Universal Design 2024: Shaping a Sustainable, Equitable and Resilient Future for All
K.S. Fuglerud et al. (Eds.)

doi:10.3233/SHTI241023

Navigating Inclusivity: Exploring Accessibility in Oslo's Public Transport Mobile App

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Abstract. This study investigates the accessibility of the Ruter mobile app, a major digital platform provided by the public transport authority for Oslo and Akershus counties in Norway. By employing a combination of case study analysis, accessibility audits, and user experience testing, the research evaluates the app's compliance with WCAG and its overall usability for individuals with disabilities. Despite the inclusion of several accessibility features, the findings reveal significant areas for improvement, particularly in contrast handling, form field support, and logical sequencing. Feedback from a group of six participants highlights the necessity for continuous enhancement of the app design to ensure it is user-friendly and accessible. This research emphasizes the importance of universal design principles and suggests that with targeted enhancements, Ruter AS can significantly improve the inclusivity and accessibility of its digital platforms.

Keywords. navigation, public transportation, accessibility, inclusivity, mobile app

1. Introduction

Ensuring equitable access to transportation services for all individuals, irrespective of their functional profile or backgrounds, hinges on the accessibility of both digital and physical support systems within public transport authorities [1]. Accessibility in public transportation is not only a matter of convenience but also important to social justice and inclusion [2,3].

In the context of public transportation, digital platforms such as mobile applications play a crucial role [4,5]. These platforms provide essential services, from route planning and real-time schedule updates to ticket purchasing and customer support. For individuals with disabilities, these digital tools can either facilitate seamless travel or present significant barriers. Therefore, it is imperative that these platforms adhere to stringent accessibility standards to ensure that they are usable by all individuals, including travelers with reduced functioning [6,7].

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This paper presents a study of the inclusivity and accessibility of the digital platforms offered by Ruter AS[2], the public transport authority for Oslo and Akershus counties in Norway. Ruter offers essential services through mobile apps, the web, and physical retailers. The Ruter mobile app is an indispensable tool for commuters, providing real-time information on bus schedules, metro, trams, ferry services, and fare regulations.

This study evaluates Ruter's mobile app accessibility, focusing on ease of navigation, assistive technology compatibility, and alternative communication methods, guided by universal design principles. An analysis of the app's current accessibility and recommended improvements is presented, contributing to the broader discourse on digital accessibility in public transportation and highlighting the importance of continuous improvement and best practices.

2. Literature Review

There are several accessibility laws and guidelines that should be followed when designing a public sector transportation app to ensure it is usable by all individuals, including travelers with disabilities. The Web Content Accessibility Guidelines (WCAG)[3] provides recommendations for making web pages and web applications, including content used on mobile devices, more accessible. WCAG is divided into three levels of conformance: A, AA, and AAA. Level AA is generally considered the minimum target for accessibility. In the United States (US), Title II of the Americans with Disabilities Act (ADA) requires state and local governments to make their services accessible to individuals with disabilities[4]. The European Accessibility Act aims to improve the accessibility of products and services in the EU, including public sector websites and mobile applications. It requires compliance with the EN 301 549 standard[5], which is closely aligned with WCAG 2.1.

The general best practices for accessible Android apps include: (1) to provide content descriptions for images, buttons, and other elements; (2) to ensure that the app can be navigated using a keyboard and other assistive devices; (3) to use scalable text and ensure high contrast between text and background; (4) to ensure touch targets (e.g., buttons) are of adequate size (at least 48dp by 48dp); (5) to support Android's Voice Access allowing users to control their devices with spoken commands; and (6) to conduct usability testing with people with disabilities to identify and address potential accessibility issues [8,9].

These guidelines and standards provide a relevant starting point for designing accessible digital platforms. However, compliance with these standards requires continuous effort and adaptation, especially as technology and user needs evolve. In reviewing the literature, it is evident that while significant progress has been made in digital accessibility, gaps still exist, particularly in the practical implementation and enforcement of accessibility standards. Studies have shown that many public sector apps fall short of full compliance, often due to a lack of resources, awareness, or technical expertise [10,11]. These insights provide a foundation for evaluating the accessibility of the Ruter mobile app and identifying areas for improvement to better serve all users, including those with disabilities.

