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Hot-Fit Framework Development For Hmis: Empirical Study And Technical Implications In A Regional General Hospital

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Abstract

The digitalization of the healthcare industry requires hospitals to adopt effective Hospital Information Systems (SIRS). However, implementation success remains highly variable. This study develops the Extended HOT-Fit Framework by adding the Data Quality dimension as a new contribution under the Technology domain. A survey of 150 active SIRS users at Dr. Sam Ratulangi Tondano Regional General Hospital was analyzed using Structural Equation Modeling (SEM). The results show that Data Quality, System Quality, and Service Quality significantly influence User Satisfaction and Net Benefit (R^2 = 0.74 and 0.63). Organizational factors have an indirect influence through User Satisfaction. This study provides a conceptual contribution to the development of a data quality-based SIRS evaluation model and offers practical guidance for hospital managers in strengthening data integrity and system effectiveness.

Keywords: Hospital Information System; HOT-Fit Model; Data Quality; Information System Success; SEM

Abstract

Digitalisasi industri layanan kesehatan mengharuskan rumah sakit untuk mengadopsi Sistem Informasi Rumah Sakit (SIRS) yang efektif. Namun, keberhasilan implementasinya masih sangat bervariasi. Studi ini mengembangkan Kerangka Kerja HOT-Fit yang Diperluas dengan menambahkan dimensi Kualitas Data sebagai kontribusi baru di bawah domain Teknologi. Survei terhadap 150 pengguna aktif SIRS di Rumah Sakit Umum Daerah Dr. Sam Ratulangi Tondano dianalisis menggunakan *Structural Equation Modeling* (SEM). Hasil penelitian menunjukkan bahwa Kualitas Data, Kualitas Sistem, dan Kualitas Layanan secara signifikan memengaruhi Kepuasan Pengguna dan Manfaat Bersih (*Net Benefit*) (R^2 = 0,74 dan 0,63). Faktor organisasi memiliki pengaruh tidak langsung melalui Kepuasan Pengguna. Studi ini memberikan kontribusi konseptual terhadap pengembangan model evaluasi SIRS berbasis kualitas data dan menawarkan panduan praktis bagi manajer rumah sakit dalam memperkuat integritas data dan efektivitas sistem.

***Kata Kunci*:** Sistem Informasi Rumah Sakit; Model HOT-Fit; Kualitas Data; Keberhasilan Sistem Informasi; SEM

1. Introduction

Advances in information technology have transformed data management and service delivery models across various public sectors, including healthcare. As healthcare providers, hospitals are required to efficiently process, integrate, and rely on various information systems to support effective management and operational decision-making. By automating various service processes, from patient registration to medical records and financial management, Hospital Information Systems (HIS) offer a strategic path to meeting these needs.

Although the Indonesian government, through the Ministry of Health, has mandated the implementation of HIS for all healthcare facilities, its effectiveness also depends on a number of other issues. The main challenges are human resources, organizational readiness, and, perhaps most importantly, the quality of the technology used.

The HOT-Fit model, proposed by Yusof et al. (2006), is one of the popular models used to measure the success of health information systems (Setyohadi, 2021; Septiyani & Sulistiadi, 2022). This model simplifies three main aspects, namely people, organization, and technology. These three dimensions correspond to the fit between the combined elements of these dimensions to measure the extent to which the fit of these components can influence the net benefit (Putri et al., 2022) for the organization.

Despite its widespread application in information systems evaluation research, the traditional HOT-Fit framework is limited in its ability to accommodate increasingly crucial technical elements in the digital age, such as data quality and system integration. In hospitals, data reliability is crucial because every

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medical and administrative decision relies on patient data and services, which must be accurate and complete.

Based on this, this study aims to expand the HOT-Fit model by integrating the Data Quality variable as a subdimension of the Technology dimension. Thus, this study not only broadens the perspective on measuring information system success but also highlights the interdependence of technical data aspects on information system success in public hospitals in Indonesia.

In addition to conceptual contributions through model development, this study also contributes to the empirical literature by investigating the relationships between variables using SEM (Nurhayati, 2022). The findings of this study are expected to generate insights into the determinants of SIRS success that can be utilized by hospital management to improve hospital digitalization strategies.

2. Literature Review

The information systems success model introduced by DeLone and McLean (2003) provides a basis for assessing the success of information systems in various information systems disciplines. This model consists of six main dimensions: system quality, information quality, service quality, system usage, user satisfaction, and net benefits (Suryana et al., 2022).

