iJETRM
International Journal of Engineering Technology Research Management
(IJETRM)
https://ijetrm.com/

READING AID FOR BETTER ACCESSIBILITY: A MOBILE APPLICATION DESIGNED TO ASSIST DYSLEXIC AND VISUALLY IMPAIRED STUDENTS IN READING AND LISTENING TO TEXT

Ronald B. Fernandez
rbfernandez042176000111@gmail.com | **ORCID ID - 0009-0007-0979-6315**
Professor, College of Computing Studies, Universidad de Manila, Philippines

John Joseph P. Mintar
jpmintar@udm.edu.ph | **ORCID ID - 0009-0009-2142-7314**
UG, College of Computing Studies, Universidad de Manila, Philippines

Francedrick C. Reanzares
fcreanzares@udm,edu.ph | **ORCID ID - 0009-0006-8774-9138**
UG, College of Computing Studies, Universidad de Manila, Philippines

Levi M. Sarmiento
lmsarmiento@udm.edu.ph | **ORCID ID - 0009-0004-4324-5531**
UG, College of Computing Studies, Universidad de Manila, Philippines

Hazel Caryl B. Timpangco
hbtimpangco@udm.edu.ph | **ORCID ID - 0009-0007-8385-7366**
UG, College of Computing Studies, Universidad de Manila, Philippines

ABSTRACT
This study introduces Reading Aid for Better Accessibility; a mobile application aimed at assisting students with dyslexia and visual impairments in reading and auditory comprehension of text. It uses Optical Character Recognition (OCR) and Text-to-Speech (TTS) technologies to turn printed or digital text into sound, which makes learning more fun and easier to understand. The app also lets users change the font size, style, and color contrast to make it easier to read. It also supports both English and Tagalog and lets users access it online. Overall, the system is a useful and easy-to-use tool that encourages students with reading problems to learn on their own.
The project adhered to the Software Development Life Cycle (SDLC) and was assessed using the ISO/IEC 25010 Software Quality Model to evaluate both operational functionality and user satisfaction. A quantitative research methodology was utilized via standardized survey questionnaires disseminated to students, educators, and stakeholders. The test looked at important software quality traits and always got good results.
To sum up, the Reading Aid mobile app is a big step forward in making it easier for students with reading problems and low vision to get help. The results show that the system meets and often exceeds user needs. There are still ways to improve security and personalization features, though. The project shows that the school is dedicated to using technology to make education more inclusive, and it makes a real difference in making sure that all students have equal and accessible learning experiences.

Keywords:
Dyslexia, Visual Impairment, Accessibility, Optical Character Recognition, Text-to-Speech

INTRODUCTION

Reading and comprehension form the foundation of learning, still students with dyslexia and low vision are having a hard time with reading materials that are accessible. Dyslexia confuses the child as to the words and sounds recognition, whereas vision defects make reading printed texts difficult. These difficulties can result in less opportunity for self-learning.

iJETRM
International Journal of Engineering Technology Research Management
(IJETRM)
https://ijetrm.com/

Progress in assistive technology, mainly Optical Character Recognition (OCR) and Text-to-Speech (TTS), opens opportunities to overcome these barriers. Many existing tools still miss key features, such as customization options and bilingual support. In addition, most applications address either students with dyslexia or those with visual impairments individually, leaving a need for an inclusive solution that accommodates both.
The study presents the Reading Aid for Better Accessibility, a mobile application that transforms text into audio and provides adaptable features, including adjustable text settings and contrast modes. With support for both English and Tagalog, as well as online access, the application seeks to enhance comprehension, encourage independent learning, and promote inclusivity for students with special needs.

OBJECTIVES

The main goal of the project, it defines what the research or project is trying to achieve, and in broad terms. This is the base objective from which the specific objectives that will narrow down the scope of the research will further be determined. The key of it is in the title of this project which is to create a mobile application which will facilitate reading, especially to the students with dyslexia and visual disabilities by fitting at the most inclusive and adequate, respective, features for the above-mentioned students.
The study shall focus on the following specific objectives:

1. To build customizable text settings, such as size, style, and color contrast, for better legibility.
2. To add Text-to-Speech (TTS) capability for auditory learning and understanding.
3. To include Optical Character Recognition (OCR) to translate printed text into usable forms.
4. To maintain compatibility with assistive tools such as screen readers and magnification tools.
5. To make the application more usable by integrating bilingual support English and Tagalog.

