

Business Process Reengineering In Library Book Lending System (Case Study Of Sma Muhammadiyah 2)

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Abstract

The development of information technology is in line with the development of internet use in Indonesia, so that organizations that are unable to adapt to information technology and the internet will find it difficult to develop in the face of today's global competition. Computerized data processing contributes greatly when compared to manual data processing. SMA Muhammadiyah 2 has a library which is still relatively new and not many books. This is very inefficient, because in addition to wasting paper, data is inaccurate, filing becomes unorganized and messy. One way to increase effectiveness and efficiency is to use Business Process Reengineering (BPR) methods to improve old business processes. These stages consist of data collection, business process analysis, business process throughput efficiency test, process redesign refinement, process redesign recommendation, throughput efficiency test business process recommendation, comparison of throughput efficiency test results, solutions. The results obtained from this study are 2 the main processes studied are the process of borrowing books and the process of returning books, which are old processes that have efficiency values of 46% and 35%. However, after re-engineering the business processes of the two processes it was able to reach 100%, which found 5 processes that were eliminated and 5 processes that were automated online.

Keywords: business process reengineering; throughput efficiency test; BPR; ASME; BPMN

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1. Introduction

Information technology currently plays an important role in supporting various company activities. As a result, the development of software or application technology must be carried out continuously. Companies that are slow to embrace IT and the web will struggle to grow in the face of intense global competition (Ellyzabeth Sukmawati et al., 2022; Suharso & Arya, 2018). The growth of the internet in Indonesia is in line with the development of information technology there.

Processing data into digital information is one strategy to overcome dangers and shortcomings. This is very important and necessary. When compared to manual data processing, computerized data processing makes a significant contribution (Wimpertiwi et al., 2014). Understanding the needs of the organization in advance is critical to improving the quality of service so that technology can be used to meet those goals.

Libraries are an important tool for raising standards in early childhood, primary, and secondary education. The Education, Youth, and Sports Strategic Plan of the Ministry of Education has encouraged increased use and maintenance of educational facilities and infrastructure, such as books and teaching aids, libraries, and laboratories, for both public and private schools including Early Childhood Education, Primary Education, and Secondary Education (Musa et al., 2023; Rachmad et al., 2023; Rahadian et al., 2014).

The library of SMA Muhammadiyah 2 has a small number of volumes and is still relatively fresh. In terms of data collection and recording of loans and returns of goods, everything is still done manually. This is very wasteful because in addition to paper wastage, incorrect and irregular data, resulting in messy files (Effendi & Noviansyah, 2018). Making business processes inefficient and very time and energy consuming.

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One way to increase effectiveness and efficiency is by reengineering business processes. Reengineering is a process of reviewing a system for changes aimed at improving the functionality and reliability of the system. The purpose of business process reengineering can identify business processes, analyze business processes and can redesign business processes to improve performance and quality (Syuhada, 2020). The reengineering process needs to be carried out if the legacy system is no longer relevant to the development of the changing business environment and the emergence of new needs in a system used (Karina & Kusuma, 2018). Business process reengineering is done to save money, speed up services, and drastically improve business processes (Agustin, 2015).

In research conducted at FISIP UNJANI, there are faster time changes in business processes, reduced human resources, and fewer costs. From a business process that takes 5 hours 40 minutes after business process reengineering, the long business process time becomes 1 hour 30 minutes (Tri Widiastuti, 2022).

Business process reengineering research at the University in Bandung can find out the problems and solutions to the entire process using the VSM method and find obstacles that occur in the process using the VOB and VOC methods (Siboro & Gantini, 2022).

Modeling to be used to describe business processes using Business Process Modelling Notation (BPMN). BPMN is used to describe business processes that are assembled to create a graphical model of the activities that define the sequence of work (Yohana & Marisa, 2018).

Business processes must be tested before they can be considered efficient. Throughput efficiency testing is one of the techniques used to measure the effectiveness and efficiency of business processes (Ismanto et al., 2020). A test for throughput efficiency can increase productivity by 30% (Waluyo et al., 2021). Throughput efficiency testing will be used to determine which processes require improvement in terms of service time.

