

Accessibility Barriers in Brazilian Government Mobile Applications: A Thematic Analysis of User Reviews

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Abstract. *This study analyzes accessibility barriers reported by users in reviews of three Brazilian government mobile applications (gov.br, Meu SUS Digital, and Carteira de Trabalho Digital), available on the Google Play Store. A qualitative thematic analysis was conducted on user evaluations. Two central themes emerged: issues in the implementation of accessibility features and the implicit expectation of a standardized user, particularly in facial biometrics. The results show that the mere presence of features does not ensure accessibility, highlighting the need for inclusive and user-centered design. The research contributes by providing empirical evidence based on users' experience and by demonstrating the feasibility of reviews as a complementary source for analyzing accessibility.*

1. Introduction

The digitalization of public services has expanded citizens' access to essential services through government mobile applications. However, the mere availability of digital services does not guarantee the inclusion of citizens with diverse profiles, especially those with disabilities, functional limitations, low levels of digital literacy, or difficulties associated with aging. In the Brazilian context, data from the Brazilian Institute of Geography and Statistics (IBGE) indicate that a significant portion of the population has some type of functional limitation, reinforcing the need for accessible digital services [Instituto Brasileiro de Geografia e Estatística (IBGE) 2022].

In this scenario, digital accessibility should not be understood merely as a technical requirement, but as an essential element to ensure the full exercise of citizenship. Accessibility barriers may compromise users' autonomy and limit access to fundamental public services, particularly in mobile applications, which often represent the primary channel of interaction between citizens and the government. Several studies have investigated accessibility in mobile applications through the analysis of user reviews and automated techniques, such as classification and sentiment analysis [Eler et al. 2019, Alshayban et al. 2020, AlOmar et al. 2021, Aljedaani et al. 2021,

Reyes Arias et al. 2022, Aljedaani et al. 2022, Oliveira et al. 2023]. These approaches have contributed to identifying issues at scale; however, they present limitations in achieving a deeper understanding of users' experiences. The literature shows a predominance of automated approaches, with limited exploration of qualitative analyses that allow for a more in-depth understanding of the barriers faced by users. Furthermore, studies focusing on the Brazilian context are still scarce, and even more so those addressing government mobile applications.

In light of this context, this study aims to answer the following research question: "*What do users report the main digital accessibility barriers in reviews published on Google Play regarding Brazilian government mobile applications?*". To answer this question, this study qualitatively analyzes user reviews published on the Google Play Store for three Brazilian government mobile applications: *gov.br*, *Meu SUS Digital*, and *Carteira de Trabalho Digital*. To this end, a process was conducted involving the collection of over 1.1 million reviews, their filtering based on accessibility-related keywords, and the analysis of a final corpus of 216 reviews using Thematic Analysis [Braun and Clarke 2006]. The main contributions of this study are: (i) providing empirical evidence on accessibility barriers based on user experiences in Brazilian government applications; (ii) presenting a qualitative analysis based on spontaneous user reviews; and (iii) discussing practical implications for improving accessibility in digital public services.

The remainder of this paper is organized as follows. Section 2 presents related work on accessibility in mobile applications and digital government services, with an emphasis on studies based on user reviews. Section 3 describes the research method adopted. Section 4 presents and discusses the results. Finally, Section 5 presents the conclusions of this study.

2. Related Work

The literature has explored digital accessibility in government systems from different perspectives, including technical evaluations based on guidelines, institutional analyses, and user experience-centered studies. These approaches aim to identify accessibility barriers and support the development of more inclusive digital services.

In the context of technical evaluations, studies such as [Serra et al. 2015] analyzed the accessibility of Brazilian government mobile applications based on guidelines such as WCAG, highlighting limitations related to the adaptation of these guidelines to the mobile context. Complementarily, research such as [Oliveira et al. 2020a, Oliveira et al. 2020b, Oliveira et al. 2021, Sousa et al. 2024] investigated the adoption of accessibility requirements in government systems and portals, pointing to institutional weaknesses and the limited systematic incorporation of these guidelines into development processes.