METHODOLOGY

Methodology in Developing Reading Aid for Better Accessibility: A Mobile Application Designed to Assist Dyslexic and Visually Impaired Students in Reading and Listening to Text covers how data was gathered, how the system was planned, built, and tested, and how each step was carried out in a clear and organized way. The goal of this methodology is to ensure the system is reliable, efficient, and truly effective in meeting users' needs.

Research Design

The study's research design is developmental, focusing on the designing, developing, and evaluating of a technological solution to address reading accessibility challenges. This design was selected to ensure the final application is usable and effective in assisting users with accessibility needs. The application itself was created to enhance reading accessibility for users. This process involved design, development, and evaluation phases. Finally, the researchers employed a quantitative approach to gather data to validate the application's usability and effectiveness in aiding users.

Figure 1 System Development Model

1. Planning

The proponents used interviews as the initial stage of the Agile methodology to determine the feasibility and the need to enhance reading accessibility. The main stakeholders were also consulted, specifically the Ophthalmologists and Optometrists. The aim of these interviews was to collect the necessary information regarding the limitations of the existing reading aids and systems, including elements like the challenges faced by

iJETRM
International Journal of Engineering Technology Research Management
(IJETRM)
https://ijetrm.com/

users with specific visual impairments and reading disorders, the current accessibility of reading materials, as well as the needs for a comprehensive reading aid.
Besides the interviews, the proponents also designed and conducted a survey for Visually Impaired and Dyslexic users. The survey was done to get the users' views and receive feedback regarding their experience with current reading methods and what they expect in a more effective and user-friendly reading aid assistant system. These basic data gathering exercises are crucial for the pre-planning stage and serve as the basis for requirements identification and prioritization of improvements that will lead to the iterative development process of the proposed system.

2. Design

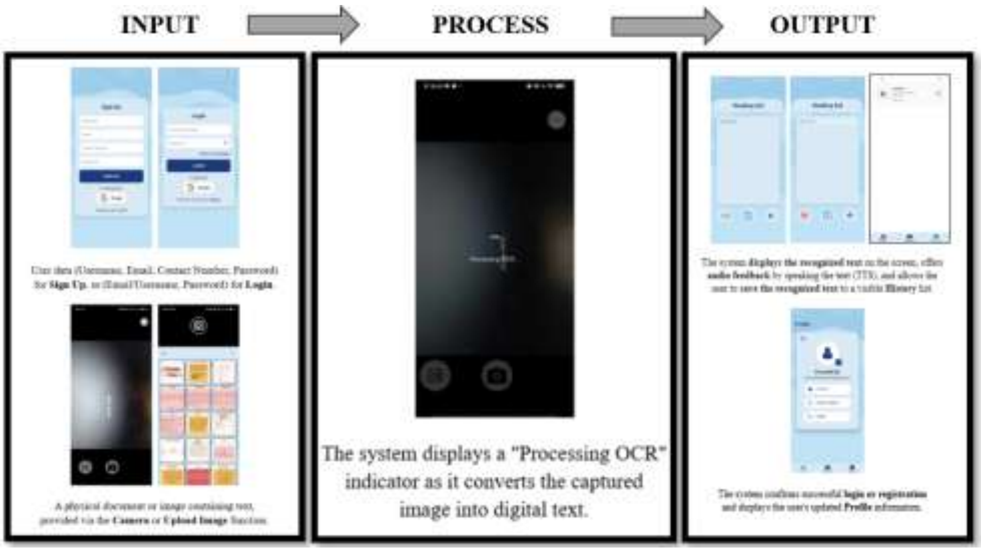

Figure 2 Input-Process-Output (IPO) Model

The proponents developed system diagrams, user workflows, and prototypes to illustrate the structure and functionality of the proposed accessibility application. The team created interactive mockups of the core user interfaces using Figma, as exemplified by the screens shown in Figure 2. These prototypes included the Login/Registration flow and the Profile/Settings interface, which enabled the proponents to visualize the user journey from initial sign-in and preference setup to accessing the core Optical Character Recognition (OCR) and Text-to-Speech (TTS) features.
The design process also involved developing the Input-Process-Output (IPO) model and the system architecture diagram to clearly outline how data moves through the system specifically, how text is captured, processed by the OCR, and converted to speech by the TTS. This step provided the proponents with a clear development framework and ensured that all accessibility features and core modules were properly planned and aligned with the requirements identified for users with visual impairments and dyslexia.

