

Design and Construction of a Web-Based Sales Performance Monitoring Information System for PT Pertamina Gas Negara (Karawang) using Waterfall

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Abstract

This research aims to develop a web-based information system for monitoring and recording the performance of outsourced workforce (TAD) in the marketing of Gaskita products at PT Pertamina Gas Negara, Karawang Area. The system is designed to address the limitations of conventional recording methods using paper forms and Excel, which are prone to data loss, require lengthy input times, and lack real-time performance tracking. The development process adopts the Waterfall methodology, consisting of requirement gathering, system design, development, testing, and maintenance stages. The system provides centralized data recording, faster information access, and performance visualization through an interactive dashboard. Black Box Testing confirms that all features function as intended, while the System Usability Scale (SUS) yields an average score of 79, indicating good usability. The implementation of this system improves workflow efficiency, enhances data accuracy, and supports informed decision-making. With further development, it has the potential to integrate advanced analytics and mobile technology to broaden monitoring capabilities and optimize operational performance.

Keywords: Gaskita; Monitoring System; Waterfall; System Usability Scale; Black Box Testing

1. Introduction

PT Pertamina Gas Negara, a subsidiary of Pertamina, operates in the natural gas sector and plays a key role in the distribution, processing, and marketing of natural gas. In the Karawang Area, the company is responsible for serving Karawang, Subang, Purwakarta, and Bandung regions. Its operations extend across various sectors, including industrial, household, and commercial markets, by managing pipeline infrastructure and supplying gas based on market demand. The company is organized into three Sales Operation Regions (SOR): SOR I covering Sumatra and Riau Islands, SOR II covering West Java, DKI Jakarta, Banten, and parts of Central Indonesia, and SOR III covering Central Java, East Java, Bali, Nusa Tenggara, and Eastern Indonesia. PT Pertamina Gas Negara offers several products, such as Gaskita for household and small-scale customers, Sinergi for commercial and industrial clients, Gasku for transportation, and Gaslink for CNG-based mobile gas distribution.

During the internship, the author was assigned to the Household and Small Customer Sales Division in SOR II Karawang Area, working alongside the Outsourced Workforce team. This division focuses on promoting Gaskita to meet sales targets within a set timeline. The current marketing goal is to connect 11,000 households in Karawang to the gas network, with approximately 2,000 homes already connected. Although the sales and outsourced workforce teams utilize the Relly On system for data management, real-time monitoring is often lacking, affecting sales performance and decision-making. Both teams face limitations due to the absence of immediate access to updated data, which hampers operational efficiency.

In practice, the outsourced workforce still relies heavily on manual reporting methods, using paper forms to record customer leads and complaints before entering the data into Microsoft Excel. This conventional process is time-consuming and increases the risk of data loss or damage. From the author's observation, this method slows down performance, delays reporting, and often results in missing data, requiring additional effort to resolve. The research in this study aims to address these issues by evaluating the effectiveness of the current data recording and monitoring systems, identifying challenges in manual data processing, and developing a more efficient digital system that can provide real-time performance data to enhance the productivity of the outsourced workforce in Gaskita marketing activities.

2. Literature Review

2.1. System

A system can be defined as an organized entity composed of interconnected elements, components, or variables. Each element has a specific role and function, interacting and depending on one another to form a unified whole. These interactions are crucial, as the components work harmoniously to achieve the system's goals. Therefore, the comprehensiveness and interrelation of elements determine the system's success in operation [1]. From another perspective, a system is a series of coordinated activities aimed at accomplishing a particular objective, where all components collaborate to realize the set goals [2].

2.2. Information

Data that has been processed is converted into a clear and relevant format for users. This format aims to deliver valuable information that aids in making decisions at present. Moreover, the processed data acts as a dependable resource for further examination and user-required tasks. Therefore, data is not merely raw figures or symbols but an essential asset for producing insights that help in making precise and strategic choices [3].

2.3. Information System

An information system consists of interconnected elements that work together to gather, process, store, and share information, facilitating decision-making in an organization. It encompasses systematic procedures for collecting, entering, managing, storing, regulating, and delivering data to help the organization reach its objectives [4].

2.4. Monitoring

Monitoring involves the ongoing and organized collection and evaluation of data based on specific indicators, allowing for corrective measures that enhance the quality of programs over time [5]. As noted by Susanto[6], the purpose of monitoring is to collect factual information about how a program is carried out, ensuring that activities follow the planned schedule. It also serves to identify challenges encountered during implementation and assess how program leaders respond to them. The insights gained through monitoring are vital for evaluation, helping determine if the program has achieved its goals or requires adjustments. Consequently, monitoring systems track problems or interruptions by keeping detailed records, which support administrators in diagnosing issues efficiently and accurately [7].

