

Khanza Hospital Information System and Outpatient Service Efficiency at Bhayangkara Brimob Hospital

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Dikirim 14 April 2026; *Diterima dalam bentuk revisi* 15 Mei 2026; *Diterima* 30 Juli 2026; *Diterbitkan* 10 September 2026. Semua hak dilindungi oleh Lembaga Penelitian dan Pengabdian Masyarakat (LPPM) STM IK Indonesia Banda Aceh.

Abstrak

Penelitian ini menganalisis penerapan Sistem Informasi Manajemen Rumah Sakit (SIMRS) Khanza pada layanan rawat jalan di Rumah Sakit Bhayangkara Brimob, Depok, serta kontribusinya terhadap efisiensi layanan yang dirasakan dan efisiensi berbasis proses. Studi lapangan dilakukan pada tahun 2025 menggunakan desain kualitatif deskriptif. Sebanyak 38 partisipan dipilih secara purposif: 29 informan utama dari bagian pendaftaran, poliklinik rawat jalan, farmasi, kasir/keuangan, dan teknologi informasi, serta sembilan informan triangulasi yang memegang peran koordinasi atau pengawasan. Data dikumpulkan melalui wawancara mendalam terpandu dengan pertanyaan terbuka, observasi langsung, dan telaah dokumen. Rekaman wawancara ditranskripsikan, dikelompokkan berdasarkan karakteristik partisipan dan unit kerja, serta dianalisis menggunakan lima dimensi implementasi infrastruktur, sumber daya manusia, prosedur operasional standar, pengawasan, dan sistem eksternal beserta isu-isu teknis dan kegunaan yang muncul berulang kali. Temuan diperkuat melalui triangulasi lintas sumber. Khanza mendukung alur informasi yang terintegrasi, dokumentasi klinis dan peresepan elektronik, proses farmasi dan keuangan yang lebih terstruktur, aksesibilitas data yang lebih baik, serta koordinasi antarunit yang lebih optimal. Namun, manfaat tersebut terkendala oleh ketergantungan pada satu penyedia layanan internet, pembaruan sistem yang tidak seragam, kesalahan perangkat lunak, kompleksitas antarmuka, integrasi perangkat medis yang belum lengkap, kesalahan input data, serta pengawasan dan tingkat adopsi pengguna yang tidak merata. Penelitian ini menunjukkan adanya kontribusi positif terhadap efisiensi rawat jalan yang dirasakan dan efisiensi berbasis proses, alih-alih efisiensi ekonomi atau waktu yang dapat dikuantifikasi. Penguatan tata kelola, pelatihan berbasis peran, pemantauan sistematis, redundansi jaringan, aspek kegunaan, validasi data, dan interoperabilitas sangat disarankan.

Kata Kunci: Sistem Informasi Rumah Sakit; Perawatan Rawat Jalan; Efisiensi Layanan; Kesehatan Digital; Khanza.

Abstract

This study analyzes the implementation of the Khanza Hospital Management Information System in outpatient services at Bhayangkara Brimob Hospital, Depok, and its contribution to perceived and process-based service efficiency. The field study was conducted in 2025 using a descriptive qualitative design. Thirty-eight participants were selected purposively: 29 main informants from registration, outpatient clinics, pharmacy, cashier/finance, and information technology, and nine triangulation informants in coordinating or supervisory roles. Data were collected through guided in-depth interviews with open-ended questions, direct observation, and document review. Interview recordings were transcribed, organized by participant characteristics and work units, and analyzed using five implementation dimensions—infrastructure, human resources, standard operating procedures, supervision, and external systems—together with recurring usability and technical issues. Findings were strengthened through cross-source triangulation. Khanza supported integrated information flow, electronic clinical documentation and prescriptions, more structured pharmacy and financial processes, improved data accessibility, and better inter-unit coordination. Nevertheless, these benefits were constrained by dependence on a single internet provider, non-uniform updates, software errors, interface complexity, incomplete medical-device integration, data-entry errors, and uneven supervision and user adoption. The study therefore supports a positive contribution to perceived and process-based outpatient efficiency rather than quantified economic or time efficiency. Strengthening governance, role-based training, systematic monitoring, network redundancy, usability, data validation, and interoperability is recommended.

