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Some Notes from Research Papers

Common disability types:

- ADHD
- Autism
- Mental health (anxiety)

Things to consider:

- **Dark theme** used by many people nowadays, especially whose eyes are more sensitive to light. Implementing dark theme switch would help to reduce eye strain in the evenings.
- **Stereo source:** headphones for people which cannot hear well?
- **Vision impairment people:** colour blindness, poor vision,
- **Font changing** when zoom in (and UI design/navigation needs to adapt) – but difficult to implement
- **People who cannot hear** – audio content should have an alternative consumption format (e.g., subtitles, translate-to-text techniques, eg. In films, AI tools voice-to-text). Deaf people have smaller vocabulary, so you need to have translating tool. *Subtitles need to be adapted to the language of the deaf.*

Code should be written so that screen reader program can work well with it (for people that can hear only). Screen readers work relies on quality of the code elements representation.

If app is text based mostly = it is a lot easier users with poor vision to use it

Apple has content navigation controlled by face mimic

+controlling UI by voice. (it may make app similar to talking to the robot)

“Native accessibility tools alone are insufficient”

While native accessibility tools built into iOS and Android are a valuable starting point for builders, they are not a silver bullet. Our testing revealed numerous instances where apps using basic native components still failed to provide a fully

accessible experience. Notable examples include unlabeled icons, improperly grouped content, missing headings, and a lack of dynamic font support. These issues demonstrate that builders must go beyond simply using native components and actively test and optimize their apps for accessibility. To truly understand where users with disabilities encounter barriers, real user testing is essential.”

Source: <https://arctouch.com/state-of-mobile-app-accessibility>

“Home screen: A poor first impression often leads to abandonment”

The home screen is the first and often most important interaction a user has with an app. A poor home screen experience can lead to immediate abandonment, especially for users with disabilities who encounter accessibility barriers. Across all industries, we found that nearly half (48%) of home screen attributes received Poor or Failing scores, highlighting the need for prioritizing accessibility from that very first interaction.”

Source: <https://arctouch.com/state-of-mobile-app-accessibility>

Web Content Accessibility Guidelines (WCAG)

“Any company, regardless of size of industry, could face legal action” if their websites and apps are inaccessible. (ArchTouch, 2025)

“Beyond legal ramifications, inaccessible apps exclude a significant portion of the potential market, limiting business growth and opportunities. By embracing accessibility, companies not only mitigate legal risks but also unlock the full potential of the digital marketplace”. (ArchTouch, 2025)

“Forrester Research highlighted the **curb-cut effect**, where accessibility features designed for a specific

group end up benefiting a much broader audience.” It worth implementing accessibility features, as it helps to **mitigate legal risks** and cover **more users** in the global population (ArchTouch, 2025)



Source: Forrester blog, [“Make Your Website Accessible Or Leave Money On The Table This Holiday Season.”](#) October 21, 2024.

Key types of assistive technologies: (source: (ArchTouch, 2025))

Screen reader: Evaluating how effectively screen reading software, built into iOS and Android, reads information in the app to users with vision disabilities or to those with learning disabilities that prevent them from accessing text, images, and graphics.

- **Alternative navigation:** Assessing the availability and functionality of alternative navigation methods, including iOS’s Voice Control and Android’s Voice Access, for users with physical disabilities.

- **Font scaling:** Determining whether apps correctly adapt to user-defined font size settings, as users make the text larger or smaller based on their preference and visual needs, ensuring readability for users with low vision or age-related vision changes.

- **Device orientation:** Checking if an app supports both landscape and portrait orientations, accommodating preferences for users with different motor or physical disabilities, as well as those with low vision who may prefer to read in landscape mode

Food & Delivery sector, we chose these six use cases:

- **Home screen:** The initial experience upon launching the app, crucial for first impressions and navigation.
- **Choose address:** Specify the location for delivery.
- **Select restaurant:** Choose local restaurant.
- **Choose menu item:** Browse and select items from a menu.
- **Add to cart:** Add selected items to the shopping cart.
- **Checkout:** View the cart and begin the checkout process.