3. Development

The development phase focused on integrating the system's core functionalities Optical Character Recognition (OCR) and Text-to-Speech (TTS) to provide an efficient reading and listening experience for users. The OCR component was implemented using Text Recognition from the @react-native-ml-kit/text-recognition library, which accurately scans and converts printed or image-based text into digital format. The extracted text is then processed by the TTS module, developed with the expo-speech library, enabling natural and clear voice output for auditory learning.
These frameworks were selected for their strong compatibility with mobile platforms and optimization for accessibility-driven applications. The combination of accurate image recognition and high-quality speech synthesis allows the system to generate real-time audio output, making printed and digital materials more

iJETRM
International Journal of Engineering Technology Research Management
(IJETRM)
https://ijetrm.com/

accessible. This integration not only enhances user convenience but also bridges the gap between visual and auditory learning for individuals with dyslexia and visual impairments.

4. Testing
The proponents conducted a series of technical, usability, and clinical testing sessions in collaboration with key stakeholders Ophthalmologists, Optometrists, and end users, particularly individuals with dyslexia and visual impairments. This phase was vital in validating the system's functionality, clinical relevance, and the effectiveness of its accessibility features, including the Optical Character Recognition (OCR) and Text-to-Speech (TTS) modules.
Feedback gathered from experts and users guided the refinement of the interface, accessibility settings, and overall system performance. Bugs and errors, especially those affecting the accuracy of OCR and TTS functions, were promptly resolved. The team followed the Agile testing approach throughout development to ensure quality, responsiveness, and cross-platform stability across different devices.

5. Release
The system was deployed gradually using an Agile approach, beginning with a soft launch or beta testing phase. This pilot release allowed real users students with visual impairments and dyslexia to evaluate the application's performance, usability, and accessibility in real-world conditions. Stakeholders, including Ophthalmologists and Optometrists, supervised the testing to ensure the system's features met professional and clinical expectations.
Based on user and expert feedback, refinements were immediately implemented to enhance interface design, accessibility options, and functional stability. After successful pilot testing, a quantitative evaluation was conducted to measure the system's overall quality and user satisfaction. The results confirmed the application's readiness for full-scale implementation.

6. Feedback
Following the system's release, continuous feedback was collected from visually impaired and dyslexic users, along with Ophthalmologists and Optometrists, to assess clarity, speed, usability, and clinical reliability. Feedback was gathered periodically and after major updates to maintain smooth system performance and address issues promptly.
This process allowed the team to make ongoing improvements, refining the OCR and TTS algorithms for greater text recognition accuracy and more natural voice output. Interface adjustments were also made to further enhance accessibility and user experience, ensuring the system remains responsive to the needs of its diverse users.

RESULTS AND DISCUSSIONS

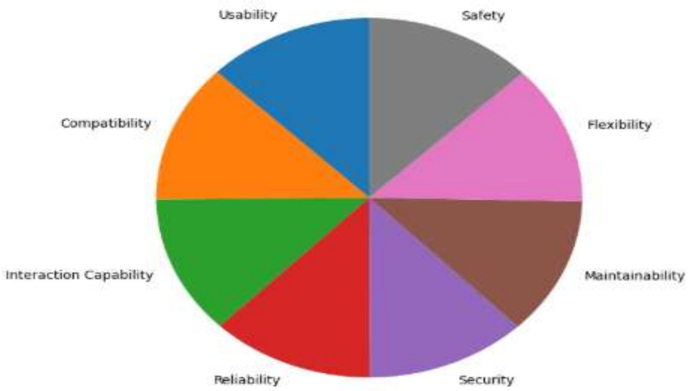

Figure 3 Pie Graph Category

The evaluation phase of this study assessed the quality characteristics of the Reading Aid Mobile Application designed to assist dyslexic and visually impaired students in reading and listening to text. The assessment followed the ISO/IEC 25010 Software Quality Model and utilized user ratings collected from 200 respondents through a

iJETRM
International Journal of Engineering Technology Research Management
(IJETRM)
https://ijetrm.com/

structured questionnaire. The evaluation covered eight key quality characteristics: Usability, Compatibility, Interaction Capability, Reliability, Security, Maintainability, Flexibility, and Safety.

