

Design of the entry and exit letter system at the boyolali regency education and culture office

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Abstract

Advances in information technology have encouraged government agencies to shift from manual administrative systems to more efficient digital systems. One crucial administrative activity is the management of incoming and outgoing mail, which supports smooth inter-agency communication. This research aims to design a web-based incoming and outgoing mail system at the Boyolali Regency Education and Culture Office to allow for faster, more accurate, and more organized recording, storage, and retrieval of mail. The research method used is Design Thinking, which consists of five stages: empathize, define, ideate, prototype, and test. The research produced an interface design for an incoming and outgoing mail system featuring secure login access, an edit and delete function for correcting recorded data, and a table-based display that makes mail tracking more structured, alongside a simple and easy-to-use interface with a fast and accurate search feature. A usability test involving three respondents yielded an average satisfaction score of 4.8 out of 5, indicating that the resulting system design is well received and considered feasible for use. This system design is expected to improve employee work efficiency and minimize errors in mail management within the office environment

1. Introduction

The rapid development of technology from year to year, especially in the field of the internet, has had a great influence on various aspects of human life. This advancement not only changed the way people think, but also changed the lifestyle and work system in various sectors. According to Kraus et al. [1] and corroborated by Nadkarni and Prügl [2], the development of information technology has become the main driver of digital transformation and understanding of information system concepts in various fields of life.

One of the sectors that feels the significant impact of technological developments is government agencies, where information technology plays an important role in supporting the implementation of e-government to increase the effectiveness of public services. According to Oladimeji et al. [3], good digital literacy for public sector employees has been proven to increase work productivity, so it is an important factor in supporting the successful implementation of e-government. In line with this, Desai and Manoharan [4] stated that digital transformation in public administration, including through the development of digital public infrastructure, is able to accelerate the service process and create greater public value for the community.

Government agencies have high administrative activity, so they need information technology support to facilitate work. With a technology-based system, the work process can be carried out more quickly, accurately, and organized, as explained by Mohamed et al. [5], that process automation through information systems is able to increase the efficiency and effectiveness of employee work compared to manual processes.

One of the important activities in government agencies is the management of incoming and outgoing letters, which function as a medium of communication and official documentation between agencies. Research by Sihaloho and Sukata [6] and Nababan et al. [7] It shows that the application of a web-based mail information and management system or structured method can make it easier to record documents and speed up the mail tracking process, thereby increasing employee work productivity.

The Boyolali Regency Education and Culture Office is one of the agencies that has a high intensity in correspondence activities. However, in its implementation, the process of managing letters is still carried out manually, namely by recording incoming and outgoing letters in the agenda book. This method has various drawbacks, such as potential delays in recording, data input errors, and difficulties in finding archives of old letters. This condition can hinder the smooth running of administrative activities and public services.

Based on these problems, a digital-based incoming and outgoing mail system is needed that can help employees record, search, and dispose of letters more quickly and efficiently. This research focuses on designing information systems by paying attention to the aspects of User Interface (UI) and User Experience (UX) so that they are easy to use and in accordance with user needs. Good interaction design is very important because it will improve the quality of experience and user satisfaction with digital systems.

The purpose of this research is to produce a system design that is able to improve the efficiency of mail management and provide an optimal user experience. In addition, this research is expected to be a practical solution for the Boyolali Education and Culture Office in facing digital administration challenges and become a reference in the development of public administration information systems in other government agencies.

Several previous studies have discussed the design of incoming and outgoing mail systems and the application of User Interface (UI) and User Experience (UX) concepts in government information systems as an effort to improve the efficiency and effectiveness of document management. These studies generally highlight the importance of digitizing administrative processes, especially in overcoming obstacles such as the accumulation of physical archives, recording errors, and the difficulty of tracking letters.

Research by Sihaloho and Sukata [6] entitled "Design and Build an Information System for Incoming and Outgoing Mail Management at the Communication and Information Service" produces a system that can facilitate the management and recording of letters and speed up the document tracking process. Meanwhile, Nababan et al. [7] Conducted research on the design of filing systems, the results of which showed that the development of structured software can improve the effectiveness of archiving and mail search. Furthermore, Akbar et al. [8] develop a Mail Management System (SMART) as a solution to overcome the problem of mail archives in government agencies. The web-based system was evaluated through usability testing using the System Usability Scale (SUS) and proved to be effective in improving data collection efficiency.