Another research line has investigated accessibility through the analysis of user reviews in app stores. Studies such as [Eler et al. 2019] have shown that accessibility issues are present in user reviews, although with low visibility. More recent works have explored automated approaches, including the classification of accessibility-related reviews [AlOmar et al. 2021, Aljedaani et al. 2022] and sentiment analysis [Aljedaani et al. 2021], as well as the construction of specialized datasets [Reyes Arias et al. 2022, Oliveira et al. 2023]. These studies highlight the potential of user reviews as a data source for identifying accessibility issues.

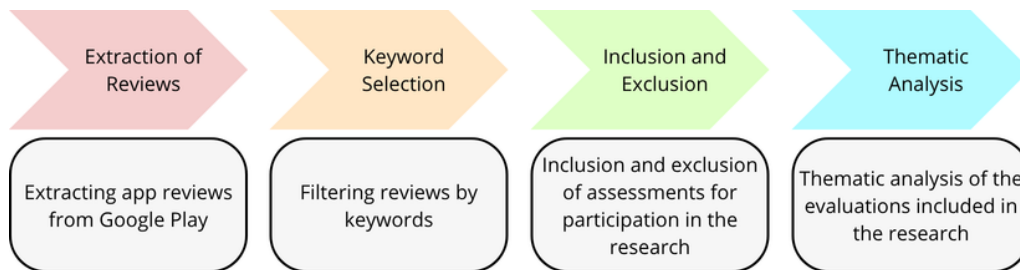
Additionally, investigations such as [Alshayban et al. 2020] combine multiple approaches, including automated analysis, surveys, and review mining, while studies such as [da Silva et al. 2023] explore social factors that influence the use of digital government services, such as in the case of older adults. These works broaden the understanding of the problem by considering different dimensions of digital accessibility. Despite these advances, there is still a predominance of automated approaches focused on large-scale issue detection, with limitations in achieving a deeper understanding of users' experiences. Furthermore, studies that qualitatively investigate spontaneous user reviews remain scarce, particularly in the context of Brazilian government mobile applications. This gap limits the understanding of accessibility barriers from the perspective of real-world system use.

This study differs from prior work by conducting an in-depth qualitative analysis of user reviews in Brazilian government mobile applications, aiming to provide a more detailed understanding of reported accessibility barriers and their implications for the development of more inclusive digital public services.

3. Research Method

This study is characterized as an exploratory qualitative research, based on the analysis of secondary data derived from user reviews. The investigation was structured into four stages: (i) Extraction of Reviews, (ii) Keyword-Based Selection, (iii) Inclusion and Exclusion, and (iv) Thematic Analysis, as illustrated in Figure 1.

Figure 1. Methodological workflow of the study.



In the first stage, an initial search for government applications was conducted on the Google Play Store, considering applications developed by *Serviços e Informações do Brasil*¹ as well as those available in the application gallery of the *gov.br* portal². The complete list of applications and their respective metrics is documented in the file *Gov-APPs.xlsx*, available in a public repository³.

The applications *gov.br*, *Carteira de Trabalho Digital*, and *Meu SUS Digital* were selected for analysis based on their high popularity (among the most downloaded during the data collection period) and for representing different domains of public services, such as digital identity, employment, and healthcare. Data collection was carried out in April 2025 using the Python library *google-play-scraper*⁴, which enables the automated extraction of user reviews. In total, 1,177,250 user reviews were collected.

¹https://play.google.com/store/apps/dev?id=5829287075355252046&hl=pt_BR

²<https://www.gov.br/pt-br/apps/@galeria-de-aplicativos>

³<https://doi.org/10.5281/zenodo.19278631>

⁴<https://github.com/JoMingyu/google-play-scraper>

In the second stage, the reviews were filtered using a script specifically developed for this study, based on a set of accessibility-related keywords (e.g., “accessible”, “screen reader”, “contrast”, “zoom”), inspired by [Eler et al. 2019] and adapted to Brazilian Portuguese. The script and the complete set of keywords are available in the project repository. This stage resulted in the identification of 9,625 reviews potentially related to accessibility. In the third stage, the filtered reviews were manually analyzed to remove false positives and verify their relevance to the study scope. The analysis was conducted independently by two researchers in the field of Computer Science, based on previously defined criteria documented in the repository. The spreadsheets generated by each evaluator (*ResearcherAnalysis1.xlsx* and *ResearcherAnalysis2.xlsx*) are also publicly available.