Business process analysis is currently conducted, and throughput efficiency is calculated, to determine efficient and effective book lending procedures at SMA Muhammadiyah 2. The implementation of business process reengineering will be carried out if the calculation results are inaccurate.

2. Methods

2.1. Research Stages

This research uses business process reengineering (BPR) to improve old business processes. These stages consist of data collection, business process analysis, business process throughput efficiency test, process redesign improvement, process redesign recommendation, throughput efficiency test business process recommendation, comparison of throughput efficiency test results, solutions. The detailed steps of the method are shown in Figure 1.

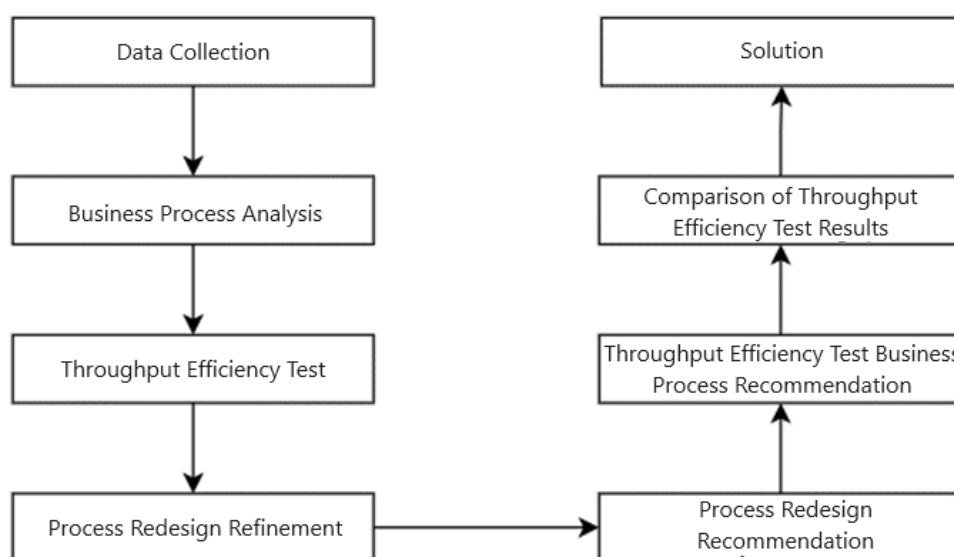


Figure 1. Research Methods

2.2. Data Collection

The data collection phase aims to collect data to identify and understand the business processes that run in the library at SMA Muhammadiyah 2. The method used for data collection is interviews and direct observation related to the process in it.

2.3. Business Process Analysis

Existing business processes are discovered during the business process analysis phase. In the next step, the business process model (BPMN) will be presented. Business Process Model and Notation (BPMN) is used to define and document the steps involved in a business process as a sequence of activities (Perdanakusuma et al., 2020). To simplify the presentation of business process flows for business users, BPMN (Aagesen & Krogstie, 2015).

2.4. Business Process Throughput Efficiency Test

At this point, the efficacy and efficiency of business processes are assessed using throughput efficiency tests. Due to the results of the very in-depth research, this stage is necessary to fully understand the process (Suharso et al., 2018). Equation 1 shows the throughput efficiency test equation.

$$efisiensi\ throughput = \frac{waktu\ proses\ bukan\ tunda}{total\ waktu\ dalam\ sistem} \times 100\% \quad (1)$$

The service time performance of the organization's business processes will be measured by mapping them using the ASME (American Society of Mechanical Engineers) standard (Fikry et al., 2021) shown in Figure 2.