[2]https://ruter.no/en/

[3]https://www.w3.org/TR/WCAG21/

[4]https://www.ada.gov/resources/small-entity-compliance-guide/

[5]https://www.etsi.org/human-factors-accessibility/en-301-549-v3-the-harmonized-european-standard-for-ict-accessibility

3. Methods

Several research methods are utilized, including case study analysis, accessibility audits, and user experience testing. Case study analysis involves analyzing relevant documentation, policies, and initiatives undertaken by Ruter to improve inclusivity. Accessibility audits are performed on Ruter's mobile app to assess compliance with accessibility standards and guidelines. Usability testing sessions with users representing diverse demographics are used to evaluate the effectiveness of Ruter's accessibility features during common interactions, such as planning a journey and purchasing tickets.

3.1. Case Study

A detailed document-based examination of the Ruter mobile app, focusing on its design, functionality, and user experience, was conducted using publicly available documents. Specific case studies on the Ruter mobile app were limited in availability. In Norway, the Authority for Universal Design of ICT (Tilsynet for universell utforming av ikt)[6] is responsible for enforcing regulations on the universal design of ICT solutions, linked to the Equality and Discrimination Act. The inspectorate mandates that all public websites and apps must have an accessibility statement, created in the Norwegian Digitalization Agency's (Digdir) central solution, uustatus[7]. This accessibility statement helps businesses get an overview of their compliance status and provides users with the opportunity to report accessibility issues and give feedback. Ruter's app includes a similar accessibility statement accessible through the app's menu (Profile → Support menu → Accessibility statement)[8].

3.2. Accessibility Auditing

Accessibility audits involve the evaluation of a digital product to identify barriers and assess its conformance with accessibility guidelines and standards. As part of this study, an accessibility audit of the Ruter mobile app was conducted using the Android Accessibility Scanner [9] to identify potential barriers for users with disabilities. These results were compared with publicly available accessibility audit reports of the Ruter mobile app.

3.3. User Experience Testing

To evaluate the ease of navigating and operating the Ruter mobile app, we conducted user experience testing in a real-world environment. A diverse group of six participants, each with varying levels of technological proficiency and different disabilities, provided comprehensive feedback. 1 provides an overview of these participants. The participants were tasked with common activities such as planning a journey, purchasing tickets, and navigating the app's features. Some were already familiar with the app, while others required assistance with installation, ticket purchase, and actual travel. The aim was to identify usability issues and understand the challenges users face when interacting with the app.

[6] https://www.uutilsynet.no/english/about-us/903
[7] uustatus.no
[8] https://uustatus.no/nb/erklaringer/publisert/b8590bd9-b039-4bf6-84d0-ca57e24a8625
[9] https://play.google.com/store/apps/details?id=com.google.android.apps.accessibility.auditor

Table 1. List of participants for user experience testing

Participant ID	Age	Gender	Characteristics	Prior Experience with Ruter App	Technological Proficiency
P1	19	Male	Bachelor student in Humanities	YES	Medium
P2	26	Female	Master's student in IT	YES	High
P3	35	Female	Individual with visual impairment /legally blind	YES	High
P4	40	Male	Individual with motor disabilities	NO	Medium
P5	53	Female	Immigrant housewife	NO	Low
P6	72	Male	Pensioner	NO	Low

4. Results

4.1. Case Study

According to the Ruter AS accessibility statement published on uustatus.no, the Ruter app partially complies with the requirements for the universal design of ICT. There are breaches of 13 out of 42 requirements. Ruter presents the content on the app that is not universally designed. In the statement, they explained which content applies, the reasons for non-compliance, and what it means for the user. It is presented in the same order as the WCAG 2.1 recommendations. Ruter AS categorizes the content that is not universally designed in the Ruter (Android) app as follows:

Principle 1: Perceivable

- Information and Relationships: Visual headings are not always coded as headings, making it difficult for users to jump between sections.
- Meaningful Sequence: The onboarding flow has an illogical sequence, requiring users to choose between using the image carousel or the next button to complete the flow.
- Identify Purpose of Input Data: Some form fields lack the ability to autofill data, particularly for entering payment cards and phone numbers during login and user creation.

Principle 2: Operable

- No Keyboard Traps: It is not possible to exit QR scanning for keyboard scooters.
- Pause, Stop, and Hide: The reservation amount for ordering a scooter is displayed for only 7 seconds, after which it is no longer visible.
- Visible Focus: The app uses the standard focus indicator from Android, which can be almost invisible in certain cases.

