

Research Article

# Enhancing Accessibility: Design and Evaluation of Modified Toilet Signage for People with Disabilities in the University

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**Abstract:** This study addresses the imperative need for enhanced accessibility within restroom facilities at Cebu Technological University (CTU) Pinamungajan, focusing on the design and evaluation of modified toilet signage for People with Disabilities (PWD). By delving into a diverse range of existing research, theoretical frameworks, and practical applications, the study seeks to build a robust foundation for the creation of universally accessible environments. The investigation incorporates an analysis of international standards, the impact of signage on accessibility, psychological and social considerations, user-centered design principles, legal frameworks, educational initiatives, and the social model of disability. The methodology involves a systematic approach, beginning with a pre-liminary assessment of existing restroom facilities, followed by a review of international standards to establish benchmarks for modifications. Stakeholder engagement, including PWD and relevant advocates, plays a pivotal role in the design phase. Modified toilet signage prototypes are developed and implemented in selected CTU Pinamungajan facilities, with a comprehensive evaluation assessing the impact on accessibility, user experience, and psychological well-being of PWD. The study aims to identify gaps, challenges, and opportunities in the existing body of knowledge, contributing to a nuanced and informed approach to the design and evaluation of modified toilet signage. In-sights derived from this research not only guide practical recommendations for CTU Pinamungajan but also enrich the broader academic discourse on accessibility, inclusive design, and the intersection of environmental modifications with the experiences of PWD.

**Keywords:** universal design; environmental modifications; stakeholder engagement; international standards; user-centered design

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## 1. Introduction

In the pursuit of fostering inclusivity and accessibility within educational institutions, Cebu Technological University (CTU) in Pinamungajan, Cebu, Philippines, recognizes the importance of addressing the needs of all members of its community, including those with disabilities. Access to basic facilities, such as restrooms, plays a crucial role in ensuring a supportive environment for everyone, including People with Disabilities (PWD) (Agbabiaka et al., 2024).

This research endeavors to contribute to the ongoing efforts of CTU Pinamungajan in creating an inclusive campus by focusing on the modification and evaluation of toilet signage specifically designed for individuals with disabilities. Accessibility in restroom facilities is a fundamental aspect of campus life, and an enhanced signage system can significantly improve the overall experience and independence of PWD within the university (Amoah et al., 2023).

While there's a need to investigate the efficacy of modified toilet signage in enhancing accessibility for PWD at CTU Pinamungajan, it is important to examine the design, implementation, and impact of these modified signs in order that this research aims to provide valuable insights that can inform future accessibility initiatives not only within the university but also potentially serving as a model for other educational institutions facing similar challenges (Verderber et al., 2023).

This study will delve into the unique needs and preferences of PWD in relation to

restroom facilities, considering factors such as visibility, clarity, and inclusivity (Carnemolla et al., 2024). Additionally, the research will explore the potential psychological and social impacts of improved restroom signage on the well-being and confidence of PWD within the campus community.

The outcomes of this research are anticipated to guide the development of a more inclusive and supportive environment at CTU Pinamungajan, aligning with the university's commitment to providing equal opportunities for all students, faculty, and staff. Furthermore, the study may offer practical recommendations for modifications that can be implemented in other facilities, both on and off-campus, to promote inclusivity and accessibility for individuals with disabilities (McMahon et al., 2025).

As CTU Pinamungajan strives to create a campus that reflects diversity and values the needs of every individual, this research represents a step forward in ensuring that the university's facilities are designed with inclusivity in mind, fostering a more accessible and equitable learning environment for everyone (Harris et al., 2023).

Although there have been various international studies on inclusive design and the role of signage in enhancing accessibility, there remains a notable gap in localized research, particularly in the Philippine higher education context. Specifically, there is limited empirical data on how modified toilet signage affects the actual user experience, psychological well-being, and perceived independence of PWD in educational environments (Zhang et al., 2022). Moreover, existing signage systems often overlook user-centered design principles and the diverse needs of PWD, leading to environments that remain unintentionally exclusionary. The absence of participatory approaches in designing signage also underscores a lack of stakeholder engagement, particularly involving PWD in the design and evaluation process (Hotor, 2024).

