Website-Based Student Achievement Book Using the Waterfall Method

Rizqi Putri Nourma Budiarti[1]*, A N Fathin[1], and E Sulistiyani [1]

[1]Sistem Informasi, Fakultas Ekonomi Bisnis dan Teknologi Digital, Universitas Nahdlatul Ulama Surabaya, Surabaya

Abstract.
Al Qur'an Education Park (TPA) Al Badar has approximately thirty students, but that number will continue to grow. The recording of achievement cards is done manually, and everything is done by the Al-Badar TPA teacher. Usually, teachers record student learning outcomes using achievement cards, and achievement cards are filled out after students learn to read Iqro or the Qur'an and handed over to their students. However, amid the current COVID-19 pandemic, face-to-face meetings are very difficult, especially between teachers and participants who are undergoing online teaching. Based on the problems that occurred at the Al Badar TPA regarding the recording of student achievement and the importance of technology for education, it is necessary to have an information system at the Al Badar TPA. The method used in this research is the waterfall method approach in the manufacture of information systems with several stages, including problem identification, system requirements analysis, system design, system creation, and system testing, and also system analysis. In making the system, PHP and MySQL are used with the CodeIgniter framework. In system testing, the author uses two methods of black-box testing and white-box system testing. While the results of the analysis of the system in terms of testing the quality ofservice users, namely by using usability testing. The results of this study are a website-based student achievement book as an online learning achievement record book that can function well, both systemically and from the user's side of the application and greatly assists the needs of the Al-Badar TPA during the pandemic. The results obtained from the usability testing analysis are 90%, so it can conclude that the system is feasible and easy to use. So, a website-based student achievement book as book's achievement record online can function properly and greatly help the needs of the TPA Al-Badar during the pandemic.

1. Introduction

Al Qur'an Education Park (TPA) is an informal religious education unit based on a Muslim community that uses the Qur'an and Al Hadith as its primary material and learns Islamic subject matter such as daily prayer, Islamic history, and guides them to become devout Muslims religious [1]. Established 17 years ago, TPA Al Badar has two grade levels, namely class A and B. Class A students study Iqro one to six while class B learns the Qur'an. Teaching and learning at TPA Al Badar start at 16.00 WIB and end at 17.00 WIB every Monday to Friday.

Currently, Al Badar TPA has approximately thirty students, but it is possible if the number of students continues to grow. This institution has two permanent teachers and the youth of the Al Badar prayer room who assist in the teaching and learning process.

Still using the manual method, the teacher records student learning outcomes using achievement cards, the achievement cards are filled in after the students learn to read Iqro' or the Qur'an. The card contains seven tables consisting of Number, Date, Volume, Page, Ustadz, Initials, and Description. The achievement card is handed back to the students after being filled in by the teacher. Parents of students can also check the results of students' achievements on the achievement card. So, both teachers, students, and parents of students can find out the results of these achievements. But not all student's parents check the achievement results on the achievement card. Therefore, an educational institution with various elements that must be handled manually, of course, is not influential because it will consume much time and other resources [2]. In

scientific articles related to TPA and website creation, application development is usually used in teaching Iqro' and reading the basics of the Qur'an [3], [4]or studying the religious impact of children's learning in TPA [5], [6]. In this research, it is designed to create a website-based application that is devoted to recording the achievements of TPA Al Badar students after learning iqro' and the basics of the Qur'an.

2. Related Works

Information systems are very important to use in organizations, including the field of education [7], [8]. One of the information systems that exist in the world of education is the value processing system. According to Nurhaeni, in her research at SMK PGRI 1 Tambunan Selatan, in the past, value processing was still conventional, that is, all assessments were recorded using a book or grade book, so that the process had to be done repeatedly and took a long time. This is not efficient in the assessment process and making student grade reports takes a long time and grade books may be lost [7]. In addition to the value processing system in the world of education, according to Eni in her research at TPQ PP. Shirotul Fuqoha' II Kalipare-Malang. The daily assessment of students is carried out using daily report cards by the teacher, only the teacher who teaches at that time knows the learning outcomes of students while students and parents cannot monitor the progress of learning outcomes. Thus, we need a web-based information system for reporting student learning outcomes, so that the results of the student learning achievement assessment can be accessed at any time by teachers, students or parents. There is an admin form, a teacher management form, a student data form and there is a class management form that contains classes based on volumes such as first grade then volume one[9][10].