These six dimensions are connected in a causal network that describes how (a) the technical dimensions of the system influence user perceptions and (b) perceptions influence outcomes for the organization (Tawar et al., 2022; Nasution, 2023; Serhalawan et al., 2023). This model was later expanded as a reference model in various studies, even for the healthcare industry.

However, the DeLone & McLean model does not clearly identify organizational and human aspects as factors in information system success. This limitation prompted the development of a new, more holistic assessment framework, the Human Organization Technology Fit (HOT-Fit) model.

2.1 Human Organization Technology Fit (HOT-Fit) Model

HOT-Fit Model Yusof et al. (2006) proposed the HOT-Fit model as an extension of the DeLone and McLean model by incorporating human, organizational, and technological factors to fit the social and structural aspects of information systems (Makalalag, 2023; Rusdiana, 2023). It divides the critical success factors of information systems into three important areas:

1. Human Factors: two dimensions of system use (SU) and user satisfaction (US), which reflect the ease, usefulness, and comfort of the IS perceived by users.
2. Technology Factors: such as system quality (SQ), information quality (IQ), and service quality (SQ) which represent technology or system related features.
3. Organizational Factors: consist of two (2) elements, namely structure (S) and environment (E) which represent things like policy support, organizational culture, and environmental readiness for the use of IS.

These three variables combine to influence net benefits, which are an indicator of the success of information systems in improving organizational performance.

2.2 Data Quality in Hospital Information Systems

In hospitals, data is a critical resource, and all operational activities, as well as clinical and administrative decision-making, depend on it. Data quality has four essential attributes: accuracy, completeness, consistency, and timeliness.

Poor data quality can result in misdiagnosis, service delays, and hospital operational inefficiencies. Therefore, this aspect has strategic importance as a foundation for the success of information systems (Wardhana, 2024).

Previous research also shows that data quality significantly impacts user satisfaction and organizational performance. Therefore, in this study, based on these literature findings, the Data Quality variable was included in the Technology factor, along with System Quality, Information Quality, and Service Quality.

2.3 Differences between Data Quality and Information Quality in Hospital Information Systems

In the context of hospital information systems, it is important to distinguish between data quality and information quality because they are at conceptually different levels.

Data Quality refers to the technical accuracy, completeness, consistency, and timeliness of raw data stored in a database (Ghalavand et al., 2024). In other words, it relates to the reliability of data before it is processed into information.

Information Quality, as stated by DeLone and McLean (2003), focuses on the value and usefulness of processed data for user decision-making (Aziz et al., 2024). Information quality includes the relevance, clarity, and ease of understanding of system output.

Thus, data quality is the foundation for information quality: without accurate data, it is impossible to produce useful information. However, in the extended HOT-Fit framework, Data Quality is viewed as a separate construct because it operates at the technical (database) level, not at the user perception level (Aziz et al., 2024). This approach provides conceptual clarity while increasing the validity of the developed empirical model (Saad et al., 2025).

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2.4 Conceptual Framework of the Research

In this study, we extend the HOT-Fit model (Extended HOT-Fit Framework) by incorporating the Data Quality construct into the Technology Dimension (Munjirin, 2024). From a conceptual perspective, this model represents the following causality:

1. System Quality, Information Quality, Service Quality and Data Quality have a positive effect on User Satisfaction and System Usage.
2. User Satisfaction and System Usage in turn affect Net Benefits.
3. Organizational Structure and Environment act as enablers for the sustainability of the system.

Therefore, additional Data Quality attributes expand the classic information quality dimensions in the technical context of information in digital-based hospital systems.

2.5 Research Hypothesis

Based on the proposed meta-model, the following hypotheses are formulated in this study:

H1: System Quality is positively related to System Usage.

H2: Information quality has a positive effect on organizational environmental satisfaction with net benefits.