Inter-rater agreement was measured using Cohen’s Kappa coefficient [Cohen 1960], resulting in a value of 0.76 for the inclusion/exclusion classification, indicating substantial agreement. Disagreements were discussed and reviewed by two PhD-level researchers acting as independent reviewers, consolidating the final decisions recorded in the file *FinalAnalysis9625.xlsx*. At the end of this stage, 216 reviews were selected to compose the final corpus of analysis (150 from *gov.br*, 29 from *Meu SUS Digital*, and 37 from *Carteira de Trabalho Digital*), available in the file *EvaluationsInserted216.xlsx*. This discrepancy in the number of selected reviews is mainly due to the keyword filtering and manual validation stages, in which *gov.br* presented a higher proportion of reviews with descriptive accessibility-related content (especially associated with facial biometrics), resulting in greater retention after applying the inclusion criteria.

Finally, in the fourth stage, the selected reviews were analyzed using Thematic Analysis, as proposed by Braun and Clarke [Braun and Clarke 2006], a widely used method in qualitative research to identify and interpret patterns of meaning in textual data. The analysis was conducted in a predominantly *inductive* and *semantic* manner, allowing themes to emerge directly from the data without the imposition of predefined theoretical categories.

The analytical process was supported by the *Taguette*⁵ tool, which enables the organization and coding of qualitative data. The six phases proposed by Braun and Clarke were followed: (i) data familiarization, (ii) generation of initial codes, (iii) search for themes, (iv) review of themes, (v) definition and naming of themes, and (vi) report production. The adopted methodological approach, combining automated procedures with in-depth qualitative analysis, enabled the construction of a consistent corpus and the identification of relevant patterns related to digital accessibility.

4. Results and Discussion

This section presents the results of the Thematic Analysis of the collected reviews, as well as a discussion of the main findings in light of the literature. Initially, the identified themes and subthemes are described, followed by a quantitative analysis of the codes and a comparison among the analyzed applications. A total of 216 accessibility-related reviews were analyzed, including 150 from the *gov.br* application, 29 from *Meu SUS Digital*, and 37 from *Carteira de Trabalho Digital*. The analysis resulted in two main themes and five subthemes, highlighting different types of barriers faced by users.

⁵<https://www.taguette.org/>

4.1. Thematic Analysis

The thematic analysis was conducted in an inductive manner and at a semantic level, allowing themes to emerge directly from user reviews. Figure 2 presents the structure of the identified themes and subthemes.

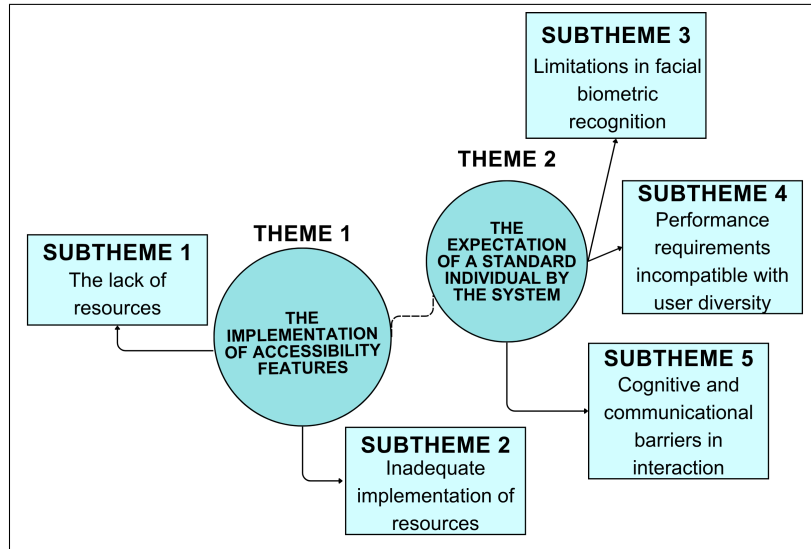


Figure 2. Themes and subthemes identified in the thematic analysis.