If a user can't complete the journey of ordering food — by completing all these individual steps — then the app has likely failed in its intended purpose.

14 accessibility attributes used for scoring methodology in the Arch Touch Report (ArchTouch, 2025):

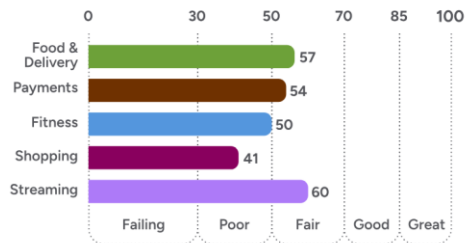
TABLE 1: Accessibility attributes

Screen reader
Are all elements focusable?
Is the focus order logical?
Are related items logically grouped to reduce navigation fatigue?
Do the elements have the correct name, role, and value?
Are the element states being correctly announced?
Are you able to interact with all actionable items?
Do non-decorative images and videos have meaningful text alternatives and descriptions?
Alternative navigation
Are all actionable elements reachable using alternative navigation?
Can you interact with all actionable elements?
Font scaling
Is the font scaling up?
Is the layout resistant to breaking when the font scales up?
Are you able to see everything, without any loss of information?
Are you able to perform all actions?
Orientation
Does the app support both portrait and landscape orientations?

10 key findings from the ArchTouch study report:

1. “Streaming media platforms had highest Industry Accessibility Score.” We can use their mobile app and platforms UI as an example (but not as an ideal, as the grade falls to Fair) for our QT Robot mobile app project.

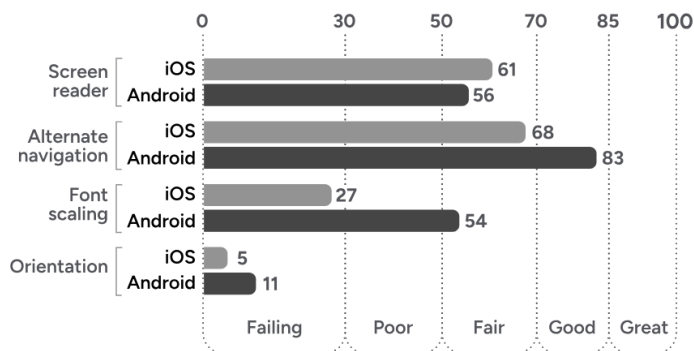
FIGURE 1: Industry Accessibility Scores



[VIEW FIGURE 1 DATA TABLE](#)

2. Android vs IOS apps Assistive Technology support

FIGURE 3: iOS vs. Android Apps by Assistive Technology Support



Neglecting the crucial accessibility feature - **screen orientation** – is a common mistake in the industry (ArchTouch, 2025). Thus, it is important to ensure that our QT Robot app has both portrait and landscape device orientation.

3. Many app developers do not even consider accessibility – and it is a mistake. For this QT Project mobile app we need to:
 - **PROPERLY** label “**name, role, value**” for the on-screen elements. It is essential because the assistive technologies use that information from the code and elements’ labels. There is a widespread disregard for this basic requirement, suggesting that many developers do not prioritize accessibility, even for bare minimum.

Name, role, and value: Key attributes of interactive elements that convey their purpose and functionality to assistive technologies. The name identifies the element (e.g., “Volume”), the role describes its function (e.g., “adjustable”), and the value indicates its current state (e.g., “75 percent”). Although each platform and framework has different nomenclature — e.g. `accessibilityLabel` and `accessibilityTraits` on iOS — we’ve generically used “name, role, and value” nomenclature for the sake of simplicity.