The Design Thinking method is also widely used in the development of user-based systems because it is able to place human needs at the center of the design process. The application of this method to improve the user experience of web-based systems, has been proven to be effective through a case study by Tamma et al. [9] which states that the Design Thinking approach has succeeded in improving User Experience (UX) on academic platforms, such as on the university graduation website (UNS Graduation Website).

Studies in international journals have also strengthened the relevance of the Design Thinking and UI/UX approach in web system design. Nasution and Nusa [10] prove that the Design Thinking method has proven to be very effective in compiling the stages of UI/UX design in web-based learning applications, while Darmawan et al. [11] shows that the application of these methods to academic systems is able to increase the success rate of user testing by up to 100%.

In a more specific context related to agency correspondence, Julianto et al. [12] Designing web-based incoming and outgoing mail archiving software at provincial government agencies. A similar thing was done by Putri et al. [13] which develops a web-based incoming and outgoing mail information system to improve administrative efficiency and service transparency. In addition, Alif syahda [14] examine the

governance of electronic documents (Document Management System) using an interactive dashboard design approach. This finding is supported by Alade [15] which emphasizes that a web-based document management system can improve filing efficiency and make it easier to search documents in an organization.

From some of the above studies, it can be concluded that most of the previous research focused on system function and administrative process efficiency, but not many have emphasized the balance between system function and user convenience. Therefore, this research has a new position by combining the design of the incoming and outgoing mail system with the Design Thinking approach and paying attention to the user-oriented aspects of User Interface and User Experience.

2. Research Methodology

The research method applied to this official letter system is Design Thinking, which is an approach that focuses on a deep understanding of user needs to produce innovative and targeted solutions. This method involves several main stages, namely Empathize, Define, Ideate, Prototype, and Test, each of which plays an important role in the system design process. Through this approach, it is hoped that the incoming and outgoing mail system can provide a better user experience, improve employee work efficiency, and minimize problems in the management of mail archives at the Boyolali Education and Culture Office.

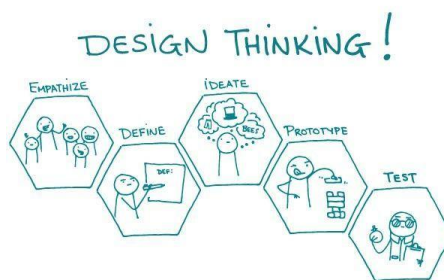


Figure 1. Design Thinking

There are five main stages in the Design Thinking method, here are the steps to apply this method:

1. Empathize Stage

This stage aims to understand the emotions, needs, and problems of users through observation and data collection. With empathy, developers can know what users are thinking, saying, feeling, and doing. These insights are the basis for designing products that truly fit their needs.

2. Define Stage

At this stage, the insights gained from the empathy stage are analyzed to formulate a key problem statement. The creation of user personas is carried out as the basis for product or application development. By understanding the needs and perspectives of users, developers can determine the primary focus in designing solutions.

3. Ideate Levels

This stage focuses on developing various creative ideas as solutions to problems that have been identified. This process involves brainstorming and exploring innovative concepts to find the most effective solution. All the resulting ideas are collected and analyzed to choose the best alternatives that can be applied in product development.

4. Prototype Stage

At this stage, the idea that has been developed is realized in the form of an initial prototype of the features or appearance of the product. Prototypes allow for simulation and initial testing before the final product is developed. Users can try out directly and provide feedback, so developers can make improvements before the final stage.

5. Test Stage

This stage is the evaluation of the prototype through direct testing to the user. Users provide feedback on the advantages and disadvantages of the prototype, which is then used as a basis for product improvement. With this process, developers can ensure that the final product is in line with the user's needs and expectations.

3. Results and Discussion

3.1 Levels of Empathy

In the Emphasize stage, data collection is carried out through two main methods, namely observation and interviews. Observation was carried out by directly reviewing the process of managing incoming and outgoing letters at the Boyolali Regency Education and Culture Office. Through this observation, the researcher studied how the flow of letters was received, recorded, stored, and disposed of to related parties. In addition, the researcher also identified obstacles that occur in the manual recording system, such as document stacking, recording errors, and difficulties in searching for letters. Interviews are conducted directly with employees and interns involved in the correspondence administration process. The goal is to deeply explore their views and experiences on the manual systems currently in use as well as the need for digital-based systems. Interview questions include problems in recording letters, the level of efficiency of searching old letters, problems with writing errors or document loss, as well as expectations for a new system that is easier to use, here is presented the user persona of the person in charge of incoming and outgoing mail which can be seen in figure 2.