Generic comments that did not describe specific elements or accessibility barriers were not included in the thematic structure but were considered in the overall interpretation of the results.

Theme 1 - Implementation of Accessibility Features

Theme 1 encompasses reports on the presence, absence, or inadequate functioning of accessibility features in the analyzed applications. Overall, the findings indicate that the mere inclusion of functionalities does not guarantee effective accessibility. When implemented inadequately, these features may lead to user frustration and intensify usage barriers.

Subtheme 1 - Absence of Accessibility Features: Users reported the absence of several accessibility features considered essential, such as dark mode, zoom functionalities, text enlargement, accessible validation alternatives, screen reader support, audio feedback, and features for users with color vision deficiency. The lack of zoom and text adjustment functionalities was particularly recurrent among users with visual impairments or low vision, highlighting limitations in adapting the interface to their needs. This type of issue is consistent with failures related to the WCAG principle of perceivability, as it hinders access to information for different user profiles. The excerpts below are identified by codes (e.g., [Av216]) to ensure the traceability of the analyzed reviews.

- R1: “Good app, it just doesn’t get five stars because it is a bit difficult to use for visually impaired users. I suggest adding a zoom feature.” [Av216]⁶

⁶Identifier of the review in the analyzed dataset.

- R2: *“It needs accessibility settings [...] there is no option to enable dark mode [...]”* [Av190]

Additionally, difficulties were reported due to the absence of accessible alternatives to facial biometrics, especially for users with visual and hearing impairments. Demands were also identified for features such as Brazilian Sign Language (Libras) support, visual customization, and more inclusive validation mechanisms.

- R3: *“Facial recognition for users with hearing impairments and vision problems [...] please provide another form of validation [...]”* [Av119]
- R4: *“There is no accessibility support for Libras.”* [Av165]
- R5: *“[...] I also suggest support for dark mode, as well as better accessibility for colorblind users.”* [Av177]
- R6: *“[...] What makes it difficult is the verification ‘click where there is such object’. For someone with visual impairment like me, it is VERY BAD [...]”* [Av70]

These reports indicate that the absence of accessibility features directly impacts users’ autonomy, especially those who rely on assistive technologies or interface adaptations. In general, it is observed that the lack of such features not only makes application usage more difficult but may also render access to essential functionalities unfeasible.

Subtheme 2 - Inadequate Implementation of Accessibility Features: In addition to the absence of features, users reported situations in which accessibility functionalities were present in the applications but did not adequately meet their needs. In these cases, the issue was not the lack of the feature itself, but rather its insufficient or ineffective implementation within the usage context. One of the reports illustrates this situation by mentioning the presence of voice-related features in the application, but indicating that they were not sufficient to assist a user with visual impairment. Furthermore, the slowness of the recognition process was identified as a factor that aggravates usability difficulties, further limiting interaction.

- R7: *“Terrible app, my father has a visual impairment and there is no function to help; although there is a voice feature, it is useless, and to make matters worse, the recognition process is slow, causing the time to run out. For me, this is the worst app, and it is even from the government.”* [Av14]

Additionally, users who rely on screen readers reported several obstacles resulting from low compatibility with this type of assistive technology. Among the identified issues are the absence or inadequacy of interface element labeling, difficulties in reading content, navigation failures, and the presence of inaccessible validation mechanisms, such as CAPTCHA with audio in a foreign language and containing noise.