Website is one type of service provided by the internet that is most widely used in addition to other services. Several things are the reasons why the website is widely used, the first is because the website is a means to introduce companies or organizations to the public in more detail. The second reason is because the internet is an unlimited medium of information, so through the website it can be accessed anywhere and anytime[11]–[15]. The third reason That is, if the website is designed properly and correctly so that it has an attractive appearance, it can instill trust in the eyes of the user or users. The fourth reason having a website can improve a company or organization[16], [17].

In addition to the four reasons for making a website, choosing to create a website instead of an application has several considerations. Application creation is relatively long, while the resources for making this website are individuals, not groups. The advantage of making a website is that it can be accessed by all devices, while applications cannot be indexed by search engines. The application requires a larger budget than making a website. Deciding to make an application or website depends on the end goal because the purpose of this research is only to focus on creating a website application such as information system scheduling in [18], [19], web applications for student grade processing [7], [8][20], web application for library [21]–[24], administration for student data[25]–[29], and web application for ISO[30]–[33]. While developing a system website, to make the evaluation of the website application, we use BlackBox, Whitebox and usability testing. The system testing regarding checking if the users are satisfied with the system, like the research of Muhammad C, et al[34]. His team created an application and defined improvement of the system, and checked the system using usability testing. Based on the literature review, one of the ways to check the quality or performance of the website can use usability testing to know user experience and satisfaction [35]–[39].

Based on the problems at the TPA Al Badar regarding recording student achievement results and the importance of technology for education during the pandemic, the authors have analyzed the situation and the environment by asking students whether their parents have smartphones. The result of the question is that the students answered if their parents had a smartphone. Some students also said that during the pandemic, they have their own smartphones, and teachers also have smartphones. So it is necessary to have an information system such as a website application at TPA Al Badar to overcome problems related to recording student achievement results in the form of a website, and it's more convenient during the pandemic than using the manual book to record student achievement.

3. Methodology

The methodology can be seen in Figure 1. This section describes in detail how the process of designing a web-based student achievement book for TPA Al Badar. The methods are shown, such as problem

identification, system analysis, system design, book's achievement system development, system testing, and system improvement.
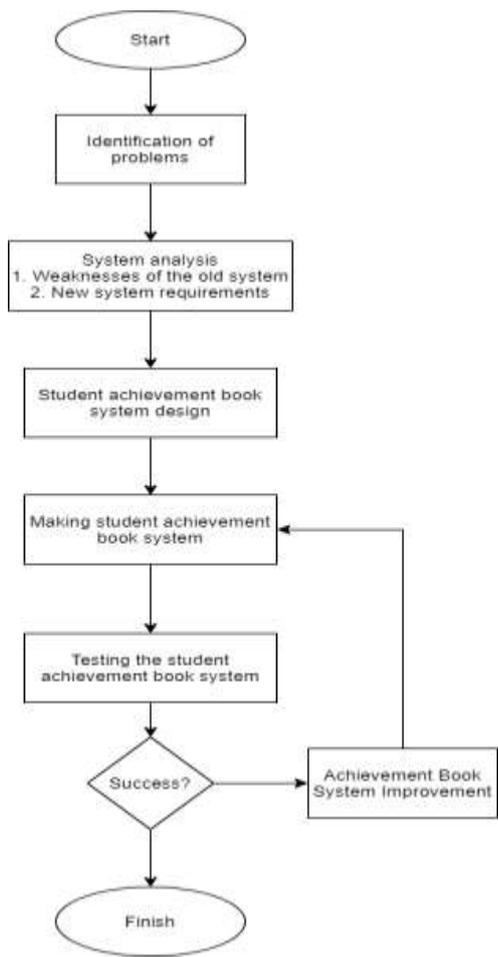

Figure 1. Research Methods

4. Results and Discussion
The results of this study include the definition of problem identification, system analysis, system design, system creation and system testing.