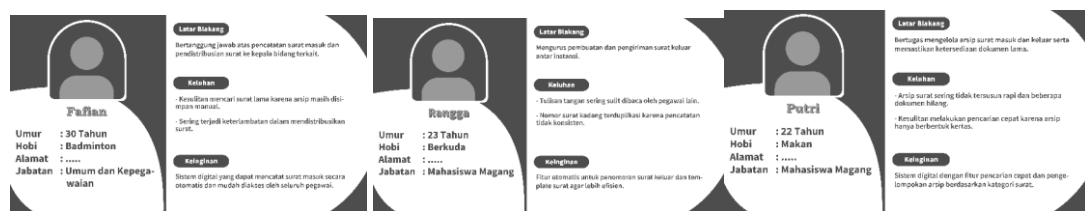


Figure 2. User Persona

From the results of these observations and interviews, several important findings were obtained. Employees complained of difficulties in finding old letters because the archives were still stored manually and not well organized. In addition, there are often recording errors due to handwriting that is difficult to read between employees. Some employees also expressed concern about the potential for loss of mail due to the lack of a centralized digital storage system. To clarify the findings, three user personas were created that represent the characteristics of the main users of the system.

1. Fafian, a 30-year-old public and personnel officer, is in charge of recording incoming letters every day. He needed a system that could help record faster and reduce the risk of input errors.
2. Rangga, a 23-year-old intern, was responsible for the outgoing letter. He wanted a system that could automatically set mail numbers and save time in mail creation.
3. Putri, a 22-year-old intern, is in charge of storing and managing the archives of letters. It requires a system that is able to store documents digitally and make it easy to search for letters with specific keywords.

The three user personas describe the various needs and challenges faced by system users in mail administration activities. The data from these observations and interviews is an important basis for understanding user needs and is the main reference for designing an inbound and outgoing mail system that is relevant, efficient, and easy to use by employees of the Boyolali Regency Education and Culture Office.

3.2 Define Stage

The Define stage is a process in the Design Thinking method that aims to formulate the main problems based on the findings of the Empathize stage. At this stage, various data obtained through observation and interviews with employees and interns at the Boyolali Regency Education and Culture Office are analyzed to identify the needs and obstacles they face in the process of managing incoming and outgoing letters. Through the analysis process, the researcher seeks to understand more deeply the core problems that cause low efficiency in the filing and letter-recording system. The results of the analysis are then used as a basis to determine the direction of designing solutions that suit user needs. One of the tools used in this stage is the Empathy Map, which serves to describe the user's experience and view of the current system. Through the Empathy Map, a comprehensive picture of what users feel, think, say, and do in carrying out mail administration tasks, the visualization of the results of the Empathy Map can be seen in figure 3.

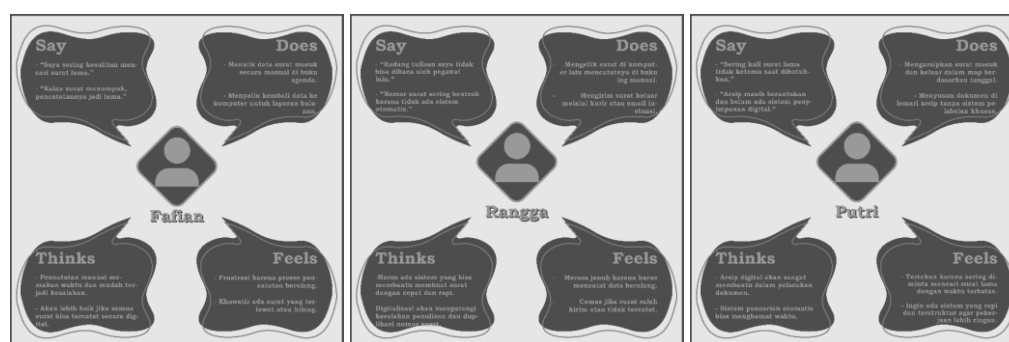


Figure 3. Empathy Map

Based on the results of the Empathy Map, several main problems that need to be the focus of the system design were found, including:

1. The process of recording letters is still done manually, so it takes a long time and is prone to errors.
2. The letter archive has not been digitally arranged, causing difficulties in searching for documents.
3. There is no centralized system that facilitates tracking and updating of incoming and outgoing mail data.