Principle 3: Understandable

- Language on the Page: Deviation messages may be missing or in the wrong language, and receipts are generated only in Norwegian.
- Identification of Errors: Some text fields during ticket purchase and profile registration do not show error messages for incomplete data.
- Prompts or Instructions: Command text-in-text fields for feedback during mobility use, travel search, and phone number registration are inadequate, making it difficult to understand how to fill in the fields.

Principle 4: Robust

- Parsing: The webview for adding cards has validation errors and is unreadable without the stylesheet, complicating the presentation of information.
- Name, Role, and Value: Some UI components lack button roles, making it difficult for screen reader users to understand their function.
- Status Notifications: Changes in departures for active trips and scooters are not automatically announced to screen readers.

4.2. Accessibility Auditing

Google's Android Accessibility Scanner provides issues related to content labels, touch target size, clickable items, and text and image contrast. Figure 1 shows three issues detected by the scanner on its home screen.

1. Image Contrast: The contrast ratio between the image's foreground and background is 1.52. It should be increased to 3.00 or greater.
2. Text Contrast: The text contrast ratio is 3.84. Consider using colors that result in a contrast ratio greater than 4.50 for small text or 3.00 for large text.
3. Touch Target: The clickable item's size is 21dp x 21dp. It should be increased to at least 48dp by 48dp.

Figure 2 shows three issues detected by the scanner on its ticket purchasing screen.

1. Item Descriptions: Multiple items have the same description, which can confuse screen readers.
2. Text Contrast: The text contrast ratio is 3.15. It should be increased for improved readability.

4.3. User Experience Testing

Participants provided valuable qualitative feedback, highlighting both strengths and areas for improvement. Here are some key quotes from the participants:
P1: *The overall design and look of the app are quite appealing. I was a bit confused when they redesigned the app initially, but I am getting used to it, and it's becoming easier to understand.*
P2: *Purchasing tickets was mostly straightforward, but the lack of clear error messages during the process was frustrating. It would be helpful if the app provided more guidance when something goes wrong.*
P3: *I feel like the text contrast is too low, making it hard to read, and some buttons don't have proper labels for screen readers. Additionally, a voice-to-text feature for inputting start and destination points would be very beneficial.*
P4: *It would be helpful to incorporate features like larger touch targets and voice commands to make the app more accessible. I am not aware of the accessibility information feature of the app.*
P5: *I found it hard to understand certain parts of the app because the instructions weren't clear. I prefer using physical travel cards over the app for convenience.*
P6: *I am not a fan of mobile apps, and they confuse me sometimes. The small touch targets and low-contrast text made it difficult to use the app. I prefer using physical travel cards since they are easier to handle and more straightforward for someone of my age.*

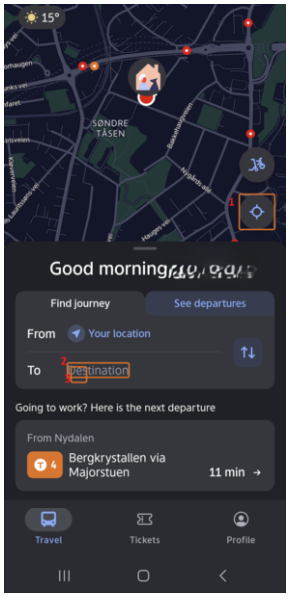

Figure 1. Home screen of Ruter with accessibility issues (shown in colored boxes with numbers).

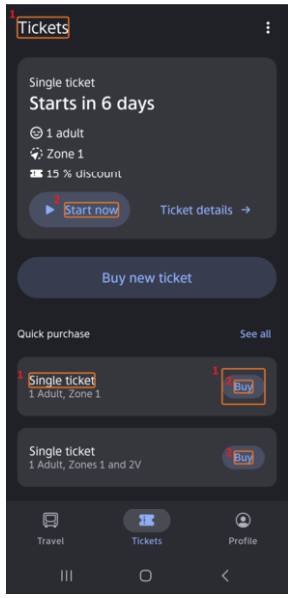

Figure 2. Ticket booking and ticket expiration screen of Ruter with accessibility issues (shown in colored boxes with numbers).

The Ruter app also provides accessibility-related information regarding public roads and stops during transit. Figure 3 illustrates this feature in the app, and Figure 4 shows how this information is presented.

5. Discussion

The findings from this study highlight both the ongoing challenges and progress in enhancing digital accessibility within the public transport sector, using the Ruter mobile app as a case. Despite significant efforts, critical areas still require improvement to achieve full compliance with universal design principles and to provide an inclusive experience for all users [12].