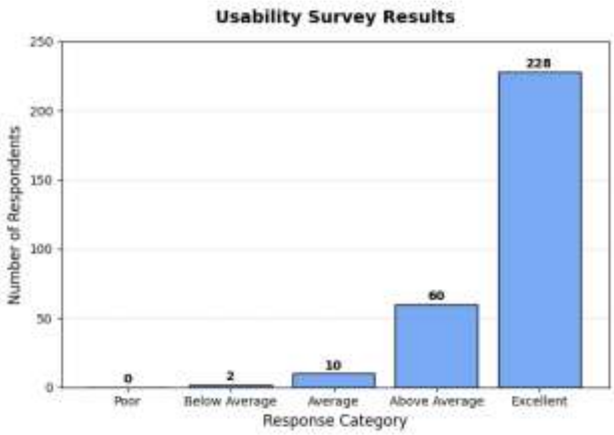

Figure 4 Usability

The system demonstrates exemplary performance regarding this characteristic, as evidenced by the overwhelming concentration of 97% positive ratings (Above Average and Excellent). This indicates that the application is intuitive, highly learnable, and exceptionally easy to operate for its intended users. The focus for future development should not be on fixing usability issues but on enhancing advanced personalization features to move the small fraction of "Above Average" ratings into the "Excellent" bracket, thereby ensuring universal satisfaction.

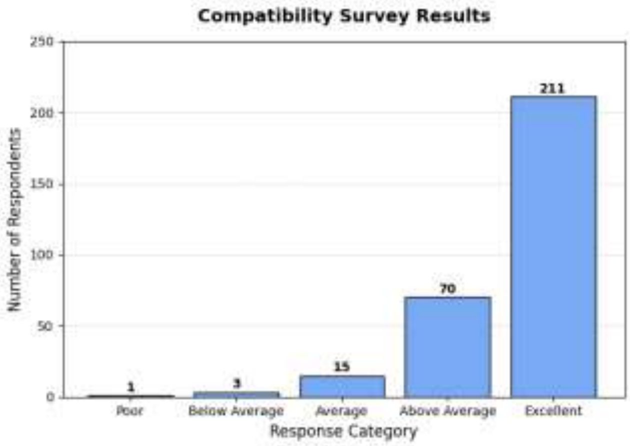

Figure 5 Compatibility

The Reading Aid app also shows strong performance in compatibility, achieving 95% positive feedback from respondents. Users recognized that the application worked across different devices and supported multiple file types without issues. The priority for future development lies in optimizing performance across more assistive tools and operating systems, ensuring that all users regardless of their technological setup consistently experience seamless integration.

iJETRM
International Journal of Engineering Technology Research Management
(IJETRM)
https://ijetrm.com/

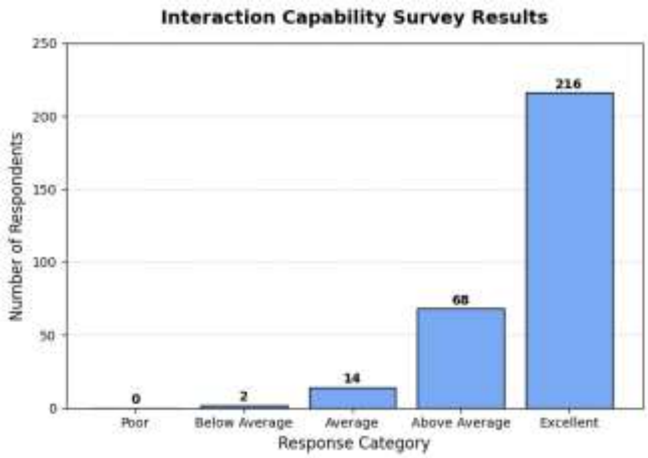

Figure 6 Interaction Capability

The majority of responses for interaction capability also fell in the 4 and 5 range, indicating that the system's interface design and interactivity exceeded expectations. Respondents reported that the application provided smooth navigation, clear user feedback, and customizable settings for text and audio. This demonstrates that the Reading Aid app successfully addressed the unique accessibility needs of dyslexic and visually impaired students, making reading less difficult and more engaging.

