everyone and especially for users of assistive technologies users.

Read more at: appt.li/2.4.4

Multiple Ways

Success Criterion 2.4.5 • Level AA

Ensure users can reach the screens of an app in multiple ways. For example, onboarding screens are often shown when an app is first launched. You should offer these screens elsewhere in the app so they can be viewed again. A search function can also be useful to jump to a certain screen.

Read more at: appt.li/2.4.5

Headings and Labels

Success Criterion 2.4.6 • Level AA

Ensure headings and labels are descriptive.

Descriptive headings are important to understand how the content is constructed. Blind users can navigate through headings using a screen reader.

Descriptive labels help users identify content. Voice control users speak the labels to perform actions.

Read more at: appt.li/2.4.6

Focus Visible

Success Criterion 2.4.7 • Level AA

Ensure that elements focused by assistive technologies are clearly indicated. App developers might not be able to adjust the color of the frame. However, it is possible to give elements a different background color when they have focus.

Read more at: appt.li/2.4.7

Focus Not Obscured (Minimum)

Success Criterion 2.4.11 • Level AA

Ensure elements remain at least partially visible upon keyboard focus. When users cannot see the focused element, they might not know how to proceed. The focused element should not be completely covered by other content.

Read more at: appt.li/2.4.11

Input Modalities
Guideline 2.5

Ensure all forms of input are possible with assistive technologies. With voice control it is not possible to perform certain gestures. Some users are physically unable to shake their device. These kind of functionalities must be offered in an alternative way.

Pointer Gestures
Success Criterion 2.5.1 • Level A

Ensure there is an alternative for gesture-activated actions. Not everyone is able to move two fingers apart or able to swipe. Provide an alternative, such as a button, that allows the user to perform the action.

Read more at: appt.li/2.5.1

Pointer Cancellation
Success Criterion 2.5.2 • Level A

Ensure it is possible to cancel touches. Buttons should only activate by clicking and not by touching. This gives the user the option to cancel the activation.

Read more at: appt.li/2.5.2

Label in Name

Success Criterion 2.5.3 • Level A

Ensure that the technical name of operable elements includes the visual name. A user should be able to activate a button with the text 'Log in' via this name. This is not possible if the technical name is different. In addition, it is confusing for screen reader users if they hear a different name compared to what is shown on the screen.

Read more at: appt.li/2.5.3

Motion Actuation

Success Criterion 2.5.4 • Level A

Ensure an alternative is provided for motion-triggered actions and make it possible to disable them. Users with limited hand function might not be able to shake their device. On the other hand, users with spasms might accidentally trigger actions.

Read more at: appt.li/2.5.4

Dragging Movements
Success Criterion 2.5.7 • Level AA

Ensure dragging movements have a single-pointer alternative with equivalent functionality, such as tapping or long pressing. Users might not be able to drag items due to mobility impairments or use of assistive technologies. A button could be an alternative to drag-and-drop.
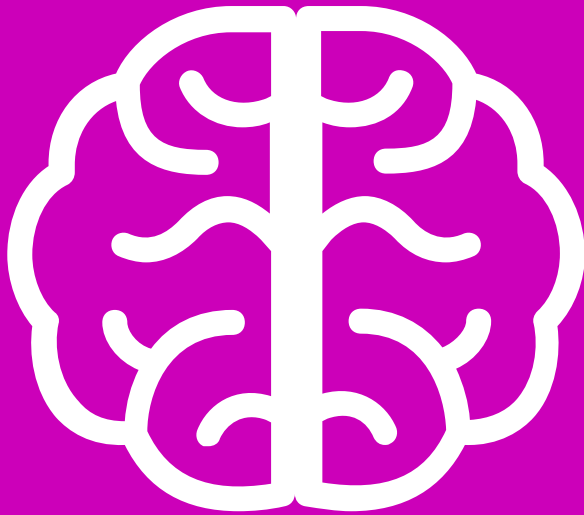
Read more at: appt.li/2.5.7

Target Size (Minimum)
Success Criterion 2.5.8 • Level AA

Ensure targets are large enough and have sufficient spacing to allow users to activate them easily. Users with physical impairments may not be able to activate small targets. The minimum size is 24x24 pixels.

Read more at: appt.li/2.5.8

Understandable
Principle 3

Users must be able to understand the content of apps. It is important to set the language to allow assistive technologies to speak the content in the correct language. Also make sure that the behavior of the app is predictable, allowing users to understand what is expected. Furthermore, clearly identify errors so users can correct them.

Readable

Guideline 3.1

Content must be readable by assistive technologies. This is especially important for assistive technologies which convert text to speech. The content can be spoken clearly when the language is set correctly.