The Ruter app demonstrates a commitment to accessibility through various features designed to aid users with disabilities, such as the provision of real-time information, support for assistive technologies, and efforts to ensure ease of navigation. However, the case study revealed several shortcomings in these areas. Accessibility barriers, such as inadequate form field support for autofill, and issues with the visibility of focus indicators, suggest that more rigorous testing and user feedback incorporation are needed.

The accessibility audits revealed that the Ruter app does not fully comply with WCAG 2.1 standards. While the app incorporates basic accessibility features, significant room for improvement remains to ensure these features are implemented correctly and comprehensively. A particular area of concern is the app's handling of contrast, crucial for users with visual impairments. Current WCAG contrast checks are primarily effective for dark text on bright backgrounds but often yield inaccurate results for light text on dark backgrounds. This limitation suggests the app may not be optimally accessible in

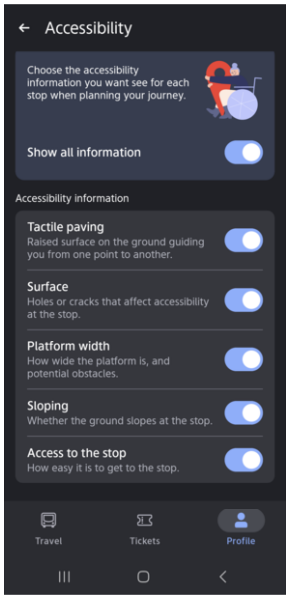

Figure 3. Accessibility information in the Ruter app.

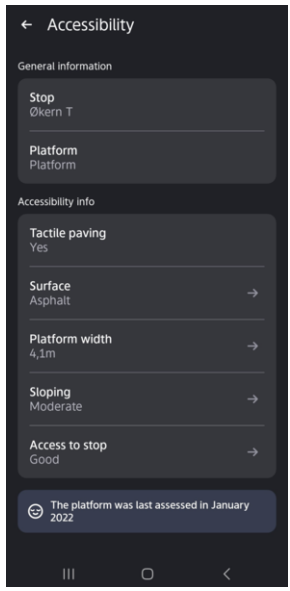

Figure 4. An example of accessibility information presentation.

dark mode, which is increasingly popular among users. To address this issue, there is an initiative to adopt the APCA (Advanced Perceptual Contrast Algorithm) contrast model, which is better suited for evaluating contrast in inverted (dark mode) color schemes, providing a more accurate assessment of accessibility for all users [13].

Although the user experience testing was conducted with only six participants, the insights gained are invaluable in understanding how real users interact with the Ruter app and the challenges they face. The feedback underscores the necessity for continuous improvements to enhance the app's accessibility and usability for all users. It is noticeable that although the Ruter app provides accessible information related to each stop (refer to Figure 4), users are not aware of this feature and therefore do not use it. Increasing public awareness of various features that make the app more inclusive and accessible should be prioritized. With a more structured testing process involving a larger and more diverse group of users, we could obtain varied perceptions and feedback, leading to even more comprehensive improvements.

Based on the findings, several recommendations can be made to enhance the accessibility of the Ruter mobile app:

- Enhanced testing and feedback mechanisms: Implementing more rigorous testing procedures such as regular accessibility audits and user testing with individuals with diverse disabilities, can help identify and rectify accessibility barriers more effectively.
- Incremental design improvements: Addressing specific issues such as text and image contrast and touch target sizes can significantly improve the user experience for individuals with disabilities.

- Compliance monitoring: Regularly updating the app to comply with the latest WCAG standards and other relevant guidelines will ensure that the app remains accessible as standards evolve.

6. Conclusion

The study of the Ruter mobile app highlights the importance of ongoing accessibility improvements in digital public transport services. While the app demonstrates progress in adhering to universal design principles, further enhancements are necessary to improve accessibility. By addressing these areas, Ruter AS can create a truly accessible and user-friendly app that benefits all passengers. Additionally, we plan to share our findings with Ruter to facilitate more in-depth discussions about their internal accessibility practices, standards, and barriers, contributing to a collaborative approach to improving accessibility. The future scope of this study also includes conducting detailed manual testing on the app as well as testing on different platforms such as iOS. We also plan to expand user testing to include more diverse participants in the experience testing process to gather comprehensive feedback on the app's accessibility features.

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