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Evaluation of the successful implementation of the SIAK using the HOT-Fit model

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ABSTRACT. This study investigates the human, organizational, and technological aspects of successfully implementing the Population Administration Information System (SIAK) in Bone Bolango District, Gorontalo. This study adopted PLS-SEM to test the hypothesis model of the influence of the three aspects on the benefits obtained by users in using SIAK. The hypothesis model was tested on 122 respondents, including staff at the Population and Civil Registry Office of Bone Bolango Regency and SIAK operators at each village office in Bone Bolango Regency. The data has been validated using a measurement model to determine internal consistency reliability and convergent validity with Smart PLS. The results showed that system quality, information quality, and organizational structure positively affected SIAK's success. Meanwhile, system usage and user satisfaction still need to be improved. Human factors, such as user expertise and motivation, also significantly influenced the success of SIAK implementation. This study provides recommendations to improve the quality of user training, improve information technology infrastructure, and adjust the organizational structure to support SIAK implementation better. The findings of this study can serve as input for other local governments in optimizing SIAK implementation in their respective implementing units.

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INTRODUCTION

With a population of more than 270 million, Indonesia faces various challenges related to population issues. Rapid population growth, uneven distribution, and diverse quality of life in multiple regions are problems that need to be overcome. In this context, implementing the Population Administration Information System (SIAK) is very important for the government at the central and regional levels. Regulation of the Minister of Home Affairs No. 95 of 2019 states that SIAK is an information system that utilizes information and communication technology to facilitate the management of population administration information at the organizing level and implementing agencies as a unit (Kemendagri, 2019). SIAK implementing agencies are district/city government officials responsible and authorized to carry out services in population administration affairs as stated in Law Number 24 of 2013 Amendment to Law Number 23 of 2006 concerning Population Administration (Republik Indonesia, 2006). This shows that SIAK plays a crucial role in managing population data centralized and integrated.

In its development, SIAK has been implemented nationally in all regions of Indonesia. SIAK has been upgraded from the previous version of distributed SIAK to Centralized SIAK. In the Centralized SIAK, the data input process works in real-time or online and is directly connected to the central server. Various research results show that SIAK has been successfully implemented,

including Firdaus et al. (2023) and Simanjuntak and Sembiring (2023). However, some facts in the field show various problems in implementing SIAK in Bone Bolango District. Constraints such as inadequate information and communication technology (ICT) infrastructure, lack of public awareness and participation, and limited human resources hinder SIAK implementation. Various obstacles and problems in SIAK implementation show that SIAK has not been optimal in supporting development planning and public services in implementing agencies. Effective SIAK implementation provides excellent benefits to local governments and communities. For local governments, SIAK assists in managing accurate and centralized population data, thus facilitating development planning and targeted budget allocations. SIAK also helps accelerate and improve the quality of population administration services such as family cards, birth certificates, and others. For the community, SIAK ensures the accuracy and security of personal data and facilitates access to the population services needed.

Many studies related to SIAK in Indonesia have been conducted in the literature, especially those focusing on technical aspects, such as system architecture, data security, and integration with other systems. Research by Zalukhu et al. (2022) found problems such as the absence of a telecommunications network that causes interference with the SIAK network system, there are still Identity Cards (KTP) that have duplicates, and the system does not yet have automatic access to change the data entered. In addition, systems that often error or go down during working hours, lack of user interest in the system, and inaccurate data are obstacles to implementing SIAK (Panjaitan & Ginting, 2022). These constraints hinder the optimization of SIAK benefits for local governments and communities. The successful implementation of SIAK impacts improving the quality of public services and plays a vital role in supporting sustainable development through accurate and comprehensive population data collection.

The HOT-Fit (Human, Organization, Technology-Fit) model is a model that considers human, organizational, and technological fit aspects in assessing the success of information system implementation (Yusof et al., 2006). This HOT-Fit model offers a comprehensive approach to evaluating information systems so that it can help identify factors that affect the success of information systems and provide appropriate improvement recommendations (Febrianti et al., 2022; Duhe et al., 2022; Purnomo, 2023; Maita & Ayu Riski, 2020; Vantissha & Azizah, 2022). However, research that comprehensively evaluates the implementation of SIAK in Indonesia, especially in Bone Bolango Regency, using the HOT Fit model, has not been found. Therefore, this study aims to evaluate the implementation of SIAK in Bone Bolango Regency using the HOT-Fit model. To achieve the research objectives, factors were identified covering the three aspects of humans, organization, and technology.