These problems are the basis for designing a web-based incoming and outgoing mail system which is expected to improve the work efficiency of employees and facilitate the process of recording, storing, and searching documents within the Boyolali Regency Education and Culture Office.

3.3 Ideation Stage

The Ideation stage is the process of developing ideas and ideas as solutions to problems that have been identified in the Define stage. At this stage, various alternative solutions are developed based on the needs and constraints found from the results of interviews with users. The main goal of this stage is to design the concept of an effective, efficient, and easy-to-use incoming and outgoing letter system for employees of the Boyolali Regency Education and Culture Office. The results of the ideation process are then grouped into priority quadrants, which consist of four categories, namely (1) High Impact - Easy to Implement, (2) High Impact - Hard to Implement, (3) Low Impact - Easy to Implement, and (4) Low Impact - Hard to Implement. This quadrant helps determine which ideas should be prioritized in the system design process. Here are some ideas:

1. Simple and user-friendly interface
2. Mail data table for easy viewing and searching
3. Feature to upload files in various formats (PDF, JPG, PNG)
4. Feature view files without switching pages
5. Data edit feature to fix input errors
6. Login system to restrict user access
7. In-depth search feature

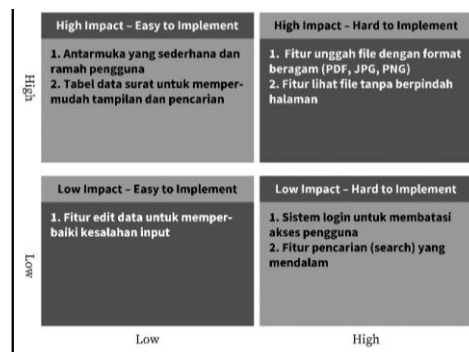


Figure 5. Empathy Map

Based on the results of the ideation stage and the analysis of priority quadrants shown in figure 5, it can be concluded that the main focus of the system design is on the development of a simple interface, the presentation of data in the form of tables, and the addition of the upload and view file feature as the main function of the system. Supporting features such as data editing, user login, and search will be reinforces that complement the system to be more optimal and in accordance with the needs of users at the Boyolali Regency Education and Culture Office.

3.4 Prototype Stage

In the Prototype stage, the design process and application of various ideas that have been produced in the previous stage are carried out. This stage aims to create an initial visual design that is able to describe the appearance and how the system works when used by the user. In its implementation, this stage involves several important aspects that focus on creating an interface display, setting the user interaction flow, and the preparation of the main components that represent the overall function of the system, The flow of using the system is described through the task flow which can be seen in figure 6.

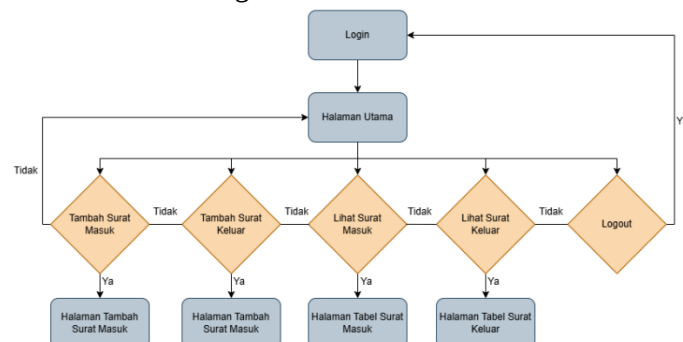


Figure 6. Taskflow

Taskflow serves to describe the flow of user activity when interacting with the system, making it easier to understand the steps that users take on each available feature. In addition, the task flow also helps in recognizing possible obstacles or difficulties that may arise during the deployment process, so that developers can evaluate and improve before the system enters the further development stage.