Keyword: Hospital Information System; Outpatient Care; Service Efficiency; Digital Health; Khanza.

1. Introduction

Hospital information systems have become an important component of hospital management because clinical, administrative, pharmaceutical, financial, and reporting activities depend on timely and accurate information. A Hospital Management Information System integrates these activities into a coordinated information flow that supports diagnosis and treatment, medical records, pharmacy management, billing, human resources, and managerial control. In Indonesia, the current policy environment increasingly emphasizes digital and electronic health records. Minister of Health Regulation No. 24 of 2022 requires health facilities to implement electronic medical records, while Law No. 17 of 2023 provides the broader contemporary legal framework for health services and health information governance (Kementerian Kesehatan Republik Indonesia, 2022; Republik Indonesia, 2023). Implementation, however, has developed unevenly across hospitals. As a historical baseline, the Indonesian Ministry of Health reported that by September 2017, 52.05% of hospitals had implemented a hospital management information system, while other hospitals had systems that were not fully functional, had not implemented a system, or had not reported their implementation status (Kementerian Kesehatan Republik Indonesia, 2017). Although this figure should not be interpreted as the current national rate, it illustrates a persistent implementation lesson: acquiring software alone does not ensure successful digital transformation. Operational readiness, user competence, infrastructure resilience, procedures, supervision, and interoperability remain critical to system performance (Yayasan SIMRS Khanza, 2017). Bhayangkara Brimob Hospital in Depok provides healthcare services for police personnel, their families, and the general public. The hospital has experienced increasing outpatient utilization, with 120,845 polyclinic visits in 2023 and 134,946 visits in 2024. Before 2019, patient registration, medical records, prescriptions, diagnostic requests, billing, and reporting relied heavily on paper documents and manual transfer of information between units. As service volume and process complexity increased, this manual workflow created risks of slow document retrieval, duplicated work, recording errors, delayed reporting, and fragmented information. In 2019, the hospital began using Khanza, an open-source hospital management information system designed to integrate service, administrative, reporting, and coordination processes (Kementerian Kesehatan Republik Indonesia, 2014).

Previous studies indicate that hospital information system performance is strongly affected by human, organizational, and technological factors. Sudiarti, Soepangat, and Wiyono (2019) found that staffing and competency gaps could constrain system development and registration activities (Sudiarti *et al.*, 2019). Suryantoko, Agnes, and Faisol (2020) identified the need to strengthen brainware, hardware, software, training, maintenance, work instructions, and system integration (Suryantoko *et al.*, 2020). Aprilianingsih, Listina, and Kayrus (2022) similarly reported that user satisfaction, management support, monitoring, hardware quality, and system development influenced the effectiveness of hospital information system use (Aprilianingsih *et al.*, 2022). Romadhoni (2020) emphasized the need for special training, adequate infrastructure, and consistent operating procedures (Romadhoni, 2026). These studies suggest that digital hospital services should be evaluated as a socio-technical process rather than as a software issue alone, consistent with the socio-technical perspective proposed by Sittig and Singh (2015) (Sittig & Singh, 2010). The present study addresses this issue by examining Khanza implementation in outpatient services through five dimensions: infrastructure, human resources, standard operating procedures, supervision, and external systems. It also considers usability problems and service efficiency. In this study, efficiency is understood as the ability to improve service output with available resources or to reduce unnecessary inputs and process steps while maintaining service output. In the hospital context, this principle can be observed qualitatively through reduced manual steps, faster availability of information, more integrated workflows, fewer avoidable errors, and better coordination across service units. Accordingly, this study aims to identify implementation issues, describe barriers and challenges, determine usability aspects requiring improvement, and analyze how Khanza supports outpatient service efficiency at Bhayangkara Brimob Hospital. Figure 1 summarizes the analytical

relationship used in this study between implementation conditions, workflow mechanisms, and perceived process efficiency (Hayati & Budi, 2025).