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TABLE 2: App Screens Including Clear Labels with Name, Role, and Value, by Industry

Industry	Yes
Food & Delivery	23.3%
Payments	14.7%
Fitness	12.8%
Shopping	8.9%
Streaming	51.1%
Average	22.2%

4. **“Native accessibility tools alone are insufficient”.** Most notable issues are: unlabeled icons, improperly grouped content, missing headings, and a lack of dynamic font support. Based on findings, authors of the report suggest to “actively test and optimise apps for accessibility” and use **real user testing** to spot barriers for users.
5. **How Shopping apps failed accessibility implementation:**
 - Lacking basic accessibility features, such as properly labelled buttons and image descriptions. Customers cannot identify the purpose of the button, or what products is shown on the picture.
6. **“Landscape orientation is widely unsupported, creating barriers for many”**
Landscape orientation is crucial for:
 - Users with low vision (they also often use landscape mode with font scaling)
 - Users with low mobility (they may have their devices mounted in fixed positions)
7. **Home Screen.** A poor first impression leads to abandonment.
 - It is first and the most important interaction user has with an app. (Should research how to make screen accessible and good for all users).
8. **Builders are too focused on screens, but not enough on the user journeys.**
 - Need to consider accessibility as the entire user journey, rather than in “a fragmented, screen-by-screen manner”.
9. **Technology users aging** and experience changing to their up-close eyesight (presbyopia). Also, 83% of the 50-64 demographic are now users of smartphones. They need features such as font-scaling, subtitles, etc.

Example of successful accessibility features implementation in apps (from the ArcTouch Report) :

Fitness App:

- Screen reader compatibility; captions, audio descriptions, or transcripts for almost all workouts videos; landscape orientation support, seamless switching between landscape and portrait; good navigation; elements and font scaling.

For the project user testing, we could consider **Fable** platform – “enables accessibility managers, user researchers, designers, and developers to connect

remotely and on-demand to people with disabilities, for user research and testing.”

Actions for product leaders, UX/UI designers, and software developers

(Suggested from the Arc Touch Report)

- 1) The [Web Content Accessibility Guidelines \(WCAG\)](#) Aim for conformance with [WCAG 2.2 Level AA](#) as a minimum target and stay informed about the latest updates.

<https://www.gov.uk/service-manual/helping-people-to-use-your-service/understanding-wcag>

- 2) **Leverage native accessibility tools and resources:** Familiarize yourself with and use the built-in accessibility features and tools provided by iOS and Android. Integrating these resources into your workflow can help catch basic accessibility issues early.
- 3) **Go beyond native components: Native** components are a good starting point, but not a complete solution. Actively test and optimize for accessibility, conducting thorough assistive technology testing, and addressing issues with labelling, traits, values, and grouping.
- 4) **Prioritize font scaling and orientation (for people with poor vision and low-mobility)**
- 5) **Accessibility is about the entire user journey, not just individual screens.** Focus on creating seamless and accessible experiences across all user flows.

To meet WCAG 2.2 requirement in thinking and understanding (like people with dyslexia, autism or learning difficulties) ,the QT Robot app design needs to include the principles of **Perceivable, Operable, Understandable** from [Understanding WCAG 2.2 \(GOV.UK\)](#):

Perceivable:

- provide text alternatives ('alt text') for non-text content
- transcripts for audio and video material
- captions for video material
- make sure content is structured logically and can be navigated and read by a screen reader - this also helps if stylesheets are disabled
- use the proper markup for every feature (for example, forms and data tables), so the relationships between content are defined properly
- not use colour as the only way to explain or distinguish information
- use text colours that show up clearly against the background colour
- make sure every feature can be used when text size is increased by 200% and that content reflows to a single column when it's increased by 400%
- do not use images of text
- make sure your service is responsive - for example to the user's device, page orientation and font size they like to use
- make sure your service works well with assistive technologies - for example, important messages are marked up in a way that the screen readers knows they're important

Operable:

