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Function Point Analysis for Quality Evaluation of a Natural Resource Information System in Bulungan Regency

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Abstract

This study evaluates the quality of a natural resource information system in Bulungan Regency using Function Point Analysis (FPA). As information systems become increasingly essential in managing complex processes, measuring their quality is crucial, especially for operational systems. FPA was applied to assess various system components, including external inputs, outputs, inquiries, internal logical files, and external logical files, to determine the system's functionality. The analysis involved calculating the Crude Function Point (CFP) and adjusting it using the Relative Complexity Adjustment Factor (RCAF) to determine the final Function Point value. The results indicate a total Function Point value of 317.34, reflecting the system's current complexity and identifying areas for enhancement. The detailed evaluation of system components such as external inputs, outputs, and logical files provided insights into specific areas that require improvement, such as data handling efficiency and user interface functionality. These findings underscore the importance of continuous quality assessment to maintain optimal system performance and adaptability to user needs. This analysis provides stakeholders with a clear benchmark for optimizing system performance, user satisfaction, and resource allocation, ultimately supporting better decision-making for future enhancements.

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Keywords: Function Point Analysis, Information System Evaluation, Quality Measurement, Natural Resource Information Systems

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I. INTRODUCTION

The rapid growth of information systems technology, driven by increased internet accessibility, has spurred intense competition among developers to create software and systems that cater to diverse user needs. In this context, measuring the quality of an information system has become essential, particularly for systems that are already operational. Quality measurement helps identify areas for improvement, validate system performance, and ensure the system remains effective in meeting evolving user needs [1]. Despite the lack of well-structured regulations or standardized criteria to measure the quality of information systems, such evaluations are crucial for optimizing system functionality and ensuring it continues to support users effectively [2], [3]. Hence, this study focuses on the assessment of the quality of an information system using Function Point Analysis (FPA), particularly in the context of natural resource management in Bulungan Regency, North Kalimantan.

Measuring the quality of information systems is intrinsically difficult because it requires taking into account a number of different aspects that have an impact on the functionality of the system as well as the requirements of the users. User requirements, the scope of the project, the allocation of resources, and the capability to efficiently change or expand functions in response to changing needs are some of the elements that determine these characteristics. After the system has been built, quality measurement plays an essential function since it serves as a foundation for determining subsequent versions and changes when they are implemented [4], [5]. Moreover, it aids in assessing resources, such as human capital and budget, to ensure alignment between the project's scope and the contractual obligations. However, a significant gap in current practices lies in the limited application of a consistent and quantifiable method to evaluate these factors in detail. Addressing this gap through a structured measurement method is therefore vital.

The necessity of evaluating the quality of information systems also stems from the common observation that many systems, despite being well-designed, struggle with issues related to performance, maintenance, and user training. Such issues typically arise due to the inadequate definition of requirements and functionalities, leading to user dissatisfaction [6], [7]. This points to the need for a comprehensive quality assessment that accurately measures each critical factor. Function Point Analysis (FPA) is a recognized method that provides a reliable means of breaking down complex systems into measurable components, thus facilitating a detailed evaluation of system quality [8], [9]. This study's focus on applying FPA to the natural resource information system in Bulungan aims to bridge the gap by providing a more systematic approach to quality measurement.

Function Point Analysis (FPA) is preferred over other measurement methods due to its focus on functional user requirements, which makes it particularly suitable for assessing systems that are already in operation [4], [10], [11]. Unlike other methods that may require extensive technical metrics or deep code analysis, FPA evaluates the system based on its functional components, such as inputs, outputs, user interactions, and data files. This approach allows for a more user-centric evaluation, ensuring that the system's performance aligns with user needs and expectations. FPA's emphasis on quantifying functionality also enables stakeholders to make informed decisions about system modifications without requiring in-depth technical expertise [5], [12].

