

Original article

Development of the Health Office Management Information System (SIM-DINKES) to Support Digital Transformation

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Received 27 February 2026, Revised 26 April 2026, Accepted 6 June 2026

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Abstract: Background — In recent years, digital transformation has become a key strategy for enhancing the efficiency, transparency, and quality of data utilization in the healthcare sector. Currently, this process is being implemented in Badung Regency (Bali Province) through the Health Office Management Information System (SIM-DINKES).

Objective — To monitor the development of the SIM-DINKES system to support digital transformation and improve public health in Badung Regency, Indonesia.

Methods — The study employed a mixed-methods approach using an exploratory sequential design. The qualitative phase involved in-depth interviews with stakeholders to assess product readiness, as well as the market, and financial and organizational feasibility of its implementation in Badung Regency. Quantitative data were obtained through a survey in which respondents evaluated the functional capabilities of the SIM-DINKES prototype. Qualitative data were collected via in-depth interviews and focus group discussions and analyzed using a descriptive method.

Results — The results indicated that using the Indonesian national identification number (NIK) as a unique identifier is a prerequisite for SIM-DINKES implementation, requiring inter-agency collaboration and a clear legal framework. Disease Spread Tracking, Emergency Assistance, and Home Care features received positive evaluations, particularly regarding their utility (with scores of 70.60%, 66.48%, and 33.52%, respectively). These features were well-received by users, reflecting satisfaction with the system, ease of use, and an understanding of the benefits for self-monitoring health status.

Conclusion — The findings demonstrate that the development of SIM-DINKES as a tool for the digitalization of health services (including Disease Spread Tracking, Emergency Assistance, and Home Care features) facilitates public access to healthcare.

Keywords: Data interoperability, digital transformation, disease spread tracking prototype, emergency assistance prototype, SIM-DINKES.

Cite as Puspita BP, Januraga PP, Budayanti NNS, Pramatha CRA, Jawi IM, Wirawan IMA, Ani LS, Sutiari NK. Development of the Health Office Management Information System (SIM-DINKES) to support digital transformation. *Russ Open Med J* 2026; 15: e0308.

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Introduction

The rapid advancement of digital technologies accelerated Indonesia's efforts to implement digital governance systems across various sectors, including public health. This aligns with global trends emphasizing the use of technology in public administration, the creation of smart infrastructure, and the delivery of citizen-centric services [1, 2]. The digitalization of health information services, previously accessible only through in-person consultations with healthcare professionals, has shifted delivery increasingly to digital platforms. This enhances service accessibility, affordability, and timeliness [3, 4].

Numerous published sources indicate that the effective implementation of health information systems (HIS) improves service quality, strengthens program accountability, and enhances clinical decision-making via real-time reporting, comprehensive monitoring, and the automation of medical record-keeping [5, 6]. This digital revolution benefits not only patients but also healthcare professionals; by utilizing standardized and validated

data, they can analyze disease spread patterns in the community, assess service coverage, and allocate resources efficiently [7, 8].

Unfortunately, the implementation of the smart city concept has yet to reach an optimal level. A key challenge is data fragmentation, which necessitates the manual entry of identical information into multiple applications. This inevitably leads to significant administrative burdens, reduced data quality, limited system interoperability, and delays in accessing critical health information in real time [9, 10]. Such fragmentation hampers the responsiveness of policy implementation and the effectiveness of program monitoring, thereby hindering efforts to improve public health outcomes.

Digitalization initiatives are planned for Bali, specifically the Badung Regency, driven by the fact that maternal mortality rates exceed expected national thresholds, while the monitoring of infant mortality, malnutrition cases, and healthcare service coverage remains inconsistent. This situation necessitated the accelerated adoption of smart city technologies to create a more

integrated system that facilitates easier assessment. Previous studies have identified incomplete indicator tracking and gaps in information flows as primary obstacles to public health monitoring; these issues hinder the rapid identification of at-risk groups and delay the implementation of timely interventions [10, 11]. Although established benchmarks for several Minimum Service Standards (MSS) have been met, other indicators remain below target levels, underscoring the need to strengthen accountability across all system levels and improve the efficiency of monitoring and program implementation oversight.

Currently, the implementation of the integrated Health Office Management Information System (SIM-DINKES) represents a critical strategic development priority for the Badung Regency. SIM-DINKES was conceived not merely as a data repository but as an active platform for managing services (including home care) aligned with the modern smart healthcare concept, which emphasizes citizen empowerment and active participation in service delivery [12, 13].

Unfortunately, the practical application of this system has not yet undergone detailed analysis regarding user feedback. Consequently, this study aims to examine and describe user perceptions of the SIM-DINKES and to evaluate its usability and the rationale for its implementation; this serves as a first step toward the digital transformation of the public health system in the Badung Regency (Bali Province). The study was designed as a descriptive exploratory investigation aimed at identifying characteristic features of user reactions rather than testing for statistical differences. Accordingly, methods of statistical inference for comparing metrics were not employed.