METHOD

Research Stages

To achieve the objectives, the research was carried out through several stages (Figure 1). The first stage is to review the literature related to the application of SIAK in Indonesia and the HOT Fit model.

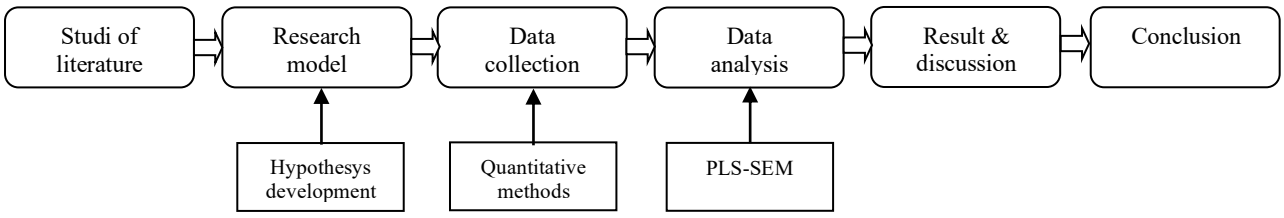

Figure 1. Research stages

In the second stage, a research hypothesis was developed by adopting the HOT Fit model, which was then compiled using a questionnaire adapted from Yusof et al. (2006). The researcher used a 4-point Likert rating scale to rank items from 1 = strongly disagree to 4 strongly agree (Hertanto, 2017). Partial Least Squares Structural Equation Modeling (PLS-SEM) was used to test the research hypothesis using SmartPLS 4.0 (Chua, 2024; Mariano & Plá, 2023; Sabol et al., 2023). Furthermore, in stage 5, the data analysis and discussion results are presented. At this stage of analysis, the analysis results of the measurement model (outer model) are reported to ensure the validity and reliability of the developed construct. After that, the structural model (inner model) is assessed to test the research model, which consists of 12 hypotheses.

Research Model

This study uses a quantitative descriptive method that aims to analyze the factors that affect the success of SIAK, both from human, organizational, and technological aspects referring to the HOT-Fit model. In this model, eight variables are interrelated to the success of the implementation of the information system, namely: *system quality, information quality, service quality, system use, user satisfaction, organizational structure, organizational environment*, and *net benefit.* (Yusof et al., 2006). The research model used can be seen in Figure 2.

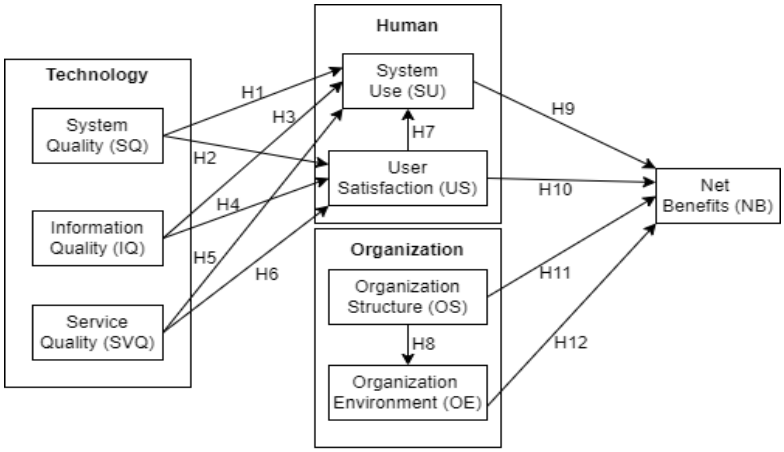

Figure 1. Research model

Hypothesis

Based on the research model, the following hypotheses are proposed:

H_1: System Quality has a significant effect on System Use
H_2: System Quality has a significant effect on User Satisfaction
H_3: Information Quality has a significant effect on System Usage
H_4: Information Quality has a significant effect on User Satisfaction
H_5: Service Quality has a significant effect on System Use
H_6: Service Quality has a significant effect on User Satisfaction
H_7: User Satisfaction System has a significant effect on System Use
H_8: Organizational structure has a significant effect on the Organizational Environment
H_9: System Usage has a significant effect on Net Benefits
H_{10}: User Satisfaction has a significant effect on Net Benefits
H_{11}: Organizational Structure has a significant effect on Net Benefits
H_{12}: Organizational Environment has a significant effect on Net Benefits