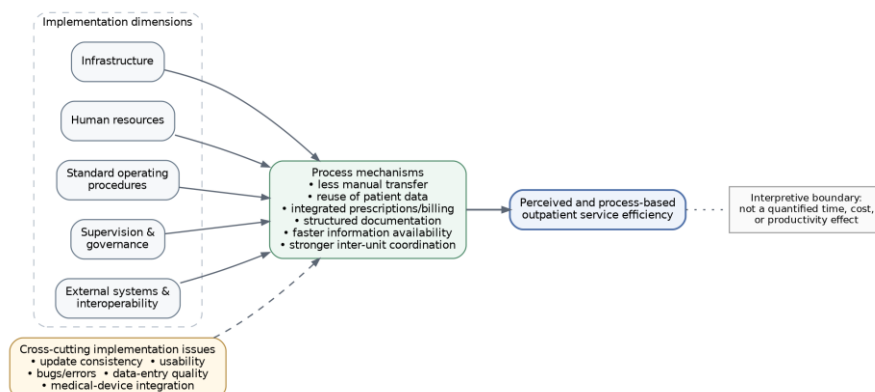


Figure 1. Analytical framework linking Khanza implementation dimensions to perceived and process-based outpatient efficiency

2. Research Methodology

2.1 Study Design and Setting

This study employed a descriptive qualitative design to examine how the Khanza Hospital Management Information System was implemented in the outpatient service environment of Bhayangkara Brimob Hospital, Depok. The qualitative approach was appropriate because the study focused on operational experiences, workflow changes, user practices, implementation barriers, usability concerns, and coordination across service units rather than on statistical estimation of system effects. The unit of analysis was the outpatient service process supported by Khanza, including registration, clinical care, supporting services, pharmacy, administration or cashier functions, and information technology support. The field study was conducted during the 2025 research period at Bhayangkara Brimob Hospital, Depok. Reporting the study year is relevant because Khanza had been used at the hospital since 2019 and the analysis reflects the operational configuration, user practices, and integration conditions observed during the 2025 study period.

2.2 Participants and Sampling

Participants were selected purposively because they were directly involved in using, managing, coordinating, or supervising Khanza in outpatient services. A total of 38 informants participated, consisting of 29 main informants and nine triangulation informants. The main informants represented registration staff, outpatient nurses, pharmacy assistants, cashier or finance staff, and information technology staff. The triangulation informants represented coordinating or supervisory roles, including the registration coordinator, outpatient unit heads or persons in charge, pharmacy supervisors, and information technology supervisors or persons in charge. Participants were 25-48 years of age and had educational backgrounds ranging from senior high school to undergraduate level. Across the sample, six participants had senior-high-school education, 19 held diploma-level qualifications, and 13 held undergraduate qualifications. Eligibility was based on direct functional involvement in using, managing, coordinating, or supervising Khanza rather than on a minimum tenure threshold. Sample adequacy was addressed through coverage of all predefined operational roles in the outpatient pathway and the inclusion of supervisory counterparts for triangulation. The source thesis did not document a separate formal saturation stopping rule; therefore, the present article describes adequacy in terms of functional coverage and cross-role triangulation rather than claiming formal saturation.

Table 1. Distribution of Participants By Functional Unit and Research Role

Functional Unit	Main Informants	Triangulation Informants	Total	Role Represented
Registration	6	1	7	Registration staff and coordinator
Outpatient clinics	16	4	20	Nurses and clinic heads
Pharmacy	3	2	5	Pharmacy assistants and supervisors
Cashier / finance	1	0	1	Cashier/finance staff
Information technology	3	2	5	IT staff and SIMRS supervisors

2.3 Data Collection

Three complementary methods were used. First, in-depth interviews explored participants' experiences of using Khanza, perceived benefits, technical and non-technical barriers, training, usability, data-entry practices, coordination, supervision, and support. Second, direct observation examined how Khanza was used during registration, outpatient examination, supporting services, pharmacy, administration, and cashier activities. Third, document review covered system-related manuals, implementation documents, workflow information, standard operating procedures, and service records relevant to outpatient operations. Using these three sources allowed the study to compare what participants reported with observed workflow and documentary evidence. In-depth interviews were conducted using an interview guide containing open-ended questions so that participants could explain their experience of Khanza, barriers encountered, perceived operational effects, training, coordination, and improvement needs in their own terms. The thesis records that interview data were audio-recorded and subsequently transcribed into written form for analysis. Direct observation was guided by an observation checklist covering workflow, system use, procedural conformity, and technical or non-technical obstacles. Document review used a structured analysis format to examine manuals, implementation documents, standard operating procedures, workflow records, and relevant service information. The supplied thesis does not report a standardized interview duration, and no duration is introduced in this article to avoid reconstructing information that was not documented.