Material and Methods

Study design and settings

This study employed a mixed-methods design using an exploratory sequential approach, combining qualitative and quantitative phases to gain a comprehensive understanding of the development and feasibility of the SIM-DINKES platform. The first phase was qualitative in nature, involving in-depth interviews and focus group discussions (FGDs) with key stakeholders to explore system requirements and feasibility aspects, as well as to gather recommendations for the design of SIM-DINKES. The study relied on a mixed-methods methodology integrating qualitative and quantitative data. Accordingly, the study organization was aligned with the Mixed Methods Appraisal Tool (MMAT) checklist to ensure consistency with the study design.

The study was conducted in Badung Regency (Bali Province, Indonesia). The qualitative phase lasted four weeks in March 2025, followed by prototype development. The second phase involved quantitative data collection and spanned over 12 weeks (April–June 2025).

Variables, instruments, and measurement methods

The quantitative phase assessed user acceptance and the usability of the SIM-DINKES prototype. Variables included respondent characteristics and user ratings obtained using the Health Information Technology Usability Evaluation Scale (Health-ITUES). The Health-ITUES scale served as a validated instrument for evaluating the subjective user experience following interaction with the prototype. Four aspects were assessed: (1) impact, (2) perceived usefulness, (3) perceived ease of use, and (4) user

control. The questionnaire was adapted from the validated Health-ITUES instrument, which had previously demonstrated good internal consistency. According to Schnall et al., the internal consistency of the multi-item scales was assessed using Cronbach's alpha coefficients, which demonstrated high reliability: alpha values ranged from 0.85 to 0.92, significantly exceeding the recommended threshold of 0.7. Notably, all coefficients remained below 0.95, indicating an absence of item redundancy. Furthermore, interscale correlations (ranging from 0.56 to 0.82) were consistently lower than the corresponding Cronbach's alpha values, indicating moderate to strong associations. Specifically, the impact scale showed a stronger correlation with perceived usefulness ($r=0.82$) than with perceived ease of use ($r=0.63$) or user control ($r=0.56$), thereby confirming both convergent and discriminant validity [14].

The Health-ITUES originally employed a 5-point Likert scale. However, in the present study, the neutral category was excluded because the presence of a middle option often inadvertently triggers a behavioral strategy known as '*satisficing*', wherein respondents select the neutral option to simplify the cognitive task. When faced with questions requiring significant cognitive effort, or those that are ambiguous or beyond their expertise, respondents often use the middle option to avoid committing to an answer. This tendency distorts the actual data distribution, as a neutral choice may reflect a lack of engagement or a misunderstanding of the question rather than a genuine absence of preference. Excluding the middle option compels respondents to engage in deeper cognitive processing to determine their position. Furthermore, this approach encourages direct communication between the respondent and the researcher to clarify details, rather than allowing the selection of a neutral option misinterpreting it as a default. Moreover, the inclusion of a *neutral*, or *no opinion*, option can significantly reduce the psychometric reliability of the research instrument. In terms of validity, a middle option often triggers the social desirability bias: participants select it to avoid expressing an opinion that might be perceived as controversial or socially unacceptable. This gives rise to the central tendency bias, which artificially reduces data variance. Reduced variance leads to lower measurement reliability, as the scale fails to capture the true diversity and intensity of participants' attitudes toward the subject matter. When dealing with questions concerning consumer interests, the use of a forced-choice scale typically yields more accurate data that reliably reflect the psychological constructs being measured, thereby enhancing the overall validity of the research findings.

Phase 1 of the study (qualitative research)

Participants were selected using purposive sampling based on their roles in policy formulation, service delivery, information system operations, and intersectoral management. The study involved representatives from healthcare organizations, program coordinators from the Badung District Health Office, representatives from relevant regional agencies, and community representatives. A total of 27 informants participated in the qualitative study. Interviews were conducted either at the participants' workplaces or via online platforms, depending on availability.

Phase 2 of the study (quantitative research)

The second phase focused on assessing the level of acceptance of the SIM-DINKES system concept; data were collected through a quantitative survey using a convenience sampling method. Inclusion criteria were as follows: healthcare workers from public health centers, hospitals, and private medical facilities in Badung District (employed since January 2024), as well as Badung District residents (residing there since January 2024) who owned and knew how to use a smartphone and expressed willingness to participate by completing a digital questionnaire and an informed consent form. Exclusion criteria involved healthcare workers with less than three months of work experience and cases of incomplete digital questionnaires.

Statistical analysis

Descriptive statistics were used to summarize socio-demographic characteristics and analyze the distribution of usability scores. Qualitative data were analyzed using thematic analysis, which involved transcription, coding, and the identification and refinement of the patterns of meaning (themes).

Results

Key requirements were identified during the development of the SIM-DINKES system, which aims to drive the digital transformation of healthcare within the smart city framework and improve public health outcomes in Badung Regency. Stakeholders consistently emphasized that digital transformation would only be sustainable if institutionalized through official regulations, clear administrative mechanisms, and stable funding. As one government representative noted, "We had previously implemented various information systems, but they ceased operations due to a lack of official mandates or sustainable funding to guarantee continuity." This reinforces the prevailing view that regulatory backing and long-term budget planning are prerequisites for the system's full-scale implementation.