Population and Sample

The population in this study is 175 people obtained from SIAK application users, namely the Staff of the Population and Civil Registration Office of Bone Bolango Regency and the

operators/officials of the village office in Bone Bolango Regency. The sampling technique uses the Slovin formula with an error rate of 5%. Probability sampling is used with the disproportionate stratified random sampling method to calculate the proportion of the number of samples because there are members of the population that are not equal (homogeneous) or disproportionate; namely, several strata groups are very small (Sugiyono, 2019). So, 122 respondents, 10 from the Capil Disduk Staff and 112 from village operators were obtained for the number of samples.

Instruments

Data was collected by distributing questionnaires directly and through Google Forms to respondents. In this study, the instruments used (Table 1) are arranged based on the HOT-Fit model adopted by Yusof et al. (2006). The model consists of 8 variables: system quality, information quality, service quality, system usage, user satisfaction, organizational structure, organizational environment, and benefits. For the determination of the assessment score, the Likert scale is used with four levels of scale, namely: 1= strongly disagree (STS), 2= disagree (TS), 3= agree (S), and 4= strongly agree (SS).

Table 1. Research instruments

Variables and Indicators	Items
System Quality (SQ)	
Ease of Use	The SIAK application is easy to use and user-friendly.
Availability	SIAK is easy to access
Security	Data confidentiality is guaranteed because each user has a different password.
Reliability	SIAK application rarely experiences errors.
Information Quality (IQ)	
Relevance	The information generated is based on the data entered.
Accuracy	The information generated by the SIAK is reality.
Completeness	The information generated by the SIAK is very complete and detailed.
Readability	The information produced by the SIAK is easy to read.
Service Quality (SQ)	
Empathy	There is a guide to using the SIAK application.
Service Follow-up	Fast and responsive service from the developer.
Quick Response	The SIAK application can be accessed from anywhere.
System Usage	
Acceptance	Using the SIAK application helps my daily work.
Expertise	Users have expertise in using the SIAK application.
User Attitude	I am very dependent on the SIAK application to carry out my work.
User Satisfaction	
Perceived usefulness	Overall, the SIAK application meets your expectations in helping with daily tasks.
User satisfaction	All features and functions in the SIAK application have run to the needs.
	Users are satisfied, and there is no need for the SIAK system to be developed and improved.
	The information generated is accurate according to the needs.
	Users are satisfied with the appearance of the SIAK application.
Organization Structure	
Strategy	The SIAK application is a strategy to improve performance.
Management	Managing the Population and Civil Registration Office of Bone Bolango Regency always updates the hardware and software needed.
Planning	Implementation has been well planned by management.
Management Support Top	Managing the Population and Civil Registration Office of Bone Bolango Regency supports the implementation of the SIAK application.
	Managing the Population and Civil Registration Office of Bone Bolango Regency supports infrastructure facilities for implementing the SIAK application.
Organizational	

Variables and Indicators	Items
Environment	
Financing	SIAK application receives adequate financial support from management
Government	The SIAK application receives support from the Ministry of Home Affairs.
Relationship between organizations	All work units support and assist in implementation.
Net Benefits	
Direct Benefits	The SIAK application helps with daily work tasks.
	SIAK application helps in decision-making
Efficiency	SIAK application improves work efficiency.
Effectiveness	Applications help achieve goals effectively.
Communication	Applications improve communication between all parts of the organization.

RESULTS AND DISCUSSION

Respondent Demographics

Table 2 presents demographic information for the respondents. Based on gender, most of the respondents were dominated by female respondents, with 81 respondents or a percentage of 66%. The age of 31-40 dominated the characteristics of respondents based on age with a percentage of 50%. The characteristics of respondents based on the last education of high school were dominated by the last education of high school, which was 48 or with a percentage of 39%, and characteristics based on the type of user as many as 112 respondents with a percentage of 92%, while the type of Disdukcapil staff users was ten respondents with a percentage of 8%.