2.6 HOT-Fit Framework

The suggested conceptual model (an extended HOT-Fit framework) describes the relationships among key variables in the following way:

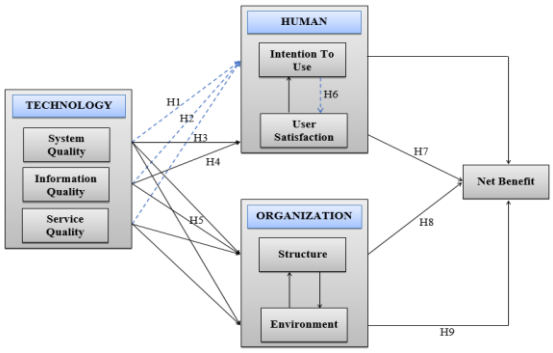

Figure 1. Hot-Fit Model Components

The figure shows that the Data Quality subdimension serves as a foundational layer in the Technology dimension and enhances the influence of system quality on user satisfaction (Putri, 2024). Both organizational structure and environmental factors remain influential external factors that support the successful implementation of SIRS.

2.7 Previous Research

This research was not conducted separately but was related to previous research as a comparison and contrast material (Ekananda, 2024), as in Table 1. The research results were used as a basic reference for the topics discussed.

Table 1. Previous Research

Research	Dominant	Findings
Rahman et al. (2023)	Human Organization	success
Abdullah et al. (2023)	Technology	user satisfaction
Tran et al. (2023)	Man	system acceptance
Choi et al. (2023)	Technology	integration
Alqahtani et al. (2023)	Organization	implementation success
Singh et al. (2024)	Technology	user trust
Wong and Hassan (2024)	Man	system usage
Park & Lee (2024)	Organization	play a key role
Liu et al. (2024)	Human Technology	staff satisfaction
Musa et al. (2024)	Human Organization	connection
Martínez et al. (2025)	Organization	His success
Lee et al. (2025)	Human Organization	sustainability

3. Research Methods

3.1 Research Approach

This research uses quantitative methods with an explanatory approach, which aims to test the causal relationship between variables (Sinaga et al., 2024; Laia et al., 2025) in the context of the Extended HOT-Fit Framework. This model is based on a previous model by Yusof et al. (2006), with modifications to the Technology aspect by including the Data Quality variable.

Quantitative methods are used (Erlirianto, 2025; Wardhana, 2025; Nasution, 2025) because they have the ability to show empirical indications regarding the influence of one (or more) variables on other variables even within the most complex model framework, as well as to examine the validity and reliability of constructs using the Structural Equation Modeling (SEM) approach.

3.2 Research Population and Sample

The research subjects were all active users of the Hospital Information System (SIRS) at Dr. Samratulangi Tondano Regional General Hospital, Minahasa Regency, North Sulawesi Province. This population (Putri, 2025) consists of groups such as administrators, medical records officers, IT personnel, and healthcare providers who are daily SIRS users.

The sampling technique used in this study was purposive sampling, meaning respondents were selected with specific considerations to ensure they were relevant to the research objectives. To meet the requirements:

1. Participants must be active SIRS users for at least six months.

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2. Respondents held positions in administration, data management, or patient services within information systems.
3. Respondents agreed to complete the research questionnaire voluntarily.

A questionnaire was distributed to 150 active users of the Hospital Information System (SIRS) at Dr. Sam Ratulangi Tondano Regional General Hospital. Of these, 150 valid responses were obtained that met the analysis criteria, resulting in a response rate of 85.7%.

Non-response analysis revealed no significant demographic differences between respondents and non-respondents, so non-response bias can be ignored. Therefore, the full sample size should be equal to or exceed 5 times the number of model indicators in the case of SEM.

3.3 Research Instruments

The survey used a 5-point Likert scale (1 = strongly disagree, 5 = strongly agree), with all questions closed-ended. Each item was derived from indicators of the HOT-Fit model and the new Data Quality variable included in this study.

Table 2. Research Instruments

Build	Point	Information
Rectangle	5	Technical aspects and reliability of the system
intellectual intelligence (IQ)	4	Accuracy and relevance of information
Rectangle	4	Responsiveness and technical support
DQ	4	Accuracy, completeness, consistency, timeliness
SU	3	Frequency and intensity of use
WE	4	Overall satisfaction with the system
Operating system	3	Policy and management support
OE	3	External support and infrastructure
Notes	4	Impact on efficiency and productivity

3.4 Data Collection Procedures

The data collection process involved sending an electronic survey (Google Forms) to participants in collaboration with the IT department and hospital administration. A pilot test was conducted with 20 subjects prior to the survey to ensure understanding of the items and initial construct validity. In addition to the primary data from the questionnaire, secondary data for this study included hospital policy documents on SIRS, system usage reports, and technical guidelines provided by the Ministry of Health for data triangulation.