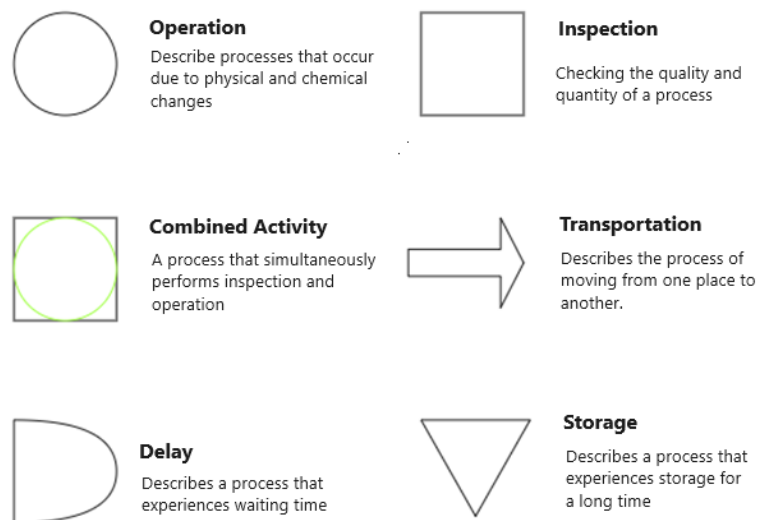


Figure 2. ASME Standard

2.5. Process Redesign Improvements

The process redesign refinement phase is performed to simplify, eliminate, standardize, and automate processes. So that it can improve business processes and can provide solutions to problems that occur. This stage is done to improve the old process into a new process. So that it can provide solutions to problems that occur.

2.6. Process Redesign Recommendations

This stage will redesign the business processes that have been carried out at the stage of refining the process redesign. Process redesign recommendations are used to correct problems with older processes (Islahudin & Hadikurniawati, 2022). The new business process will adjust to the results of the business process reengineering analysis.

2.7. Throughput Efficiency Test Business Process Recommendations

This stage is the same as in the test stage of the throughput efficiency of business peoses. The results obtained from the recommendation stage are calculated by testing throughput efficiency using ASME standards. This stage is to ensure an improvement in services after the improvement process is carried out.

2.8. Comparison of Throughput Efficiency Test Results

At this point, it compares throughput efficiency test findings with business process results. Evidence of increased efficiency of business processes when comparing new methods with old methods. to ensure that new business processes meet current needs.

2.9. Solutions

The last stage provides solutions or recommendations based on the results of the study. Recommendations can be used to improve business processes in the current SMA Muhammadiyah 2 library.

3. Results and Discussion

3.1. Data Collection

There are two methods for collecting data: observation and interviews. They conduct field observations to gather knowledge about the company and understand operational business operations. While the purpose of the interview is to obtain an explanation of the business procedures carried out. According to the results of the interview, there are two keys to the business process: borrowing books and returning them.

3.2. Business Process Analysis

At this stage, identify ongoing business processes. The results found that the book lending business process at SMA Muhammadiyah 2 has 2 main business processes that will be developed using the Business Process Model and Notation (BPMN). The book loan business process flow can be seen in Figure 3 and the book return business process flow in Figure 4.