2.4 Data Analysis and Triangulation

Interview data were transcribed and organized according to participant characteristics and work units. The analytical process followed four linked stages documented in the thesis: data collection, data grouping, problem identification, and synthesis of findings. Within the grouping stage, evidence was mapped to five predefined implementation dimensions: infrastructure, human resources, standard operating procedures, supervision, and external systems. Recurring cross-cutting issues were then identified, including network limitations, non-uniform system updates, interface complexity, software errors, incomplete medical-device integration, data-entry errors, and uneven user adoption. The final synthesis examined how these conditions influenced information flow, duplication of work, administrative burden, data accuracy, coordination, and continuity of outpatient services. Triangulation was performed across participant groups and data-collection methods. Statements from operational users were compared with information from coordinating or supervisory informants and then checked against direct observation and relevant documents where available. Convergence across these sources was treated as stronger evidence than a finding based on a single source. Differences between sources were retained as implementation issues rather than forced into a single interpretation. This strategy strengthened the credibility of the findings while remaining consistent with the descriptive qualitative design. Efficiency was interpreted as perceived and process-based efficiency. It referred to qualitative evidence of fewer manual steps, reduced duplicate recording, faster availability of information, improved continuity of information across units, more

structured documentation, and better coordination while using existing organizational resources. The study did not employ a time-motion design, standardized productivity measure, or cost-efficiency analysis; therefore, the analysis does not claim quantified economic or temporal efficiency.

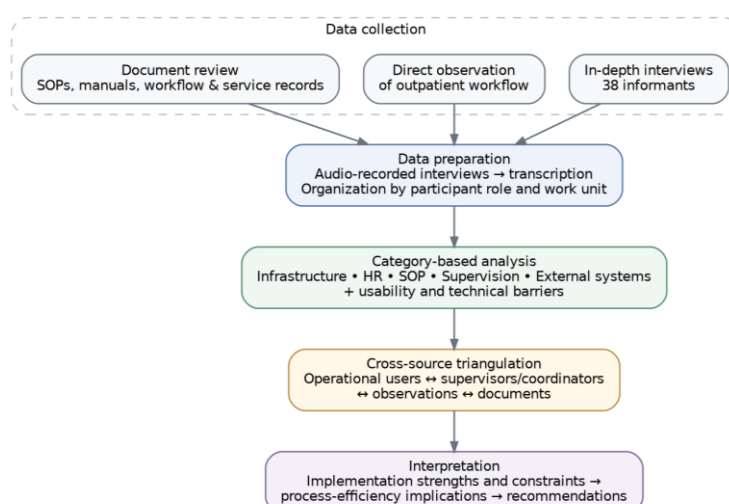


Figure 2. Data Collection, Category-Based Analysis, and Cross-Source Triangulation Used In The Study

2.5 Ethical Considerations

Participant confidentiality was protected in the research report by using initials and by presenting findings primarily at the level of role and work unit. The supplied thesis does not state a formal ethics committee approval number, approval date, or the mode of informed consent. Because these items cannot be reconstructed reliably from the manuscript alone, they should be verified against the original institutional research records before journal submission. No ethics approval number or consent procedure has been invented in this article.

3. Result and Discussion

3.1 Results

3.1.1 Integrated Outpatient Workflow

Across interview, observation, and document sources, Khanza was identified as the central information platform connecting registration, outpatient clinics, supporting services, pharmacy, administration, and cashier functions. Patient identity and administrative data entered at registration could be retrieved by the destination clinic; clinical documentation could be recorded in Subjective, Objective, Assessment, and Plan format; laboratory or radiology requests could be transmitted through the system; electronic prescriptions could be forwarded to pharmacy; and recorded services could subsequently support billing and reporting. The principal process change was therefore not merely the digitization of isolated tasks, but the creation of a more continuous information flow across the outpatient pathway. Figure 3 summarizes the service and information flow reconstructed from the research documentation and observations (Wahyuni *et al.*, 2025). Participants described easier retrieval and reuse of information, less repeated manual recording, and more structured service documentation. Direct observation was consistent with these descriptions because information generated upstream was available to downstream units without relying entirely on physical transfer of paper files. These findings indicate perceived and process-based efficiency through reduced

fragmentation and duplication; however, they do not provide a numerical estimate of waiting-time reduction or productivity gain (Fachruddin *et al.*, 2025).