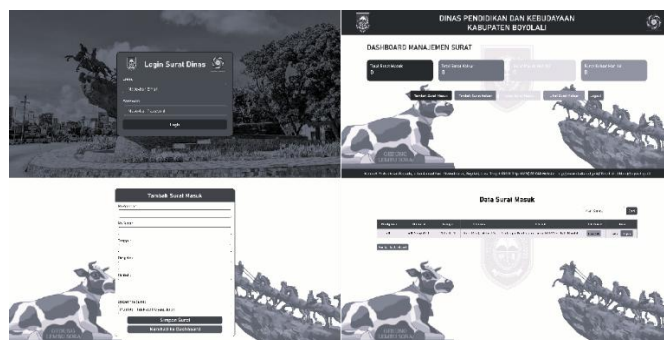


Figure 7. Low-fidelity

The low-fidelity prototype in Figure 7 is an initial design of the incoming and outgoing mail system presented in the form of a simple sketch or wireframe, with the aim of illustrating the arrangement of the main elements in the user interface. This prototype serves as an initial representation of the system design before it is developed to a more detailed stage, thus helping in determining the display structure and flow of user interaction in general.

Meanwhile, the high-fidelity prototype is a more detailed version of the design and resembles the final system. At this stage, the interface design of the incoming and outgoing mail system has been realistically developed with a more complete visual appearance as well as interactions that are closer to actual use. This prototype aims to provide a more accurate picture of the user experience, as well as to be the basis for evaluating the functionality of the system before the implementation stage is carried out.

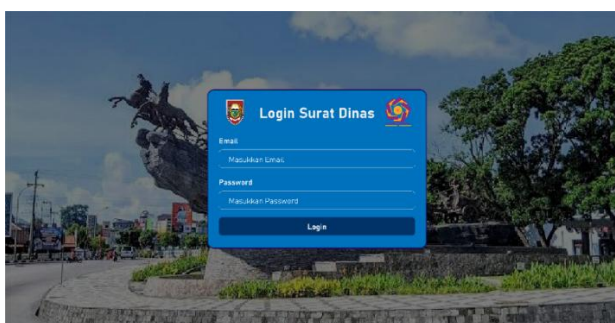


Figure 8. Login Page



Figure 9. Home

Figure 8 shows the login page containing the logo of the Boyolali Regency Education and Culture Office and the STMIK Amikom Surakarta logo as the official identity of the system development agencies and institutions. On this page, there are email columns and passwords that have been determined so that not all users can access the system. This aims to maintain data security and limit access only to authorized employees.

Figure 9 shows the main page of the system, which serves as a navigation center to access all mail management features. Users can see various main menus such as Add Incoming Mail which functions to add incoming mail data, and Add Outgoing Mail to add outgoing mail. In addition, there is a View Incoming Mail and View Outgoing Mail menus that are used to display a list of letters that have been successfully inputted. There is also statistical information in the form of Total Incoming Letters and Total

Outgoing Letters, which shows the number of letters. While the Incoming Mail Today and Outgoing Mail Today sections display the number of letters received and sent on the same day.

Figure 10. Add Incoming Letter Page

Figure 11. Add Outgoing Letter Page

Furthermore, in figure 10 is shown the add incoming mail page, which is used to add incoming mail data into the system. Users are required to fill in some data such as Agenda Number, Letter Number, Date, Sender, About, as well as upload a letter file in PDF, JPG, or PNG format. Once all the data is filled, the user can press the Save button. The stored data will automatically update the Total Incoming Letters and Today's Incoming Letters on the main page.

The appearance and method of filling in the add letter outgoing page has similarities to the add letter inlet page, as seen in figure 11. The difference lies in the type of data entered, namely outgoing mail data. Users fill in information such as Agenda Number, Mail Number, Date, Recipient, About, and upload the mail file to be sent.

No Agenda	No Surat	Tanggal	Pengirim	Penerima	Aksi
500	4533.5 A/9300	2025-05-10	Kuar (Pusat), Diklatas, LS	Strukturisasi Partisipasi Lulusan P.533N SD Klatas Bayan	Lihat Edit Hapus

Figure 12. Incoming Mail Data Page

No Agenda	No Surat	Tanggal	Pengirim	Penerima	Aksi
401	6765.6 A/9005	2025-10-29	Inspektur Insan	Strukturisasi Partisipasi Lulusan P.533N SD Klatas Bayan	Lihat Edit Hapus

Figure 13. Outgoing Mail Data Page

In figure 12, the incoming mail data page is shown in the form of a table that contains important information such as Agenda Number, Letter Number, Date, Sender, and Subject. There is a search field to make it easier for users to find certain mails. In addition, there is a View File button to open the mail document, Edit to change the data in case of errors, and Delete to delete the mail data.

