

CHAPTER V

CONCLUSIONS AND RECOMMENDATIONS

5.1. Conclusions

Based on the results of the design, implementation, and testing carried out in this research, the following conclusions can be drawn.

First, the enterprise information system for pesantren management at Pondok Pesantren Modern As-Sholihin Surabaya was successfully designed and built using the MERN Stack architecture, consisting of MongoDB version 8.0.23, Express.js version 5.2.1, React.js version 19.2.5, and Node.js version 22.19.0. This system covers six main modules, namely the authentication, registration, publication, finance, personnel, and academic modules, with an access control mechanism based on (*Role-Based Access Control*) that divides users into six access rights: General Public, Santri (Students), Guardian, Teacher, Staff, and Headmaster. The development process was carried out using the *Agile Kanban* methodology through the ClickUp platform, which proved effective in accommodating changes in requirements that arose during the implementation process based on the results of direct clarification with the pesantren. All development tasks were successfully completed and moved to the Done column at the end of the development cycle.

Second, the *Simple Additive Weighting* (SAW) method was successfully implemented automatically within the system through a *backend* Node.js function capable of performing all computation stages in an integrated manner, including the formation of a decision matrix from real database data, matrix normalization, weighting based on four criteria (academic scores, achievement points, violation points, and attendance percentage), and final ranking of students. The algorithm validation results using the Spearman Rank Correlation Coefficient produced a value of $r_s = 1$, indicating a perfect positive correlation between the manual calculation results and the system's automatic computation results. This proves that the implementation of the SAW algorithm in the system was carried out with full accuracy without logical distortion, so that the system can provide recommendations for the best student rankings objectively and accountably.

Third, functional testing of the system using the *Black-Box Testing* method on all test scenarios across the six system modules showed results consistent with the expected specifications, with no functional failures found, so the system was declared

to have passed overall functional testing. Meanwhile, usability testing using the *System Usability Scale* (SUS), involving 9 respondents consisting of the head of the pesantren, administrative staff, and teaching staff, produced an average score of 76.39. Based on the SUS rating scale, this score falls into the *Good* category with an *adjective rating* of "Good", a *grade* of "B", and an acceptance level of *Acceptable*, indicating that the system is well accepted and can be properly operated by end users from various backgrounds within the pesantren environment.

5.2. Recommendations

Based on the limitations found during the research process and the results of the evaluation that has been carried out, there are several recommendations that can serve as a reference for further system development.

First, the currently web-based pesantren management information system can be further developed into a mobile application for Android and iOS. Development into a mobile platform would provide significantly easier access, particularly for guardians who need to monitor information about their children quickly and flexibly without having to open a browser. In addition, a mobile platform opens up opportunities for integrating native *push notification* features, so that guardians and students can proactively receive information related to attendance, grades, violations, and financial status in *real-time*.

Second, to improve the long-term reliability and scalability of the system, migration from *free tier* hosting services (Vercel and Railway *Starter Plan*) to a paid service with a higher *uptime* guarantee should be considered, especially if the system is to be actively used by all pesantren stakeholders at full operational scale.

Third, future research could explore the use of other multi-criteria decision-making methods, such as TOPSIS or AHP, as a comparison to the SAW method that has been implemented, in order to evaluate the consistency and advantages of each method in the context of determining the best students.