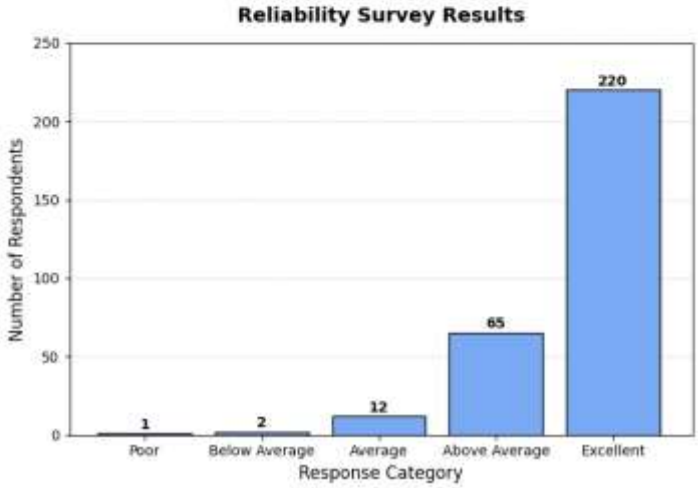

Figure 7 Reliability

The reliability of the system is proven with 95 percent who have been asked giving it a positive rating. Failures, downtime and data loss were not frequently seen by users, supporting the robustness of the system. The emphasis on the future development should be shifted from error fixing to improving system robustness, especially for rare cases, e.g., particularly for unusual cases such as blurry text input, ensuring that every user experience remains consistently excellent.

iJETRM
International Journal of Engineering Technology Research Management
(IJETRM)
https://ijetrm.com/

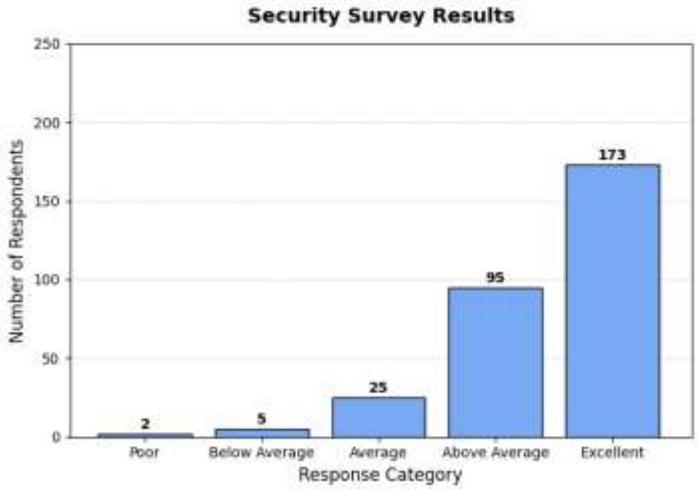

Figure 8 Security

The security on the other hand, though still it was rated as positive by nearly 90% of respondents, got slightly less ‘Excellent’ marks than other categories. This is to say that the system is relatively safe; however, authentication and data protection worries remain. Future enhancements should focus on improving the login process, encryption and protecting privacy (move “Above Average” to the higher satisfaction level).

