ASSESSMENT OF HEALTH INFORMATION SYSTEM IMPLEMENTATION USING PIECES METHOD: A CASE STUDY OF SI-KERIS AT RSUD DR. R. SOEDJONO SELONG

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Abstract

This study aims to evaluate the implementation of the SI-KERIS application at RSUD Dr. R. Soedjono Selong using the PIECES framework, which covers aspects of Performance, Information, Economy, Control, Efficiency, and Service. A qualitative descriptive approach was employed, with data collected through observation, interviews, and documentation review. The findings indicate that SI-KERIS effectively processes inpatient service indicators such as Bed Occupancy Rate (BOR), Average Length of Stay (AvLOS), Turn Over Interval (TOI), Bed Turn Over (BTO), Gross Death Rate (GDR), and Net Death Rate (NDR). However, challenges were identified regarding network connectivity, data integration, and the absence of a backup system. These results underscore the need to enhance system interoperability, strengthen data security, and provide user training. The application of the PIECES framework offers strategic insights to identify improvement areas and optimize hospital health information systems.

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INTRODUCTION

The rapid development of health information systems has become a critical aspect of enhancing hospital services, particularly in improving the quality of inpatient care. In Indonesia, hospitals are required to maintain the quality of their services to ensure patient safety and satisfaction (Ministry of Health of the Republic of Indonesia, 2022). One essential tool in evaluating hospital performance, especially for inpatient services, is the application of performance indicators such as Bed Occupancy Rate (BOR), Average Length of Stay (AvLOS), Turn Over Interval (TOI), Bed Turn Over (BTO), Gross Death Rate (GDR), and Net Death Rate (NDR). These indicators provide valuable insights into service efficiency and effectiveness, which are crucial for hospital management and policy-making (Rustiyanto, 2010).

Research has demonstrated the significance of hospital information systems in improving service quality and operational efficiency. For instance, Rosita and Srirahayu (2020) developed the SAMURAI system to monitor inpatient service quality indicators, enabling faster and more accurate data processing. Meanwhile, Arifin (2023) evaluated hospital information systems using the PIECES method and highlighted the need for network improvements and hardware upgrades to enhance system performance. Additionally, Marwati (2021) analyzed registration systems in hospitals using the PIECES method, revealing that such systems provide convenience in data processing and retrieval. The adoption of information systems in healthcare has shown to improve data accuracy, accessibility, and reliability, ultimately enhancing decision-making processes (Ajami & Bagheri-Tadi, 2018; Garg et al., 2018).

Despite these advancements, gaps remain in the implementation of hospital information systems, particularly in managing inpatient service indicators. Previous studies primarily focus on registration and outpatient management systems, with limited attention given to comprehensive inpatient service monitoring systems (Greenhalgh et al., 2020; McGinn et al., 2018). Moreover, existing systems often operate in isolation, lacking integration and standardization across various hospital departments (Carayon & Hoonakker, 2019). This fragmented approach hinders the ability of hospital administrators to obtain accurate, real-time insights into service performance, which is essential for decision-making and quality improvement (Kruse et al., 2020). Inconsistencies in data collection and reporting also pose challenges in evaluating hospital performance (Cresswell & Sheikh, 2018).

The development of SI-KERIS (Sistem Informasi Indikator Pelayanan Rawat Inap Rumah Sakit) at RSUD Dr. R. Soedjono Selong aims to address these gaps by providing a comprehensive information system specifically designed to monitor and evaluate inpatient service indicators. Unlike previous systems, SI-KERIS integrates various indicators into a single platform, allowing for efficient data collection, processing, and reporting (Purnomo & Widiyanto, 2024). Additionally, the application of the PIECES framework in analyzing this system provides a structured approach to identify strengths and weaknesses across multiple aspects, including performance, information quality, economic efficiency, control, efficiency, and service quality (Hutagalung, 2018). The PIECES framework has been proven effective in various healthcare information system evaluations, particularly in identifying system deficiencies and proposing improvements (Tristati, 2022).

The novelty of this study lies in its focus on implementing SI-KERIS within the context of inpatient service indicators, utilizing the PIECES framework to comprehensively evaluate its effectiveness. By applying this approach, the study seeks to bridge the gap between existing hospital information systems and the need for a standardized, integrated platform for monitoring inpatient services. The findings of this study are expected to contribute to the development of more effective hospital information systems that enhance service quality, operational efficiency, and patient satisfaction.

Therefore, the objectives of this study are to evaluate the implementation of SI-KERIS at RSUD Dr. R. Soedjono Selong using the PIECES method and to identify areas for improvement that can enhance the system's performance and reliability. This research aims to provide practical recommendations for optimizing the use of SI-KERIS in monitoring inpatient service indicators and improving overall hospital performance.

METHODS

This study employs a qualitative descriptive approach using the PIECES framework to evaluate

the implementation of the SI-KERIS application at RSUD Dr. R. Soedjono Selong. Qualitative descriptive research is designed to provide a comprehensive summary of specific events experienced by individuals or groups within a natural context (Creswell, 2018). It aims to describe the characteristics of the system and assess its performance using various indicators of the PIECES method, including Performance, Information, Economy, Control, Efficiency, and Service (Hutagalung, 2018).