3.5 Trial Results

The instrument was piloted on 20 purposively selected respondents to test the clarity and consistency of the questionnaire items. Initial reliability test results showed Cronbach's Alpha values ranging from 0.81 to 0.93, indicating good internal consistency.

Based on pilot feedback, three items in the Information Quality and Service Quality variables were revised to clarify the statements. After revision, the final instrument demonstrated improved content validity with a Content Validity Index (CVI) of 0.92, indicating the indicators' alignment with the constructs being measured.

3.6 Data Analysis Techniques

Descriptive statistics were used to describe respondents' characteristics in terms of job role, duration of system use, and frequency of SIRS use. Furthermore, this analysis provides an overview of user satisfaction at the system level.

Inferential analysis was conducted through SEM based on AMOS 26, as this approach allows testing of simultaneous relationships between latent variables, and the search for direct and indirect effects among model constructs.

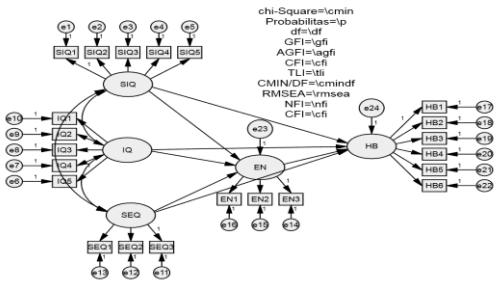

Figure 2. AMOS Path Diagram Framework

The testing stages include:

1. Convergent Validity Test:using Standardized Loading Factor (SLF) > 0.7, Average Variance Extracted (AVE) > 0.5.
2. Construct Reliability Test:with Composite Reliability (CR) criteria > 0.7.
3. Model Fit Test (Fitness):based on Chi-Square/df < 2.0, CFI > 0.90, TLI > 0.90, and RMSEA < 0.08.

Once it was verified that the model was feasible, path analysis was conducted to test the significance of the impact between the variables according to the established hypotheses.

3.7 Instrument Validity and Reliability Test

The results of the validity and reliability tests indicate that all constructs are valid and reliable with SLF values above 0.7 and CR above 0.9. The AVE values of all constructs range from 0.70 to 0.87, which implies that the indicators used are sufficient to represent the latent variables.

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Table 3. Results of Construct Reliability Test

Build	CR	ROAD	Conclusion
Rectangle intellectual intelligence (IQ)	0.956	0.811	Valid and reliable
Rectangle	0.933	0.742	Valid and reliable
DQ	0.921	0.796	Valid and reliable
SU	0.938	0.781	Valid and reliable
WE	0.962	0.836	Valid and reliable
Operating system	0.945	0.711	Valid and reliable
OE	0.964	0.847	Valid and reliable
Notes	0.951	0.872	Valid and reliable
	0.961	0.826	Valid and reliable

4. Results And Discussion

4.1 Goodness of Fit Test

Structural model analysis was conducted to ensure the suitability of the empirical data with the proposed theoretical model. Test results using AMOS 26 software indicate that the research model meets most of the suitability criteria, as shown in the following table:

Table 4. Conformity

Fit Index	Cut	Value	Result
Chi-Square/df	< 2.00	1,134	Good
CFI	> 0.90	0.982	Very good
TLI	> 0.90	0.981	Very good
GFI	> 0.90	0.936	Acceptable
RMSEA	< 0.08	0.027	Good
AGFI	> 0.90	0.912	Suitable

These findings indicate that the extended HOT-Fit model with DQ variables fits the empirical data well and thus the model can be used to test the hypothesized relationships among the latent variables.

4.2 Hypothesis Testing Results

Hypothesis testing was conducted through path analysis to determine the direct and indirect influences between variables. The test results are shown in the following table:

Table 5. Hypothesis Testing Results

Code	Connection	p-value	Track	Results
H1	SQ → SU	0.042	0.213	Accepted
H2	IQ → US	0.017	0.248	Accepted
H3	SQ → US	0.001	0.321	Accepted
H4	DQ → US	0.000	0.392	Accepted
H5	DQ → NS	0.004	0.267	Accepted
H6	SU → US	0.030	0.201	Accepted
H7	US → NS	0.000	0.411	Accepted
H8	OS → NS	0.013	0.228	Accepted
H9	OE → NS	0.077	0.142	Rejected