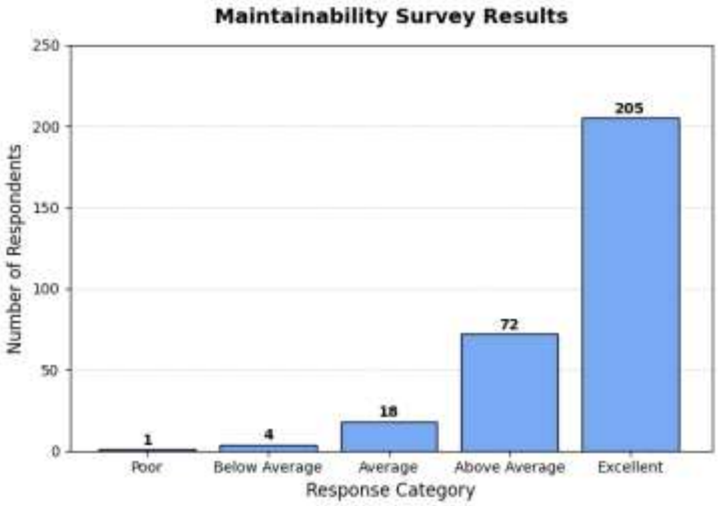

Figure 9 Maintainability

The maintainability had an impressive 96% of positive ratings which indicates that users can trust in the app for further development and enhancement. There is already flexibility and is easy to update for the system. Next development should not only be about addressing problems, but also developing user needs and new accessible solutions that come from market or technology., which would enhance satisfaction level to reach even more the excellent area.

iJETRM
International Journal of Engineering Technology Research Management
(IJETRM)
https://ijetrm.com/

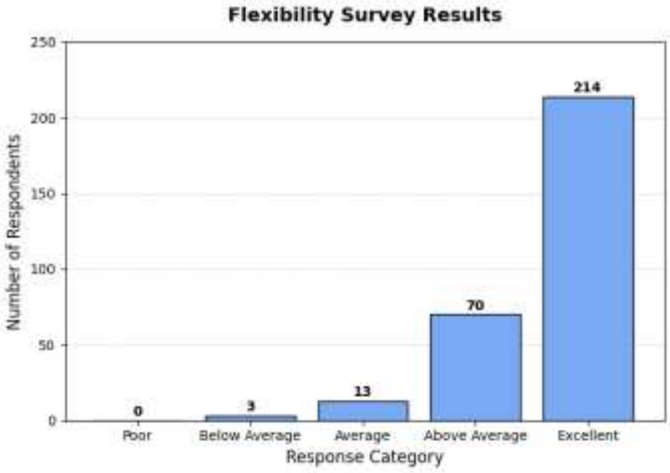

Figure 10 Flexibility

The safety recorded the highest success receiving a positive rating from 98% of respondents. This proves that the app offers a safe, easy, and non-invasive book reading experience. Because so many users feel that it is already Excellent, attention to future developments also ought to be less about fixing problems than about imagining new accessibility enhancements in the system. Improvements along those lines could turn this product into a new standard of safety in all-digital reading for students with disabilities everywhere.

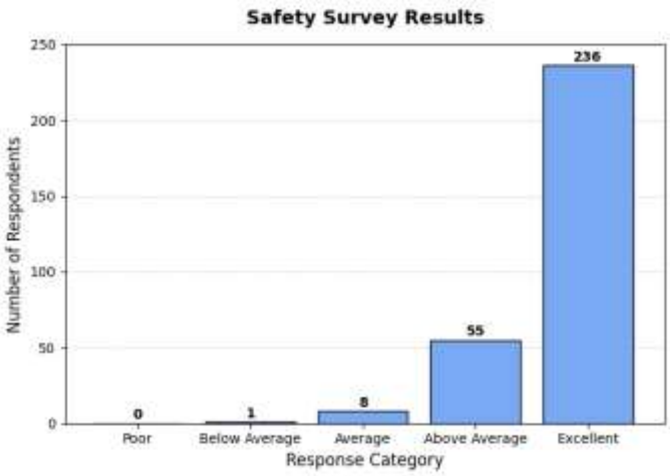

Figure 11 Safety

The safety got the most amount of number marks in Excellent, across all categories. Respondents felt that the app was a non-threatening, easy and discreet resource for reading. How its features of access were put to use, for which the confusion or application of strain was avoided in failure from important uses. It shows that the Reading Aid tool proved to be a supportive and safe environment for dyslexic and visually impaired students.

ACKNOWLEDGEMENT

We would like to extend our sincere appreciation to our Capstone Adviser, Mr. Ronald B. Fernandez, for his continuous guidance, constructive feedback, and encouragement throughout this study. His dedication and support greatly motivated us to stay focused and strive for excellence in our research.

