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DESIGN OF A WEB-BASED LIBRARY APPLICATION USING THE DESIGN THINKING METHOD

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Abstract: This research was conducted to design a web-based library information system at SMP Negeri 2 Grati. This system was developed to improve the effectiveness of the book borrowing and returning process, late fine management, and book stock management, which were previously done manually. The method used was design thinking, a creative approach that focuses on understanding user needs and creating appropriate solutions. The research stages included creating a system prototype, testing using the Single Ease Question (SEQ) method, and analyzing the results to evaluate the system's ease of use and effectiveness. The evaluation results showed that this system can improve service efficiency, provide practical solutions, and meet the needs of students and library managers. The implementation of this system is expected to make library services more modern and professional, while supporting the learning process. This system also has potential for further development, such as integration with the school's academic system and the addition of more comprehensive reporting features.

Keywords: Library Information Systems; Design Thinking; Prototyping; SEQ Testing; Book Management

Abstrak: Penelitian ini dilakukan untuk merancang sistem informasi perpustakaan berbasis web di SMP Negeri 2 Grati. Sistem ini dikembangkan untuk meningkatkan efektivitas proses peminjaman dan pengembalian buku, manajemen denda keterlambatan, dan manajemen stok buku, yang sebelumnya dilakukan secara manual. Metode yang digunakan adalah design thinking, pendekatan kreatif yang berfokus pada pemahaman kebutuhan pengguna dan menciptakan solusi yang tepat. Tahapan penelitian meliputi pembuatan prototipe sistem, pengujian menggunakan metode Single Ease Question (SEQ), dan analisis hasil untuk mengevaluasi kemudahan penggunaan dan efektivitas sistem. Hasil evaluasi menunjukkan bahwa sistem ini dapat meningkatkan efisiensi layanan, memberikan solusi praktis, dan memenuhi kebutuhan siswa dan pengelola perpustakaan. Implementasi sistem ini diharapkan dapat membuat layanan perpustakaan lebih modern dan profesional, sekaligus mendukung proses pembelajaran. Sistem ini juga memiliki potensi untuk pengembangan lebih lanjut, seperti integrasi dengan sistem akademik sekolah dan penambahan fitur pelaporan yang lebih komprehensif.

Kata kunci: Sistem Informasi Perpustakaan; Pemikiran Desain; Pembuatan Prototipe; Pengujian SEQ; Manajemen Buku

INTRODUCTION

In today's digital era, technological transformation has transformed various aspects of life, including education. One significant impact is the change in how information is accessed and managed in schools.

School libraries, as centers of learning resources, face the challenge of adapting to technological developments to improve efficiency and quality of service [1]. Over time, digital transformation has had a strong impact on many sectors of life, including literacy.

The presence of e-books and easy access to articles and other scientific references have transformed traditional ways of obtaining information in libraries [2].

School libraries are a crucial element in the world of education because they serve as information providers that support learning activities. To improve service quality, an information system is needed that can make the service process more efficient and optimal. However, in reality, a large number of school libraries use non-digital methods for borrowing and returning books. SMPN 2 Grati is one of the schools that has not implemented a library information system. This situation often creates various obstacles, such as long queues, limited student time for other activities, and difficulty in quickly locating books. From a management perspective, the lack of member IDs complicates the process of recording transactions, including determining late fines, which often leads to recording errors and data discrepancies between users and library managers.

In response to these issues, this research focuses on the design and development of a library management information system that can manage various transaction activities, including borrowing and returning books, and recording fines, and managing the availability of book collections, which were previously handled manually. This system design aims to focus on managing various library transactions, with an emphasis on the efficiency of the book return process, fine application, and book availability management. To realize more modern and professional library services, an intuitive and easy-to-use user interface (UI) is required. Good UI design can increase the effectiveness of library facility utilization, improve the user experience, and strengthen the performance of the digital library system [3].