4.1 Identification of problems
Through the interview and observation process by visiting the TPA Al Badar, several problems were found, including the process of collecting data on students and recording achievements that were still manual.
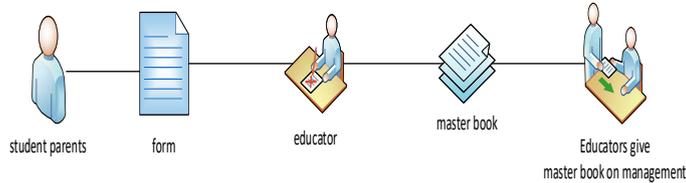

Figure 2. Student Data Collection Flow

The flow of data collection for students in Figure 2 is that parents of students play a role in registering students by filling out and then collecting forms to register at the Al Badar TPA. The form contains student biodata such as NIK, name, gender, age, address, parents name and photo. The role of the educator is to receive and check the completeness of the form after it is filled out by the parents of the students, if it is appropriate, the educator will place the form in the main book. The main book serves to store completed student forms as data collection. Educators also play a role in providing a master book to administrators for safekeeping.
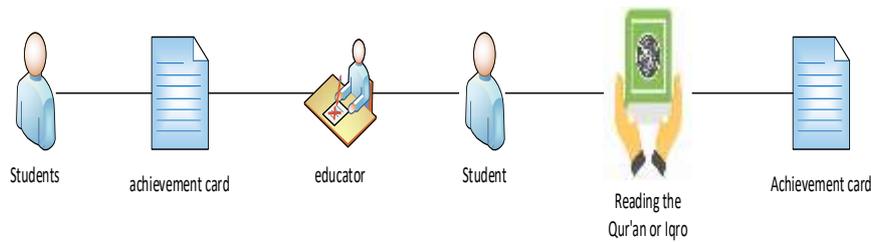
Figure 3. Flow of Recording Achievement

The flow of recording achievement results in Figure 3, students must have an Iqro or Al Quran to learn the Koran, before reading the Koran, students must collect an achievement card. The achievement card is a medium for recording the results of the students' reading, the function of collecting achievement cards before reciting is to determine the order in which to recite the Koran. The role of the educator is to call the students according to the order of the cards that have been collected by the students, after completing the study the educator will assess the students on the achievement cards and return them.

4.2 System Analysis

System analysis is the second stage after knowing the identification of problems at the TPA Al Badar, at this stage the researcher will identify the system used today and will also identify the need for a new system. In the weakness of the old system, there are non-technical constraints, namely the teacher is wrong in filling in the date, page, volume, and description. These details can be seen in Table 1.

Table 1. Weaknesses of the Old System

No	System Name	System Type	Weakness
1	Student data collection	Filling inform	The data collection process uses forms and is recorded in the master book, prone to damage, loss and errors when writing.
2	Recording achievements	Fill out the achievement card	After the student pays the student's achievement, it is recorded on a card that has the potential to be damaged such as torn, lost due to forgetting to put it and mistakes when writing.

From the description above, the researcher found the weaknesses of the old system, therefore a new system was needed to improve the weaknesses of the old system. Before creating a new system, the steps that need to be taken are mapping the need to create a new system functionally and non-functionally, which can be seen in Table 2 and Table 3.

Table 2. Functional Needs

No	Business process	Old System Analysis	New System Requirements	Utility

1	Student data collection	Student data collection only uses a form that is stored or recorded in a main book	a. Student data recording on the website b. Backing up student data using database	Function to record student data
2	Student achievement record	Recording of achievements still uses cards whose results are written manually after reciting the Koran. The card is at risk of being lost, damaged, etc.	a. Online recording of achievements b. Backing upstudent achievement results using a database	Serves to record student achievement results after reciting

Table 3. Non-Functional Needs

No	Hardware	Software
1	Laptop/Computer	Browser
2	Wifi/Data Plan	Domains and Hosting