The test results show that eight of the nine hypotheses were supported and one was rejected. To provide practical meaning to the path coefficients, the following effect size interpretation is used:

1. Small: $\beta = 0.10–0.29$
2. Moderate: $\beta = 0.30–0.49$
3. Large: $\beta \geq 0.50$

Based on the interpretation of the effect size, the influence of the Data Quality construct on User Satisfaction in the form of a value of Data Quality → User Satisfaction (β=0.392, $p<0.001$) shows a moderate to large effect, indicating that the influence of data quality is not only statistically significant but also has a substantial practical impact on user experience in increasing user satisfaction of information systems.

4.3 Empirical Test Results

Based on the empirical analysis results obtained from the research data, the coefficient of determination (R^2) value indicates that the model has strong explanatory power for endogenous variables. Specifically, the technology and organizational variables are able to explain 68% of the variance in system usage, 74% of the variance in user satisfaction, and 63% of the variance in net benefits.

These findings indicate that the developed structural model has a good level of fit, with most changes in the dependent variable being explained by the combination of the exogenous factors tested. In other words, system quality, information quality, service quality, and organizational support collectively contribute significantly to increasing the effectiveness of system use and the net benefits derived by users.

4.4 The Influence of Technology Factors on User Satisfaction (US)

The Technology factor has four subvariables, namely System Quality, Information Quality, Service Quality, and Data Quality. The analysis results show that all subfactors significantly influence User Satisfaction, with Data Quality and Service Quality being the largest contributors. This means that users gain greater satisfaction with the system when the system provides accurate (Makalalag, 2025; Ekananda, 2025), complete, and up-to-date information, and when technical services are responsive. This is consistent with research highlighting the importance of data-driven quality assurance for health information systems.

4.5 The Effect of System Usage (SU) on Satisfaction and Net Benefits (NB)

System Usage has a positive impact on User Satisfaction ($p = 0.030$; $\beta = 0.201$). The more frequently they use and interact with SIRS, the more they perceive the system as useful and providing a better user experience. However, the positive impact of System Usage on Net Benefits is obtained through User Satisfaction, which indicates that the success of system implementation depends on system usage and

users' positive perceptions of the system (Munjirin, 2025; Sinaga, 2025; Laia, 2025).

4.6 The Influence of Organizational Factors on Net Benefits (NB)

Organizational variables include Structure and Environment. A better Organizational Structure has a positive effect on Net Benefits ($p = 0.013$), which implies that system implementation will be more successful with management support and well-defined internal procedures. On the other hand, Organizational Environment has a positive but insignificant effect ($p = 0.077$), which means that external support does not have a significant influence on system function in regional hospitals (Zheng et al., 2023). This requires an integrated cross-agency policy (regional government, Health Office, and system providers) to keep SIRS running throughout the region.

4.7 The Influence of User Satisfaction (US) on Net Benefits (NB)

The test statistic shows a strong relationship between User Satisfaction and Net Benefits ($\beta = 0.411$; $p < 0.001$). This finding confirms that positive user perceptions of the system can improve work efficiency (Sastradipraja, 2025), facilitate administration, and minimize the possibility of errors in data entry. In a technical context, this implies that the success of a system depends not only on its technical performance, but also on how well it meets the needs and desires of its users.

4.8 The Important Role of Data Quality (DQ) Variables in the Model

The explanatory power of the User Satisfaction model was shown to improve with the addition of the Data Quality variable (R^2 increased from 0.62 to 0.74). This indicates that nearly 74% of the variance in user satisfaction is due to four technology constructs System Quality, Information Quality, Service Quality, and Data Quality.

Theoretically, these results indicate that data quality is a critical success factor for EHIS. Efficient clinical and administrative processing is achieved when accurate, consistent, and timely data is available, resulting in a more reliable system.

From an informatics perspective, system architecture is also a determinant of data quality. Proper database consolidation, the use of interoperability standards (e.g., HL7 or FHIR), and automated data cleansing procedures can reduce data redundancy and inconsistency, which are common in SIRS. Therefore, this study offers an empirical basis for modifying the HOT-Fit framework to incorporate data technologies that support hospital digitization in Indonesia.