2.5. Performance

Performance encompasses the entire management process focused on the outcomes produced by employees. It serves as a mechanism to recognize and appreciate their efforts and contributions within the workplace. More importantly, performance plays a fundamental role in the effective management of human resources, making it a vital element that organizations cannot overlook. Rather than being solely a measure of the results achieved, performance also reveals how management actively engages with employees—motivating, guiding, and supporting them to work collaboratively towards shared objectives. This holistic view emphasizes that good performance management is not just about numbers or targets but about fostering an environment where employees are empowered to contribute meaningfully to organizational success [8].

2.6. Sales

Sales refer to the transactional activities involving the recording and management of data related to the sale of goods and services. This includes inventory control, preparation of financial reports, and analysis of sales trends. In this study, sales extend beyond simple exchanges of products for payment, incorporating the use of technology such as Point of Sale (POS) systems to enhance operational efficiency, improve accuracy in record-keeping, and support more effective business decision-making [9].

2.7. Waterfall

The Waterfall method is a sequential and systematic software development model where each phase must be completed before moving on to the next. It includes key stages such as requirements analysis, system design, implementation, testing, and maintenance. This approach is commonly applied in information system development because it offers a well-structured and thoroughly documented process. By following the Waterfall method, development proceeds step-by-step, ensuring that each phase is finalized before progressing, which helps reduce the risk of errors during system implementation [10].

3. Research Method

This study uses a quantitative approach with the Waterfall method to develop a data recording and performance monitoring system for the outsourced team marketing Gaskita gas products at PT Pertamina Gas Negara, Karawang Area. The Waterfall method is chosen for its structured, sequential stages—from requirement analysis to maintenance. The research focuses on measuring system effectiveness using quantifiable indicators like recording frequency, data accuracy, and processing time. Each development phase is evaluated to identify issues before moving forward. The goal is to create a more efficient data recording system to improve team performance and provide management with data-driven recommendations to enhance marketing and customer service. The study was conducted at PT Pertamina Gas Negara's office from January to March 2024, focusing on challenges in conventional data collection and processing methods within the outsourced team.

3.1. Waterfall Method

This research adopts the Waterfall method, which follows a series of sequential stages illustrated in Figure 1. The Waterfall approach offers a systematic and step-by-step process for software development, beginning with analysis and design, followed by coding, testing, and maintenance [11].

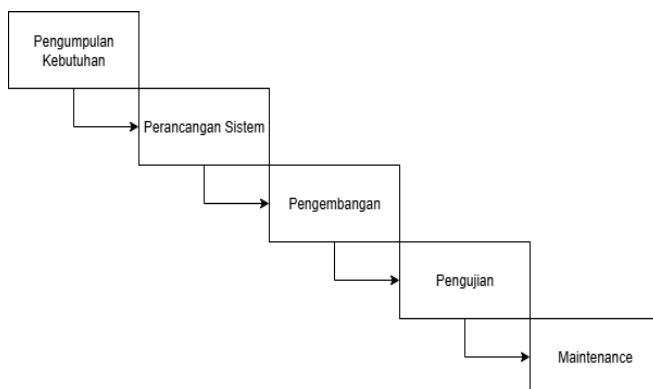


Fig. 1: Waterfall Method

The adjacent diagram illustrates the overall workflow of the Waterfall method applied in developing the data recording and performance monitoring system for the outsourced team at PT Pertamina Gas Negara. The main goal of this analysis is to design an efficient system that simplifies data entry and enhances supervision of the team’s performance. The Waterfall approach is implemented through several distinct phases. First, the Requirement Gathering stage involves collecting detailed information about the challenges faced by the team, conducted through interviews and field observations with employees. This phase ensures a thorough understanding and documentation of user needs for the software [12]. Next, the System Design phase uses the gathered data to create the system’s architecture and user interface to align with user expectations[13]. Following this, the Implementation phase focuses on coding and building the system according to the approved design, resulting in an application ready for deployment by the outsourced team. Once development is complete, the Testing phase begins, where the system undergoes functional tests using Black Box Testing to verify that all features work correctly and no defects remain [14]. Finally, the Maintenance phase involves regular system updates and bug fixes after deployment, ensuring the system remains effective, adapts to user needs, and stays current with technological and operational changes [15].