4.3 System Design

The design of this system starts from a flowchart to describe all the concepts of each application feature that will be made, use case diagrams and activity diagrams that describe user interactions with the system. Flowchart serves to describe a concept or activity of a system, namely from the student achievement book system at Al Badar TPA. In Figure 4 the process of data collection for students starts from the admin logging in to the website. If the login is successful, you will befaced with the dashboard page, then whether the admin will add, edit, or delete the student data, it will automatically be stored in the database.
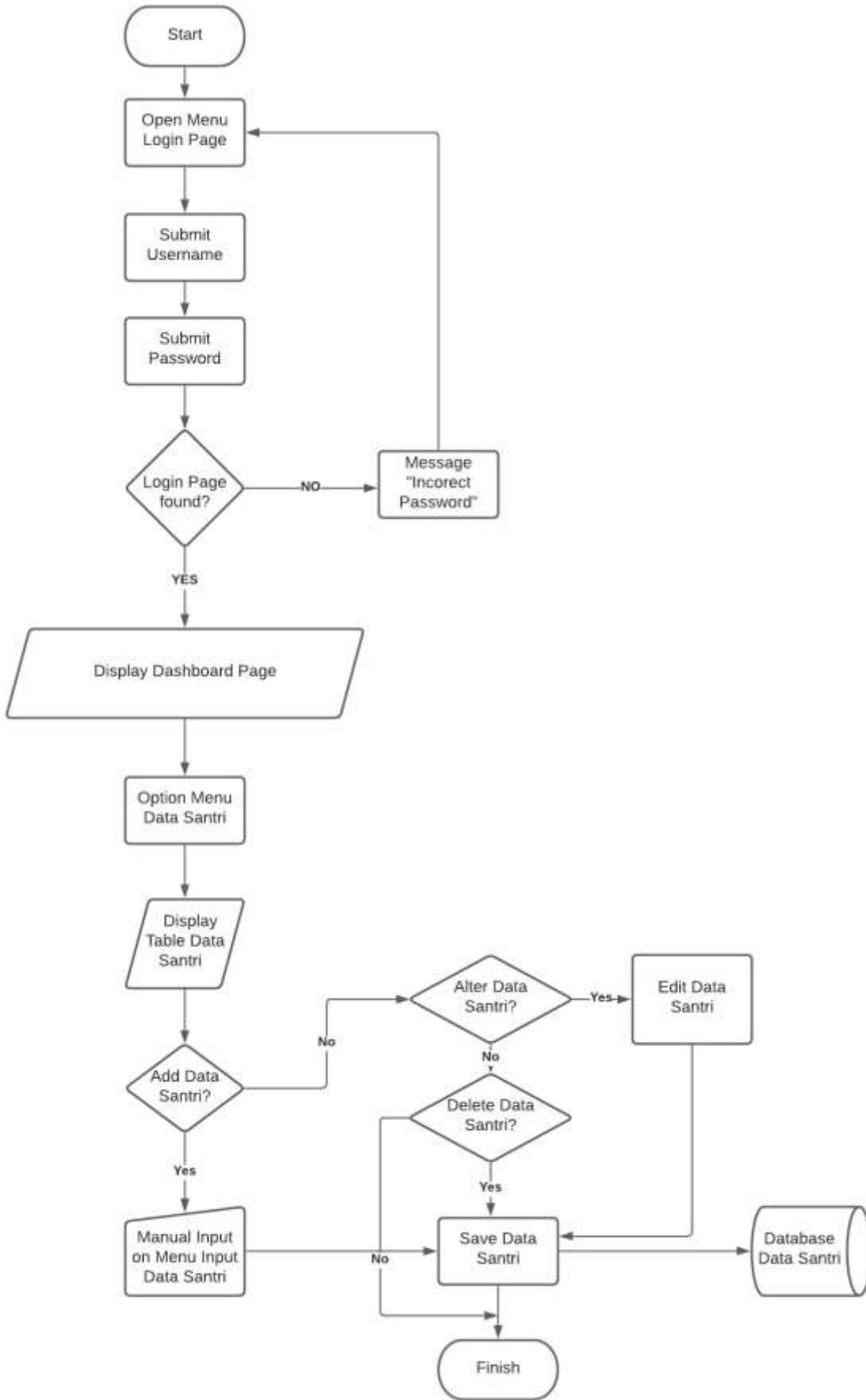
Figure 4. Student Data Collection Process Flow

4.4 System Development

This stage is the implementation stage of each plan that has been drawn previously. At this stage the researcher uses the CodeIgniter 3 framework with the PHP programming language. The first step is to download the framework from the official website codeigniter.com. After downloading the framework file, proceed to the installation stage so that it can be used. Move the file to our local server, respectively.

The first part of the configuration explains what to do first is to open the application folder then the config folder after that open the autolod.php file. The second configuration explains to configure in the config.php file then fill in the variables according to the url in the project name. The third configuration describes to fill in the database configuration in the database.php file. After this configuration stage, the researcher tested the coding stage.

The coding stage has an mvc concept, namely the model, view, and controller. The model section describes the coding for storing data into the database and the data from the controller. The coding of the controller section explains that in this section is the logic where the system processing receives data from views before the model. The coding of the view section is that the input from the user will be sent to the controller and vice versa, the view section can also display data based on the controller's decision.

4.5 System Testing

Black box testing focuses on finding program errors in functionality, while whitebox testing is a test based on the program's internal structure to check whether there is an error path. In this process, we conduct software testing which is carried out on an ongoing basis in accordance with customer needs by using the principles of agile Blackbox testing and Whitebox testing. So, in the system testing stage, we provide the software testing results to the user in order to evaluate the usefulness of the system whether or not it is in accordance with the needs of the user.

