

ABSTRACT

Navigating public spaces remains a major challenge for individuals with visual impairments, especially when there is no guidance system that is informative and accessible. This study aims to design and develop a mobile application based on Bluetooth Low Energy (BLE) Beacon technology as a navigation aid to enhance the independence of visually impaired users when moving from place to place. The development method used is prototyping, conducted in two iterations. The first iteration focused on developing core features such as beacon scanning, destination selection, and voice-based directional instructions. In the second iteration, the system was improved with the addition of beacon and route management features for admin users, as well as enhancements to accessibility aspects based on initial evaluation results.

Evaluation was conducted through usability testing using the System Usability Scale (SUS), Single Ease Question (SEQ), and direct user testing. The average SUS score for end users increased from 65 in the first iteration to 78 in the second, falling into the “Acceptable,” “Good,” and Top Quartile categories. For admin users, the SUS score decreased slightly from 86.7 in the first iteration to 85 in the second, but still remained within the “Acceptable,” “Excellent,” and Top Quartile Ranges. These results indicate overall improvement and consistency in user experience.

User feedback suggests that the system is practical and informative, and has the potential to enhance independent mobility for visually impaired individuals in public environments such as special needs schools and public facilities. This system contributes to technological inclusivity and can be further developed for broader-scale implementation.

Keywords — *Accessibility inclusion, Bluetooth Beacon, indoor navigation, prototyping, usability testing, visual impairment*