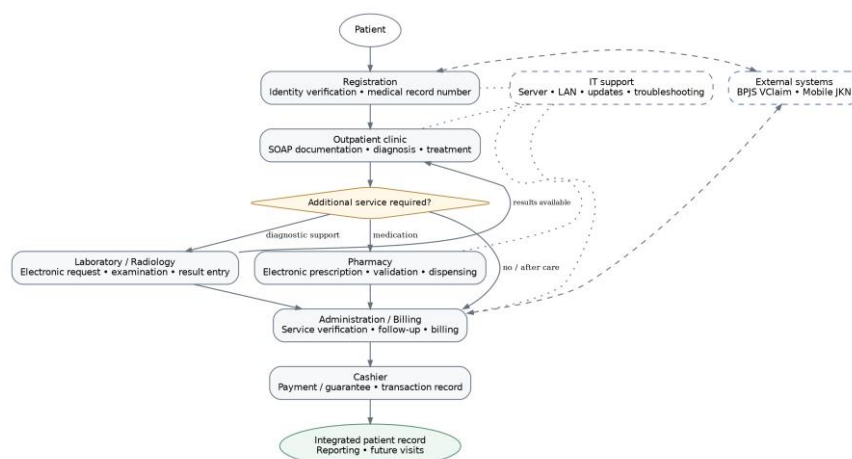


Figure 3. Khanza-supported Outpatient Service and Information flow at Bhayangkara Brimob Hospital

Table 2. Triangulated Evidence For Principal Findings

Theme	Evidence from data sources	Analytic interpretation
Integrated workflow	Interviews: users reported easier retrieval, reuse, and transfer of patient/service information. Observation/documents: registration, clinical documentation, requests, prescriptions, billing, and reporting were connected through Khanza.	Khanza reduced information fragmentation and repeated administrative handling across outpatient units.
Infrastructure	Interviews (IT and service units): internal operation was generally perceived as adequate, whereas external synchronization was vulnerable to internet interruption. Document/system data: Xeon Silver server, 64 GB memory, approximately 1.2 TB storage, >150 computers, LAN coverage, and approximately 150 simultaneous active users. Observation: routine internal Khanza access was available across major outpatient units.	Internal digital operation had a sufficient operational base, but the single internet provider created a continuity risk for external services.
Human resources	Interviews (registration, clinic, pharmacy, cashier, IT): training supported routine use and inter-unit coordination, but competence and adoption were uneven. Participant profile: 38 informants represented operational and supervisory roles. Operational evidence: data-entry errors and incomplete electronic documentation were still reported in some situations.	Staff availability supported operation, but digital competence and consistent adoption remained determinants of performance.
Standard operating procedures	Interviews and documents: SOPs were available for registration, outpatient clinics, pharmacy/supporting services, and cashier	SOP availability supported standardization, but consistent application

	functions and were generally considered understandable. Observation: work followed structured registration, clinical documentation, supporting-service, prescription, and transaction processes.	depended on socialization and supervision.
Supervision and governance	Interviews (IT and supervisors): monitoring mainly occurred through assistance and education, often via unit representatives. Organizational evidence: the study did not identify a dedicated team with a structured routine mechanism for utilization monitoring, update coordination, and continuous evaluation.	Weak formal governance limited early detection of inconsistent use, update problems, and training needs.
External integration and interoperability	Interviews (IT): Khanza was integrated with BPJS VClaim and had Mobile JKN connectivity that still required adjustment. Observation/documents: some diagnostic-device data could be entered into Khanza, but complete automatic integration with all devices was not available.	External integration reduced duplicate administration, but incomplete interoperability and internet dependence created new operational vulnerabilities.
Usability and technical reliability	Interviews: users reported uneven updates, interface complexity, software errors, and data-entry problems. Operational evidence: some workflows remained partially manual because device integration was incomplete.	Usability and reliability problems reduced the efficiency gains achievable from otherwise integrated workflows.