Table 4. Blackbox Testing

No	Feature	Scenario	Expected results	Results
1	Login	Enter username and password (correct)	The user has successfully logged in and entered the dashboard page	Success
		Enter username or password (incorrect)	A warning appears "Invalid username or password"	Success
2	Student data menu	Add button on student data	Student data increases according to what is entered	Success
		Edit button on student data	Student data changes according to what is entered	Success
		Delete button on student data	The selected student data appears a notification "sure delete" if "ok" it will be deleted. if "cancel" is not deleted.	Success
3	Performance data menu	Add performance data	Performance data increases according to input	Success
		Editing performance data	Performance data changes according to what is entered	Success

		Click clear achievement data	The selected achievement data will display a "sure delete" notification if "ok" then it will be deleted if "cancel" is not deleted.	Success

4	Educator data menu	Add educator data	User data increases according to what is entered.	Success
		Editing educator data	User data changes according to what is entered.	Success
		Click delete educator data	The selected user data appears a notification "sure delete" if "ok" it will be deleted if "cancel" is not deleted.	Success
5	Attendance data menu	Add attendance data	Attendance data increases according to what is entered.	Success
		Edit attendance data	Attendance data changes according to what is entered.	Success
		Delete to clear attendance data	The selected attendance data appears a "sure delete" notification if "ok" it will be deleted if "cancel" is not deleted.	Success
6	Student parent data menu	Add student parent data	The student's parent data increases according to what is entered.	Success
		Editing student parent data	The student's parent data changes according to what is entered.	Success

In addition to testing using the Blackbox method. The test is carried out using the white box method based on the path (basic path). In this technique, test cases are made which are obtained by finding independent paths. The numbering on the flowchart is made to make it easier to read the program flow and as a node mark on each line of program code.
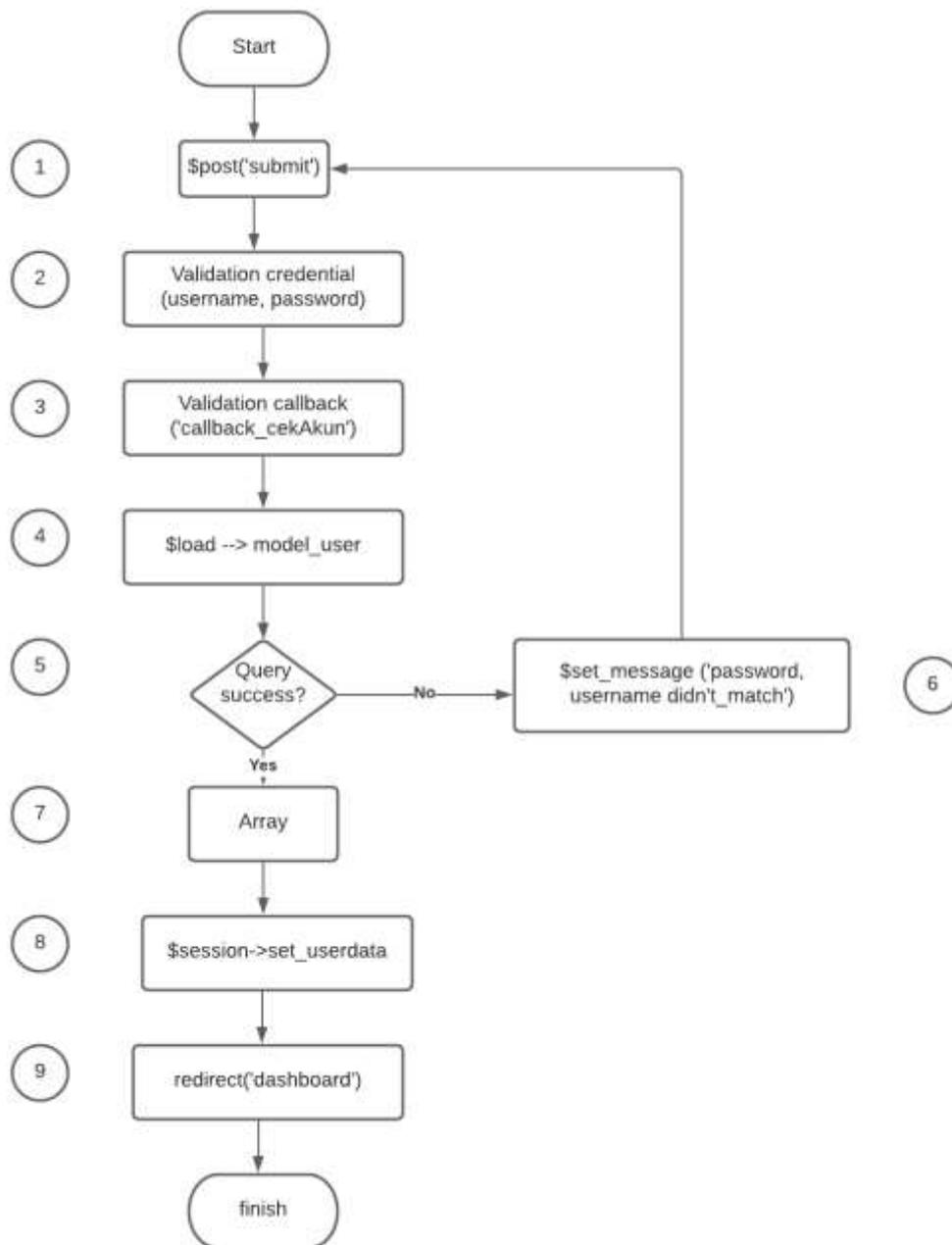
Figure 5. FlowChart Login Whitebox Testing