Table 2. Demographic profile

Variabel demografis	Kategori	Frequency Percentage
Gender	M	34%
	F	66%
Age	24-30	24%
	31-40	50%
	41-50	20%
	> 50	6%
Level of education	senior high school (SMA)	39%
	senior high school (SMK)	7%
	Diploma (D1)	1%
	Diploma (D3)	16%
	Undergraduate	37%
User	Disdukcapil office staff	8%
	Village operator	92%

Measurement Model (Outer Model)

The measurement model (outer model) was analyzed to test its validity and reliability. This test consists of four stages: convergent validity, discriminate validity, Average variance extracted (AVE), and reliability.

Convergent validity

In the Convergent validity test, the value is the value of the loading factor on the latent variable with its indicators. The Convergent validity value is used to determine the validity of a construct. An indicator is said to be valid if the value of the loading factor is above 0.06; if an indicator has a value below 0.6, it is removed from its construction because it shows that the indicator is not enough to represent its construction. The loading factor value can be seen in Table 4.

Table 4. Results of convergent validity testing

	Outer Loadings	Information
SQ1 > System Quality	0,905	Valid
SQ2 > System Quality	0,923	Valid
SQ3 > System Quality	0,861	Valid
IQ1 >Information Quality	0,910	Valid
IQ2 > Information Quality	0,881	Valid
IQ3 > Information Quality	0,905	Valid
IQ4 > Information Quality	0,912	Valid
SVQ1 > Service Quality	0,867	Valid
SVQ2 > Service Quality	0,885	Valid
SVQ3 > Service Quality	0,847	Valid
SU1 > System Use	0,846	Valid
SU2 > System Use	0,912	Valid
SU3 > System Use	0,870	Valid
SU4 > System Use	0,868	Valid
US1 > User Satisfaction	0,859	Valid
US2 > User Satisfaction	0,917	Valid
US4 > User Satisfaction	0,885	Valid
US5 > User Satisfaction	0,873	Valid
OS1 > Organizaton Structure	0,832	Valid
OS2 > Organizaton Structure	0,824	Valid
OS3 > Organizaton Structure	0,916	Valid
OS4 > Organizaton Structure	0,909	Valid
OS5 > Organizaton Structure	0,798	Valid
OE1 > Organization Environmen	0,870	Valid
OE2 > Organization Environmen	0,901	Valid
OE3 > Organization Environmen	0,919	Valid
NB1 > Net Benefit	0,887	Valid
NB2 > Net Benefit	0,876	Valid
NB3 > Net Benefit	0,900	Valid
NB4 > Net Benefit	0,926	Valid
NB5 > Net Benefit	0,887	Valid

Discriminant Validity

Discriminant validity testing is based on the Fornell-Lacker value; in the Fornell-Lacker, the AVE root value must be higher than the correlation between constructs. The results of the discriminant validity test are in Table 5.

Table 5. Results of the discriminant validity test

	US	IQ	SVQ	SQ	OE	NB	SU	OS
US	**0,884**							
IQ	0,822	**0,902**						
SVQ	0,777	0,747	**0,867**					
SQ	0,693	0,764	0,747	**0,896**				
OE	0,754	0,711	0,675	0,747	**0,897**			
NB	0,855	0,743	0,687	0,704	0,825	**0,893**		
SU	0,808	0,761	0,762	0,746	0,726	0,792	**0,874**	
OS	0,847	0,793	0,732	0,697	0,834	0,834	0,738	**0,857**

Average Variance Extracted (AVE)

The AVE value is used to determine the value of a construct. Each construct is said to have met the convergent validity or validity if the AVE value is> 0.5. The results of the AVE test can be seen in Table 6.

Table 6. AVE test results

	AVE	Set Value	Information
User Satisfaction	0,781	>0,5	Valid
Information Quality	0,814		Valid
Service Quality	0,751		Valid
System Quality	0,804		Valid
Organization Environment	0,804		Valid
Net Benefit	0,797		Valid
System Use	0,764		Valid
Organization Structure	0,734		Valid

Reliability

At this stage, reliability testing uses the criteria used in this measurement, namely Cronbach alpha. The construct can be reliable if the Cronbach alpha value is> 0.07. The Cronbach alpha test can be seen in Table 7.