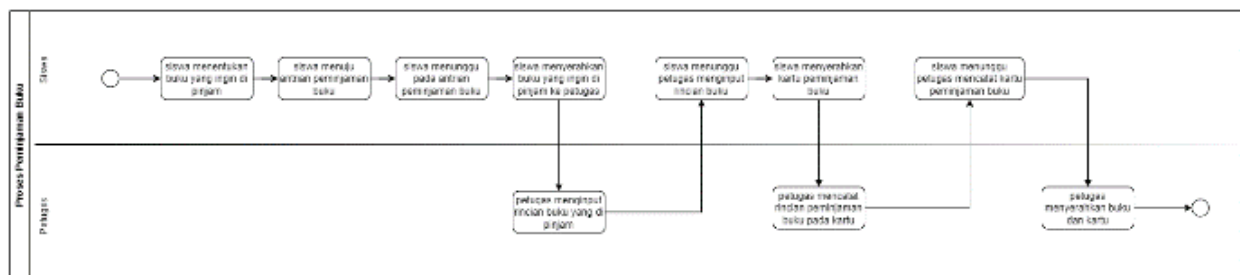


Figure 3. Book Lending BPMN Diagram

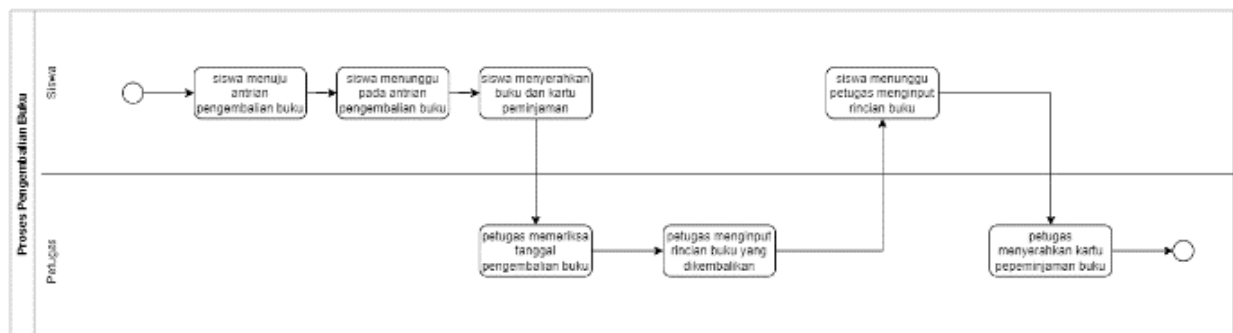


Figure 4. Book Return BPMN Diagram

3.3. Business Process Throughput Efficiency Test

At this stage, currently poor processes will be identified, assessed for their throughput efficiency, mapped against ASME standards, which measure overall time performance, and compared to suggested business processes. The procedure for borrowing books at SMA Muhammadiyah 2 using ASME standards can be seen in Table 1.

Table 1. ASME Standard Process Mapping Book Lending

No.	Business Process Flow	○	⇒	□	◐	▽	◻	Runtime (minutes)	Process Owner
1.	student decide which book they want to borrow			●				10	student
2.	student go to the book lending queue	●						1	student
3.	student wait in the book lending queue				●			20	student
4.	student hand over the book they want to borrow to the officer		●					1	student
5.	officer writes the details of the borrowed book			●				10	officer
6.	student wait for the officer to write the details of the book				●			10	student
7.	student hands over the book borrowing card		●					1	student
8.	the officer records the details of the book borrowing on the card			●				10	officer
9.	student waits for the officer to record the book borrowing card				●			10	student
10.	officer hands over the book and card		●					1	officer
Number of Stages		1	3	3	3	0	0	10	
Total Time		1	3	30	40	0	0	74	

Students and officers are responsible for managing the process of borrowing books. Throughput efficiency tests are performed using ASME standard mappings to measure overall service time performance. Equation 2 displays the ASME standard results for the book lending process.

$$efisiensi\ throughput = \frac{74-40}{74} \times 100\% = 46\% \quad (2)$$

There are three delay processes totaling 40 in Table 2. The throughput efficiency test result for the book lending procedure was 46%. Undelayed processing time is calculated using the following equation: 34 divided by 74, the total business processing time, and 100%.

In Table 2 is the process of returning books to the library of SMA Muhammadiyah 2 using ASME standards.

Students and officers are responsible for the procedures for returning books. Throughput efficiency tests are performed using ASME standard mappings to measure overall service time performance. Equation 3 in the ASME standard results illustrates the process of returning books.

$$efisiensi\ throughput = \frac{54-35}{54} \times 100\% = 35\% \quad (3)$$

There are two delay procedures totaling 35 in Table 2. The throughput efficiency test results for book lending procedures are 35%. The undelayed processing time is calculated in this formula as 19 divided by the total business processing time of 54, then multiplied by 100%.

Table 2. ASME Standard Mapping Book Return Process

No.	Business Process Flow	○	➡	□	⬇	▽	◻	Runtime (minutes)	Process Owner
1.	students go to the book return queue	●						1	student
2.	students wait in the book return queue							20	student
3.	student hands over the book and borrowing card		●					1	student
4.	the officer checks the book return date	●						1	officer
5.	the officer writes the details of the returned book			●				15	officer
6.	students wait for the officer to write the details of the book							15	student
7.	the officer hands over the book loan card		●					1	officer
Number of Stages		2	2	1	2	0	0	7	
Total Time		2	2	15	35	0	0	54	

3.4. Process Redesign Improvements

The results of the redesign stage of the library book lending process can be seen in Table 3. It is shown that there are 3 processes eliminated and 3 processes automated.