After completing all existing blackbox testing and whitebox testing, the next step is Usability testing by distribute questionnaires to users in TPA Al-Badar and the quisioner variable using 21 statements that represent the three aspects of usability, namely efficiency, effectiveness and satisfaction [22]. Users fill out questionnaires that have distributed based on their experiences while using this website. The result of the usability testing can be shown in the Table 1.

Table 5. The Result of Usability Testing using 21 Variable

R	\multicolumn{21}{c}{Usability}	Total
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	
R1	3	4	5	3	3	4	4	3	5	5	4	3	3	5	5	3	4	3	5	4	5	83
R2	5	3	4	5	4	5	3	3	4	5	5	3	4	4	3	5	3	5	3	3	4	83
R3	4	5	3	4	5	4	3	5	4	3	5	4	4	3	4	3	5	3	4	5	3	83
R4	5	4	5	5	3	3	4	4	5	3	4	5	3	4	3	5	3	5	3	3	4	83
R5	3	5	4	3	5	3	5	4	3	4	3	5	5	5	5	4	4	4	5	4	5	88
\multicolumn{22}{c}{Total}	420
\multicolumn{22}{c}{Average}	84
\multicolumn{22}{c}{Procentage}	90%

Based on the results of the evaluation in usability testing criteria, the website-based of book's achievement record in TPA Al Badar got an overall score of 420 with an overall average of 84 and an overall percentage of 90% so that the management information system in all aspects of the variables can be said to be very feasible and easy to use for the student member and teacher. It could help them to digitalize their activity during the pandemic.

5. Conclusions and Recommendations

This research is based on the development of a website based on book achievement records at the Al Badar TPA. The results of the system analysis test and system usability criteria indicate the condition of recording student achievement data at the Al Badar TPA, where it is obtained that the results of information system testing in making a website-based student achievement book application can function well in terms of functional testing using Blackbox testing. When the system is sampled tested using whitebox testing in the login section, which shows that the system runs well and can be simplified. With this, the website-based student achievement book is ready to be applied at the Al Badar TPA. Further testing of the test results on users of this application using usability testing also shows that this website-based system application is quite easy to use for admins, educators and parents of students.