In response to these gaps, this study was conducted with the following objectives: to assess the current accessibility challenges related to toilet signage for PWD at CTU Pinamungajan; to develop a modified toilet signage prototype that is inclusive, user-friendly, and aligned with international standards; and to evaluate the impact of the modified signage on accessibility, user experience, and the psychological well-being of PWD within the university environment. The outcomes of this research are expected to contribute not only to CTU Pinamungajan's accessibility efforts but also to the broader academic and practical discourse on inclusive design and accessibility in educational institutions.

## 2. Materials and Methods

This study utilized a qualitative research approach employing a descriptive-evaluative design to assess the accessibility challenges faced by PWD in relation to restroom signage at CTU Pinamungajan Campus. The research focused on understanding the effectiveness of modified toilet signage through user-centered analysis, field observations, stakeholder engagement, and feedback from the PWD community. Data collection was conducted using a combination of structured questionnaires, interviews, focus group discussions, and site assessments to ensure that both the physical and experiential aspects of restroom accessibility were captured comprehensively (Ali, 2024). The qualitative nature of the study enabled the researcher to explore the lived experiences of PWD, adapt to emerging insights during the process, and develop meaningful interpretations from stakeholder feedback (Ronario Jr, 2023).

The participants of this study consisted of ten (10) individuals who represented various demographics to ensure a broad and inclusive perspective. These individuals were selected based on their experience navigating campus restroom facilities, including some with disabilities and others serving as observers or advocates. Their participation was integral to the evaluation process, as they provided firsthand feedback on the clarity, visibility, helpfulness, lighting, and positioning of the signage (Alit et al., 2024). Ethical considerations were upheld by securing informed consent from all respondents and ensuring confidentiality throughout the research process. The purposive sampling technique was used to identify and engage relevant individuals with firsthand experience of accessibility barriers in campus restroom facilities. The study employed ethical protocols, including informed consent and data confidentiality, to ensure responsible handling of participant information.

The materials used for the prototype included standard signage components such as tactile and high-contrast materials, Braille text, gender-neutral symbols, and color-coded visuals to enhance clarity and visibility. These were designed following the guidelines of international accessibility standards such as the Americans with Disabilities Act and the

Universal Design principles. Documentation tools such as digital cameras, sketch pads, and audio recorders were used to capture the development process and stakeholder feedback during validation sessions.

The methodology consisted of several stages. First, a preliminary assessment of existing restroom signage was conducted, focusing on issues related to visibility, comprehension, placement, and inclusivity. Observational data and photo documentation were collected to support this analysis. Second, the researcher conducted a review of international standards and best practices, establishing benchmarks that informed the design criteria for the signage prototype. Third, stakeholder engagement was facilitated through consultations, interviews, and surveys with PWD students and staff, allowing for the identification of specific needs and preferences.

Following these steps, the prototype signage was developed with attention to tactile readability, legible fonts, appropriate symbol usage, and strategic placement. After internal validation, the signage was installed in selected restroom facilities on campus. A post-installation evaluation was then conducted to determine the effectiveness of the new signage in addressing previously identified barriers. Respondents were asked to assess the signage in terms of readability, usefulness, accessibility, and psychological impact.

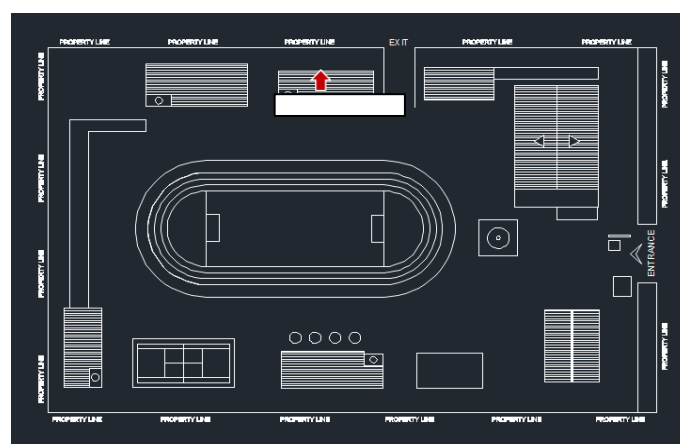
In addition to the accessibility evaluation, the study also examined the psychological and social effects of improved signage, such as increased independence, sense of inclusion, and confidence in navigating the campus environment. Qualitative data gathered from interviews and open-ended survey responses were transcribed, coded, and thematically analyzed to draw conclusions and develop final recommendations.