Table 3. Redesigned Improvements to the Book Lending Process

No.	Book Lending Business Process	Improvement Steps	Reason
1.	Students determine the book they want to borrow	None	None
2.	Students head to the book lending queue	None	None
3.	Students wait at the book lending queue	Elimination	Eliminates waiting time
4.	Students hand over the books they want to borrow to the officer	None	None
5.	The clerk wrote the details of the borrowed book	Automation	Writing details is done on the system
6.	Students wait for the clerk to write the details of the book	Elimination	Eliminates waiting time
7.	Students submit book borrowing cards	Automation	Lending cards are done online
8.	The clerk records the details of borrowing books on the card	Automation	The clerk took notes on the system
9.	Students wait for the clerk to record the book loan card	Elimination	Eliminates waiting time
10.	The clerk handed over books and cards	None	None

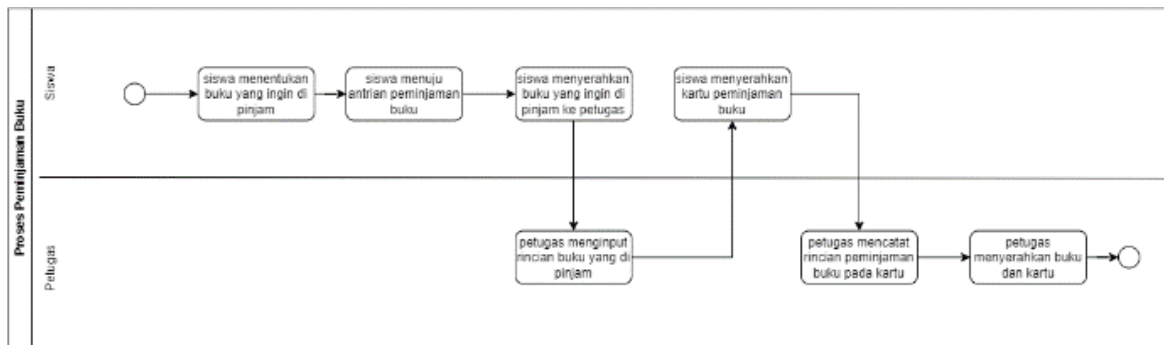
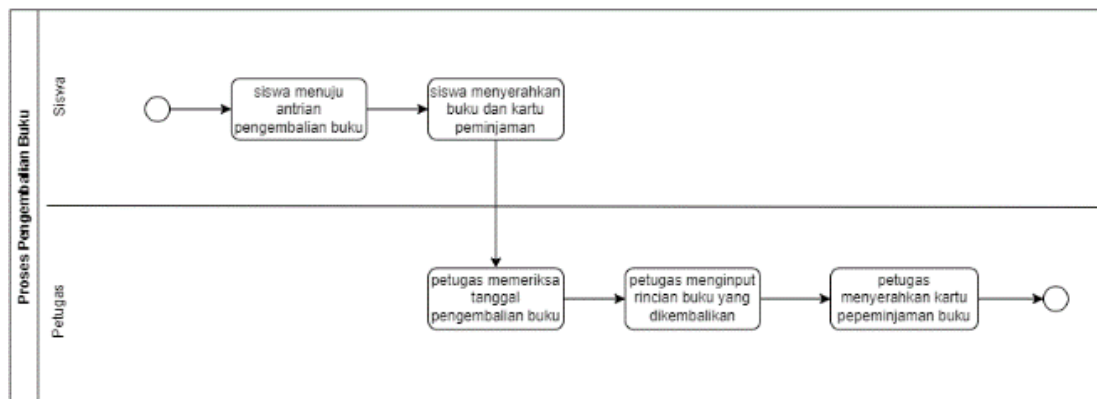
In Table 4 As a result of the redesign of the library book return process, there are 2 processes that are eliminated and 2 processes that are automated.

3.5. Process Redesign Recommendations

After doing the previous stage, then recreate the new business process according to the results at the stage of perfecting the process redesign. In Figure 5. is the result of recommendations for the redesign of the library book borrowing process of SMA Muhammadiyah 2. Then, in Figure 6. is the result of recommendations for the redesign of the library book return process of SMA Muhammadiyah 2.