Table 7. Reliability test results

	Cronbach's alpha	Set value	Conclusion
User Satisfaction	0,906	> 0,7	Reliable
Information Quality	0,924		Reliable
Service Quality	0,834		Reliable
System Quality	0,877		Reliable
Organization Environment	0,878		Reliable
Net Benefit	0,936		Reliable
System Use	0,897		Reliable
Organization Structure	0,909		Reliable

The overall outer model has shown statistically adequate characteristics and has been qualified at four measurement stages. Figure 2 shows the results of the measurement model evaluation.

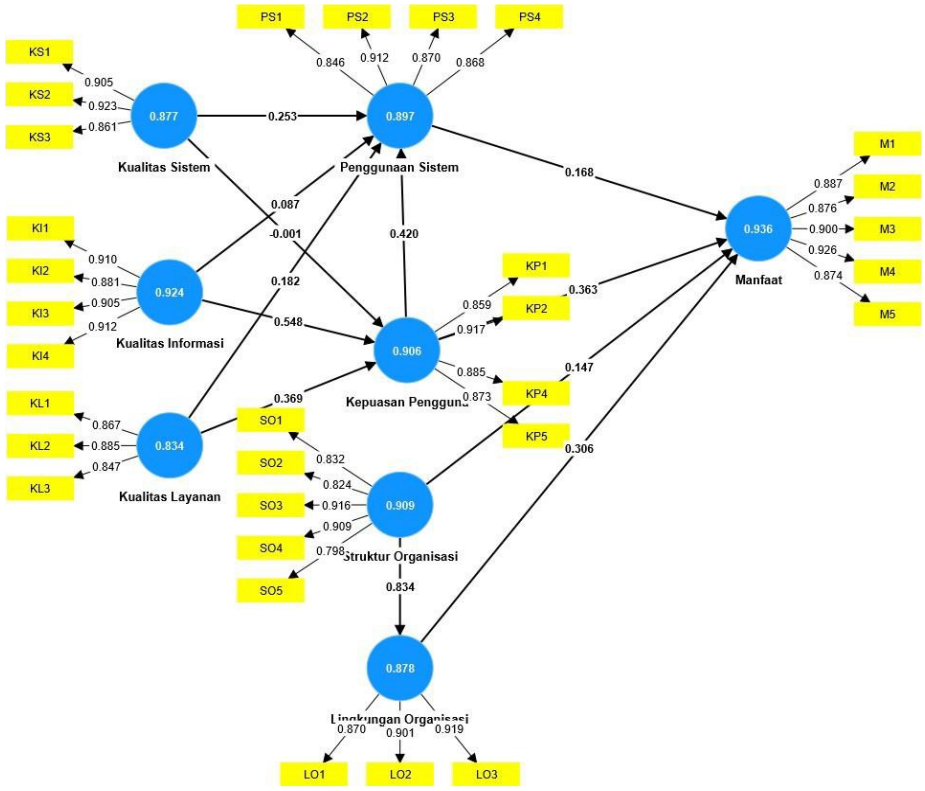

Figure 2. Measurement model evaluation results

Structural Model (Inner Model)

This analysis involves various tests to evaluate the relationship between variables and assess the suitability of the model as a whole, including the path coefficient test, test coefficient of determination (R^2), t-test (t-statistic), test effect size (f^2), predictive relevance (Q^2), and relative impact (q^2).

Path Coefficient Test

The Coefficient path test aims to see the significance of the relationship between constructs; the assessment in the path coefficient test is seen from the P-value value with a set value of <0.05; if the P value has met the set value, then the relationship between can be said to be significant. The path coefficient test can be seen in Table 8.

Table 8. Coefficient path test results

	P values	Conclusion
User Satisfaction > Net Benefit	0,014	Significant
User Satisfaction > System Use	0,002	Significant
Information Quality > User Satisfaction	0,000	Significant
Information Quality > System Use	0,533	Not significant
Service Quality > User Satisfaction	0,003	Significant
Service Quality > System Use	0,130	Not significant
System Quality > User Satisfaction	0,990	Not significant
System Quality > System Use	0,027	Significant
Organization Environment > Net Benefit	0,022	Significant
System Use > Net Benefit	0,081	Not significant
Organization Structure > Organization Environment	0,000	Significant
Organization Structure > Net Benefit	0,363	Not significant

Determinant Coefficient Test (R-square)

The coefficient of the determinant test is used to see how much the independent latent variable can explain the latent dependent variable. An assessment of 0.67 strong means strong, 0.33 means moderate, and 0.19 or below means weak. The results *of the coefficient of the determinant* test can be seen in Table 9.