3.1.2 Infrastructure and Network Continuity

The hospital had a server equipped with an Intel Xeon Silver processor, 64 GB of memory, and approximately 1.2 TB of storage, and the study reported approximately 150 simultaneous active users. More than 150 computers, generally with Intel Core i5 processors, 8 GB of memory, and solid-state storage, were distributed across service and support areas. The local area network reached the main outpatient service units. These resources were perceived as sufficient for routine internal access to Khanza. The main infrastructure vulnerability involved external connectivity. The hospital relied on one internet provider and did not have a reported backup connection. This created a single point of failure for external synchronization, particularly functions linked to national health-insurance services. The evidence therefore supports the narrower conclusion that internal infrastructure was operationally adequate according to users and available system data, while network resilience for external services remained insufficient.

3.1.3 Human Resources and User Adoption

Staffing was generally perceived as sufficient to sustain routine outpatient use of Khanza, and training had been provided. Users from registration, clinics, pharmacy, cashier or finance, and information technology reported that system use facilitated coordination. Nevertheless, competence and adoption were not uniform. Some physicians had not fully optimized electronic documentation, while data-entry errors were reported when users were rushed or insufficiently familiar with particular functions. The finding indicates that availability of personnel alone did not guarantee complete digital adoption; competence, familiarity, workload conditions, and role-specific use also influenced performance.

3.1.4 Standard Operating Procedures

Standard operating procedures were available for major outpatient functions, including registration, outpatient clinics, pharmacy or supporting services, and cashier processes. Participants generally described the procedures as understandable and useful for standardizing work. Documentary and observational evidence supported the existence of structured workflows for data entry, clinical documentation, prescriptions and supporting-service processing, and transactions. The remaining issue was not the absence of procedures, but the need for stronger socialization, monitoring, and reinforcement so that procedures were implemented consistently across users and after system changes.

3.1.5 Supervision and System Governance

Supervision was the least developed implementation dimension. Monitoring primarily took the form of assistance and education during implementation or when problems occurred, and information was often delivered through representatives from each work unit. The study did not identify a dedicated governance team with a structured schedule for routine utilization review, update coordination, compliance monitoring, incident review, and continuous improvement. This gap increased the risk that variations in practice, incomplete adoption, update inconsistencies, and recurring technical problems would be detected only after they affected operations.

3.1.6 External Integration and Interoperability

Khanza was integrated with the national health-insurance VClaim service, supporting eligibility verification and insurance administration within the hospital workflow. Integration with Mobile JKN was also available, although users reported that further adjustment was required. These integrations reduced the need for completely separate administrative processes. At the same time, their performance depended on stable external connectivity. Interoperability with diagnostic equipment was less complete: some ultrasound and electrocardiography data still required manual transfer into the system. This residual manual work created additional process steps and potential transcription error.

3.1.7 Usability and Technical Reliability

Four recurring technical and usability issues were identified. First, system updates were not always implemented at the same time across service units, creating the possibility of version differences and inconsistent user experience. Second, some parts of the interface were considered insufficiently intuitive, particularly for users with less technological familiarity. Third, software bugs and errors continued to occur and resolution times were not always consistent. Fourth, manual transfer remained necessary where medical-device integration was incomplete. In addition, data-entry errors were associated with time pressure and uneven familiarity with system functions. Together, these issues reduced the degree to which workflow integration translated into consistently efficient use.

Table 3. Khanza Implementation Dimensions and Process-Efficiency Implications

Dimension	Main finding	Process-efficiency implication
Infrastructure	Internal server, computers, and LAN were perceived as sufficient for routine operation; external connectivity depended on one provider.	Supports integrated internal access but exposes external services to downtime risk.
Human resources	Staffing and training supported routine use, but competence, documentation practices, and adoption were uneven.	Enables routine digital operation, but variability can produce errors, incomplete use, and workarounds.
Standard operating	Procedures were available and	Supports standardization and

procedures	understood in major outpatient units.	reduces variation when applied.	avoidable when consistently
Supervision and governance	Monitoring was mainly assistance/education; no dedicated structured monitoring mechanism was reported.	Weakens early detection of inconsistent use, update problems, and recurring operational risks.	
External systems and interoperability	VClaim and Mobile JKN integration were available; device integration remained incomplete.	Reduces duplicate administration but increases dependence on internet reliability and creates manual steps where interoperability is incomplete.	
Usability and technical reliability	Uneven updates, interface complexity, software errors, and data-entry problems persisted.	Can increase cognitive and administrative burden and reduce the efficiency benefit of an integrated system.	