4.9 Discussion and Comparison with Previous Research

The findings in this study align with the traditional HOT-Fit model, with the additional implication of the Data Quality variable. Several important comparisons can be drawn:

Table 6. Research Comparison

Aspect	Previous HOT-Fit	Latest HOT-Fit
Technology Focus	Systems, Information, and Service Quality	+ Data Quality (new)
Measurable Aspects	Use and Satisfaction	+ Data Integrity and System Validity
Coverage	Evaluation of health information systems	Technical & Empirical Evaluation of Data-Based SIRS
Theoretical Contributions	Socio technical system relations	An empirical model based on data integrity and system performance

Our study presents a new theoretical contribution in the context of big data and modern hospital systems by strengthening the information system success model with factors specific to big data and modern hospital system integration. Furthermore, empirical studies show that the success of SIRS implementation depends not only on system functionality but also on data quality (Al-Kofahi et al., 2025). This opens new avenues for research and practice in Health Informatics, particularly for systems based on national health data interoperability.

5. Conclusion

This study proposes an Extended HOT-Fit Framework by incorporating Data Quality variables into the Technology component in the case of Hospital Information Systems (SIRS) implementation in Indonesia. Based on the results of Structural Equation Modeling (SEM) analysis of 150 respondents who used SIRS in regional hospitals in North Sulawesi, it was found that:

1. The Technology Dimensions (System Quality, Information Quality, Service Quality, and Data Quality) have a positive influence on User Satisfaction and Net Benefit of the system. Data Quality is the most beneficial factor among the four, indicating the importance of data integrity and reliability in health information systems.
2. The Importance of Organizational Factors and Organizational Structure for System Success. In fact, organizational factors, especially organizational structure, are crucial for facilitating system success through policies,

coordination, internal oversight, and so on. However, the external organizational environment remains less influential, which highlights the importance of institutional synergy in SIRS implementation.

3. Positive user satisfaction is a fundamental latent variable mediating between system use and net benefits. Such systems have superior usability and generate satisfaction among their users, which positively impacts the efficiency and quality of hospital care.

Additionally, with the inclusion of Data Quality, the explanatory power (R^2) of user satisfaction increased from 0.62 to 0.74, indicating that the model is better able to explain IS success as an outcome.

Therefore, this study confirms that the success of SIRS implementation inherently depends on the technical quality of the data that underpins the system processes and the capacity of the organization and users to adapt to new technologies.

5.1 Theoretical Implications

This research contributes to the theorization of information systems evaluation because:

1. Extending the HOT-Fit model by adding DQ variables that are considered important in the era of big data and digital transformation in the healthcare industry.
2. The importance of data integrity and validity in improving User Satisfaction and Net Benefits has been empirically validated.
3. Synergistic modeling strategies with technical informatics review, for the benefit of advancing HOT-Fit as a multidimensional evaluative model.

5.2 Practical implications

In practice, the findings of this study offer guidance for regional hospitals and healthcare industry policymakers on how to:

1. Standardization and systematization of data input processes to improve data quality and system compatibility.
2. Creating technical and digital literacy education for system users to achieve maximum utilization of SIRS.
3. Develop hospital data governance procedures that protect patient information and facilitate system-to-system interoperability.
4. To enhance the organizational support and the internal policy, because it is not only the technical, but also the managerial commitment and the organizational culture that determine the success of an information system.

The findings of this study provide three practical recommendations that can be followed up:

1. Strengthening Data Governance: Hospitals need to implement a data governance framework with national interoperability standards (HL7, FHIR) to ensure the consistency and security of patient data.
2. Continuous Technical Training in the form of holding regular training for SIRS users on data literacy and input procedures to ensure data quality is maintained.
3. External Collaboration involves developing partnerships with health agencies and system vendors to optimize integration and post-implementation support. These steps can increase the net benefits of the system and strengthen the sustainability of SIRS.

5.3 Limitations and Directions for Further Research

Some limitations of the study include:

1. The research is still focused on one region, that was in the city of Tondano, Minahasa district (North Sulawesi), therefore the results cannot be generalized for the whole area of Indonesia.
2. The present study has not explicitly explored the effect of mediators such as Technology Readiness or Information Security.

Further research is advised to:

1. To make the results more nationally representative, this study will correlate with more different samples from more different provinces.
2. Incorporate machine learning or data analytics to evaluate data quality automatically.
3. Construct a HOT-Fit model based on RAG to enable big data systems in the public health domain - a case study to be presented.

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