- R8: *“The app is completely inaccessible for people with visual impairments! The screen reader does not recognize the text, there is no option to enlarge the font, and during registration it asks for that awful CAPTCHA with audio in English and full of noise! The Brazilian Inclusion Law is nowhere to be seen here!”* [Av174]

Problems related to the use of dark mode were also identified, in which contrast changes compromised the readability of interface elements.

- R9: *“My phone is set to dark mode, and in the app the menus and icons became unreadable.”* [Av169]

These reports indicate that the mere presence of accessibility features is not sufficient to ensure an inclusive user experience. When such features are not properly implemented or are incompatible with assistive technologies, they may not only fail to fulfill their intended purpose but also introduce new barriers to use. Thus, the findings reinforce that accessibility should be evaluated not only in terms of the existence of functionalities but also in terms of their effective operation and usefulness for different user profiles.

Theme 2 - The System's Expectation of a Standard User

Theme 2 highlights the implicit assumption of a standard user in the design of the applications, disregarding the diversity of user profiles, including people with disabilities, older adults, and individuals with different levels of literacy and technological familiarity. The following subthemes detail the main identified barriers, encompassing limitations in facial biometrics, requirements incompatible with different user profiles, and cognitive and communication-related difficulties observed in the reviews.

Subtheme 3 - Limitations in Facial Biometric Recognition: This subtheme encompasses reports on limitations in facial biometric recognition experienced by users, particularly in the *gov.br* application. The reports reveal difficulties related to the system's inability to properly recognize different facial characteristics and usage conditions. Among the identified issues, limitations in recognizing users who wear glasses stand out, as this compromises their ability to read instructions during the authentication process.

- R10: *"[...] I would also add that you do not care at all about inclusion. You are not inclusive. You say that glasses should not be worn, but how, in my case, am I supposed to read the instructions during facial recognition? This is Brazil."* [Av54]

Additionally, failures were reported in recognizing users with limitations in eye opening or alignment, resulting from visual impairments, specific facial conditions, or other limitations.

- R11: *"Flawed visual recognition, even OFFENSIVE! I am blind, I have an atrophied eye, and it keeps repeating 'keep your eyes open'. Accessibility score: ZERO [...]"* [Av39]

The reports indicate that the facial biometric mechanism presents limitations in adapting to the diversity of facial characteristics and user conditions. As a result, the authentication process may become inaccessible or unfeasible for certain user profiles, especially those who do not conform to the system's expected standards. These findings reinforce that facial recognition-based solutions must account for human variability and provide accessible authentication alternatives.

Subtheme 4 - Performance Requirements Incompatible with User Diversity: Also concentrated on the facial biometric functionality of the *gov.br* application, the reports highlight criticisms regarding the requirements imposed during the validation process. To complete the verification, users must follow specific rules and perform predefined steps that, in many cases, are not compatible with their physical capabilities or usage conditions. One recurring issue is related to the requirement to remove glasses during

the recognition process. Although this condition may be necessary for image capture, it compromises the user's ability to properly view the instructions, making it difficult to complete the required steps.

- R12: *"I cannot complete facial recognition because I have severe myopia, and the app does not allow me to take the picture while wearing glasses. When I remove my glasses, I cannot see the image properly, and all attempts fail. Is there no other way to authenticate?"* [Av50]

Additionally, the validation process requires users to perform specific facial expressions, such as smiling or blinking. However, not all users are able to meet these requirements, whether due to physical limitations, specific facial conditions, or post-stroke impairments.

- R13: *"The app is terrible, it does not recognize smiles or blinking. It is awful. I cannot complete the life verification for my father. It should be something simple, but an elderly person who had a stroke cannot perform the commands quickly within the limited time."* [Av127]

Another recurring difficulty relates to the time constraints imposed during validation. In addition to following complex instructions, users must perform actions within a restricted time frame, which proved particularly challenging for older adults, people with visual impairments, and users with reduced mobility.