Disparities in digital literacy were identified, particularly among management and staff with no prior experience using

digital systems. One participant remarked, "Some employees feel anxious when faced with numerous data entry fields, even though the information required is actually quite simple." This highlights the need to complement the implementation process with a modular user training program, hands-on sessions, and multilevel training materials, including visual demonstrations and written instructions.

Staff readiness also emerged as a critical structural requirement. Surveys and interviews revealed uneven levels of staff competence regarding system operation across different healthcare facilities. One operator admitted, "Sometimes we cannot complete data entry because we are unsure which menu option to select." To address these issues, stakeholders proposed assigning qualified system specialists to each facility, implementing a competency-based certification system, and clearly defining job responsibilities to prevent fragmented data entry and administrative inconsistencies.

Furthermore, it was noted that operational efficiency depends on infrastructure stability. Several staff members who interact directly with patients pointed out issues caused by limited network bandwidth and inconsistent connection quality across medical facilities. One respondent explained, "When the network is slow, we cannot update records in real time, and patients become dissatisfied." Consequently, stakeholders recommended establishing a secure, centralized infrastructure, ensuring equal system access across all medical facilities, guaranteeing server reliability, and incorporating offline data synchronization capabilities to mitigate connectivity issues.

Master plan for the SIM-DINKES: Supporting healthcare digital transformation in the smart city era and improving public health outcomes in Badung Regency

The master plan is centered on creating a unified, integrated platform described by survey participants as a single sign-on system that eliminates the need for disparate applications and multiple access routes. The system aims to streamline administrative processes and consolidate all workflows into a single digital interface.

Table 1. Characteristics of Disease Spread Tracking, Emergency Assistance, and Home Care features by respondents

Variable	Category / Group	Disease Spread Tracking feature		Emergency Assistance feature		Home Care feature	
		N	%	N	%	N	%
Gender	Male	93	25.55	89	24.45	115	23.81
	Female	271	74.45	275	75.55	368	76.19
Highest education level	Elementary school/equivalent	11	3.02	11	3.02	25	5.17
	Junior high school/equivalent	32	8.79	30	8.24	39	8.07
	Senior high school / Vocational school/equivalent	211	57.97	213	58.52	280	57.97
	Diploma	33	9.07	32	8.79	39	8.07
	Bachelor / Professional degree	69	18.96	68	18.68	89	18.43
	Graduate (Master's/Doctorate, S2/S3)	8	2.20	10	2.75	11	2.28
Religion	Hindu	341	93.68	344	94.51	455	94.20
	Islam	18	4.95	16	4.40	23	4.76
	Christian	4	1.10	3	0.82	4	0.83
Occupation	Unemployed / Homemaker	113	31.04	114	31.32	147	30.43
	Government employee / Military personnel/ Police officer/ Civil servant	114	31.32	32	8.79	37	7.66
	Entrepreneur / Merchant	77	21.15	78	21.43	118	24.43
	Teacher / Lecturer / Education professional	14	3.85	14	3.85	19	3.93
	Manual worker / Farmer / Fisherman / Driver / Mechanic / Construction worker	17	4.67	16	4.40	23	4.76
	Healthcare professional	5	1.37	5	1.37	7	1.45
	Other occupations	24	6.60	21	5.77	17	3.52
	Private sector employee	–	–	84	23.08	107	22.15

Table 2. Respondent evaluation of the prototype (Disease Spread Tracking feature)

Variable / Question	Category / Response	Frequency (N)	Percentage (%)	Variable / Question	Category / Response	Frequency (N)	Percentage (%)
Utility of the application for obtaining information on disease spread	Strongly Disagree	0	0.00	Allows for regular monitoring of health status	Agree	274	75.27
	Disagree	1	0.27		Strongly Agree	80	21.98
	Slightly Agree	1	0.27		Strongly Disagree	0	0.00
	Agree	257	70.60		Disagree	0	0.00
Improves the population's quality of life and health status	Strongly Agree	105	28.85	The feature is convenient to use	Slightly Agree	11	3.02
	Strongly Disagree	0	0.00		Agree	272	74.73
	Disagree	2	0.55		Strongly Agree	81	22.25
	Slightly Agree	4	1.10		Strongly Disagree	1	0.27
Helps meet the need for information on disease spread	Agree	266	73.08	Easy to learn how to use the feature	Disagree	0	0.00
	Strongly Agree	92	25.27		Slightly Agree	6	1.65
	Strongly Disagree	0	0.00		Agree	277	76.10
	Disagree	1	0.27		Strongly Agree	80	21.98
Provides easy access to information	Slightly Agree	1	0.27	Easy to master the feature and use it confidently	Strongly Disagree	1	0.27
	Agree	275	75.55		Disagree	0	0.00
	Strongly Agree	87	23.91		Slightly Agree	13	3.57
	Strongly Disagree	0	0.00		Agree	275	75.55
Helps track health status and disease risks	Disagree	1	0.27		Strongly Agree	78	21.43
	Slightly Agree	2	0.55	Overall, the feature is easy to use	Strongly Disagree	1	0.27
	Agree	270	74.18		Disagree	0	0.00
	Strongly Agree	91	25.00		Slightly Agree	11	3.02
Increases the likelihood of receiving information regularly	Strongly Disagree	0	0.00		Agree	275	75.55
	Disagree	1	0.27		Strongly Agree	77	21.15
	Slightly Agree	6	1.65	Easy to remember how to log in and use the feature	Strongly Disagree	1	0.27
	Agree	267	73.35		Disagree	0	0.00
Useful for independent use of the feature	Strongly Agree	90	24.73		Slightly Agree	14	3.85
	Strongly Disagree	0	0.00		Agree	278	76.37
	Disagree	3	0.82		Strongly Agree	71	19.51
	Slightly Agree	6	1.65	Error messages are clear and explain how to resolve issues	Strongly Disagree	1	0.27
Satisfaction with using the application	Agree	269	73.90		Disagree	0	0.00
	Strongly Agree	86	23.63		Slightly Agree	15	4.12
	Strongly Disagree	0	0.00		Agree	274	75.27
The application simplifies access to information	Disagree	0	0.00		Strongly Agree	74	20.33
	Slightly Agree	7	1.92	Errors can be fixed quickly	Strongly Disagree	1	0.27
	Agree	267	73.35		Disagree	0	0.00
	Strongly Agree	90	24.73		Slightly Agree	19	5.22
Helps track health status	Strongly Disagree	0	0.00		Agree	269	73.90
	Disagree	1	0.27		Strongly Agree	75	20.60
	Slightly Agree	9	2.47	Guides and instructions are easy to understand	Strongly Disagree	1	0.27
					Disagree	0	0.00
					Slightly Agree	9	2.47
					Agree	277	76.10
					Strongly Agree	77	21.15