Meanwhile, the outgoing mail data page has a similar structure and function to the incoming mail data page, as seen in figure 13. The difference only lies in the type of data displayed, i.e. outgoing mail. All features such as search, view files, edit, and delete are also available with the same function.

DPAT users correct mail data that has been entered previously in case of input errors. The edit page displays several columns that can be changed, namely Agenda Number, Mail Number, Date, Sender, About, and provides the option to re-upload the letter file in PDF, JPG, or PNG format. This feature serves to make it easier for users to update or correct data without the need to delete and add new letters. With the mail editing feature, data accuracy can be maintained and the process of managing incoming and outgoing letters becomes more efficient.

A pop-up display confirming deletion, will appear when the user presses the delete button to ensure that the action is taken so that no data deletion error occurs. This feature serves as a prevention so that the data is not accidentally deleted.

3.5 Testing Stage

At this stage, an explanation of the steps for use and testing of three testers was carried out. This test uses the Usability Testing method, which is an evaluation method used to measure the extent to which a product, application, or system can be used effectively, efficiently, and provides a satisfactory experience for users. To obtain the results of the Usability Testing, we have prepared several questions or test scenarios that will be given to the testers. The assessment was carried out by three examiners using a scale of 1 to 5, where 1 means Strongly Disagree, 2 means Disagree, 3 means Neutral, 4 means Agree and 5 means Strongly Agree.

Table 1. Test Table

Yes	Questions	Fafian	Squirt	Princess	Average
1	Is the system view easy to understand and use?	5	5	5	5.0
2	Does the system simplify the process of recording incoming and outgoing letters?	5	5	4	4.7
3	Does the mail search feature work well and help your work?	5	4	5	4.7
4	Is the speed of access and system response as expected?	4	5	5	4.7
5	Is the interface (UI) attractive and not confusing?	5	5	5	5.0
6	Does the system minimize recording errors or loss of mail?	5	5	4	4.7
7	A Do you feel satisfied using this system as a whole?	5	5	5	5.0
Overall Average					4.8

Based on the results of testing three respondents with seven questions in table 1, an average score of 4.8 was obtained on a scale of 5. This value indicates that the user is very satisfied with the design of the incoming and outgoing mail system that has been created. The system is considered easy to use, efficient, and helps employees in managing documents digitally.

4. Conclusion

This research successfully designed a web-based incoming and outgoing mail system using the Design Thinking method which consists of five main stages, namely empathize, define, ideate, prototype, and test. The design results resulted in a system interface that is simple, easy to understand, and in accordance with the needs of users within the Boyolali Education and Culture Office. This system has several advantages, such as a faster and more efficient mail recording and search process, a search feature that makes it easier for users to find mail accurately, and an edit and delete feature to correct data without having to re-input. In addition, the system is equipped with a security login so that only authorized users can access the data, and the display of data in the form of a table makes the mail monitoring process more structured. Based on the results of the testing phase involving three respondents, an average user satisfaction score of 4.8 out of 5 was obtained, which shows that this system is considered very good and worth using. Users rated the display as easy to understand, the features worked well, and the system navigation ran smoothly without significant problems. However, the drawback found is that the prototype is still limited to the interface and flow of interactions, not yet fully implemented with a real-time database system. For further development, this system can be developed into a web-based application that is integrated with the official e-office system, equipped with automatic notifications and time-based mail tracking features to support more optimal work efficiency.

REFERENCES

- [1] S. Kraus, P. Jones, N. Kailer, A. Weinmann, N. Chaparro-Banegas, and N. Roig-Tierno, "Digital Transformation: An Overview of the Current State of the Art of Research," *SAGE Open*, vol. 11, no. 3, 2021, doi: <https://doi.org/10.1177/21582440211047576>.