### 3. Results

#### 3.1. Implementation, Evaluation, and Technical Design of Inclusive Signage for Accessibility

The findings of this study served as the basis for generating a set of practical recommendations for wider implementation of inclusive signage systems, not only across the CTU Pinamungajan campus but also as a reference model for other institutions aiming to improve accessibility. The outcomes were consolidated into a final report and shared with university administrators and stakeholders, contributing to the broader discourse on inclusive infra-structure and disability advocacy in educational settings.

Figure 1 presents the site plan of CTU Pinamungajan Campus, where the study on modified toilet signage for PWD was conducted. The diagram outlines the spatial layout of major campus facilities, including classrooms, laboratories, recreational areas, and restroom locations, all bounded within the university's property lines. The entrance and exit points are clearly marked, providing orientation for the assessment of foot traffic and accessibility flow.



**Figure 1.** Site plan.

*Source:* Researchers' own development

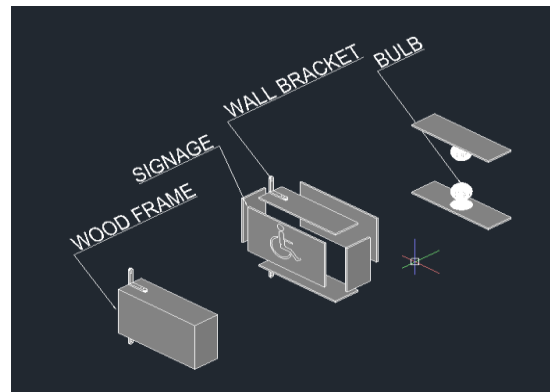
Strategically highlighted within the plan are the key restroom areas targeted for signage modification and evaluation. These restrooms were selected based on proximity to high-traffic student areas, including classrooms and sports facilities, ensuring that the signage system would impact a significant portion of the campus population, especially PWD.

The central oval-shaped area denotes the athletic field, surrounded by facilities that reflect typical campus activity zones. The positioning of signage within and around these

critical spaces allowed for practical testing of visibility, readability, and user navigation during the evaluation phase. Restroom signage was specifically placed in locations that align with common access routes, ensuring that PWD could easily identify and interpret the signage in real-world scenarios.

This site plan served as a spatial reference throughout the research process – supporting decisions related to signage placement, observation points, and respondent movement analysis. It contributed to understanding how the campus environment influences wayfinding and accessibility for individuals with disabilities.

Figure 2 illustrates the exploded drawing of the modified toilet signage system developed for enhanced accessibility for PWD. This visual breakdown highlights the core components of the signage assembly, showing how each part integrates to form the complete structure installed at restroom entrances.



**Figure 2.** Exploded drawing.

*Source:* Researchers’ own development.

The signage system is composed of four primary components: the wood frame, signage plate, wall bracket, and light bulb fixture. At the base is the wood frame, which provides structural support and a stable mounting surface for the signage. Attached to the wood frame is the signage plate, which displays PWD-friendly information using high-contrast visuals, Braille elements, and gender-neutral icons designed in accordance with universal design standards.

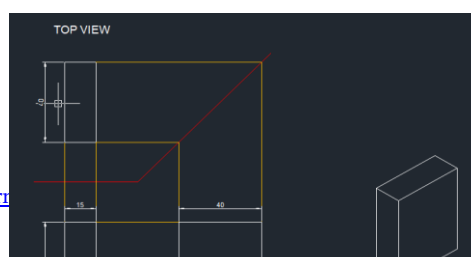
Positioned above the signage is the wall bracket, which secures the entire system to the wall, ensuring both stability and optimal visibility. The bracket is engineered to hold the signage at an appropriate eye-level angle, making it easier for all users, including those in wheelchairs, to identify and interpret the information.