- R14: *"Facial validation for older adults is not functional, as impaired mobility makes it difficult to perform the required movements, and the app demands precision and speed in executing these actions [...]"* [Av126]

These reports indicate that the validation process implicitly assumes a set of physical and cognitive capabilities that do not reflect the diversity of users. Requirements such as removing glasses, performing specific facial expressions, and completing tasks within strict time limits constitute barriers that may render access unfeasible for certain user profiles. As a consequence, such mechanisms may reduce user autonomy and lead individuals to depend on third parties to complete the authentication process.

Subtheme 5 - Cognitive and Communication Barriers in Interaction: Several reports were identified regarding difficulties in using and understanding the applications, especially among older adults and users with lower levels of literacy and technological familiarity. The reports indicate that the interface was perceived as being designed for users with prior experience in digital technologies, which makes interaction more difficult for those with little or no familiarity with such systems.

- R15: *"[...] The interface is designed for young people or those who are used to technology, forgetting the rest of the older and less privileged population who do not have such devices and are unfamiliar with how to use them [...]"* [Av76]

Additionally, difficulties were reported related to the complexity of the interaction flow, particularly in stages such as facial biometrics, which require understanding and executing multiple instructions. These difficulties become more evident among users with cognitive limitations or specific health conditions.

- R16: *“Facial recognition does not work, I have tried several times. My grandmother is 85 years old, suffers from dementia, and I have to keep asking her to turn her face [...]”* [Av136]

Limitations were also identified regarding the lack of adequate user support, such as tutorials, clear guidance, or help mechanisms during application use.

- R17: *“Very poor accessibility, users with lower levels of knowledge may have difficulties, as the application has no tutorial and is not intuitive to use.”* [Av206]

These reports indicate that the interface structure, combined with the complexity of interaction flows and the lack of adequate support, may hinder use by users with different levels of literacy and technological familiarity. These findings reinforce that the design of the applications assumes a user profile with specific competencies, which may compromise accessibility and reduce the autonomy of a significant portion of the population, leading to dependence on third parties to perform basic tasks.

4.2. Discussion

During the data familiarization phase, it was observed that a significant portion of the reviews described accessibility barriers generically, with comments such as “accessibility needs improvement” [Av11], without detailing the difficulties faced or the specific conditions of users. Nevertheless, the recurrence of such reports indicates a perceived lack of digital inclusion in the analyzed applications.

Another relevant aspect concerns the fact that several reviews were written by third parties responsible for assisting users during their interaction with the applications. This finding highlights that accessibility barriers directly impact users’ autonomy, leading them to rely on external support to perform basic tasks. This dependency was particularly evident in reports related to facial biometrics, in which users emphasized difficulties in completing the required steps and even suggested the use of the rear camera as an alternative to facilitate assistance. We emphasize that the data represents only an indication of the barriers present in the studied applications, since not all users who faced such obstacles were able to record their experience in the form of reviews.

In general, the identified barriers affect a wide range of users, including people with disabilities, older adults, and individuals with different levels of literacy and technological familiarity, reinforcing the limitations of these systems in accommodating diverse user profiles. In quantitative terms, the *gov.br* application concentrates the greatest diversity and frequency of reported barriers, with 259 code occurrences, followed by *Carteira de Trabalho Digital* (53) and *Meu SUS Digital* (48)⁷. This discrepancy is also reflected in the number of accessibility-related reviews selected for analysis. However, the lower volume of records in the other applications does not imply less severe barriers, but possibly a lower number of reviews or lower user engagement in reporting such difficulties.

In the case of *gov.br*, most reported issues are associated with facial biometrics, highlighting both recognition limitations and requirements that may be considered exclusionary. This result is consistent with the findings of the thematic analysis, which revealed difficulties related to both the implementation and the imposed requirements of

⁷Tables with code frequencies for each application are available in the study repository.

this authentication mechanism. Additionally, barriers related to language clarity, compatibility with assistive technologies, and the absence of features such as Brazilian Sign Language (Libras) support were identified. In the *Meu SUS Digital* application, there is a higher concentration of reports related to low compatibility with screen readers, followed by complaints about the absence of features such as dark mode and zoom functionalities. Limitations related to the lack of specific accessibility features and interface intuitiveness were also identified. In *Carteira de Trabalho Digital*, occurrences are mainly concentrated in general accessibility issues, lack of clarity, and interface usability difficulties. Limitations related to screen reader compatibility, absence of visual customization features, and issues associated with the language used in the application were also identified.