We are also truly grateful to Dr. Syndel Tan, Ophthalmologist at Novagen Eye Center SM City Manila, for not only extending her support during the system testing and data gathering but also for the valuable guidance, thoughtful feedback, and insightful ideas she shared with us. Her contributions were instrumental in shaping the direction of this project. Alongside her, we thank Dr. Josefina Grajo Mojica, Optometrist of Vista Prima Optical

International Journal of Engineering Technology Research Management
(IJETRM)
https://ijetrm.com/

Clinic, together with their staff, for their cooperation and assistance, which made the successful implementation of this project possible.
Our special thanks go to Mr. Josue C. Miras, LPT, MAEd, who served as our Grammarian, for ensuring the clarity and accuracy of our manuscript. We would also like to acknowledge Mr. Roberto E. Viray II, our Technical Adviser, for his valuable insights and recommendations that helped us enhance and refine our system.
We sincerely appreciate the respondents who took part in evaluating the system and answering our questionnaires. Their feedback has been instrumental in shaping the results of this study. We also extend our encouragement to future proponents who may continue this project, with the hope that our work will serve as a useful foundation for their research.
We give our heartfelt thanks to our families, and friends for their unwavering support, patience, and belief in us throughout this journey. Above all, we offer our utmost gratitude to Almighty God for his wisdom, guidance, and blessings, without which this research would not have been possible.

CONCLUSION

The Reading Aid Mobile Application represents a significant step toward promoting accessibility and inclusivity for dyslexic and visually impaired students at Universidad de Manila, as evidenced by its overall Excellent evaluation rating based on the ISO/IEC 25010 Software Quality Model. With features such as Text-to-Speech, Optical Character Recognition, and customizable accessibility settings, the system successfully addresses the barriers faced by its target users, making reading more efficient, supportive, and engaging. While areas such as security offer opportunities for further enhancement, the results affirm that the system not only meets but often exceeds user expectations, thereby reflecting Universidad De Manila commitment to technological innovation, inclusive education, and continuous improvement.

REFERENCES

[1] Al-Razgan, M., Almoaiqel, S., Alrajhi, N., Alhumegani, A., Alshehri, A., Alnefaie, B., AlKhamiss, R., & Rushdi, S. (2021). A systematic literature review on the usability of mobile applications for visually impaired users. *PeerJ Computer Science, 7,* e771. https://doi.org/10.7717/peerj-cs.771

[2] Alnahdi, G. H., & Schwab, S. (2023). *Attitudes toward the inclusion of students with disabilities: The role of teaching experience and teacher education. Education and Information Technologies, 28*(12), 14011–14026. https://doi.org/10.1007/s10639-023-12195-5

[3] Asri, D. N. A., Mohd Ramli, H. A., & Saidin, N. (2025). Development of a mobile application for dyslexic-friendly learning materials. *IIUM Engineering Journal, 26*(2), 142–154. https://doi.org/10.31436/iiumej.v26i2.3429

[4] Bacalla, I., Barcelonia, A. L., Gisultura, F., Pacatang, R., Romarate, K., & Cabanilla, A., Jr. (2024). Challenges and opportunities of students with visual impairment in a state university: A multi-case study. *International Journal of Multidisciplinary Research and Growth Evaluation, 5*(1), 711–720.

[5] Bertumen, E., Albornoz, C., Cañero, D. R., Manalo, J., & Ramos, A. (2017). *FLIPPINO: A mobile application on reading for the dyslexic students of Wordlab.* In *EDULEARN17 Proceedings* (pp. 8117–8126). IATED. https://doi.org/10.21125/edulearn.2017.0005

[6] Bianan, D. R., & Delos Santos, P. G. (2020). Personality types and learning styles of children with dyslexia in San Carlos City Division. *Asian Journal of Multidisciplinary Studies, 3*(1). https://asianjournals.org/online/index.php/ajms/article/view/306

[7] Binlang, J. B., & Donguiz, R. G. (2024). Beyond sight: A systematic review of the challenges and coping mechanisms in inclusive education for visually impaired students. *Cognizance Journal of Multidisciplinary Studies, 4*(7), 59–74.