References
1. F. Rohman, C. Wijaya, and A. Naldi, "Teacher's Perception of the Digital Report Card Application and it's Implementation at Private Primary School for Islamic Studies," *FITRAH J. Kaji. Ilmu-ilmu Keislam.*, vol. 7, no. 1, pp. 169–180, 2021.
2. S. Febriani, M. Noor, and others, "Information System Design for Tadarus Madrasah Ibtidaiyah (MI) Darul Ulum Kintap Webbased," *Int. J. Res. Vocat. Stud.*, vol. 1, no. 1, pp. 26–36, 2021.
3. N. Ekawati, M. Sarjan, and A. I. Hidayat, "DIGITAL E-LEARNING PADA TPA MADINATUL ILMI MASJID KERAJAAN BALANIPA MANDAR," in *Journal Peqguruang: Conference Series*, 2021, vol. 3, no. 1, pp. 130–133.
4. I. Ismail, "Pelatihan dan Pengajaran Baca Tulis Al-Qur'an Pada TK-TPA At-Taqwa dalam Mengatasi Buta Aksara Qur'an di Kelurahan Kambiolangi," *MASPUL J. COMMUNITY Empower.*, vol. 1, no. 1, pp. 21–30, 2019.
5. T. Prehadini, A. Senen, and A. Mustadi, "Can children's religiosity be built through family's religious culture and the discipline in attending TPA at school?," *J. Prima Edukasia*, vol. 9, no. 1, pp. 145–157, 2021.
6. A. Khumairo and O. Y. Romlah, "The Assistance of Social Harmony Character of Children at Taman Pendidikan Al-Quran (TPA) Ar-Rahman East Metro City," *Int. J. Community Engagem.*

Payungi, vol. 1, no. 2, pp. 59–65, 2021.

7. R. Nurhaeni, E. H. Hermaliani, and A. Merdekawati, "Sistem Informasi Pengolahan Nilai Sekolah Secara Online Berbasis Lingkungan (Adiwiyata) Di Kementerian Lingkungan Hidup," *Bina Insa. ICT J.*, vol. 3, no. 1, pp. 17–30, 2016.

8. A. L. Yusuf, M. A. Ramadan, E. Retnoningsih, and S. Rofiah, "Sistem Informasi Pengolahan Nilai Siswa Pada SMP Islam Al-Falah Bekasi Berbasis Web," *J. Mhs. Bina Insa.*, vol. 3, no. 2, pp. 203–212, 2019.

9. T. K. Rahayu and others, "Application Report Process Of Islamic School Based On Pesantren Boarding Using Waterfall Model," in *Journal of Physics: Conference Series*, 2020, vol. 1569, no. 2, p. 22025.

10. E. Farida and A. Afifuddin, "Sistem Informasi Pelaporan Hasil Prestasi Belajar Santri Tpq Pp. Shirotul Fuqoha'II Kalipare--Malang," *J. Teknol. Inf. Teor. Konsep, dan Implementasi*, vol. 3, no. 1, pp. 12–22, 2012.

11. S. A. Adepoju, I. O. Oyefolahan, M. B. Abdullahi, and A. A. Mohammed, "Multi-criteria decision-making based approaches in website quality and usability evaluation: a systematic review," 2020.

12. Y. Udjaja, "Ekspanpixel Bladsy Stranica: Performance Efficiency Improvement of Making Front-End Website Using Computer Aided Software Engineering Tool," *Procedia Comput. Sci.*, vol. 135, pp. 292–301, 2018.

13. D. M. B. Paiva, A. P. Freire, and R. P. de Mattos Fortes, "Accessibility and software engineering processes: A systematic literature review," *J. Syst. Softw.*, vol. 171, p. 110819, 2021.

14. B. R. Barricelli, F. Cassano, D. Fogli, and A. Piccinno, "End-user development, end-user programming and end-user software engineering: A systematic mapping study," *J. Syst. Softw.*, vol. 149, pp. 101–137, 2019.

15. S. F. Nurrohmah and M. F. Nugraha, "Build Website-Based Equipment Inventory Information System in Pesantren Al Ma'soem," in *IOP Conference Series: Materials Science and Engineering*, 2021, vol. 1115, no. 1, p. 12047.

16. G. J. Langley, R. D. Moen, K. M. Nolan, T. W. Nolan, C. L. Norman, and L. P. Provost, *The improvement guide: a practical approach to enhancing organizational performance*. John Wiley \& Sons, 2009.

17. F. Iddris, "Adoption of E-Commerce solutions in small and medium-sized enterprises in Ghana," *Eur. J. Bus. Manag.*, vol. 4, no. 10, pp. 48–57, 2012.

18. K. Haryono, "SISTEM INFORMASI: MONITORING SISTEM PENGELOLAAN TAMAN PENDIDIKAN AL-QUR'AN (TPA) HIDAYATUL FALAH." 2021.

19. M. Multazam, "Sistem Informasi Jadwal Mengajar Berbasis Web pada TPQ Al Ikhlas Ampenan," *EXPLORE*, vol. 7, no. 1, 2017.

20. E. Puspitasari, B. E. Purnama, and others, "Sistem Informasi Pengolahan Raport Siswa Pada Smp Negeri 3 Kebonagung," *IJNS-Indonesian J. Netw. Secur.*, vol. 4, no. 3, 2013.