Language of Page

Success Criterion 3.1.1 • Level A

Ensure the language of the app is set. Some assistive technologies read the text shown on the screen. The pronunciation of the words depends on the selected language. An incorrect or missing language causes unclear pronunciation.

Read more at: appt.li/3.1.1

Language of Parts

Success Criterion 3.1.2 • Level AA

Ensure the language of parts is set. Sometimes pieces of text are written in another language. Set the language so text is read out correctly.

Read more at: appt.li/3.1.2

Predictable

Guideline 3.2

Make it predictable what happens after an action. Prevent the screen from jumping on focus or input, because this can be confusing. Keep the navigation in the same place on every screen. Make sure the icons on each screen have the same function. This allows users to know where to navigate and what to expect.

On Focus

Success Criterion 3.2.1 • Level A

Ensure it is predictable what happens when users move to an element. When an element receives focus, it should not be activated unexpectedly. Predictable focus behavior makes it easier for people with disabilities to use your app.

Read more at: appt.li/3.2.1

On Input
Success Criterion 3.2.2 • Level A

Ensure it is predictable what happens when entering data. If the focus is automatically moved upon input, this must be indicated in advance. Avoid this behavior for input fields and checkboxes, among others. Unexpected actions can particularly confuse users with visual or cognitive impairments.

Read more at: appt.li/3.2.2

Consistent Navigation
Success Criterion 3.2.3 • Level AA

Ensure navigation is always in the same place. For example, place the back button in the top left corner. Consistent navigation is especially useful for users of assistive technologies.

Read more at: appt.li/3.2.3

Consistent Identification
Success Criterion 3.2.4 • Level AA

Ensure icons always have the same function. For example, only use a magnifying glass icon to search, and not to enlarge. This makes it clear to users which function they can expect from this icon.

Read more at: appt.li/3.2.4

Consistent Help

Success Criterion 3.2.6 • Level A

Ensure users can access help from a consistent place. When they can't find help, they might give up, make mistakes, or need help from others. Consistent help is useful for everyone and especially for people with disabilities.

Read more at: appt.li/3.2.6

Input Assistance
Guideline 3.3

Make it easy to input data. Users with a disability and users of assistive technologies are more likely to make input errors. It may also be more difficult for them to discover where they have made a mistake. Clearly indicate errors and provide suggestions to solve the errors.

Error Identification
Success Criterion 3.3.1 • Level A

Ensure users receive a clear error message after entering incorrect data. Clearly indicate which entry is incorrect and why. It is important that error messages are also clear to users of assistive technologies. Therefore, also indicate errors in text to allow everyone to perceive them.

Read more at: appt.li/3.3.1

Labels or Instructions

Label

Success Criterion 3.3.2 • Level A

Ensure clear instructions are provided when asking users to input data. Add a label to input fields, for example 'First name'. Mark whether fields are required or optional. Indicate if data must be entered in a specific format, such as dates and phone numbers. Clear instructions help all users, especially users with cognitive disabilities.

Read more at: appt.li/3.3.2

Error Suggestion

Success Criterion 3.3.3 • Level AA

Ensure users are provided with suggestions to correct errors. For example, if a date is entered incorrectly, indicate in which format the day, month and year are expected. The format is yyyy-mm-dd for the order year, month, day. In particular, users with cognitive disabilities benefit from clear suggestions.

Read more at: appt.li/3.3.3

Error Prevention (Legal, Financial, Data)

Success Criterion 3.3.4 • Level AA

Ensure users submit data intentionally. Allows users to undo, correct, or confirm a submission. Provide at least one of these options for submissions that result in a legal obligation, financial transaction, or loss of data. We recommend offering these options for other types of submission as well.

Read more at: appt.li/3.3.4
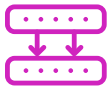
Redundant Entry

Success Criterion 3.3.7 • Level A

Ensure that previously entered information is not requested again. Users with cognitive disabilities may have difficulty remembering what they have previously entered. Previously entered information should be auto-populated or available for the user to select.

Read more at: appt.li/3.3.7

Accessible Authentication (Minimum)

Success Criterion 3.3.8 • Level AA

Ensure that it's easy to log in. Users should be able to use a password manager or have the ability to copy and paste their password. For users with cognitive disabilities it can be difficult to remember passwords.

Read more at: appt.li/3.3.8

Robust
Principle 4

Users must be able to make proper use of apps on their device. Ensure a wide variety of versions and variants of accessibility features are supported.

Compatible

Guideline 4.1

An app should be compatible with as many devices as possible. Avoid errors in the source code. Set a name, role and value for all elements. Ensure status messages are also posted to assistive technologies.