Another advantage of FPA is its adaptability across different types of information systems, regardless of the technology or programming language used. This makes FPA a versatile tool for assessing system quality in a consistent manner, enabling comparisons across different projects and providing a standard measure for productivity and performance [13], [14]. Moreover, FPA's structured methodology helps identify specific areas for improvement, such as enhancing particular functionalities or optimizing resource use, which is crucial for ongoing system development. By providing clear, quantifiable metrics, FPA supports better project management and strategic planning, making it an ideal choice for evaluating the natural resource information system in Bulungan Regency.

The purpose of this research is to evaluate the quality of the natural resource information system in Bulungan Regency using Function Point Analysis (FPA). By assessing the system's functionality, this study aims to identify areas for improvement, ensure that the system meets user requirements effectively, and provide a solid foundation for future enhancements. The evaluation results will serve as a reference for stakeholders to make informed decisions regarding system updates and resource allocation, ultimately enhancing the system's performance and usability.

II. Research Method

Software quality measurement involves evaluating various aspects of a software product to determine its effectiveness in meeting user requirements, ensuring reliability, and maintaining performance standards [15]. A systematic measurement approach is necessary to identify issues that might impact software usability and functionality. Quality measurement typically includes assessing factors such as functionality, reliability, usability, efficiency, maintainability, and portability [16]. These factors help determine how well the software meets its intended purpose and whether it needs improvements to meet user expectations effectively.

When it comes to evaluating the quality of software, there are a variety of approaches that may be utilised. These methodologies include metrics that measure system performance and user happiness. When compared to these methodologies, Function Point Analysis (FPA) stands out due to the fact that it places an emphasis on quantifying functional needs. This is especially advantageous for systems that are currently in operation. Through the measurement of particular functional components, FPA makes it possible for stakeholders to evaluate the overall complexity and effectiveness of the information system. The purpose of this structured evaluation is to provide insights into the system's strengths and limitations, which will promote continual improvement and better decision-making for future upgrades [10].

Function Point Analysis (FPA) is a structured methodology used to measure the functionality of an information system based on its components [4], [9], [17]. The FPA method involves breaking down the system into smaller functional components, which are quantified to evaluate the system's overall size and complexity. The main steps in FPA include identifying and categorizing components such as External Inputs (EIs), External Outputs (EOs), External Inquiries (EQs), Internal Logical Files (ILFs), and External Interface Files (EIFs). Each of these components is assigned a weight based on its complexity—categorized as simple, average, or complex—and these weights are used to calculate the system's Function Points (FP) .

The calculation of Function Points follows the formula:

$$FP = CFP \times (0.65 + 0.01 \times RCAF) \quad (1)$$

Where:

- FP is the Function Point value.
- CFP (Crude Function Point) is calculated based on the weighted values of EIs, EOs, EQs, ILFs, and EIFs.
- RCAF (Relative Complexity Adjustment Factor) is derived from evaluating 14 general system characteristics, such as data communications, performance, and user efficiency, each rated on a scale from 0 (no influence) to 5 (essential).

The FPA method was chosen because it allows for a comprehensive yet straightforward evaluation of system functionality without delving into technical implementation details. By assessing the functional user requirements, FPA helps ensure that the system remains aligned with user needs, facilitating targeted improvements and efficient resource allocation.