One respondent noted, "We envision a system with a single point of access so that we only need to remember one password... one is enough; we do not need multiple applications" (R03). Another participant highlighted the benefits of such consolidation, explaining that "By using a single application, we can meet all needs; if the ministry requires something, it can access it directly" (R10). As one stakeholder observed, "To achieve this, we need infrastructure in all districts, especially in areas with poor internet access" (R15).

A second key aspect concerns data interoperability and system integration based on big data technologies. Survey participants emphasized that SIM-DINKES should facilitate a single data entry process, with subsequent automatic transmission to all relevant healthcare providers. This minimizes data duplication, reduces

administrative burdens, and accelerates service delivery. One respondent articulated this clearly, "How can we ensure that data are entered once and the system transmits it across platforms? That is precisely what we mean by system interoperability" (R03). In the context of regional health programs, respondents also highlighted the need to integrate local initiatives, such as home care and services for the elderly.

A third key theme was user-centric design. Respondents emphasized that the system's success depends on its accessibility, speed, and interface usability. One staff member noted that, "Without training, people will not know how to use the system; introductory briefings and practical sessions are essential" (R03). Personal data protection was another crucial aspect; respondent R26 remarked, "The application needs to be simple, yet security

and confidentiality must be guaranteed". These comments demonstrate that user experience is not merely a technical issue; it is closely linked to principles of equity, financial protection, and accessibility.

Moreover, system reliability was viewed as integral to data protection and investment in maintenance. Respondents emphasized that a lack of proper system management creates a risk of data breaches, saying that "Improper management can lead to data leaks, which entails risks" (R17). It was also noted that maintenance inevitably requires time, technical personnel, and operational budget allocations. Beyond technical capabilities, participants discussed the need to implement innovative features tailored to local conditions. One respondent stated, "The system

should allow for the uploading of photos and videos directly into the SIM-DINKES application" (R01).

The study results also indicated that successful implementation requires effective intersectoral coordination underpinned by regulatory frameworks. One participant noted, "We hold meetings to define the role of each party and assign areas of responsibility" (R22). At the same time, concerns were repeatedly raised regarding departmental silo mentality and the fragmentation of providers: "Involving multiple providers fosters departmental insularity" (R12); according to the respondents, this issue could be addressed through competent local leadership and regulation.

Table 3. Respondent evaluation of the prototype (Emergency Assistance feature)