Table 9. R square test results

	R-square	Conclusion
User Satisfaction	0,736	Strong
Organization environment	0,695	Strong
Net Benefit	0,819	Strong
System Use	0,732	Strong

Based on Table 9, it can be seen that *the R Square* value is as follows:

- *The R square* value on the user satisfaction variable was 0.736, meaning that the influence of system quality, information quality, and service quality variables on user satisfaction was 73.6%.
- The R *square value* in the organizational environment variable is 0.695, which means that the influence of the organizational structure variable on the organizational environment is 69.5%.

- The R *square value* on the benefit variable was 0.819, which means that the influence of the variables of system use, user satisfaction, organizational structure, and environment on the benefits was 81.9%.
- The R *square* value on the system usage variable is 0.732, which means that the influence of the system quality, information quality, service quality, and user satisfaction variables on system use is 73.6%.

Hypothesis Test

The t-test was carried out using the bootstrapping method to test the research hypothesis, which had a significant value of 5%. If the t-test value exceeds 1.96, then the research hypothesis is accepted. The t-test can be seen in Table 10.

Table 10. T-test results

	T statistics	Conclusion
System Quality > System Use	2,211	Accepted
System Quality > User Satisfaction	0,013	Rejected
Information Quality > System Use	0,624	Rejected
Information Quality > User Satisfaction	5,077	Accepted
Service Quality > System Use	1,516	Rejected
Service Quality > User Satisfaction	3,011	Accepted
User Satisfaction > System Use	3,152	Accepted
Organization Structure > Organization Environment	24,741	Accepted
System Use > Net Benefit	1,745	Rejected
User Satisfaction > Net Benefit	2,454	Accepted
Organization Structure > Net Benefit	0,909	Rejected
Organization Environment > Net Benefit	2,291	Accepted

Based on Table 10, 7 hypotheses were accepted, while five were rejected: information quality on system use, service quality on system use, system quality on user satisfaction, system use on benefits, and organizational structure on benefits. The five hypotheses were rejected because they did not meet the *t-statistic* value of >1.96.

Effect Size Test

The effect size test aims to determine the value of the influence between constructs. An f-square value of 0.02 means the influence is small, 0.15 means the effect is medium, and 0.35 means the effect is large. The results of the effect size test can be seen in Table 11.

Table 11. Effect size test results

	R include	R exclude	f square	Result
System Quality > User Satisfaction	0,36	0,358	0,003	Small
Information Quality > User Satisfaction	0,36	0,283	0,12	Medium
Service Quality > User Satisfaction	0,36	0,362	-0,003	Small
Organization Structure > Organization Environment	0,513	0	1,053	Small
System Use > Net Benefit	0,492	0,389	0,202	Medium
User Satisfaction > Net Benefit	0,492	0,489	0,005	Small
Organization Structure > Net Benefit	0,492	0,476	0,031	Small
Organization Environment > Net Benefit	0,492	0,467	0,049	Small
System Quality > System Use	0,443	0,438	0,008	Small
Information Quality > System Use	0,443	0,402	0,073	Small
Service Quality > System Use	0,443	0,437	0,01	Small
User Satisfaction > System Use	0,443	0,375	0,122	Small

Predictive Relevance Test

Predictive Relevance (Q^2) testing aims to show that the constructs in a model are related to other constructs, carried out using the blindfolding method. If the value $Q^2 > 0$ indicates that the construct is accurately predictively relevant to a particular construct. Predictive Relevance testing can be seen in Table 12.

Table 12. Predictive relevance test results

	Q^2
User Satisfaction	0,562
Organization Environment	0,553
Net Benefit	0,641
System Use	0,545

Relative Impact Test

The Relative Impact test uses the blindfolding method, which measures how much the relationship between the construct and other constructs is affected. Suppose the value on q^2 is 0.02 for small influences, 0.15 for medium influences, and 0.35 for strong influences. The relative impact test can be seen in Table 13. Based on the test results in the table above, ten research lines have a small influence, one has a medium impact, and one has a strong influence.