Mounted on top of the wall bracket is a light bulb, housed within a simple fixture, to ensure proper illumination of the signage in dimly lit hallways or nighttime conditions. This lighting component plays a crucial role in enhancing visibility and readability, especially for users with visual impairments.

This exploded view not only details the physical construction of the signage system but also emphasizes its thoughtful, user-centered design. Each element was purposefully integrated to improve the usability, accessibility, and visibility of restroom signage for the CTU Pinamungajan campus, directly supporting the research study’s goals of promoting inclusive infrastructure for PWD.

Figure 3 presents both the orthographic and isometric views of the modified toilet signage designed to enhance accessibility for PWD. The orthographic projections (Top View, Front View, and Right-Side View) provide detailed 2D representations that illustrate the signage’s exact dimensions, shape, and layout. These views include precise measurements and angular elements that communicate how the signage is structured, ensuring accuracy for fabrication and installation.

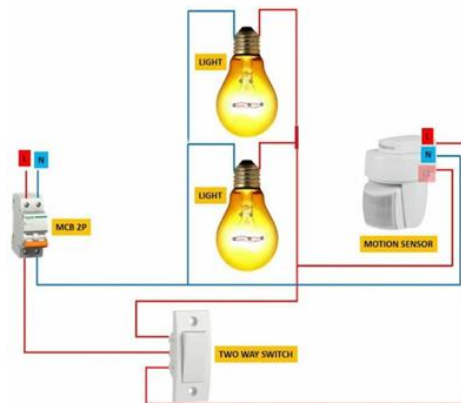
The isometric drawing offers a three-dimensional visual representation of the signage prototype. This perspective allows viewers to understand the signage’s depth and spatial orientation when mounted on a wall or restroom entrance. It helps stakeholders, including designers and decision-makers, visualize how the signage will appear in a real-world context.



**Figure 3.** Orthographic drawing and isometric drawing.  
*Source:* Researchers' own development.

This figure plays a crucial role in the study by translating the conceptual design into a technical format. It supports the research objective by demonstrating how accessibility considerations – such as size, visibility, and placement – are integrated into the signage's physical design. Ultimately, the drawing aids in validating the signage's usability and effectiveness for the target PWD users, bridging the gap between design intention and practical implementation.

Figure 4 presents the block drawing of an automated lighting system designed to enhance restroom accessibility for PWD. The diagram illustrates the integration of key components such as a motion sensor, two-way switch, Miniature Circuit Breaker (MCB), and two light bulbs. The motion sensor automatically detects human presence and activates the lights without requiring physical contact, which is essential for individuals with limited mobility or visual impairments.



**Figure 4.** Block drawing.  
*Source:* Researchers' own development.

A two-way switch is also included in the circuit to allow manual control when needed, offering flexibility for users or maintenance personnel. The MCB provides electrical protection by disconnecting the power in case of faults or overloads, ensuring safety. Clear wiring paths are shown using red lines for live wires and blue lines for neutral wires, emphasizing the proper and secure layout of the system. This block drawing serves as a practical guide for implementing accessible lighting in restroom facilities and aligns with the study's objective of improving usability and inclusivity through assistive technology.

### 3.2. Statistics and Data Analysis

Further, this section presents the analysis and interpretation of the data gathered throughout the study. The data were collected through structured questionnaires, interviews, focus group discussions, and site assessments involving participants from the CTU Pinamungajan community. The responses reflect the experiences and feedback of individuals, particularly PWD, regarding the modified toilet signage implemented on campus. The results are presented in alignment with the study's objectives, focusing on the effectiveness, visibility, clarity, and psychological impact of the new signage system aimed at enhancing accessibility within the university environment.