To evaluate the new system’s effectiveness and usability, questionnaires are distributed to users, and the feedback collected serves as a basis for ongoing evaluation and improvements. Additionally, in-depth interviews help identify user challenges and inform recommendations for further development, ensuring the system continues to meet user requirements and expectations.

4. Result & Discussion

During the research activities, the author performed various tasks, such as documenting and reporting information about visits from prospective and current customers. This process relied on both manual note-taking with paper and pen, and digital recording using Microsoft Excel. The TAD team was responsible for collecting data by hand, including details like Name, Visit Date, FID, RT/RW, Block, Phone Number, Status, Reasons, Follow-up actions or challenges faced on-site, and supporting documentation. All this information was then carefully entered into Excel to generate comprehensive reports.

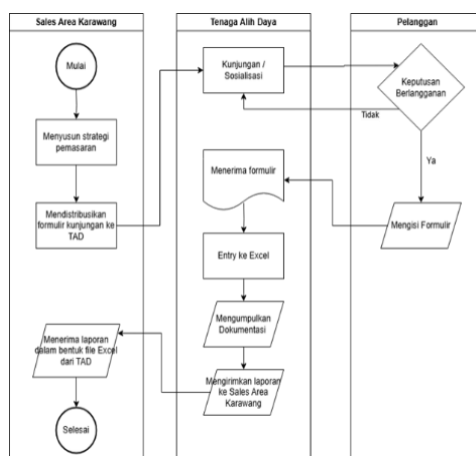


Fig 2 : Current System

The data entry process for prospective and existing customer forms at PT Pertamina Gas Negara Tbk follows a specific workflow. First, the Karawang Sales Area formulates marketing strategies based on FID. Then, the Outsourced Team (TAD) carries out visits or outreach to customers according to these strategies. When customers agree to subscribe, they fill out a paper form detailing their gas subscription plan. The TAD team collects these forms and inputs the data into Excel daily, compiling reports that are sent to the Karawang Sales Area. However, observations have revealed several challenges in this system. Paper forms are frequently lost or damaged, leading to data

inconsistencies. The manual nature of the process is time-consuming and adds to the workload of the TAD team. Additionally, the Karawang Sales Area struggles to track the team’s performance efficiently, as they must manually convert Excel data into charts for analysis.

4.1. System Design

Several problems were identified, and the author proposes the following solutions: First, to prevent the loss of documents or forms, it is recommended to implement a sales monitoring system that ensures data safety during input. Second, the suggested system can significantly improve time efficiency in completing tasks. Lastly, this system will help the Karawang Sales Area easily track the performance of the Outsourced Team, supporting sales strategy development and other related needs.

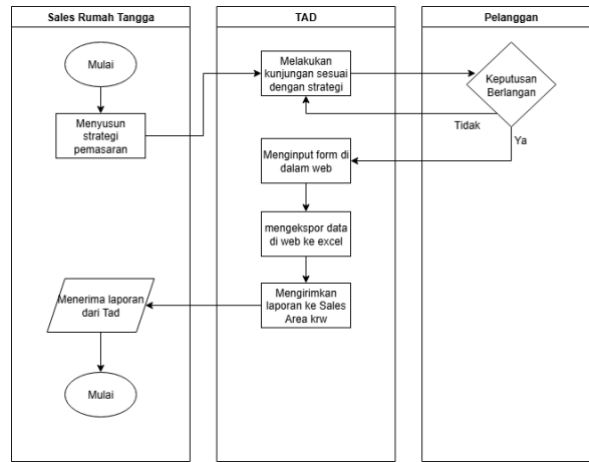


Fig 3: Proposed System

The current process of recording data for prospective and existing customers is inefficient, and the performance evaluation of the Outsourced Team during data collection and assessment is lacking. To address these issues, the author proposes the following system: First, the Household Sales team defines sales strategies and maps FIDs to identify target customers. Next, the Outsourced Team carries out visits based on the marketing strategies developed by the Karawang Household Sales Area. If a customer shows interest, the TAD team records the customer’s information using a web-based form, which is then stored in the system. Finally, the Karawang Sales Area receives comprehensive visit reports from the system, including performance graphs for each member of the Outsourced Team