Variable / Question	Category / Response	Frequency (N)	Percentage (%)	Variable / Question	Category / Response	Frequency (N)	Percentage (%)
The application facilitates access to emergency services	Strongly Disagree	0	0.00	It allows for regular monitoring of health status	Agree	265	72.80
	Disagree	0	0.00		Strongly Agree	88	24.18
	Somewhat Disagree	0	0.00		Strongly Disagree	0	0.00
	Agree	242	66.48		Disagree	0	0.00
	Strongly Agree	122	33.52		Somewhat Disagree	8	2.20
It helps improve the population's quality of life and health through emergency services	Strongly Disagree	0	0.00	Using emergency services via the application is convenient	Agree	274	75.27
	Disagree	0	0.00		Strongly Agree	82	22.53
	Somewhat Disagree	3	0.82		Strongly Disagree	0	0.00
	Agree	260	71.43		Disagree	0	0.00
	Strongly Agree	101	27.75		Somewhat Disagree	4	1.10
It helps obtain necessary information about emergency services	Strongly Disagree	0	0.00	It is easy to learn how to use the emergency services feature	Agree	272	74.73
	Disagree	0	0.00		Strongly Agree	88	24.18
	Somewhat Disagree	2	0.55		Strongly Disagree	0	0.00
	Agree	262	71.98		Disagree	1	0.27
	Strongly Agree	100	27.47		Somewhat Disagree	8	2.20
It ensures easy access to emergency services	Strongly Disagree	0	0.00	It is easy to master this feature and learn to use it confidently	Agree	278	76.37
	Disagree	1	0.27		Strongly Agree	77	21.15
	Somewhat Disagree	3	0.82		Strongly Disagree	0	0.00
	Agree	259	71.15		Disagree	1	0.27
	Strongly Agree	101	27.75		Somewhat Disagree	12	3.30
It helps monitor health status with the aid of emergency services	Strongly Disagree	1	0.27	Overall, this feature is easy to use	Agree	274	75.27
	Disagree	1	0.27		Strongly Agree	77	21.15
	Somewhat Disagree	7	1.92		Strongly Disagree	0	0.00
	Agree	265	72.80		Disagree	0	0.00
	Strongly Agree	90	24.73		Somewhat Disagree	9	2.47
It increases the likelihood of regularly accessing emergency services	Strongly Disagree	0	0.00	It is easy to remember how to log in and use the service	Agree	277	76.10
	Disagree	2	0.55		Strongly Agree	78	21.43
	Somewhat Disagree	10	2.75		Strongly Disagree	1	0.27
	Agree	262	71.98		Disagree	0	0.00
	Strongly Agree	90	24.73		Somewhat Disagree	14	3.85
It is suitable for independent access to emergency services	Strongly Disagree	0	0.00	Error messages are clear, and I know how to resolve them	Agree	268	73.63
	Disagree	0	0.00		Strongly Agree	81	22.25
	Somewhat Disagree	5	1.37		Strongly Disagree	0	0.00
	Agree	269	73.90		Disagree	1	0.27
	Strongly Agree	90	24.73		Somewhat Disagree	20	5.49
Satisfaction with using the application to access emergency services	Strongly Disagree	0	0.00	Errors can be fixed quickly	Agree	271	74.45
	Disagree	0	0.00		Strongly Agree	72	19.78
	Somewhat Disagree	7	1.92		Strongly Disagree	1	0.27
	Agree	267	73.35		Disagree	1	0.27
	Strongly Agree	90	24.73		Somewhat Disagree	23	6.32
The application makes accessing emergency services easier	Strongly Disagree	0	0.00	Help information and instructions are simple and clear	Agree	267	73.35
	Disagree	1	0.27		Strongly Agree	72	19.78
	Somewhat Disagree	0	0.00		Strongly Disagree	0	0.00
	Agree	270	74.18		Disagree	2	0.55
	Strongly Agree	93	25.55		Somewhat Disagree	12	3.30
It improves the ability to regularly monitor health status	Strongly Disagree	0	0.00		Agree	279	76.65
	Disagree	1	0.27		Strongly Agree	71	19.51
	Somewhat Disagree	10	2.75				

Table 4. Respondent evaluation of the prototype (Home Care feature)

Variable / Question	Category / Response	Frequency (N)	Percentage (%)
The application helps organize the receipt of home care services	Strongly Disagree	0	0.00
	Disagree	0	0.00
	Somewhat Disagree	4	0.83
	Agree	309	63.94
Contributes to improving the health and quality of life of the population through home care services	Strongly Agree	170	35.23
	Strongly Disagree	0	0.00
	Disagree	1	0.21
	Somewhat Disagree	3	0.62
Helps obtain necessary information about home care services	Agree	339	70.19
	Strongly Agree	140	28.97
	Strongly Disagree	0	0.00
	Disagree	0	0.00
Provides easy access to home care services	Somewhat Disagree	7	1.45
	Agree	338	69.97
	Strongly Agree	138	28.57
	Strongly Disagree	0	0.00
Helps monitor health status as part of home care services	Disagree	1	0.21
	Somewhat Disagree	6	1.24
	Agree	342	70.80
	Strongly Agree	134	27.76
Increases the likelihood of receiving home care services regularly	Strongly Disagree	0	0.00
	Disagree	1	0.21
	Somewhat Disagree	9	1.86
	Agree	350	72.47
Useful for accessing home care services independently	Strongly Agree	123	25.46
	Strongly Disagree	0	0.00
	Disagree	1	0.21
	Somewhat Disagree	9	1.86
Satisfaction with using the application to obtain home care services	Agree	350	72.47
	Strongly Agree	123	25.46
	Strongly Disagree	0	0.00
	Disagree	1	0.21
The application makes accessing home care services easier	Somewhat Disagree	11	2.28
	Agree	355	73.50
	Strongly Agree	116	24.03
	Strongly Disagree	0	0.00
Improves opportunities for regular health monitoring	Disagree	1	0.21
	Somewhat Disagree	11	2.28
	Agree	353	73.08
	Strongly Agree	122	25.26