Table 13. Predictive impact test results

	Q includes	R exclude	q square	Result
System Quality > System Use	0,545	0,531	0,030	Small
Information Quality > System Use		0,545	0	Small
Service Quality > System Use		0,539	0,013	Small
User Satisfaction > System Use		0,510	0,076	Small
System Quality > User Satisfaction	0,562	0,564	-0,004	Small
Information Quality > User Satisfaction		0,484	0,178	Medium
Service Quality > User Satisfaction		0,523	0,089	Small
System Use > Net Benefit	0,641	0,635	0,016	Small
User Satisfaction > Net Benefit		0,621	0,055	Small
Organization Structure > Net Benefit		0,639	0,005	Small
Organization Environment > Net Benefit		0,625	0,044	Small
Organization Structure > Organization Environment	0,553	0	1,237	Strong

DISCUSSION

The results showed that system, information, and service quality significantly influence user satisfaction and using the SIAK system in Bone Bolango Regency. This finding aligns with previous research, which states that these three aspects are important factors in determining the success of information system implementation (Yusof et al., 2006). However, in this study, system quality has no significant effect on user satisfaction, and information quality and service quality have no significant effect on system usage. This indicates that problems related to the quality of SIAK systems, information, and services need to be improved so that SIAK implementation can be more optimal. Recommendations include improving information technology infrastructure, increasing data security, and training users and service officers to improve their ability to operate and provide better SIAK services.

In terms of human resources, user satisfaction has been proven to have a significant influence on obtaining net benefits from SIAK implementation. In contrast, system use has not had a significant impact. This finding reinforces the theory that user satisfaction is an important factor in determining

the success of information system implementation (Yusof et al., 2006). However, system usage that does not significantly impact net benefits indicates problems in using SIAK by users, such as a lack of expertise and motivation in operating the system. Therefore, the recommendation that can be given is to increase training and socialization programs so that users can be more skilled and motivated to use SIAK optimally. In addition, it is necessary to adjust the interface design and features of SIAK to make it more user-friendly.

From the organizational side, organizational structure is proven to affect the organizational environment significantly. However, it does not significantly affect the net benefits of SIAK implementation. Meanwhile, the organizational environment has a significant effect on net benefits. The results of this hypothesis align with research conducted by Jayanti et al. (2023) and Yulianto et al. (2021) that shows that the organizational environment significantly affects net benefits. This suggests that support from the organizational environment, such as budget allocation and coordination between work units, plays a vital role in the success of SIAK implementation. However, the current organizational structure is not sufficiently supportive of optimizing the benefits of SIAK implementation. The recommendation is to adjust the organizational structure by establishing a particular unit responsible for managing and developing SIAK continuously. In addition, it is necessary to increase support from the leadership and coordination between related work units in SIAK implementation.

Theoretically, this study enriches the literature on evaluating the success of information system implementation using the HOT-Fit model. This research also strengthens the validity of the HOT-Fit model in the context of SIAK implementation in local government. The research findings can serve as input for the Bone Bolango Regency government and related agencies in formulating strategies and policies to optimize SIAK implementation in their area. However, this study has limitations, such as the coverage area that only covers the Bone Bolango Regency, so the generalizability of the results is limited. In addition, the data collection method using questionnaires may not be able to capture in-depth information related to issues in SIAK implementation. Therefore, it is recommended that future research expand the coverage area and combine quantitative and qualitative data collection methods to gain a more comprehensive understanding of SIAK implementation in Indonesia.

CONCLUSIONS

This study evaluates the successful implementation of the Population Administration Information System (SIAK) in Bone Bolango Regency using the HOT-Fit model, which includes human, organizational, and technological aspects. The results showed that information quality, service quality, user satisfaction, and organizational environment significantly influenced the success of SIAK implementation. However, several other factors, such as system quality, system usage, and organizational structure, still need to be improved to make SIAK implementation more optimal. Recommendations include improving information technology infrastructure, data security, training for users and service officers, adjusting the SIAK interface design, establishing a particular SIAK management unit, and increasing support from the leadership and coordination between related work units. Theoretically, this research enriches the literature on evaluating the success of information system implementation using the HOT-Fit model. Practically, the findings can serve as input for local governments in optimizing SIAK implementation in their respective regions.

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