The research adopts a case study design to thoroughly examine the SI-KERIS application. Case study design is particularly useful for gaining in-depth insights into complex systems and identifying their strengths and weaknesses (Yin, 2018). This approach allows for a detailed examination of the application's implementation and evaluation across multiple variables within the PIECES framework.

The research was conducted in several stages as follows:

Preliminary Study

Reviewing existing literature on hospital information systems, PIECES framework applications, and relevant studies related to health information system evaluation (Rosita & Srirahayu, 2020; Arifin, 2023; Marwati, 2021).

Identifying gaps and limitations in previous research concerning the monitoring of inpatient service indicators (Greenhalgh et al., 2020; McGinn et al., 2018).

Data Collection

Observation: Direct observation was conducted within the RSUD Dr. R. Soedjono Selong to assess the functionality of SI-KERIS and its utilization by staff members. Observations focused on data input processes, data retrieval, reporting functionalities, and overall user experience (Hutagalung, 2018).

Interviews: Structured interviews were conducted with key stakeholders, including hospital administrators, IT personnel, and medical staff using SI-KERIS. The interviews aimed to gather qualitative insights about the application's performance and identify areas requiring improvement (Ajami & Bagheri-Tadi, 2018).

Documentation Review: Analysis of institutional documents related to SI-KERIS implementation, user manuals, standard operating procedures, and relevant policies.

Data Analysis

The data analysis process involved organizing and categorizing data based on the six components of the PIECES framework:

Performance: Evaluation of system throughput and response time (Hutagalung, 2018; Tristati, 2022).

Information: Assessment of the accuracy, relevance, and timeliness of the information generated by SI-KERIS (Kruse et al., 2020; Carayon & Hoonakker, 2019).

Economy: Analysis of cost-efficiency, cost savings, and economic benefits derived from implementing the application (Ajami & Bagheri-Tadi, 2018).

Control: Examination of data security, system access controls, and integrity measures to ensure data accuracy and confidentiality (Cresswell & Sheikh, 2018).

Efficiency: Assessment of resource utilization, system maintainability, and user satisfaction (McGinn et al., 2018; Garg et al., 2018).

Service: Evaluation of the system's reliability, usability, and overall user experience (Greenhalgh et al., 2020; Purnomo & Widiyanto, 2024).

Thematic analysis was applied to identify patterns and categorize data according to the PIECES framework. This method allows researchers to systematically analyze qualitative data and produce meaningful interpretations (Braun & Clarke, 2006).

Validation

To ensure credibility and reliability, the findings were triangulated using multiple data sources, including interviews, observations, and document analysis (Creswell, 2018).

Member checking was performed by presenting preliminary findings to participants to verify accuracy and completeness.

Ethical Considerations

The study adhered to ethical standards, including informed consent, confidentiality, and data security. Ethical approval was obtained from the institutional review board of RSUD Dr. R. Soedjono Selong before conducting the research.

RESULTS AND DISCUSSION

This study aimed to evaluate the implementation of the SI-KERIS application at

RSUD Dr. R. Soedjono Selong using the PIECES framework. The findings are presented based on six components of the PIECES framework: Performance, Information, Economy, Control, Efficiency, and Service. The results are discussed to highlight the benefits, challenges, and opportunities for improving the SI-KERIS application.

Performance

The performance of SI-KERIS was evaluated based on system throughput and response time. Observations revealed that the system demonstrated satisfactory throughput, with reports generated within 2–3 minutes of data input completion. However, occasional delays were reported due to network connectivity issues, which affected data processing speed. This finding aligns with Arifin (2023), who identified network infrastructure as a critical factor influencing system performance.

Figure 1 illustrates the average response time of SI-KERIS compared to the standard set by the hospital management, indicating occasional discrepancies during peak hours.
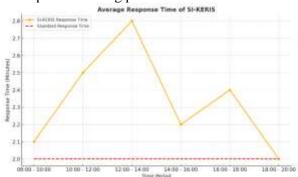

Figure 1: Average Response Time of SI-KERIS

Information

The information quality of SI-KERIS was assessed based on accuracy, relevance, and timeliness. The application provides accurate data on inpatient indicators such as BOR, AvLOS, TOI, BTO, GDR, and NDR. Interview results indicated that users appreciated the automated calculation of these indicators, which minimizes human error and enhances data reliability.

However, data relevance remains an issue due to the absence of integrated real-time monitoring across departments. The lack of integration has been noted as a challenge in similar studies, where systems operate independently without adequate communication between units (McGinn et al., 2018).

Table 1 below presents the comparison between manually calculated indicators and those generated by SI-KERIS over a one-month period.