Therefore, this research proposes the development of a web-based UI/UX interface to support service quality improvements in school libraries. The system development process adopts the design thinking method, an approach proven to generate innovative solutions based on actual user needs. This method is considered effective and creative because it combines a deep understanding of users with a practical process of exploring ideas [4].

METHOD

Design Thinking is a method that focuses on an innovative approach based on human needs, with the goal of balancing user interests, technological potential, and business objectives. This approach focuses on a deeper understanding of user perspectives and problems, which serve as the basis for developing solutions. This research demonstrates that Design Thinking is used through five main stages: Empathize, Define, Ideate, Prototype, and Test.

[5] The following is an explanation of several stages in the Design Thinking process:

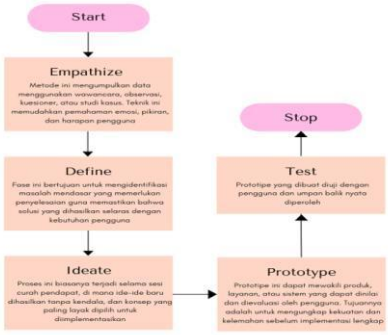


Figure 1. Design Thinking Method Stages

1. Empathize

This step aims to gain a more comprehensive understanding of the emotional aspects, needs, and user experiences by conducting direct interviews. The interviews are conducted based on specific scenarios specifically designed to elicit important information, which will then serve as the basis for the next stage [6].

2. Define

In this stage, the data and information collected during the empathize process are analyzed and interpreted to formulate the core problem that will become the focus of the research. By reorganizing the findings, researchers can systematically organize user needs and establish appropriate boundaries and directions for solution development [7].

3. Ideate

The ideate stage focuses on exploring various possible solutions to the previously formulated problem. This process involves creative and innovative thinking, including creating concept maps, developing an idea framework, and developing initial designs. The result of this stage is a solution concept that will be translated into a prototype as a reflection of the ideas developed [8].

4. Prototype

After the solution is designed in the ideate stage, the next step is to create an interface design using design software such as Figma. The design created must reflect the previously determined solution. This design result is then developed into an operational application prototype, albeit with limited features [9].

5. Testing

The testing phase is the process of testing the application prototype with direct user involvement. The purpose of this testing is to gather feedback and suggestions that will be useful for improving the application. This phase is closely related to the prototyping process, as user evaluation results will serve as a reference for further development if the system progresses to the full implementation phase [10].

RESULT AND DISCUSSION

A. Empathize

In the first stage, researchers collected data through direct observation and in-depth interviews with users of the application being the focus of the research. This stage was conducted to gain comprehensive insight into the needs, challenges, and expectations of users. Through this approach, researchers were able to identify the problems faced by users and gather in-depth information related to their needs. The results obtained at this stage served as the primary basis for designing appropriate solutions focused on user needs [11]. The following table contains the questions asked during the interview sessions with respondents:

Table 1. Observation Questions

No	Question
1	Do you often visit the school library?
2	Have you ever borrowed a book from the library?
3	Do you think the book borrowing and returning system is effective?
4	In your opinion, is there a need for a web application for borrowing books from the library?
5	Is it difficult to get information about book availability and the fine system at the library?

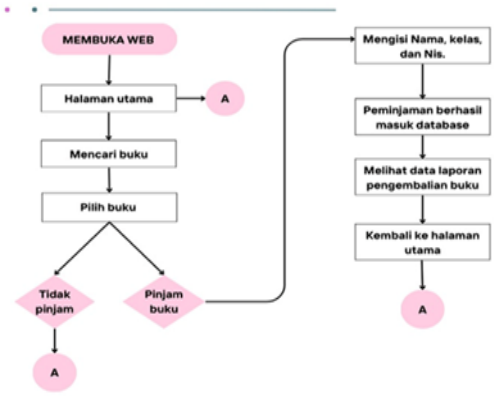


Figure 2. User Flow Diagram

B. User Persona

A user persona is a visual or written representation that describes the general characteristics of a user. This step plays a crucial role in identifying and understanding user profiles, including their goals, needs, and preferences [12], [13]. The data obtained from this analysis is used to ensure that the resulting solution is relevant to user needs and expectations. The results of the user persona analysis can be seen in the following image:



Figure 3. Dashboard

C. Ideate

The purpose of creating an Affinity Diagram is to group various issues or problems that have been previously identified, based on the results of an analysis of pain points. This diagram helps structure information, making it easier to identify patterns and the most crucial core problems [14]. A visualization of this diagram is shown in the following image:



Figure 4. Affinity Diagram

D. Prototype

A prototype is a system design model that describes the structure, standard dimensions, and scalability planned for implementation during the

development process. Prototypes are developed based on initial requirements as a basis for evaluating the features and functions built into the software. This provides an opportunity to identify potential errors early before the final product is fully launched [15]. The prototype design for a library management web application is presented in the following figure:

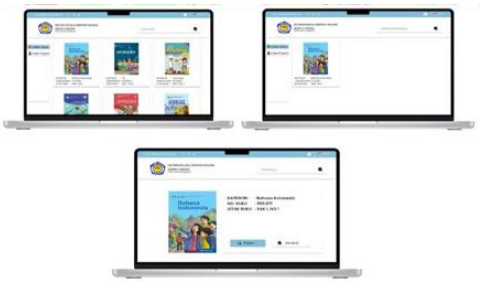


Figure 4. Home Page Design and Book Search

CONCLUSION

Based on the test results, the application of the Design Thinking method to designing a web-based library management system at Grati 2 Public Middle School proved highly effective in addressing the identified problems. The designed solution truly met the needs of the school's students. The tested prototype provided an appropriate solution to address the identified problems. The testing method used was the Single Ease Question (SEQ), which ensured that the resulting system design was easy to use and efficient in addressing the problems at Grati 2 Public Middle School.

Overall, the results of this study indicate that the Design Thinking approach to designing digital library applications can improve the quality of learning. services, streamlining the book borrowing and return process, and providing a more satisfying user experience. By using a prototype tested directly by users, we can ensure that the resulting solution meets existing expectations and needs. The implementation of this system is expected to support learning activities at SMP Negeri 2 Kesesi in a more optimal and modern way.

REFERENCES

[1] M. Ifsyaus Salam et al., “Perancangan UI/UX Pada Sistem Perpustakaan dengan Pendekatan Design Thinking,” J. Inf. Syst. Res., vol. 5, no. 2, pp. 676–685, 2024, doi: 10.47065/josh.v5i2.4654.

[2] Y. Rostiani, A. Priatna, and H. Herlina, “Library Administration System Design Using Design Thinking at SMPN 4 West Karawang,” J. Inf. Syst. Applied, Manag. Account. Res., vol. 8, no. 1, p. 26, 2024, doi: 10.52362/jisamar.v8i1.1372.

[3] Y. T. Wicaksono, Muhammad Adi; Rokhmawati, Retno Indah; Mursityo, “Evaluasi dan Perbaikan User Interface Aplikasi Perpustakaan Digital menggunakan Usability Testing dan Design Thinking (Studi Kasus : ePusda Kabupaten Karanganyar),” J. Pengemb. Teknol. Inf. dan Ilmu Komput., vol. 4, no. 14, pp. 3111–3120, 2023.

[4] I. M. Putra and D. R. Indah, “Implementasi Metode Design Thinking Dalam Aplikasi Giwang Sumsel,” KLIK Kaji. Ilm. Inform. dan Komput., vol. 3, no. 6, pp. 688–697, 2023, doi: 10.30865/klik.v3i6.872.

[5] H. Ilham, B. Wijayanto, and S. P. Rahayu, “Analysis and Design of User Interface/User Experience With the Design Thinking Method in the Academic Information System of

Jenderal Soedirman University," J. Tek. Inform., vol. 2, no. 1, pp. 17–26, 2021, doi: 10.20884/1.jutif.2021.2.1.30.