- make sure everything works for keyboard-only users
- let people play, pause and stop any moving content
- not use blinking or flashing content - or let the user disable animations
- provide a 'skip to content' link or equivalent
- use descriptive titles for pages and frames
- make sure users can move through content in a way that makes sense
- use descriptive links so users know where a link will take them, or what downloadable linked content is
- use meaningful headings and labels, making sure that any accessible labels match or closely resemble the label you're using in the interface
- only use things like mouse events or dynamic interactions (like swiping or dragging) when they're strictly necessary - or let the user disable them and interact with the interface in a different way
- make it easy for users to disable and change shortcut keys
- make sure interactive elements such as buttons are big enough or spaced far enough apart to make it easy to select the right one

Understandable (you have to make sure people can understand your content and how the service works)

- make it clear what language the content is written in, and indicate if this changes
- make sure features look consistent and behave in predictable ways, including help mechanisms
- make sure all form fields have visible and meaningful labels - and that they're marked up properly
- make it easy for people to identify and correct errors in forms - you can find best practice for form design in the [GOV.UK Design System](#)
- make it easy for people to re-enter information they've previously entered into a form
- make it easy for people to log in without having to remember information or solve a problem

Another principle – Robust (you must make sure your content can be interpreted reliably by a wide variety of user agents (including assistive technologies):

- you must make sure your content can be interpreted reliably by a wide variety of user agents (including assistive technologies)
- make sure important status messages or modal dialogs are marked up in a way that informs users of their presence and purpose, and lets them interact with them using their assistive technology

Principle	Guidelines	Success Criteria	Level
1. Perceivable	1.1 Text Alternatives	1.1.1 Non-textual Content	A
		1.2.1 Audio-only and Video-only (Prerecorded)	A
		1.2.2 Captions (Prerecorded)	A
		1.2.3 Audio Description or Media Alternative (Prerecorded)	A
		1.2.4 Captions (Live)	AA
		1.2.5 Audio Description (Prerecorded)	AA
		1.2.6 Sign Language (Prerecorded)	AAA
	1.2 Time-based Media	1.2.7 Extended Audio Description (Prerecorded)	AAA
		1.2.8 Media Alternative (Prerecorded)	AAA
		1.2.9 Audio-only (Live)	AAA
		1.2.1 Audio-only and Video-only (Prerecorded)	A
		1.2.2 Captions (Prerecorded)	A
		1.2.3 Audio Description or Media Alternative (Prerecorded)	A
		1.3.1 Info and Relationships	A
		1.3.2 Meaningful Sequence	A
	1.3 Adaptable	1.3.3 Sensory Characteristics	A
		1.3.4 Orientation	AA
		1.3.5 Identify Input Purpose	AA
		1.3.6 Identify Purpose	AAA
		1.3.1 Info and Relationships	A
		1.4.1 Use of Color	A
		1.4.2 Audio Control	A
		1.4.3 Contrast (Minimum)	AA
		1.4.4 Resize text	AA
		1.4.5 Images of Text	AA
	1.4 Distinguishable	1.4.6 Contrast (Enhanced)	AAA
		1.4.7 Low or No Background Audio	AAA
		1.4.8 Visual Presentation	AAA
		1.4.9 Images of Text (No Exception)	AAA
		1.4.10 Reflow	AA
		1.4.11 Non-text Contrast	AA
		1.4.12 Text Spacing	AA
		1.4.13 Content on Hover or Focus	AA

Full WCAG 22 requirements can be found here:

<https://www.w3.org/WAI/WCAG22/quickref/>

A paper on Neurodiverse Users from IEE Gaming, Entertainment, and Media Conference (GEM):

“This paper describes the use of serious games to reduce the initial barriers that exist towards inclusive design through the introduction of accessibility issues that affect neurodiverse users.”

It suggests we consider the following:

1. Information processing forms (thinking about what difficulties user may have trying to process what is being read, and include the provision of extra time to process information, or use the text simplification or plain text). Users may face difficulties when text must be **read in a fixed length of time**
2. Distraction via Motion (e.g., animations, pop-ups): distraction could prevent the user from completing the task.