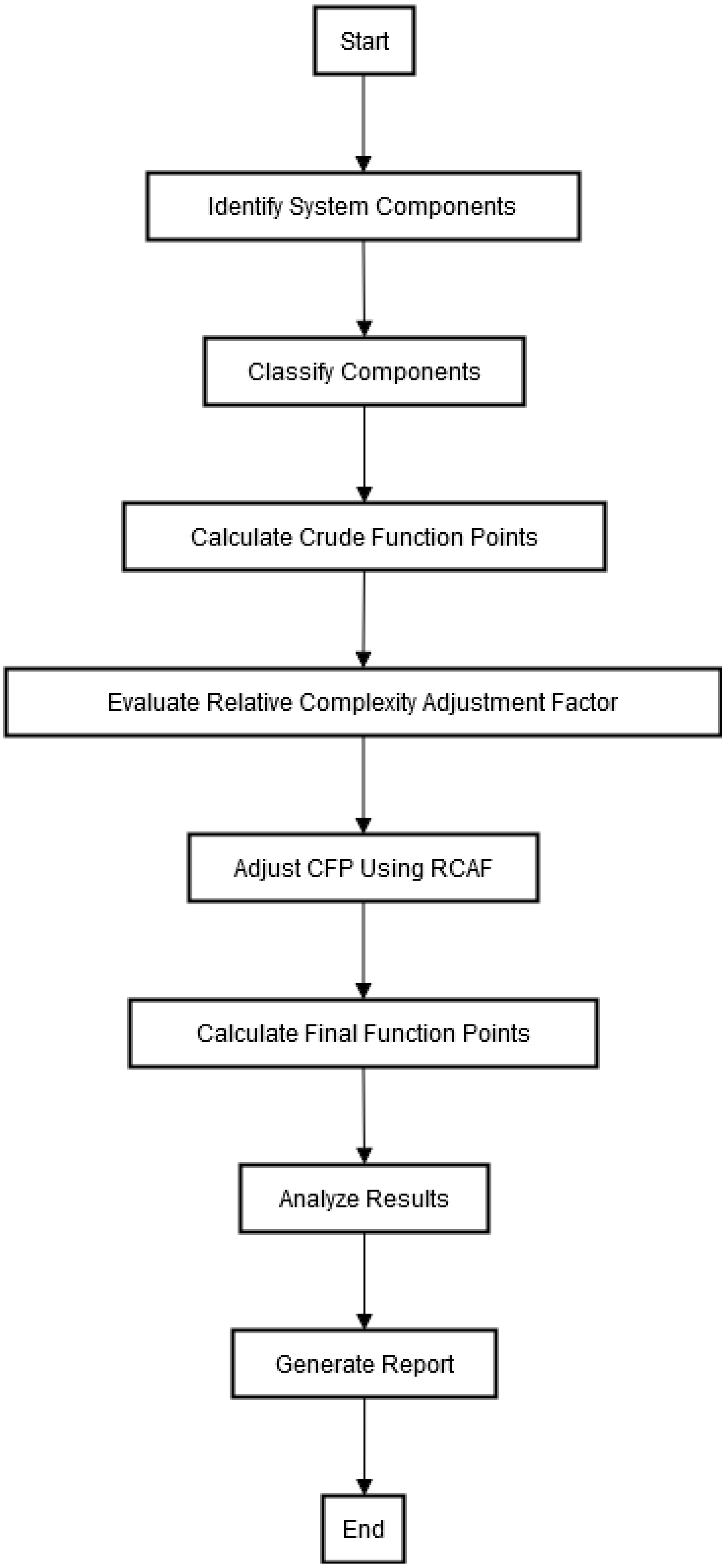

Fig 1. Flowchart

III. Results and Discussion

The results of the Function Point Analysis (FPA) on the natural resource information system in Bulungan Regency are detailed below. The analysis started with calculating the Crude Function Point (CFP) for different modules of the system. Each module was evaluated based on its functional components, including External Inputs, External Outputs, External Inquiries, Internal Logical Files, and External Interface Files, using a classification of simple, average, or complex.