21. A. Mierzecka and A. Suminas, "Academic library website functions in the context of users' information needs," *J. Librariansh. Inf. Sci.*, vol. 50, no. 2, pp. 157–167, 2018.

22. M. Iqbal and N. F. Warraich, "Usability evaluation of an academic library website: A case of the University of the Punjab," *Pakistan J. Inf. Manag. Libr.*, vol. 13, 2016.

23. P. Qing-hua, "Research on comprehensive evaluation method for library website," *Comput. Eng. Des.*, vol. 28, no. 8, pp. 1852–1854, 2007.

24. T. A. Swanson, T. Hayes, J. Kolan, K. Hand, and S. Miller, "Guiding choices: implementing a library website usability study," *Ref. Serv. Rev.*, 2017.

25. Q. Cao, T. E. Griffin, and X. Bai, "The importance of synchronous interaction for student satisfaction with course web sites," *J. Inf. Syst. Educ.*, vol. 20, no. 3, p. 331, 2009.

26. U. A. Patel and S. Priya, "Development of a student attendance management system using RFID and face recognition: a review," *Int. J. Adv. Res. Comput. Sci. Manag. Stud.*, vol. 2, no. 8, pp. 109–119, 2014.

27. C. R. Hollenbeck, C. H. Mason, and J. H. Song, "Enhancing student learning in marketing courses: An exploration of fundamental principles for website platforms," *J. Mark. Educ.*, vol. 33, no. 2, pp. 171–182, 2011.

28. S. Kim and L. Stoel, "Apparel retailers: website quality dimensions and satisfaction," *J. Retail. Consum. Serv.*, vol. 11, no. 2, pp. 109–117, 2004.

29. A. Salim, R. P. N. Budiarti, and F. Yudianto, "RANCANG BANGUN APLIKASI WEBSITE PENDAFTARAN PESERTA DIDIK BARU (PPDB) MADRASAH IBTIDAIYAH NAHDLATUL ULAMA (MINU) WARU II DENGAN MENGGUNAKAN CODEIGNITER," in *NATIONAL CONFERENCE FOR UMMAH (NCU) 2020*, 2020, vol. 1, no. 1.

30. D. Green and J. M. Pearson, "Development of a web site usability instrument based on ISO 9241-11," *J. Comput. Inf. Syst.*, vol. 47, no. 1, pp. 66–72, 2006.

31. C. Y. Laporte, C. Hébert, and C. Mineau, "Development of a social network website using the new ISO/IEC 29110 standard developed specifically for very small entities," *Softw. Qual. Prof.*, vol. 16, no. 4, pp. 4–25, 2014.

32. R. Sroufe and S. Curkovic, "An examination of ISO 9000: 2000 and supply chain quality assurance," *J. Oper. Manag.*, vol. 26, no. 4, pp. 503–520, 2008.

33. L. K. Falk, H. Sockel, and K. Chen, "Website Usability: A Re-Examination through the Lenses of ISO Standards," *Int. J. Wirel. Networks Broadband Technol.*, vol. 3, no. 2, pp. 1–20, 2014.

34. M. C. Sukron, R. P. N. Budiarti, and A. S. Kamil, "Implementation of Nadhir Online Registration System in Badan Wakaf Indonesia Using Agile Development Methods," *Appl. Technol. Comput. Sci. J.*, vol. 3, no. 1, pp. 30–47, 2020.

35. N. S. Aziz, N. S. Sulaiman, W. N. I. T. M. Hassan, N. L. Zakaria, and A. Yaacob, "A Review of Website Measurement for Website Usability Evaluation," in *Journal of Physics: Conference Series*, 2021, vol. 1874, no. 1, p. 12045.

36. D. Funai, "Usability Evaluation of an Online Resource Designed to Help Educators Recognize and Respond Appropriately to a Concussion," 2014.

37. S. E. Barry, "Usability evaluation of a website designed to guide and support best practices for online teachers," 2011.

38. M. Dishman, "Website Usability Testing Software-Improving User Experience and Satisfaction With Community College Websites," *Community Coll. Enterp.*, vol. 21, no. 1, pp. 84–87, 2015.

39. N. Mahyavanshi, M. Patil, and V. Kulkarni, "Enhancing web usability using user behavior and cognitive study," *Int. J. Comput. Appl*, vol. 164, no. 2, p. 27, 2017.