[6] A. Rayhaan Yusri, I. Faqihuddin Hanif, M. Daffa Al-farel, N. Zaandami, and M. Yasin, "Perancangan Desain UI/UX Berbasis Scan Barcode Dengan Metode Design Thinking Untuk Pemesanan Makanan," Bull. Inf. Technol., vol. 5, no. 2, pp. 102–113, 2024, doi: 10.47065/bit.v5i2.1340.

[7] K. Hasna, M. Defriani, and M. H. Totohendarto, "KLIK: Kajian Ilmiah Informatika dan Komputer Redesign User Interface Dan User Experience Pada Website Eclinic Menggunakan Metode Design Thinking," Media Online, vol. 4, no. 1, pp. 84–92, 2023, doi: 10.30865/klik.v4i1.1072.

[8] A. Widiyanto, I. Hidayat, M. L. Diwani, R. A. Hurairah, and S. Nurlela, "Partisipasi Bengkel Motor Konvensional Dalam Digital Marketing Dengan Mengimplementasikan Design Thinking," J. Pariwisata Bisnis Digit. dan Manaj., vol. 2, no. 2, pp. 97–103, 2023, doi: 10.33480/jasdim.v2i2.4240.

[9] R. Alamsyah, I. Maruf Nugroho, and S. Alam, "REDESIGN USER INTERFACE DAN USER EXPERIENCE APLIKASI WASTU MOBILE MENGGUNAKAN METODE DESIGN THINKING Program Studi Teknik Informatika Sekolah Tinggi Teknologi Wastukancana 123," Syariful Alam J. Ilm. Betrik, vol. 13, no. 02, pp. 152–159, 2022.

[10] G. P. Sutrisno, Y. Sumaryana, and M. Hikmatyar, "Designing User Interface and User Experience of Mobile-Based Nguriling Kota Tasik (Ngulisik) Bus E-Ticket Application With Design Thinking Method," Antivirus J. Ilm. Tek. Inform., vol. 17, no. 1, pp. 97–110, 2023, doi: 10.35457/antivirus.v17i1.3047.

[11] S. Ansori, P. Hendradi, and S. Nugroho, "Penerapan Metode Design Thinking dalam Perancangan UI/UX Aplikasi Mobile SIPROPMAWA," J. Inf. Syst. Res., vol. 4, no. 4, pp. 1072–1081, 2023, doi: 10.47065/josh.v4i4.3648.

[12] D. F. Aryansyah, P. Sokibi, and R. Fahrudin, "Perancangan Design UI/UX Aplikasi Penjualan Store Pakaian Dengan Metode Design Thinking Berbasis Android," J. Manaj. Inform. Sist. Inf. dan Teknol. Komput., vol. 2, no. 1, pp. 128–135, 2023, doi: 10.70247/jumistik.v2i1.19.

[13] A. R. Pradana and M. Idris, "Implentasi User Experince Pada Perancangan User Interface Mobile E-learning Dengan Pendekatan Design Thinking (Studi Kasus: Amikom Center)," Pros. Autom., vol. 2, no. 2, pp. 1–8, 2021.

[14] N. N. Arisa, M. Fahri, M. I. A. Putera, and M. G. L. Putra, "Perancangan Prototipe UI/UX Website CROWDE Menggunakan Metode Design Thinking," Teknika, vol. 12, no. 1, pp. 18–26, 2023, doi: 10.34148/teknika.v12i1.549.
1, pp. 70–78, 2022, doi: 10.38204/tematik.v9i1.915.

[15] M. F. Ardiansyah and P. Rosyani, "UI/UX Design of Inorganic Waste Processing Application Using Design Thinking Method," Log. J. Comput. Sci. and Educator., vol. 1, no. 4, pp. 839– 853,