Table 1. Level Component Count

Type	Level									Total CFP
	Simple			*Average*			*Complex*			
	Jml	**Bobot**	**Point**	**Jml**	**Bobot**	**Point**	**Jml**	**Bobot**	**Point**	
	A	**B**	**C=A*B**	**D**	**E**	**F=D*E**	**G**	**H**	**I=G*H**	**J=C+F+I**
External Input	26	3	78	-	4	-	9	6	54	**132**
External Output	15	4	60	3	5	15	-	7	-	**75**
External Inquiries	3	3	9	-	4	-	-	6	-	**9**
Internal Logical File	6	7	42	-	10	-	-	15	-	**42**
External Logical File	-	6		-	7	-	-	10	-	-
TOTAL										**258**

The Crude Function Point (CFP) value was calculated based on the weighted values of these components. The results show that the system includes a total of 26 External Inputs, 15 External Outputs, 3 External Inquiries, and 6 Internal Logical Files, resulting in a CFP of 258. The following table summarizes the component counts and their respective complexity levels:

Table 2. Summary of Component Count

Component	Simple	Average	Complex	Total CFP
External Input	26	-	9	132
External Output	15	3	-	75
External Inquiries	3	-	-	9
Internal Logical File	6	-	-	42

The Relative Complexity Adjustment Factor (RCAF) was also calculated to account for system-specific characteristics. The RCAF was determined by evaluating 14 general system characteristics, including data communication complexity, distributed processing, performance, and user efficiency. These characteristics provide a comprehensive view of the factors that influence the overall system complexity and quality. For example, aspects like data communication complexity and distributed processing indicate how well the system manages interactions and distributed data, which are critical for efficient performance.

Based on these assessments, the total RCAF score was 58. This score reflects the level of system complexity and serves as an adjustment to the Crude Function Point (CFP). A higher RCAF score suggests increased complexity, which typically means that the system needs more resources for effective management. This adjustment is essential for deriving a realistic Function Point value, ensuring that both functional requirements and complexity factors are accurately captured in the final evaluation. The RCAF, therefore, plays a essential role in understanding the operational challenges and guiding stakeholders in making informed decisions for system improvements.

The final Function Point (FP) value was calculated using the formula:

FP = CFP × (0.65 + 0.01 × RCAF).

By applying the values, the total FP was computed as follows:

FP = 258 × (0.65 + 0.01 × 58) = 258 × 1.23 = 317.34

This indicates that the overall system size and complexity, as measured in function points, is 317.34. This value provides a quantitative benchmark for understanding the functionality and complexity of the system. A function point value of this magnitude suggests that the system possesses a moderate to high level of complexity, which implies that substantial resources are needed for its maintenance and enhancement. The FP value serves as a crucial indicator for system developers and stakeholders, offering insights into the system's current capacity and highlighting the potential effort.