Variable / Question	Category / Response	Frequency (N)	Percentage (%)
Allows for regular monitoring of health status	Strongly Agree	118	24.43
	Strongly Disagree	2	0.41
	Disagree	2	0.41
	Somewhat Disagree	8	1.66
Using home care services via the application is convenient	Agree	360	74.53
	Strongly Agree	113	23.40
	Strongly Disagree	1	0.21
	Disagree	1	0.21
The home care service features are easy to learn	Somewhat Disagree	9	1.86
	Agree	365	75.57
	Strongly Agree	107	22.15
	Strongly Disagree	3	0.62
It is easy to get used to the features and learn to use them confidently	Disagree	0	0.00
	Somewhat Disagree	14	2.90
	Agree	363	75.16
	Strongly Agree	103	21.33
Overall, the features are easy to use	Strongly Disagree	2	0.41
	Disagree	0	0.00
	Somewhat Disagree	26	5.38
	Agree	357	73.92
It is easy to remember how to log in and use the service	Strongly Agree	98	20.29
	Strongly Disagree	2	0.41
	Disagree	0	0.00
	Somewhat Disagree	17	3.52
Error messages are clear, and I know how to resolve them	Agree	360	74.53
	Strongly Agree	104	21.53
	Strongly Disagree	1	0.21
	Disagree	3	0.62
Errors can be fixed quickly	Somewhat Disagree	20	4.14
	Agree	375	77.64
	Strongly Agree	84	17.39
	Strongly Disagree	0	0.00
Guides and instructions are easy to understand	Disagree	3	0.62
	Somewhat Disagree	29	6.01
	Agree	370	76.60
	Strongly Agree	81	16.77
	Strongly Disagree	0	0.00
	Disagree	3	0.62
	Somewhat Disagree	27	5.59
	Agree	371	76.84
	Strongly Agree	82	16.99
	Strongly Disagree	0	0.00
	Disagree	3	0.62
	Somewhat Disagree	13	2.69
	Agree	378	78.26
	Strongly Agree	89	18.43

Analysis of project viability: Product, market, finance, and organization

This section presents empirical data regarding the viability of developing the SIM-DINKES system, considering product characteristics, market demand, and financial and organizational feasibility. Research findings indicate strong project viability from a product perspective, driven primarily by the urgent need for service integration, reduced workloads, and increased administrative efficiency. Participants noted that system redundancy hampers efficiency, forcing staff to repeatedly enter the same data across different platforms. As one respondent observed, “Medical center staff are overwhelmed by the sheer number of reporting applications... integration is needed so that reports are interconnected” (R03). System maintenance issues

were also cited as a major obstacle, particularly when updates disrupt ongoing reporting tasks. One informant stated that “Maintenance remains problematic... new features are constantly being added, preventing medical facilities from entering data” (R01). These challenges underscore the need for a unified platform with stable functionality and a predictable update cycle. Overall, stakeholders highly valued the product’s benefits, including faster access to information and improved inter-institutional coordination. One user emphasized that “Information arrives quickly, and the response is fast, too... it helps us a great deal” (R21). The findings confirm the product’s strong viability, provided the platform prioritizes integration, security, user-friendliness (user-centric design), and stable functional development.

The project's market viability is assessed based on user readiness, demand levels, and the potential for adoption across institutions and among the general public. Stakeholders identified widespread awareness-raising and systematic promotion as essential prerequisites for mass adoption. As one participant noted, "Without large-scale awareness-raising, people will not feel the need for this system" (R03). In reality, implementation is expected to occur primarily in medical facilities during the initial phase, driven by mandatory reporting requirements. It was noted that "Private hospitals have structural ties to government bodies; they are required to implement national programs" (R04). This creates a solid foundation for institutional-level implementation. Drawing on past experience, one respondent observed that "Sometimes people use the system only sporadically, and if errors occur, they simply stop using it" (R26). Consequently, operational reliability during the implementation phase is considered a key factor determining user willingness to adopt the system permanently.

The project's financial viability is assessed in terms of funding sustainability, cost-benefit analysis, and projected long-term maintenance costs. Stakeholders emphasized that the SIM-DINKES system should be viewed as a long-term regional investment project rather than a short-term technological initiative. As one respondent remarked, "I sincerely hope that all improvements will be sustained and remain beneficial, and that the work will stop halfway through" (R03). Funding stability depends on the state of the regional budget and the authorities' willingness to support the project. One participant explained, "Budgets were cut during the COVID pandemic... but if the financial situation remains stable, the system will continue to develop" (R04). At the same time, the project's financial viability is bolstered by opportunities for collaboration; universities and research institutes can facilitate continuous innovation. It was noted that "Universities can conduct research within the framework of joint projects" (R15).

The project's organizational feasibility is influenced by management support, governance structure, human resource capacity, and regulatory mechanisms. Support from leadership, particularly at the Badung Regency administration level, was identified as a key success factor. Participants repeatedly noted that institutional collaboration is established more effectively when official directives are in place. For instance, the view was expressed that "If the regent issues an official directive, other agencies will follow suit" (R22). Operational readiness was rated positively, thanks to the monitoring and reporting mechanisms already in place within the Health Office. One respondent highlighted this advantage, "We submit daily reports making tracking progress easier" (R01). At the same time, participants explicitly pointed to departmental insularity as an organizational challenge, noting that "Sectoral selfishness within units acts as a barrier to cooperation" (R22).