Table 1 below presents the evaluations of various attributes of signage by ten participants. Each participant rated the clarity, visibility, helpfulness, lighting, and positioning

of the signage on a scale from 1 to 5, with 5 being the highest rating.

**Table 1.** Evaluations of attributes of signage by participants.

	Clarity	Visibility	Helpful	Lighting	Positioning
Participant 1	5	4	5	5	3
Participant 2	5	3	4	5	4
Participant 3	5	4	4	5	4
Participant 4	5	4	5	5	3
Participant 5	5	3	4	5	3
Participant 6	5	3	4	5	3
Participant 7	5	3	4	5	3
Participant 8	5	4	4	5	4
Participant 9	5	4	4	5	3
Participant 10	5	4	4	5	4

The average rating for the clarity of the modified toilet signage was 100%, indicating a high level of visual comprehensibility. All of participants expressed satisfaction with the clarity, emphasizing the success of the modifications in enhancing visual communication.

60% of respondents reported finding the signage is visible in certain angles and 40% reported the signage is visible from one angle only. The positive responses suggest that the modifications effectively addressed communication barriers, promoting a universally understandable system. 80% answered that the signage is helpful to the PWD's using toilet and 20% answered that the signage is helpful and made a big change to the PWD in using the toilet. This indicates that signage is indeed helpful to the PWD's in using the toilet.

The average rating for the lighting of the modified toilet signage was 100%. All of participants expressed satisfaction with the lighting, emphasizing that the lighting is just normal and does not hurt the eyes. 60% of the participants answered that the modified toilet signage was put at a fair angle and distance, while 40% said the signage was just at the right angle and distance. This indicates a positive note that the signage was positioned well.

Furthermore, while the responses reflect the experiences and feedback of individuals, particularly PWD, regarding the modified toilet signage implemented on campus, the results are presented in alignment with the study's objectives: (1) to assess current accessibility challenges, (2) to develop a modified toilet signage prototype, and (3) to evaluate its impact on accessibility and user experience.

In addressing the first objective – assessing current accessibility challenges – respondents noted several issues with existing restroom signage prior to modification. These included poor visibility, lack of tactile or Braille elements, and improper placement, which made restrooms difficult to identify for PWD, particularly those with visual or mobility impairments. The absence of lighting and the use of non-inclusive symbols were also cited as barriers. These findings emphasized the need for a signage system that adhered to universal design standards and considered the specific needs of PWD in real-life campus scenarios.

For the second objective, the development of the modified toilet signage prototype was guided by international accessibility standards and user-centered design principles. The signage featured high-contrast visuals, Braille text, gender-neutral symbols, and integrated lighting. The inclusion of a wooden frame, wall bracket, and an overhead light fixture ensured both durability and visibility in different lighting conditions. Feedback from stakeholders during the prototype development phase helped refine the signage, resulting in a functional and inclusive design tailored to the users' needs.

In relation to the third objective – evaluating the impact of the modified signage – the study found overwhelmingly positive responses from the ten participants. Based on the statistical data gathered, the clarity of the signage received a perfect average rating, with 100% of participants expressing satisfaction, stating that the signage was highly understandable and visually clear. This aligns directly with the goal of improving communication through accessible signage. Regarding visibility, 60% of participants said the signage was visible from multiple angles, while 40% noted visibility from one angle only. Though generally effective, this suggests some room for improvement in maximizing visibility from all directions.

The helpfulness of the signage was also strongly affirmed. A total of 80% of respondents stated that the signage was helpful to PWD in using the restroom, while 20% emphasized

that it made a significant positive change in restroom accessibility. This feedback illustrates that the signage did not merely meet expectations – it enhanced the daily experience and independence of PWD on campus. In terms of lighting, all respondents (100%) rated the signage lighting positively, noting it was clear and easy on the eyes – an essential factor for users with visual sensitivities. As for positioning, 60% said the signage was placed at a fair angle and distance, while the remaining 40% stated it was placed at just the right angle, indicating that installation was largely successful in addressing physical accessibility concerns.