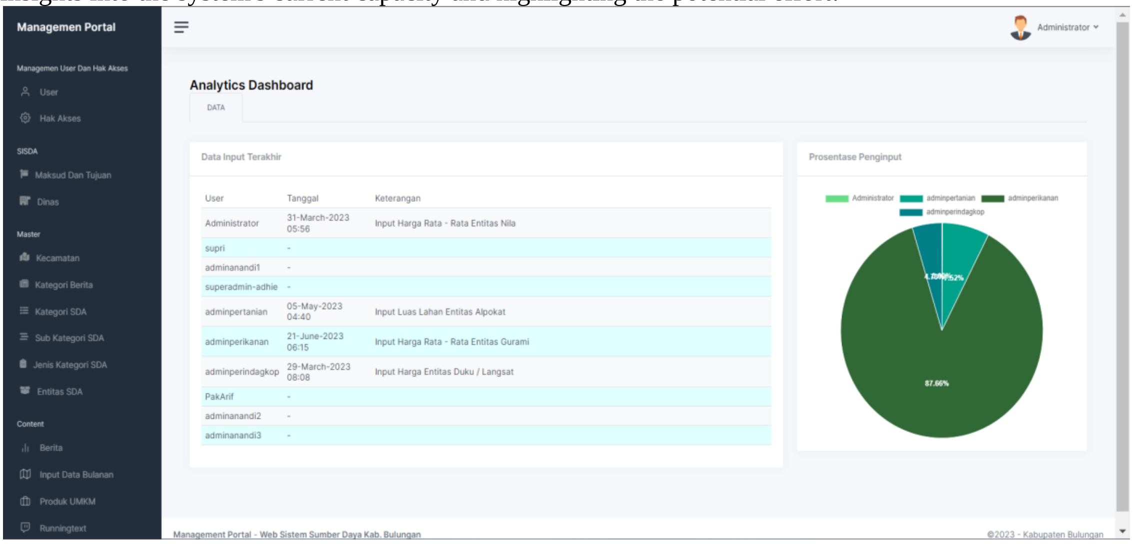

Fig.1 Dashboard of Information System Being Measured

The analysis also covered each module in detail. For example, the 'Content' module, which includes functionalities such as inputting monthly data and managing UMKM products, was found to have the most significant impact on system complexity. This module is responsible for handling large volumes of data, including frequent updates and real-time information sharing, which adds to the system's overall complexity. The complexity of the 'Content' module is further enhanced by its need to manage diverse data types and provide a seamless interface for different user groups, including government officials and local communities.

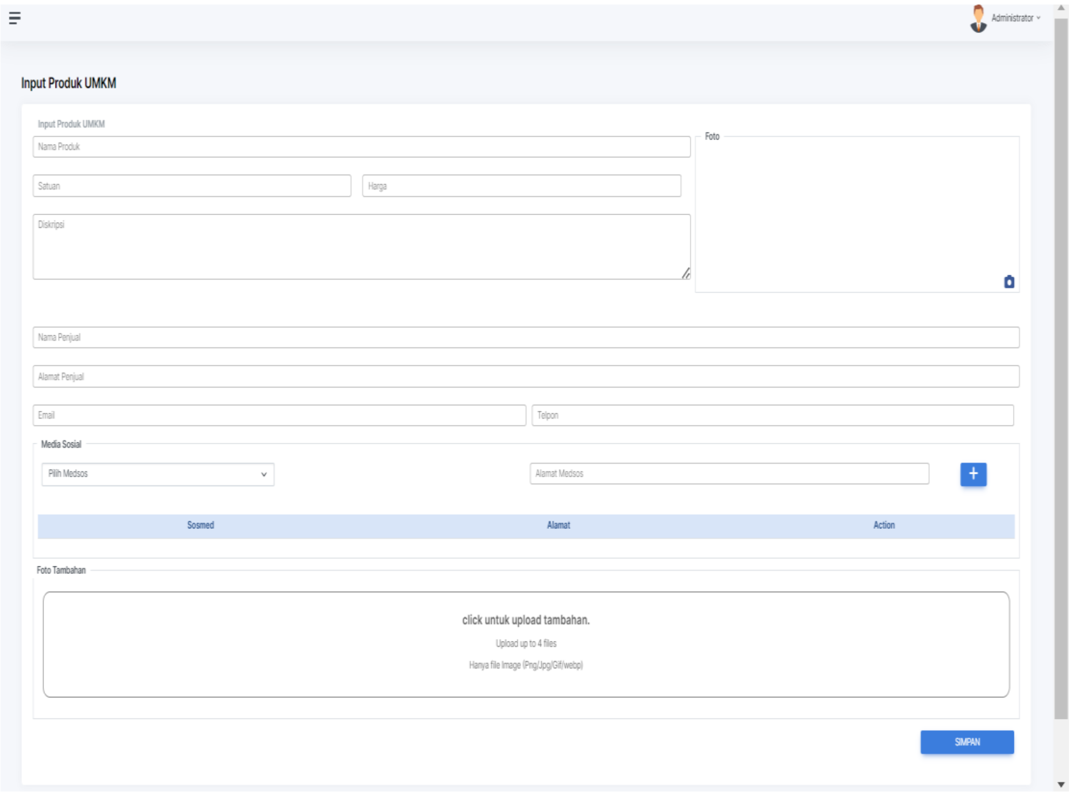

Fig 2. UMKM Module

The 'Master' module, which manages various categories of natural resources, was also notable for its contribution to overall functionality. This module includes the management of data related to districts, resource categories, subcategories, and entities, which play a critical role in ensuring that information about natural resources is well-organized and accessible. The 'Master' module's functionalities are crucial for supporting data consistency across the system and ensuring that users can easily retrieve and update information as needed. The effectiveness of this module directly influences the quality of data available to users, which in turn impacts decision-making processes related to resource management and planning.