Table 4. Redesigned Improvements to the Book Return Process

No.	Book Lending Business Process	Improvement Steps	Reason
1.	Students head to the book return queue	None	None
2.	Students wait on the book return queue	Elimination	Remove timeouts
3.	Students submit books and loan cards	None	None
4.	The clerk checks the return date of the book	None	None
5.	The clerk wrote details of the returned book	Automation	The clerk writes the details on the system
6.	Students wait for the clerk to write the details of the book	Elimination	Remove timeouts
7.	The clerk handed over the book loan card	Automation	Lending cards are made online

**Figure 5.** Book Lending Process Redesign Recommendations (in Indonesia)**Figure 6.** Book Return Process Redesign Recommendations (in Indonesia)

3.6. Throughput Efficiency Test Business Process Recommendations

This stage calculates the efficiency test of business process recommendations that have been determined in the previous stage. This calculation is to determine the results of increasing the results of new process efficiency results. In Table 5 is the result of new business process recommendations on library book lending processes mapped using ASME standards.

In Table 5 is the result of mapping the ASME diagram of recommendations for the library book lending process. Then performance calculations are carried out using the throughput efficiency test in Equation 4.

$$efisiensi\ throughput = \frac{15-0}{15} \times 100\% = 100\% \quad (4)$$

The results of the throughput efficiency test recommend the book lending process which is 100%. It is known that the processing time is not delayed 15 divided by the total time 15, multiplied by 100%. This result increases the percentage of time speed value from the previous library book lending process.

Table 5. ASME Standard Mapping Book Lending Process Recommendations

No.	Business Process Flows	○	⇒	□	D	▽	◻	Runtime (minutes)	Process Owner
1.	Students determine the book they want to borrow			●				1	student
2.	Students head to the book lending queue	●						1	student
3.	Students hand over the books they want to borrow to the officer		●					1	student
4.	The officer wrote the details of the borrowed book			●				5	Officer
5.	Students submit book borrowing cards		●					1	Officer
6.	The officer records the details of borrowing books on the card			●				5	student
7.	The officer handed over books and cards		●					1	Officer
Number of Stages		1	3	3	0	0	0	7	
Total Time		1	3	11	0	0	0	15	

In Table 6 is the result of new business process recommendations on library book return processes mapped using ASME standards.

Table 6. ASME Standard Mapping Book Return Process Recommendations

No.	Business Process Flows	○	⇒	□	D	▽	◻	Runtime (minutes)	Process Owner
1.	Students head to the book return queue	●						1	student
2.	Students submit books and loan cards		●					1	student
3.	The clerk checks the return date of the book	●						1	student
4.	The clerk wrote details of the returned book			●				5	Officer
5.	The clerk handed over the book loan card		●					1	Officer
Number of Stages		2	2	1	0	0	0	5	
Total Time		2	2	5	0	0	0	9	

In Table 6 is the result of mapping the ASME diagram recommended by library book return processors. Next, performance calculations are carried out using the throughput efficiency test in Equation 4.

$$efisiensi\ throughput = \frac{9-0}{9} \times 100\% = 100\% \quad (4)$$

The results of the throughput efficiency test recommend the book lending process which is 100%. It is known that the process time is not delayed 9 divided by the total time 9, multiplied by 100%. This result increases the percentage of time speed value from the previous library book return process.

3.7. Comparison of Throughput Efficiency Test Results

This stage is carried out by comparing the throughput efficiency test results from the old process with the recommendation process. Then, compare the time speed of each process. This stage can determine the difference between the long process time and the recommendation process. The comparison results can be seen in Table 7.

Table 7. Comparison of Old and New Business Process Efficiency

No.	Business Process	Current Process Throughput Efficiency (%)	Recommended Throughput Efficiency (%)	Current Process Speed (minutes)	Recommendation Process Speed (minutes)
1.	Book Lending	46	100	74	15
2.	Book Returns	35	100	54	9

3.8. Solutions

The final step is the recommendation of new business process solutions for the library book checking and returning business process. The display of the system that can be useful to the library of SMA Muhammadiyah 2 is shown in Figure 7 and Figure 8.