Based on the findings, it is observed that many of the reported barriers could be mitigated through the adoption of established accessibility practices, such as those recommended by [Associação Brasileira de Normas Técnicas 2025]. Among the main suggested improvements are: (i) support for dark mode and adequate contrast; (ii) zoom and text enlargement functionalities; (iii) accessible validation alternatives beyond CAPTCHA and facial biometrics; (iv) full compatibility with screen readers; (v) support for Brazilian Sign Language (Libras); (vi) simplification of interaction flows; (vii) use of clear and accessible language; (viii) provision of tutorials and help mechanisms; and (ix) continuous evaluation of accessibility features with user participation. The results reinforce that accessibility should not be treated merely as the isolated inclusion of features, but as a central aspect of system quality, which must consider user diversity and their different usage conditions.

5. Conclusion

This study aimed to identify the main digital accessibility barriers reported by users in reviews published on the Google Play Store regarding the Brazilian government mobile applications *gov.br*, *Meu SUS Digital*, and *Carteira de Trabalho Digital*. The results show that the identified barriers are not limited to the absence of accessibility features but also include implementation failures and design decisions that assume a standard user, disregarding the diversity of the population. Among the main reported issues are limitations in facial biometrics, incompatibility with screen readers, lack of accessible validation alternatives, contrast and text enlargement issues, as well as difficulties related to language, clarity, and ease of use. These findings indicate that, although accessibility is established in legal frameworks and normative guidelines, significant challenges remain in its effective implementation.

From a methodological perspective, the study demonstrates the feasibility of using app store reviews as a complementary source for analyzing accessibility in digital public services. The results also reinforce that promoting accessibility in government applications goes beyond meeting technical or legal requirements, constituting an essential element for building an inclusive, citizen-centered digital government. As limitations, it is important to note that the analyzed reviews may not reflect the current versions of the applications, as the data collection was extracted in April 2025, subsequent application updates may have introduced enhancements or fixes to the accessibility features evaluated. Additionally, temporal information (date and time of reviews) was not considered in order to reduce the risk of user identification. Although the data used are publicly available, the use of user-generated content may raise privacy concerns. To mitigate this

issue, the research was submitted to and approved by a Research Ethics Committee, ensuring compliance with applicable ethical principles. Another limitation concerns the substantial reduction in the volume of data, from more than one million reviews to a smaller final sample of accessibility-related reviews. However, this scarcity of specialized reviews is a phenomenon documented in the literature. Previous studies, such as [Eler et al. 2019, Oliveira et al. 2023], show that the volume of accessibility-related reviews is limited. Therefore, the obtained sample reflects spontaneously reported perceptions and the low frequency of accessibility-related feedback on public platforms.

As future work, the following directions are suggested: (i) extending the analysis to other government applications; (ii) including reviews from other platforms, such as the App Store; (iii) investigating developers' responses to user reviews; (iv) exploring natural language processing techniques to support the automatic identification of accessibility barriers in user reviews; (v) explore whether there are specific accessibility barriers in the health and work domains; (vi) investigating whether the lower frequency of reviews in certain public applications conceals critical, foundational accessibility issues that are unrelated to biometric authentication, using normalized sample sizes to conduct comparative inter-case analyses; (vii) to connect the suggested solutions more directly to specific criteria, transforming the findings into a practical guide for public sector developers; and (viii) developing an interactive dashboard or an open-access platform to publicize the research findings in an accessible format for public administrators and the general community, thereby broadening the research outreach and supporting targeted improvements in e-government digital services. In summary, the results reinforce the need to incorporate accessibility as a central principle in the development of digital public services, considering user diversity from the early stages of design.

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