Quantitative analysis of user acceptance of SIM-DINKES system prototype features

Characteristics of Disease Spread Tracking, Emergency Assistance, and Home Care features by respondents

An analysis of the various features' characteristics by respondents who utilized the SIM-DINKES prototype (specifically the Disease Spread Tracking, Emergency Assistance, and Home Care features) revealed relatively similar demographic profiles. Regarding the Disease Spread Tracking feature, the majority of

respondents were women (271 out of 364; 74.45%), while 93 were men (25.55%). In terms of education, the largest group consisted of individuals who had completed secondary or vocational school (or held an equivalent qualification): 211 out of 364 respondents (57.97%). Regarding occupation, the majority were salaried employees, civil servants, or members of the Indonesian National Armed Forces (TNI) or the Indonesian National Police (POLRI) totaling 114 out of 364 respondents (31.32%). Similar results were obtained from the analysis of the Emergency Assistance and Home Care features ([Table 1](#)).

Evaluation of the Disease Spread Tracking prototype feature by respondents

The majority of the 364 respondents reported a highly positive experience using the system. For instance, when evaluating the app's utility for obtaining information on disease spread, 257 respondents (70.60%) expressed agreement, while 105 (28.85%) expressed strong agreement. Similarly, regarding the assessment of the application's impact on quality of life and public health, the vast majority of respondents gave a positive answer: 286 participants (73.08%) agreed that the application is beneficial, while 92 (25.27%) strongly agreed with this statement. The evaluation results also indicate a high level of system usability and reliable error management. When asked whether the feature was easy to learn, 275 users (75.55%) answered affirmatively, and 78 (21.43%) strongly agreed. Furthermore, regarding the function's usability, 277 out of 364 participants (76.10%) expressed agreement, and 80 (21.98%) expressed strong agreement. Finally, the prototype demonstrated effective navigation and user support; specifically, regarding the ability to quickly correct errors: 269 out of 364 respondents (73.90%) agreed, and 75 (20.60%) strongly agreed ([Table 2](#)).

Evaluation of the Emergency Assistance prototype feature by respondents

An analysis of respondent opinions regarding the Emergency Assistance feature in the SIM-DINKES prototype showed that the majority viewed its use positively. Regarding the application's utility for emergency service organization, 242 out of 364 respondents (66.48%) expressed agreement, and 122 (33.52%) expressed strong agreement. Similarly, the feature was recognized as capable of improving quality of life and public health through the operation of emergency services: 260 out of 364 respondents (71.43%) agreed with this statement ([Table 3](#)).

Evaluation of the Home Care prototype feature by respondents

Table 4 presents the results of a comprehensive evaluation of the prototype Home Care feature by respondents, covering various parameters of its usability and functionality. Overall, the data indicate a highly positive user experience. For instance, regarding the app's utility for organizing home care services, approximately 309 out of 483 respondents (63.94%) expressed agreement, while 170 (35.23%) expressed strong agreement. Similarly, when assessing whether the prototype contributes to improving the population's quality of life and health through home care services, the vast majority responded positively: 339 out of 483 participants (70.19%) agreed, and 140 (28.97%) strongly agreed. The evaluation results also highlight the system's high level of usability and reliable error management. When asked

whether the system's Home Care feature was easy to learn, 363 out of 483 users (75.16%) agreed, while 103 (21.33%) expressed strong agreement in this regard. Furthermore, the prototype demonstrated the effectiveness of its user guidance system; specifically, regarding the ability to quickly correct errors metric, 371 out of 483 respondents (76.84%) agreed with the statement, while 82 (16.99%) strongly agreed ([Table 4](#)).

Discussion

Research findings indicate that the development of the SIM-DINKES system in Badung Regency is not merely a strategic necessity but also an operational priority for accelerating the digital transformation of the local health system. This approach enjoys public support, with the community endorsing the acceleration of healthcare digitalization at the local level. Positive outcomes are further reinforced by the strong political will of senior leadership and support from the executive branch, serving as key factors in the system's institutional implementation. Stakeholders have repeatedly emphasized that leadership commitment is essential to legitimize the program's direction, ensure inter-agency coordination, and maintain continuity across different administrative terms. This observation aligns with empirical evidence suggesting that governance stability, policy directives, and leadership-driven prioritization are critical factors for successful digital transformation in the public sector [15]. In the case of Badung Regency, political support is manifested through the establishment of periodic monitoring mechanisms and structured inter-agency coordination platforms, as well as the program's formalization via regulations that ensure its sustainability.

The results also demonstrate that implementing integrated digital workflows requires a robust regulatory framework, particularly regarding mobility, the division of responsibilities, and the legal authority of healthcare workers. Stakeholders noted that delays in approval processes, inconsistencies regarding service delivery authority, and unclear accountability mechanisms hinder workflow efficiency. These concerns resonate with institutional theory, which posits that technology implementation is more successful when regulatory systems are aligned with administrative workflows and accountability structures [16].

Furthermore, implementation readiness depends heavily on strategies for systematic capacity building. Stakeholders emphasized that digital literacy levels vary both among healthcare workers and across different levels of the institutional hierarchy. Preferred training formats include context-specific demonstrations, role-based training, and practical sessions utilizing simulations. This approach is supported by literature identifying staff readiness as a key factor in technology acceptance and a behavioral predictor of its implementation in public health [17].