[8] Cardona, A. J. E. (2024). *Impact of technology-assisted learning on academic achievement in students with learning disabilities. Library of Progress – Library Science, Information Technology & Computer, 44*(3), Article 992. https://bpasjournals.com/library-science/index.php/journal/article/view/992

[9] Estrada, N. S. B., Miramontes, J. E. D., Gumban, J. U., Panares, M. P., Montealegre, S. B., Caballero, S. C. O., Dabatos, M. J. B., & Nepangue, J. (2023). *Investigating the trials and acquittals of students with visual impairment in a tertiary physical education course.*

iJETRM
International Journal of Engineering Technology Research Management
(IJETRM)
https://ijetrm.com/

International Journal of Advanced Multidisciplinary Research and Studies, 3(6), 1097–1106. https://www.multiresearchjournal.com/admin/uploads/archives/archive-1702553489.pdf

[10] Lerga, R., Candrlic, S., & Jakupovic, A. (2021). *A review on assistive technologies for students with dyslexia.* In *Proceedings of the 13th International Conference on Computer Supported Education (CSEDU 2021)* (pp. 247–254). ScitePress. https://www.scitepress.org/Papers/2021/104345/104345.pdf

[11] Maculada, R. E. P., Caballero, A. R., Villarin, C. G., & Albina, E. M. (2023). *FUNologo: An Android-based mobile virtual reality assisted learning with speech recognition using diamond-square algorithm for children with phonological dyslexia.* In *Proceedings of the 2023 8th International Conference on Business and Industrial Research (ICBIR)* (pp. 403–408). IEEE. https://doi.org/10.1109/ICBIR57571.2023.10147727

[12] Newell, A. F., Gregor, G., Morgan, M., Pullin, G., & Macaulay, C. (2011). User-sensitive inclusive design. In C. Stephanidis (Ed.), *Universal access in human-computer interaction: Users diversity (UAHCI 2011). Lecture Notes in Computer Science* (Vol. 6766, pp. 235–244). Springer. https://doi.org/10.1007/978-3-642-21663-3_25

[13] Ocampo, J., Salvador, C., Luen, L. C., Yahya, A. Y., & Dela Peña, S. M. (2023). Flexible learning and student-teacher relationship experience of college students with visual impairment. *The Normal Lights, 17*(2). https://doi.org/10.56278/tnl.v17i2.2161

[14] Parasar, D., Jadhav, Y., Patel, A., & Shah, J. (2024, January 26). *Real-time text recognition and text-to-speech processing system for visually impaired. IET Conference Proceedings.* https://doi.org/10.1049/icp.2024.0493

[15] Ramos, R. M. (2013). *Manipulation of attention in children with reading. International Journal of Social Science and Humanity, 3*(3), 282–286. https://doi.org/10.7763/IJSSH.2013.V3.245

[16] Reid, G. (2016). *Dyslexia and inclusion: Classroom approaches for assessment, teaching, and learning* (3rd ed.). Routledge. https://doi.org/10.4324/9780203963241

[17] Sadh, A. (2021). Assistive technology for students with visual impairments: A resource for teachers, parents, and students. In V. Goar, M. Kuri, R. Kumar, & T. Senjyu (Eds.), *Advances in information communication technology and computing* (Vol. 135, pp. 545–553). *Lecture Notes in Networks and Systems.* Springer. https://doi.org/10.1007/978-981-15-5421-6_52

[18] San Jose, A. E. (2015, May). *Incidents of adult dyslexic learners: Basis for intervention program. Journal of International Academic Research for Multidisciplinary, 3*(4), 236–241.

[19] Tauseef, M., Naik, S. G., & Harsha, K. S. (2024). *SpeakEasy reader: An OCR-based text-to-speech device for enhanced accessibility in assisting reading challenges.* In *Proceedings of the 15th International Conference on Computing Communication and Networking Technologies (ICCCNT)* (pp. 1–6). IEEE. https://doi.org/10.1109/ICCCNT61001.2024.10723858

[20] Tei-Dornoo, N. (2022, May). *Intelligent learning systems for inclusive education: A focus on dyslexia* [Undergraduate thesis, Ashesi University]. *Ashesi Institutional Repository.* https://air.ashesi.edu.gh/items/e032b8f1-e98d-488e-9464-16c6f6e672ba