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- [2] S. Nadkarni and R. Prügl, "Digital transformation: A review, synthesis and opportunities for future research," *Great. Rev. Q.*, vol. 71, no. 2, pp. 233–341, 2021, doi: <https://doi.org/10.1007/s11301-020-00185-7>.
- [3] K. A. Oladimeji, A. K. Abdulkareem, and A. Adejumo, "From Tech Skills to Performance Gains: How Digital Literacy Drives Productivity Improvements in the Public Sector," *Administrative Institutions – J. Adm. Sci.*, vol. 4, no. 1, pp. 56–73, 2024, doi: <https://doi.org/10.54201/iajas.v4i1.93>.
- [4] A. Desai and A. P. Manoharan, "Digital Transformation and Public Administration: The Impacts of India's Digital Public Infrastructure," *Int. J. Public Adm.*, vol. 47, no. 9, pp. 575–578, 2024, doi: <https://doi.org/10.1080/01900692.2024.2350762>.
- [5] S. A. Mohamed, M. A. Mahmoud, M. N. Mahdi, and S. A. Mostafa, "Improving Efficiency and Effectiveness of Robotic Process Automation in Human Resource Management," *Sustainability*, vol. 14, no. 7, p. 3920, 2022, doi: <https://doi.org/10.3390/su14073920>.
- [6] E. Sihalohe and S. Sukata, "Design and Build an Information System for Incoming and Outgoing Mail Management at the Communication and Information Service of Banyumas Regency Based on Website," *J. Management...*, vol. 3, pp. 1–20, 2023, [Online]. Available: <http://journal.stmikjayakarta.ac.id/index.php/JMIJayakarta/article/view/928%0Ahttps://journal.stmikjayakarta.ac.id/index.php/JMIJayakarta/article/download/928/673>
- [7] C. Ulina Nababan, M. Hendri, S. Ramadhany, and A. A. Tarigan, "Design of an Incoming and Outgoing Mail Archiving System Using the Scrum Method at STMIK Logika Medan," *J. Inform. Press*, vol. 2, no. 2, pp. 7–11, 2025, [Online]. Available: <https://idpress.ac.id/jip>
- [8] M. I. Akbar, A. P. Ayudhitama, A. A. Smaragdina, and D. U. Soraya, "Development of a Mail Management System (SMART) as a Solution to the Mail Archive Problem at the Malang Customs Office," *J. Techno. Inf. and Educator.*, vol. 17, no. 2, pp. 568–583, 2025, doi: <https://doi.org/10.24036/jtip.v17i2.868>.
- [9] G. N. Tamma, I. Iftadi, and R. D. Astuti, "Design Thinking Implementation for User Experience Improvement of UNS Graduation Website: A Case Study," *J. Sist. Tek. Ind.*, vol. 27, no. 3, pp. 162–175, 2025, doi: <https://doi.org/10.32734/jsti.v27i3.19980>.
- [10] W. S. L. Nasution and P. Nusa, "UI/UX Design Web-Based Learning Application Using Design Thinking Method," *ARRUS J. Eng. Technol.*, vol. 1, no. 1, pp. 18–27, 2021, doi: <https://doi.org/10.35877/jetech532>.
- [11] I. Darmawan, M. S. Anwar, A. Rahmatulloh, and H. Sulastri, "Design Thinking Approach for User Interface Design and User Experience on Campus Academic Information Systems," *Int. J. Informatics Vis.*, vol. 6, no. 2, pp. 327–334, 2022, doi: <https://doi.org/10.30630/joiv.6.2.997>.
- [12] T. J. Saruan and R. A. Loho, "Development of Multimedia-Based Learning Media Using the MDLC Method for Elementary Schools," *J. Focus Electrode Energy List. Telecommunications. Computers, electrons. and Control*, vol. 9, no. 1, pp. 7–11, 2024, doi: <https://doi.org/10.33772/jfe.v9i1.141>.
- [13] S. A. Putri, I. K. Dewi, and A. Afrina, "Designing and developing a web-based information system for incoming and outgoing letters management," *J. Comput. Instr. Media*, vol. 3, no. 1, pp. 41–57, 2025, doi: <https://doi.org/10.58712/jcim.v3i1.143>.
- [14] A. Syahda, A. Masyhuri, B. Rahmat, and A. P. Sari, "Design and Development of a Web-Based Application for Managing Incoming and Outgoing Letters Using the Agile Methodology," *Ilk. J. Comput. Sci. Appl. Informatics E-ISSN*, vol. 7, no. 2, pp. 2715–2731, 2025, [Online]. Available: <http://journal.unublitar.ac.id/ilkomnika>
- [15] S. M. Alade, "Design and Implementation of a Web-based Document Management System," *Int. J. Inf. Technol. Comput. Sci.*, vol. 15, no. 2, pp. 35–53, 2023, doi: <https://doi.org/10.5815/ijitcs.2023.02.04>.