Parsing

Success Criterion 4.1.1 • Level A

Ensure the source code of the app does not contain any errors and does not use any deprecated functions. Assistive technologies may not behave as expected when code does not conform to modern standards.

Read more at: appt.li/4.1.1

Name, Role, Value

Success Criterion 4.1.2 • Level A

Ensure a correct name, role and value is set for all interactive elements.

The name helps users to identify elements. The screen reader speaks the name and voice control uses the name for actions.

The role lets users know what to expect. The role "button" indicates which action takes place upon activation.

The value informs the user. This includes the state (disabled), properties (selected) and values (50%).

For example, give a tab the name "Home", the role "tab", the property "selected" and the value "1 of 4".

Read more at: appt.li/4.1.2

Status Messages

Success Criterion 4.1.3 • Level AA

Ensure that status messages are also passed to assistive technologies. A blind user cannot see new information appear on the screen. This includes error messages during input or loss of internet connection.

Read more at: appt.li/4.1.3

6. Approach

Accessibility is a team effort. People from multiple disciplines have to work together to make and keep an app accessible.

You can use the W3C's Accessibility Maturity Model to determine how accessible your organization is. It has seven dimensions:

1. **Communications:** Information about an organization's accessibility and communication.

2. **Knowledge and Skills:** How well accessibility is understood within an organization.

3. **Support:** The quality of assistance provided to employees and customers with disabilities.

4. **Development Process:** The extent to which accessibility is considered within the development process.

5. **Personnel:** The diversity of the staff and the presence of inclusive employee groups.

6. **Procurement:** Finding and purchasing products that are accessible to everyone, such as software and devices.

7. **Culture:** An organization's attitude towards accessibility, including decision-making.

Read more at: appt.li/maturity

In the following chapters, we focus on three phases of the development process: design, development and testing.

Design

Many accessibility issues can be prevented in the design phase. Discovering issues earlier in the process reduces the cost of correcting them. This is known as: "Shift Left".

Contrast

Text and graphical elements must have sufficient contrast. The higher the contrast, the better the visibility.

Text should have a contrast ratio of at least 4.5:1. This also applies to placeholders in input fields.

A contrast ratio of at least 3.0:1 is sufficient in two situations:

1. Bold text (at least 18.5px, at least 700 font weight)
2. Large text (at least 24px)

Graphical elements must have a contrast ratio of at least 3.0:1. This includes icons and graphs.

Calculate contrast at: appt.li/contrast

Text Scaling

Many users prefer larger text. Create a design with double and triple the font size, and make sure everything remains readable. Text may not overlap or be truncated anywhere on the screen.

This probably means that you have to adjust some things in the design. Provide sufficient space for text to expand. Remove or adjust line limits, to make sure text fits.

Orientation

An app must be usable in portrait and landscape mode. Less vertical pixels are available in landscape mode, making scrolling necessary.

Supporting landscape mode enhances the overall user experience. Landscape mode can also be essential for users who cannot rotate their device independently.

Structure

Ensure the structure of the screens is simple, clear, and consistent. It helps to group related elements, such as list items. Annotate grouped items in the design so the developers can implement it as intended.

Grouped elements allow screen reader users to receive all relevant information at once. In addition, grouped elements have a larger touch target size, making them easier to activate.

Language

Use simple and clear language that everyone can understand. Avoid complex terms and long sentences. Keep it short and easy to read.

It's crucial to think carefully about the language used for headings. Headings often serve as signposts, directing users as they navigate through the app.

Ensure input fields are properly labeled and include clear instructions. Also take incorrect input into account. Ensure that error messages are clear, descriptive, and presented in a way that is easy for all users to understand.

Development

Next, the accessible design can be implemented by the developers. It's important to choose a framework with good accessibility support and to avoid common accessibility issues.

Framework

There are several ways to build apps, such as native, hybrid, or with a cross-platform framework. Native frameworks offer the best accessibility support. With the use of hybrid or cross-platform frameworks, you might have insufficient access to certain accessibility features. If you want to develop a fully accessible app, native is often the best choice.

Read more at: appt.li/frameworks

Name, Role and Value

All interactive elements should have a name, role and value. Users of assistive technologies depend on this information when using apps. Especially when building custom components, setting a name, role and value is often overlooked.

- **Name:** Helps users to identify the element.
- **Role:** Lets users know that to expect on activation.
- **Value:** Informs users of the current value and state.

Dynamic Interface

Due to text scaling and orientation changes, you must ensure that the interface is dynamic. Elements should not have a fixed width or height, allowing them to grow in dimensions as needed.

Try to avoid sticky elements at the top and bottom of the screen. This takes up valuable space in landscape mode. Content may be obscured when the text is scaled. They can also cause problems when the virtual keyboard is visible.