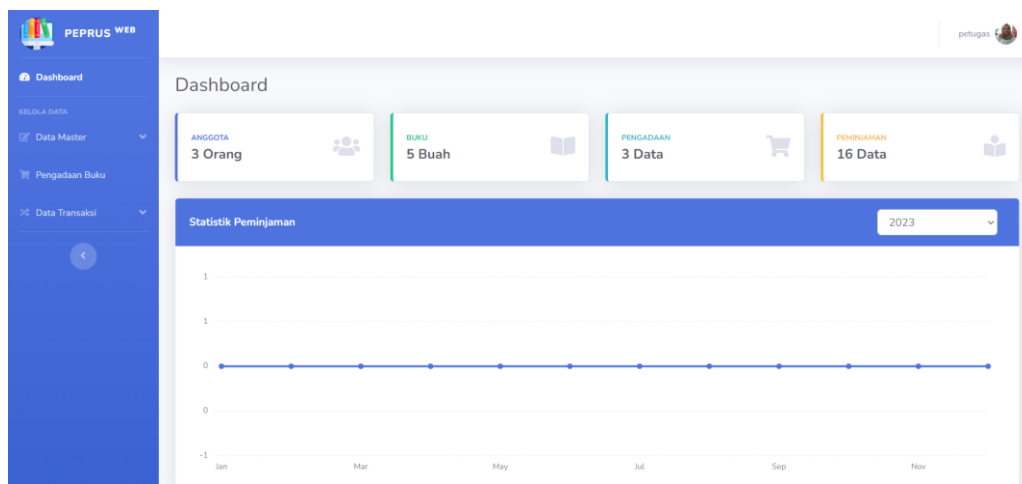


Figure 7. Recommended Solutions

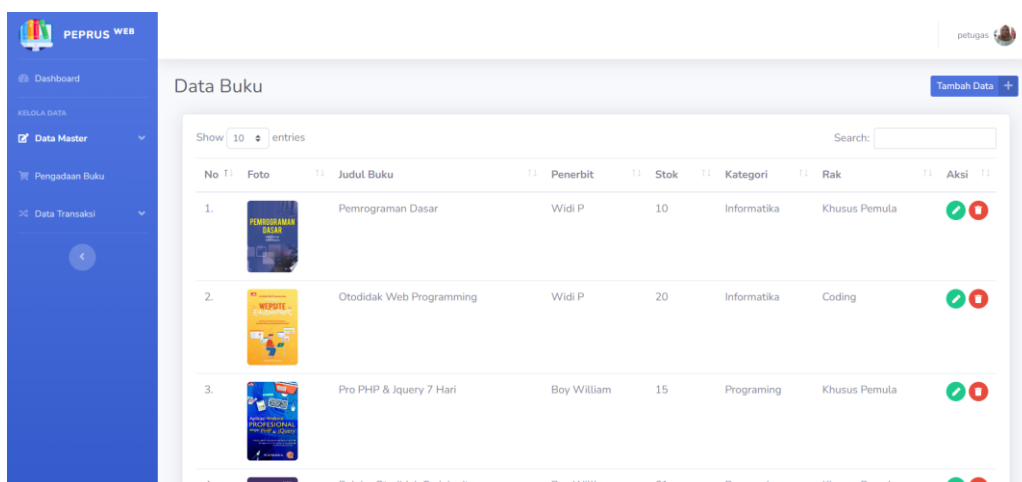


Figure 8. Recommended Solutions

4. Conclusion

Based on research that has been carried out on the reengineering of the library book lending business process at SMA Muhammadiyah 2, it can be concluded that Business Process Reengineering can make the process more effective and efficient. After collecting data, 2 main processes were found, namely the process of borrowing books and the process of returning books. To determine the efficiency value of the two processes, the throughput efficiency test formula and business processes are described using ASME (American Society of Mechanical Engineers) standards. After calculations are carried out using the throughput efficiency test, the old book lending business process has an efficiency value of 46%, and in the old book return business process has an efficiency value of 35%. After reengineering business processes and eliminating and automating some processes, the results obtained by both business processes have a value of 100% efficiency and can also speed up the time of both processes.

Acknowledgements

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