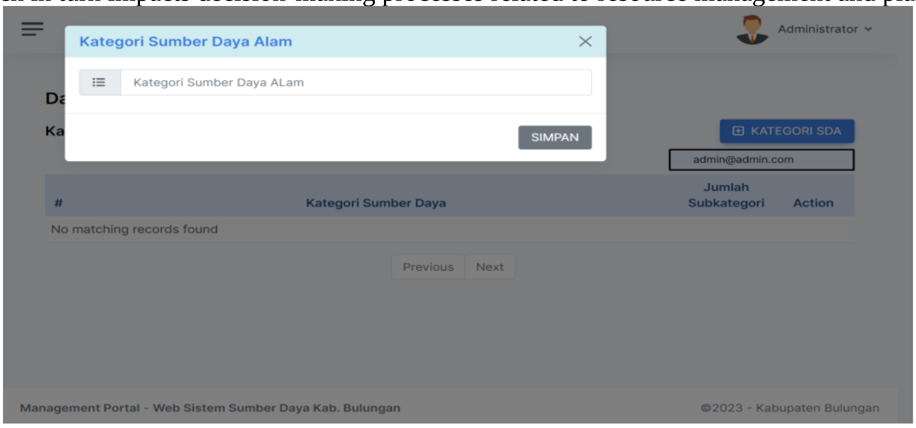

Fig 3. Category Module

When attempting to comprehend the manner in which the system interacts with its users and other external entities, it was essential to conduct an examination of the external inputs, external outputs, and various external enquiries. External inputs, which include data that is submitted by users or received from other systems, are critically important for maintaining the system's functionality and ensuring that it is always up to date. There are a total of 26 external inputs integrated into the natural resource information system, each of which makes a major contribution to the complexity of the system. These include straightforward forms for data entry as well as more involved forms for data submission.

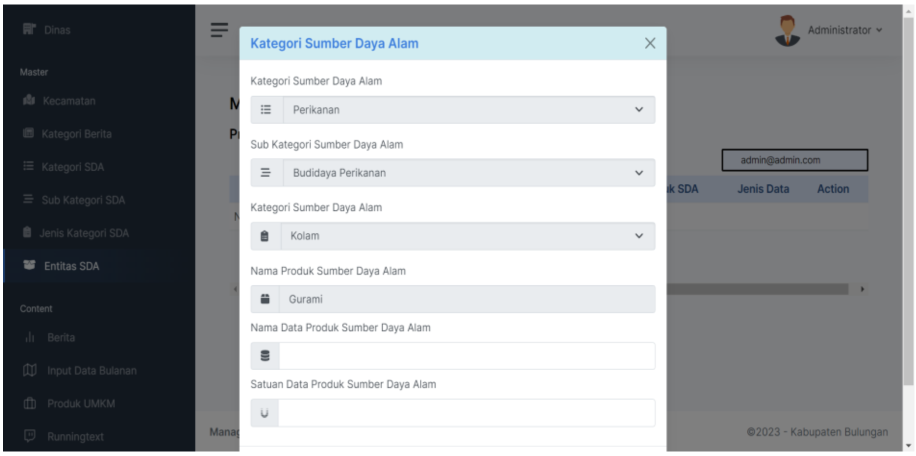

Fig 4. Entity Module

The analysis of Internal Logical Files (ILFs) and External Logical Files (ELFs) provided insight into the system's data management capabilities and its interaction with external systems. Internal Logical Files are data repositories that are maintained within the system, containing critical information that is used across various modules. In the natural resource information system, there are 6 Internal Logical Files, each contributing to the organization and storage of resource data, user records, and transactional logs. The complexity of these files impacts the system's ability to efficiently manage and retrieve data, directly influencing system performance and responsiveness.