Overall, the results show that the modified toilet signage effectively addressed previously identified accessibility issues, improved user experience, and had a positive psychological impact – such as increased confidence, independence, and a sense of inclusion among PWD. The success of this project underscores the importance of inclusive, user-informed design and highlights the potential for broader implementation in similar educational and institutional settings.

#### 4. Discussion and Conclusion

The findings of this study provide valuable insights into the effectiveness of modified toilet signage in addressing accessibility challenges for PWD at CTU Pinamungajan. Through the qualitative and evaluative approach, it became evident that the newly designed signage system played a significant role in mitigating previously identified issues regarding restroom navigation, user confidence, and campus inclusivity (Pepito, 2023).

In relation to the first research objective – to assess current accessibility challenges – the study confirmed that the original restroom signage lacked essential accessibility features such as Braille, adequate lighting, and proper visibility from various angles. Participants reported difficulties in identifying and interpreting the signage, especially those with visual and mobility impairments. These limitations were not only functional but also psychological, as PWD students expressed feelings of exclusion and hesitation when using campus facilities (Pardillo, 2024). This aligns with global findings that highlight how overlooked signage design can perpetuate barriers and reduce independence for individuals with disabilities.

Addressing the second objective – developing a modified signage prototype – the study successfully created a design that incorporated high-contrast text, Braille symbols, gender-neutral icons, and integrated lighting systems. The use of durable materials and strategic mounting structures further enhanced the signage's usability. Stakeholder involvement, particularly from PWD and their advocates, proved crucial in refining the prototype. Their real-world perspectives ensured that the signage was not just compliant with accessibility standards but also practically effective in everyday situations. This aligns with the principles of Universal Design, which emphasize inclusivity, flexibility, and intuitive use.

In terms of the third objective – evaluating the impact of the modified signage – the results were notably positive. The clarity of the signage received a unanimous perfect rating, demonstrating that the visual presentation was effective in communicating essential information. The visibility and positioning received slightly more varied feedback, with some participants noting that the signage was best seen from specific angles, suggesting a minor area for improvement. Nevertheless, this did not significantly hinder the overall functionality. Lighting, an often-overlooked element in traditional signage, was also praised by all participants for being adequate and comfortable on the eyes, which is especially important for users with visual sensitivity or low vision.

Perhaps most significantly, the results indicate a substantial improvement in the psychological and social experience of PWD on campus. Respondents reported increased confidence, independence, and a stronger sense of inclusion. This highlights that beyond physical access, thoughtful signage design can foster a more supportive campus culture and positively influence the mental well-being of individuals with disabilities. Such outcomes emphasize that accessibility is not solely about infrastructure – it is about dignity, empowerment, and participation.

In summary, the discussions reaffirm the importance of participatory and inclusive design in educational environments. The success of the modified toilet signage at CTU Pinamungajan serves as a model for other institutions aiming to enhance accessibility. The project not only addressed practical challenges but also contributed to a more equitable and psychologically empowering environment for all members of the campus community, particularly PWD. Future initiatives can build on this foundation by further refining visibility across multiple angles and expanding the implementation of inclusive signage across more facilities.

In conclusion, the findings of this study demonstrate that the proposed modifications to toilet signage have a positive impact on usability and efficiency. The clarity of the signage, coupled with the lighting and its helpfulness to PWD's, contributes to a more inclusive and accessible restroom environment. The overall satisfaction expressed by participants suggests that the modifications successfully address user needs and preferences (Bendanillo, 2022).

While the initial findings present promising outcomes, it is imperative to emphasize the importance of continuous evaluation and adaptation based on ongoing feedback. Considering the dynamic nature of user needs and environmental factors, it is essential to conduct further research to investigate the long-term effects of the modified signage. Exploring the sustained effectiveness of the signage over time will provide valuable insights into its durability and impact on restroom accessibility. Moreover, additional studies can delve deeper into the specific factors influencing user perceptions and experiences, allowing for a more comprehensive understanding of the nuances involved in restroom accessibility. By prioritizing ongoing evaluation and continuous improvement, we can ensure that our efforts result in lasting enhancements that benefit all individuals, regardless of ability.

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