Regarding usability, the results confirm that user-centric interface design is a critical factor in system adoption. Stakeholders expressed a clear preference for solutions such as integrated dashboards, single sign-on mechanisms, minimized data duplication, and the automatic synchronization of service delivery operations [18].

This study also analyzes respondent reactions to the presented prototype. The research demonstrates a high level of acceptance and perceived utility for the SIM-DINKES prototype, alongside a positive perception of its impact on public health and quality of

life; factors facilitating system adoption include ease of use and user satisfaction, as well as the role of Disease Spread Tracking feature in meeting information and health monitoring needs. The benefits of digitizing healthcare services have also been noted in other studies. Based on our findings, it can be concluded that the developed digital technology has facilitated communication in an era of increasing automation and improved the quality of public health services in Indonesia. The positive response to digitalization aligns with the goal of improving quality of life (supported by 73.08% of respondents) and facilitating access to information (74.18%) and health monitoring (75.27%), as demonstrated in this study.

Regarding emergency services, the majority of respondents agreed that the digitalization of healthcare using such a prototype could facilitate access to emergency care (71.15%) and simplify the retrieval of necessary information (71.98%). At the same time, a study by Leonardsen et al. showed that the exchange of digital messages among staff had a negative impact on professional communication within the context of healthcare system digitalization [19].

The digitalization of home care services has a significant positive impact, particularly in improving access to (and the affordability of) medical services, strengthening care coordination, and enhancing communication among patients, healthcare professionals, and caregivers through the use of technologies, such as teleconsultations, medical applications, instant messaging systems, and remote monitoring systems [18].

The implementation of digital home care services continues to face a number of challenges, such as limited access and underdeveloped technological infrastructure, difficulties in workforce management, barriers to technology-mediated communication, and evidence suggesting that the impact on clinical outcomes is not always significant [20]. According to the findings of this study, the SIM-DINKES system functions simultaneously as a technological platform and a management tool, institutionalizing collective responsibility for the performance outcomes of the healthcare system.

Study limitations

This study has several limitations. Notably, data collection was conducted at a single point in time, preventing an assessment of the stability of satisfaction levels or respondent answers (which would have required periodic measurements). The study did not examine limitations associated with the use of the prototype per se. Furthermore, the internal consistency (e.g., Cronbach's alpha coefficient) of the adapted instrument was not re-evaluated for this specific sample.

Conclusion

The study confirms that the development of the SIM-DINKES is feasible and strategically essential for the digital transformation of healthcare in Badung Regency. The results indicate that SIM-DINKES can serve as an integrated platform for delivering services to the public, facilitating data exchange between healthcare facilities, and supporting evidence-based decision-making. Stakeholders identified several key success factors: strong leadership commitment, a clear regulatory framework, workforce adaptability, and the availability of integrated, dynamic data. Analysis of user acceptance demonstrated high levels of perceived

usefulness, usability, and satisfaction, with the Home Care feature seeing the most widespread adoption. Implementing the system will require a phased approach, strengthened inter-agency collaboration, and ongoing infrastructure support to ensure equitable access to services. Overall, SIM-DINKES holds significant potential to become a regional benchmark for digital health ecosystem development, contributing to improved health outcomes and enhanced service efficiency within the smart city framework.

Acknowledgments

The authors express their gratitude to the Badung Regency Health Office, provincial authorities, and participating medical facilities for providing access to departmental data and facilitating fieldwork. Special thanks go to all respondents – including members of the public and frontline healthcare workers – for sharing their opinions and valuable insights. The contributions of the digital solution development teams and regulatory staff who reviewed the system architecture and implementation plan are also acknowledged.

Conflict of interest

The authors declare no conflicts of interest.

Funding

This study received no external financial support from commercial, government, or nonprofit organizations.

Author contributions

All authors contributed equally to the implementation of the study

Ethical considerations

Prior to data collection, the study received approval from the Udayana University Ethics Committee (approval number: 2720/UN 14.2.2.VII.14/ILT/2024). The Ethics Committee thoroughly reviewed and approved the consent procedures (including electronic informed consent) and the digital data collection methods used in the study. All potential participants received detailed information regarding the study objectives, procedures, risks, and confidentiality. Informed consent was obtained (verbally, in writing, or electronically) before interviews, FGDs, and the completion of digital questionnaires. Participation was voluntary; respondents had the right to withdraw at any stage without consequence. To protect confidentiality, all participant data, including their responses in digital questionnaires, were fully anonymized prior to analysis. Personally identifiable information was removed during transcription and data processing and replaced with an anonymous code. All recordings, transcripts, and data files were stored securely; access to them was restricted to authorized members of the research team.

Data availability

The datasets generated and analyzed during the study are not publicly available due to confidentiality agreements with the relevant government agencies; however, anonymized data may be provided upon reasonable request to the corresponding author. Access is granted solely for academic and noncommercial purposes, subject to ethical approval and compliance with institutional clearance procedures.

AI use statement

No artificial intelligence (AI) technologies or AI-based tools were used in the planning and conducting of this study, data analysis, or manuscript preparation.

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