External Logical Files, on the other hand, represent data managed by other systems but accessed by the natural resource information system for reference purposes. Although the system under evaluation does not have a large number of External Logical Files, their role is crucial in enabling data interoperability and ensuring that users have access to relevant external data when needed. The integration of these external files enhances the overall utility of the system, providing users with comprehensive data without duplicating storage. Understanding the complexity and role of both ILFs and ELFs helps stakeholders identify areas where data handling could be streamlined, ensuring that both internal and external data are effectively utilized to support system functionality.

Table 3. Component Complexity Summary

Crude Function Point (CFP)
External Inputs: 26 (Simple)
External Outputs: 15 (Simple)
Internal Logical Files: 6 (Simple)
External Inquiries: 3 (Simple)
RCAF Calculation Summary
Total RCAF: 58
Average Adjustment Factor: 1.23
Function Point (FP) Calculation
FP = 258 × 1.23 = 317.34
Module Contribution Analysis
Content Module: High Complexity
Master Module: Medium Complexity

The final FP value of 317.34 serves as a crucial benchmark for evaluating system performance, identifying bottlenecks, and planning future improvements. This analysis highlights areas where optimization is needed, such as enhancing data handling capabilities and improving user interface components to better support system usability and user satisfaction. in prioritizing system improvements, focusing on areas with higher complexity and ensuring that the natural resource information system in Bulungan continues to meet user needs effectively. The analysis also provides a clear understanding of which modules require the most attention, allowing for a targeted approach to system upgrades. By focusing on optimizing functionalities in key areas, the system can be enhanced to provide better performance, more efficient data handling, and an improved user experience. This targeted approach is essential to achieving both immediate enhancements and long-term scalability, ultimately ensuring that the system remains adaptable to future challenges and technological advancements.

By applying FPA, the study revealed the crucial role of both functional components and user interactions in determining system quality. The assessment of external inputs, outputs, and inquiries, as well as internal and external logical files, allowed for a comprehensive understanding of the system's complexity and effectiveness. This structured evaluation provided stakeholders with valuable insights, enabling informed decisions on resource allocation, system modifications, and enhancements. Ultimately, the synthesis underscores the importance of continuous assessment to maintain system alignment with evolving user needs and to support strategic development planning.

IV. Conclusion

The synthesis of the research findings suggests that Function Point Analysis (FPA) is an effective tool for assessing the quality and complexity of information systems, especially for operational systems like the natural resource information system in Bulungan Regency. The detailed analysis of various modules has revealed specific areas requiring improvement, particularly in the domains of data management, reporting, and user access control. By breaking down the system into measurable functional components, FPA has enabled a targeted approach to identifying inefficiencies and gaps in functionality, thereby providing a clear direction for future system enhancements.

Moreover, the application of FPA has highlighted the importance of aligning system functionalities with user needs, emphasizing that a user-centric approach is crucial for maintaining system relevance and effectiveness. The calculated Function Point value serves not only as a benchmark for current system performance but also as a guiding metric for strategic resource allocation and system development. Ultimately, this analysis underscores the value of systematic quality assessment in driving continuous improvement and ensuring that the information system effectively supports regional management and decision-making processes.

Future research should consider expanding the scope of the analysis by integrating additional quality metrics, such as user satisfaction surveys and system performance benchmarks, to complement the Function Point Analysis. Incorporating qualitative assessments alongside FPA could provide a more holistic view of system performance, particularly in understanding user interactions and system usability. Additionally, it would be beneficial to apply FPA to other similar information systems in different regions to establish comparative benchmarks and validate the effectiveness of FPA as a universal quality assessment tool for information systems.

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