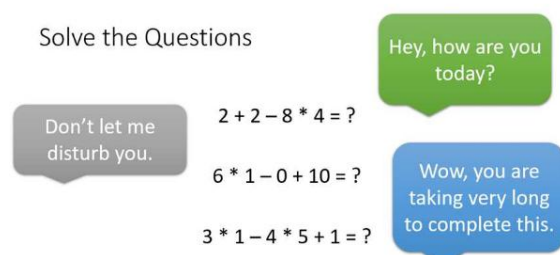


Fig. 1. Distraction via motion game.

3. Inaccessible Documentation

Especially for the visually impaired and blind, which we could consider in the later steps of our project.

It can be poorly formatted code, text instructions or PDF files, where text-to-speech readers are unable to work with the structure properly. Inaccessible documents can occur in the form of complexity can affect those with dyslexia and autism. We should make sure all written instruction, and documentation structured the way it is accessible for user.

Screen readers read the underlying metadata, not the screen!!!

4. Changing Navigation

Neurodiverse users experience difficulties with:

- Navigating new or updated software
- Software with inconsistent navigation
- Learning and memorizing of the UI in terms of how to access required functionality.
- When UI is changed often or inconsistent

Other things worth paying attention, mentioned in the paper:

- Incorrect use of a simple design element can have profound effect on usability
- Information processing – it is difficult to determine meaning of the words/phrases, but simpler if the meaning of the words is provided on the screen.

Criteria we can score our UI designs on:

- Usability: Including ease of use, intuitiveness, and navigation.
- User Centeredness: Meeting the needs of the expected user groups.
- Appearance: The choice of fonts, colour and/or sound.
- Layout: The layout of the components, the display of the information and the sequence of the screens used.

Another Paper called “A Content Recommendation (web) Platform for People with Intellectual Disability”

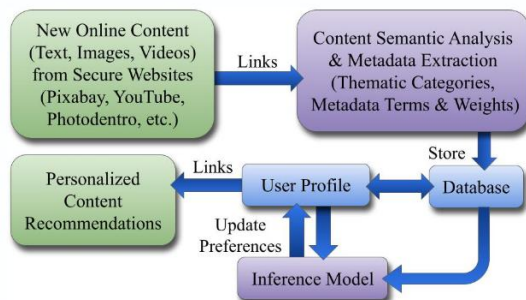


Fig. 1. Proposed platform architecture.



(suggested platform UI from the paper)

Online Articles about how to design UI for Autistic Users



<https://smart-interface-design-patterns.com/articles/design-autism/>

Note: 40% of autistic people have an anxiety disorder.

Follow the Links for UI guidance and examples (really good guides!!):

Guidelines To Design For Autistic Users

- ❌ Avoid bright contrasting colors and high luminance.
- ❌ Avoid figures of speech and idioms (verbal or visual).
- ❌ Avoid animations that are hard to control.
- ❌ Avoid non-conventional scrolling behaviour (parallax).
- ❌ Avoid time countdowns, time outs, a sense of urgency.
- ❌ Don't rely on jargon, abbreviations, sarcasm, idioms.
- ✅ Show all content about a subject on a single page.
- ✅ Use soft, muted colors and avoid pure white or black.
- ✅ Add text labels to icons and avoid icons-only buttons.
- ✅ Allow users to save and return to forms later.
- ✅ Respect user's reduced motion preferences.
- ✅ Support email/chat as communication options.
- ✅ Autistic children tend to be visual learners.
- ✅ Autistic adults prefer well-structured text.

Guide 1: <https://smart-interface-design-patterns.com/articles/design-autism/>

Guide 2: <https://uxdesign.cc/inclusive-design-guide-7-principles-of-designing-for-the-autistic-community-1e6dcd4bae85>

Guide 3: <https://uxdesign.cc/designing-for-autistic-people-overview-of-existing-research-d6f6dc20710e>

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