Focus Order

The focus order in an app should be from left to right, from top to bottom. This ensures that screen reader users will navigate through the app in a logical manner. It may be necessary to adjust the focus order in the code.

Alternative Text

Alternative text is essential for users with a visual impairment. It provides a textual description of images, which can be read out by the screen reader, or presented in Braille. Ensure all images have alternative text, except if the image is purely decorative.

Headings

Marking headings in an app helps users to navigate. When headings are indicated in the code, users of assistive technologies can jump from heading to heading. This allows them to use apps faster and understand the structure better.

Testing

The accessibility of an app should be tested during and after the development process. Apps can be tested against a certain conformance target, such as level AA of the Web Content Accessibility Guidelines (WCAG). We explain how you can test manually and automatically.

Conformance Testing

The W3C has created the Website Accessibility Conformance Evaluation Methodology (WCAG-EM) to evaluate the accessibility of websites. Many definitions are specifically for websites, such as URL's and web pages.

Because apps are different from websites, the Appt Foundation has taken the initiative to develop the Appt Evaluation Methodology (Appt-EM). With Appt-EM, organizations can accurately evaluate the accessibility of apps.

Read more at: appt.li/appt-em

Automated Testing

In addition to manual testing, it's possible to automatically test the accessibility of your app. We have created a list of available tools, both free and paid. We suggest development teams to choose a tool that best fits their needs and budget.

Various ways exist to perform automated accessibility tests on Android and iOS apps. There are platform-specific, cross-platform, and framework-specific testing solutions available.

Read more at: appt.li/automated-testing

Manual Testing

You don't need to know everything about accessibility to start testing yourself. Below are some questions to check the accessibility of an app. You can probably find up to 80% of the issues with 20% of the effort.

Disclaimer: These questions allow you to get a first impression. Reach out to an accessibility expert to get a full evaluation, including all nuances and exceptions.

Testing without Assistive Technologies

Without assistive technologies, you can visually test the points below.

- **1.2.2** – Are captions available for videos?
- **1.2.3** – Is a transcript or audio description available for videos?
- **1.3.4** – Does the content of the screen rotate when you rotate the device?
- **1.4.1** – Is all information on the screen clear without the use of color?
- **3.3.2** – Is it clear which fields are required and which data is expected in forms?

Text Scaling

Text scaling is important for many older users and users with visual impairments. You can set your preferred font size in the system settings.

- **1.4.4** – Is text displaying correctly at 200% scaling?

Contrast

Many users with visual impairments rely on sufficient contrast. Ensure text and elements have enough contrast. Take a screenshot of the screen and test the contrast of text and elements. You can do this with a contrast checker.

- **1.4.3** - Is the contrast of normal text at least 4.5:1 and at least 3.0:1 for large and bold text?
- **1.4.11** - Is the contrast of non-text content at least 3.0:1?

Screen Reader

A screen reader reads out what is displayed on the screen. This allows users to operate apps without vision. The screen reader is essential for testing a couple of requirements.

- **1.1.1** - Is alternative text available for non-text content?
- **1.3.1** - Is the layout of the screen clear when using assistive technologies?
- **2.1.1** - Can you fully operate the app with assistive technologies?
- **2.1.2** - Are there places in the app where you get stuck with assistive technologies?
- **2.4.3** - Do assistive technologies use a logical order to navigate through the screen?
- **4.1.2** - Is a correct name, role and value set for interactive elements?

Read more at: appt.li/manual-testing

7. Closing

Fantastic that you've read our handbook from start to finish! We hope you've been inspired to make your apps accessible.

The Appt Foundation promotes accessibility by sharing free knowledge and open source code. We invite everyone to increase this impact together.

Join our community: appt.li/community

Contact us: info@appt.org

About the Authors

Jan Jaap de Groot and Paul van Workum are committed to making apps accessible all over the world. In The Netherlands, they are at the forefront of promoting app accessibility.

Both are affiliated with Abra, the driving force behind the Appt Foundation and sponsor of this handbook.

Abra helps organizations make their apps accessible. Take the free kick-off training at: abra.id/kick-off

Abra also provides software to automatically test the accessibility of apps, try it out at: abra.id/testing.

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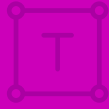
People with disabilities often encounter barriers when using apps. As a result, they are not able to fully participate in the digital world.

Are you a designer, developer, or tester and looking to make your app accessible? Or do you simply want to learn about this important topic?

This handbook simplifies the current guidelines, provides practical tools and proposes solutions. With this handbook you can start making your first improvements within a few hours.

Together we make the world accessible!