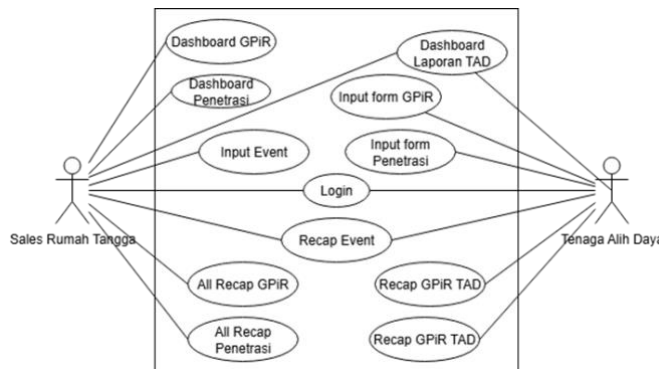


Fig 4: Proposed Usecase

The image above illustrates the Use Case of the proposed system for entering prospective customer data and monitoring sales performance. The GpiR dashboard and household sales penetration display growth charts for each FID. The Household Sales team can only input events, which serve to record marketing strategy activities. Event recaps are reports accessible to both sales and the Outsourced Team (TAD). The “All Recap GpiR and Penetration” compiles all data entries made by TAD. Additionally, TAD members are able to enter customer data through a designated form.

4.1.1. Activity Diagrams

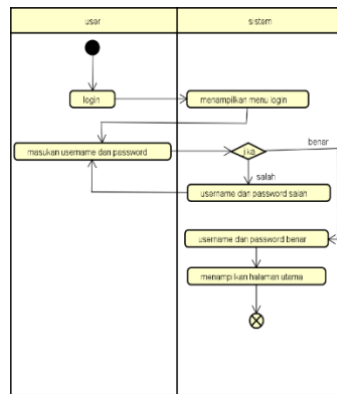


Fig 5: Activity Login

In the login activity shown above, both the Karawang Sales Area and the Outsourced Team (TAD) can access the system according to their roles. The Karawang Sales Area is able to input event data and monitor the performance and activities of the TAD team. Meanwhile, the TAD members can enter data for prospective and existing customers and also review their own performance within the system.

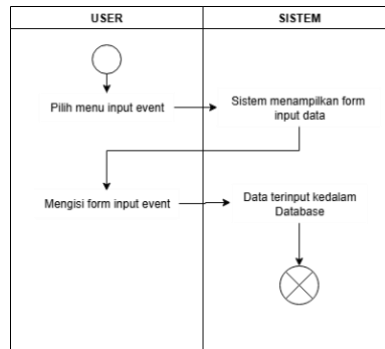


Fig 6: Event Data Input

In this activity, the Admin (Household Sales) can add additional events to support marketing activities

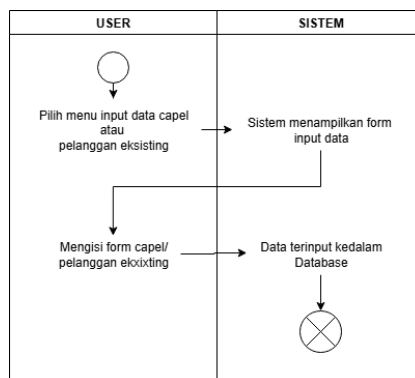


Fig 7: Activity Data Input Prospective customers / Customers for each TAD

In this activity, each user who acts as an Outsourcer can input visit data, both for potential customers and existing customers.

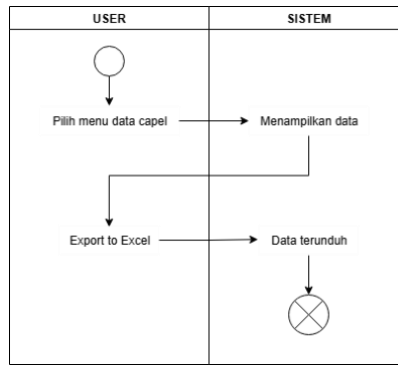


Fig 8: Proposed Use case

Fig 7: Data Entry Activity for Prospective and Existing Customers by the Outsourced Team (TAD)

The prospective customer data dashboard includes a feature that allows exporting data to Excel within the system.

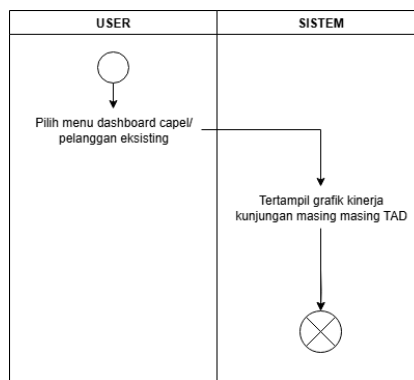


Fig 8: Proposed Usecase

The Admin dashboard displays penetration/GpiR charts to show the number of visits and monthly visits to each FID.