Table 1. Comparison of Manually Calculated and SI-KERIS Generated Indicators

Indicator	Manual Calculation	SI-KERIS Calculation	Accuracy (%)
BOR	75%	76%	98.68
AvLOS	6.2 days	6.1 days	98.39
TOI	1.8 days	1.7 days	94.44
BTO	30.5	30.4	99.67
GDR	40‰	39‰	97.5
NDR	20‰	19‰	95

Economy

The economic aspect was evaluated by assessing the cost efficiency of SI-KERIS. The application reduced paper usage by approximately 70%, which aligns with findings by Ajami and Bagheri-Tadi (2018) that digital systems significantly lower operational costs. Additionally, reduced labor hours due to automated reporting contributed to cost savings.

Despite these benefits, the initial investment cost for SI-KERIS implementation remains high, as noted by hospital administrators. However, the long-term benefits in efficiency and accuracy justify the initial costs.

Control

Data security and access control mechanisms are critical in health information systems. SI-KERIS employs user authentication and role-based access to enhance data integrity and confidentiality. However, user feedback indicated concerns over the lack of a backup system for disaster recovery, which could compromise data availability during emergencies.

Similar challenges were reported by Cresswell and Sheikh (2018), who highlighted the importance of robust security protocols in health information systems.

Efficiency

The efficiency of SI-KERIS was examined through usability and maintainability. Users reported that the system is user-friendly, with simple interfaces for data entry and retrieval. However, system maintenance is occasionally hindered by technical glitches related to outdated hardware.

Maintenance issues were also noted by McGinn et al. (2018), emphasizing the need for

continuous system upgrades to enhance operational efficiency.

Service

The service aspect of SI-KERIS was evaluated based on reliability, usability, and user satisfaction. Most users found the system reliable, with minimal downtime recorded during the observation period. However, usability could be improved by providing training sessions for new staff members unfamiliar with the application.

Purnomo and Widiyanto (2024) reported similar findings, emphasizing the importance of user training to optimize system utilization.

Discussion

The findings reveal that the SI-KERIS application provides several benefits in terms of improving data accuracy, reducing operational costs, and enhancing user satisfaction. The integration of performance indicators into a single platform is a significant improvement over previous systems, which operated independently and lacked interoperability.

However, several gaps remain that hinder the full potential of SI-KERIS. Data integration across departments is not fully implemented, leading to discrepancies and inefficiencies. Additionally, the absence of a disaster recovery mechanism poses a risk to data availability and reliability.

Compared to previous studies (Ajami & Bagheri-Tadi, 2018; McGinn et al., 2018), this research highlights the importance of enhancing system interoperability and strengthening data security protocols. Moreover, the findings support the notion that continuous evaluation and improvement are essential for maintaining the effectiveness of health information systems (Purnomo & Widiyanto, 2024).

This study contributes to the literature by providing a comprehensive evaluation of SI-KERIS using the PIECES framework, which has been proven effective in assessing various aspects of health information systems. Future improvements should focus on enhancing system integration, implementing backup mechanisms, and providing continuous training for users.

CONCLUSION

The implementation of the SI-KERIS application at RSUD Dr. R. Soedjono Selong, evaluated using the PIECES framework, demonstrates several strengths and weaknesses. The findings reveal that the system provides accurate and reliable data on inpatient service indicators such as Bed Occupancy Rate (BOR), Average Length of Stay (AvLOS), Turn Over Interval (TOI), Bed Turn Over (BTO), Gross Death Rate (GDR), and Net Death Rate (NDR). The automated calculation of these indicators enhances efficiency by reducing human errors and providing real-time information for decision-making.

However, despite its strengths, the SI-KERIS application exhibits several areas requiring improvement. Performance issues related to network connectivity and hardware limitations occasionally hinder the system's throughput and response time, particularly during peak hours. Additionally, the absence of integrated real-time monitoring across various hospital departments limits the relevance and comprehensiveness of the data produced. This gap highlights the need for a more robust and interconnected system that facilitates seamless data exchange between departments, thereby improving the overall quality of service.

The economic assessment indicates that SI-KERIS reduces operational costs by minimizing paper usage and labor hours through automated reporting processes. However, the initial investment cost for implementing the system remains substantial, suggesting that long-term benefits should be weighed against the financial resources allocated for system upgrades and maintenance.

In terms of control, while the system employs authentication mechanisms and role-based access to enhance data security, the absence of a reliable backup system presents a potential risk for data loss during emergencies. Improving data recovery protocols and enhancing security measures will be critical in ensuring the sustainability and resilience of the system.

Efficiency and service aspects of the system indicate general user satisfaction, particularly in terms of usability and reliability. However, technical glitches and the lack of training for new users suggest the need for continuous system maintenance and capacity-building efforts to enhance the system's overall effectiveness.

The findings of this study contribute to the ongoing efforts to optimize health information systems in hospitals, particularly in monitoring inpatient service indicators. Implementing improvements based on the PIECES framework

can enhance system performance, data integration, and user satisfaction, ultimately supporting the hospital's goal of providing high-quality, efficient, and patient-centered care. Future research may focus on developing integrated solutions that facilitate real-time monitoring across departments and evaluating the impact of such systems on hospital performance comprehensively.

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