4.2. System Design

In this stage, the author carries out the development process based on the previously created design by implementing coding. The following is the display of the implementation results.

4.2.1 Admin



Fig 8: Login



Fig 8: Dashboard Admin

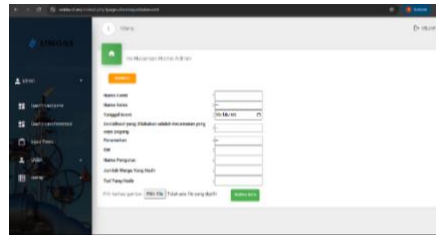


Fig 8: Input Event



Fig 8: Monitoring User Dashboard

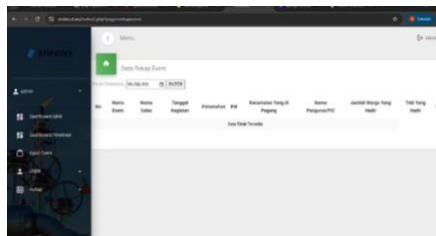


Fig 8: Event Data

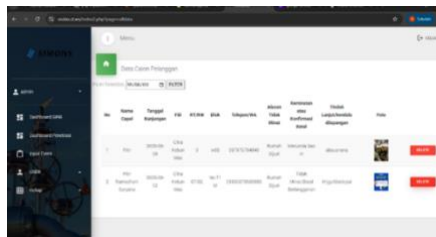


Fig 8: GpiR Data



Fig 8: Data

4.2.2 User TAD

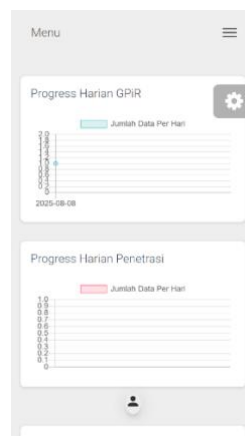


Fig 8: Dashboard TAD

Menu

Form Input Data GPiR

KEMBALI

Nama Warga Yang Ditemui :

Tanggal Kunjungan : hh/bb/tttt

FID :

RT/RW :

Blok :

Nomor Telepon/WA :

Keminatan atau Konfirmasi Batal :

Alasan Tidak Minat :

Tindak Lanjut/Kendala dilapangan :

Pilih berkas gambar:
 Tidak ada file yang dipilih

Fig 8: Form Input GPiR

Menu

Form Input Data Penetrasi

KEMBALI

Nama Warga Yang Ditemui :

Tanggal Kunjungan : hh/bb/tttt

Alamat :

Kelurahan : Simabaya

RT/RW :

Blok/Nomor Rumah :

Nomor Telepon/WA :

Keminatan atau Konfirmasi Batal :

Alasan Tidak Minat :

Tindak Lanjut/Kendala dilapangan :

Pilih berkas gambar:
 Tidak ada file yang dipilih

Fig 8: Form Input

Menu

Data Rekap Event

PLIH TANGGAL: hh/bb/tttt FILTER

No	Nama Event	Nama Sales	Tanggal Kegiatan	Perumahan	RW	Kec. Yt Pt
Data Tidak Tersedia						

Fig 8: Event Data

Menu

Data Demi Amalia

EXPORT TO EXCEL

No	Nama Capel	Tanggal Kunjungan	Alamat	Kelurahan	RT/RW
Data Tidak Tersedia					

Fig 8: GpiR User Data

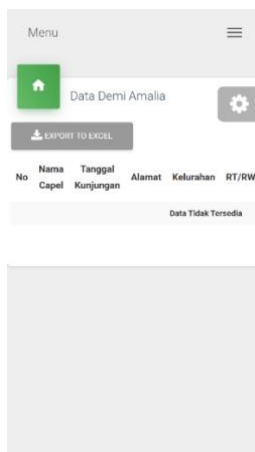


Fig 8: Penetration User Data

4.3. System Testing

At this stage, the author conducts periodic testing, starting from functionality testing (Blackbox) to user experience testing (System Usability Scale) by distributing questionnaires to each user. It is expected that through this testing process, the system will operate smoothly without errors when later used by the end users.

4.3.1 Black Box Testing

a. Admin Test

No	Menu	Test Procedure	Result
1	Login Admin	Access the system by entering the correct username and password.	Success
2	Admin GPiR Dashboard	Display graphical data including visited FID records, monthly visit statistics, and overall TAD visit data.	Success
3	Admin Penetration Dashboard	Display graphical data including visited FID records, monthly visit statistics, and overall TAD visit data.	Success
4	Event Input	Add new event data into the system.	Success
5	User Menu	View daily progress of Tenaga Alih Daya, covering both GPiR and penetration customer records.	Success
6	Event Data	Display all event data entered into the system.	Success
7	GPiR Customer Data Recap	Display all GPiR data entries submitted by TAD users.	Success
8	Penetration Data Recap	Display all penetration data entries submitted by TAD users.	Success
9	Export to Excel	Export data from the system to an XLS file format.	Success
10	Logout	Exit the system and return to the login page.	Success

b. User TAD Test

No	Menu	Test Procedure	Result
1	User Login	Access the system by entering the correct username and password.	Success
2	TAD Dashboard	Display graphical data including each user's daily GPiR and penetration progress.	Success
3	GPiR Prospect/Customer Input Form	Add GPiR prospect or customer data.	Success
4	Penetration Prospect/Customer Input Form	Add penetration prospect or customer data.	Success
5	Event Data	Display all event data entered into the system.	Success
6	GPiR Data	Display GPiR prospect/customer data entered by each TAD user.	Success
7	Penetration Data	Display penetration prospect/customer data entered by each TAD user.	Success
8	Export to Excel	Export data from the system to an XLS file format.	Success
9	Logout	Exit the system and return to the login page.	Success

4.3.2 System Usability Scale

The System Usability Scale (SUS) is an evaluation method used to measure the perceived ease of use of a system through ten statements, arranged alternately between positive and negative sentences. The responses are rated on a scale from 1 (strongly disagree) to 5 (strongly agree)

No	Respondents	Real Score									
		Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10
1	TAD	5	1	5	4	4	1	4	2	2	1
2	TAD	4	1	4	1	2	2	5	2	4	2
3	TAD	4	1	5	2	4	4	4	1	4	1
4	TAD	4	2	3	1	4	3	4	2	5	2
5	ADMIN	5	1	4	2	4	4	5	1	5	2
6	TAD	4	1	4	2	4	2	4	2	5	1

In this study, the evaluation was conducted with six respondents. The score for each statement was adjusted, where positive statements were calculated by subtracting one from the respondent's score, while negative statements were calculated by subtracting the respondent's score from five. The total score from all statements was then multiplied by 2.5, resulting in a final value ranging from 0 to 100. A score above 68 indicates a good level of usability, while a score below that suggests the need for improvement

Respondents	Calculated Score										Q	Amount	Value (Total x 2.5)
	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10			
TAD	4	4	4	1	3	4	3	3	1	4	4	31	78
TAD	3	4	3	4	1	3	4	3	3	3	3	31	78
TAD	3	4	4	3	3	1	3	4	3	4	4	32	80
TAD	3	3	2	4	3	2	3	3	4	3	3	30	75
ADMIN	4	4	3	3	3	1	4	4	4	4	3	33	83
TAD	3	4	3	3	3	3	3	3	4	4	4	33	83
Average Score (Final Result)													79

Based on the calculation using the above formula, the average score obtained from all respondents was 79. This score indicates that the developed system is considered relatively easy to use by the majority of respondents and falls into the "good" category, as it exceeds the standard threshold of 68.

5. Conclusion

This research addresses the core problem of improving the effectiveness of data recording and performance monitoring for Tenaga Alih Daya (TAD) in the marketing activities of the Gaskita product at PT Pertamina Gas Negara, Karawang Area. The findings reveal that the previous manual recording method—using paper forms and Excel processing—presented significant shortcomings, including the risk of data loss, time-consuming input processes, and limited real-time performance monitoring. The development of a web-based information system using the Waterfall approach proved to be an effective solution, offering an integrated database, easier access to information, and performance reports displayed through an interactive dashboard. Testing through the Black Box method confirmed that all system functions operated as intended, while the System Usability Scale (SUS) assessment produced an average score of 79, categorized as "good" and easy to use. The key contribution of this study lies in the implementation of a monitoring system that not only accelerates workflows but also enhances data accuracy and supports real-time, information-based decision-making. In the future, the system could be further developed by integrating analytical technology and mobile platforms to expand monitoring capabilities and improve operational efficiency.

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