3.1.8 Overall Contribution to Perceived and Process-based Efficiency

Taken together, the findings indicate a positive but incomplete contribution of Khanza to outpatient process efficiency. The system reduced dependence on paper-based information transfer, enabled reuse of data entered upstream, connected prescriptions with pharmacy processes, and made service information available for billing and reporting. Users also described improved accessibility and coordination. However, efficiency gains were moderated by network dependency, incomplete interoperability, usability limitations, data-entry errors, uneven adoption, and weak structured supervision. The appropriate interpretation is therefore that Khanza supports perceived and process-based efficiency; the study does not establish the magnitude of time savings, cost savings, or productivity improvement.

3.2 Discussion

The main analytical contribution of this study is the finding that digitalization changes the location of inefficiency rather than automatically eliminating it. Before Khanza, inefficiency was concentrated in paper movement, repeated recording, fragmented information, and manual coordination. After digital integration, the dominant constraints shifted toward network dependence, governance, update coordination, usability, interoperability, data quality, and uneven user adoption. This shift is important because it shows that hospital digital transformation should be evaluated as a socio-technical process rather than as a software-installation outcome. System performance is produced by the interaction of technology, people, workflow, organizational support, and external systems (Sittig & Singh, 2010). The Indonesian context strengthens this interpretation. Herawati *et al.* (2022) identified governance, human resources, infrastructure, management information systems, and JKN information systems as important inputs in strengthening health information systems, while bridging/interoperability and data utilization were important outputs. More recently, Hossain *et al.* (2025), in a qualitative study of hospitals in Indonesia, reported that EMR implementation continued to depend on technological infrastructure, staff digital skills, and organizational recordkeeping culture (Hossain *et al.*, 2025). The present findings are consistent with these national observations but add a specific outpatient workflow perspective: even where hardware, staffing, and SOPs are generally available, efficiency can remain constrained by weak monitoring, inconsistent adoption, external connectivity risk, and incomplete device integration. This interpretation is also consistent with Indonesia's current direction toward electronic medical records under Minister of Health Regulation No. 24 of 2022, which places greater importance on reliable digital documentation and system integration (Kementerian Kesehatan Republik Indonesia, 2022).

Khanza reduced repeated recording and physical transfer of information by allowing data entered in one unit to be reused by subsequent units. This is a meaningful process improvement because outpatient services depend on rapid exchange of administrative, clinical, pharmaceutical, diagnostic, and financial information. Nevertheless, digital integration creates a new dependency: when a shared platform, network connection, or external service is disrupted, multiple downstream units may be affected simultaneously. The absence of a backup internet connection is therefore not a minor technical issue but a continuity-of-service risk, particularly for VClaim and other externally connected functions. This finding also clarifies why hardware adequacy should not be equated with digital resilience. A hospital can have sufficient computers and server capacity while remaining vulnerable because of connectivity, update coordination, incident management, or interoperability. Hossain *et al.* (2025) similarly emphasized that successful EMR adoption in Indonesia requires attention to infrastructure together with staff capability and organizational support. The managerial implication is that infrastructure evaluation should include redundancy, availability, response time, maintenance, and recovery arrangements rather than only equipment specifications (Hossain *et al.*, 2025). The uneven use of electronic documentation and the persistence of data-entry errors show that digital efficiency depends on more than initial training. Users work under different clinical and administrative pressures, and interface design can either reduce or amplify those pressures. Cho *et al.* (2024) found that EHR documentation burden was associated with data redundancy, poor workflow navigation, cumbersome data entry, and non-alignment with clinical workflow (Cho *et al.*, 2024). Park *et al.* (2024) similarly concluded that EHR usability affects satisfaction, performance, and safety and that redesign should address human-factor goals systematically. The Khanza findings are compatible with this evidence: a less intuitive interface, uneven familiarity, and inconsistent updating can increase cognitive burden and encourage partial use or workarounds (Park *et al.*, 2024). Continuous training should therefore be role-based rather than generic. Registration staff, nurses, physicians, pharmacy personnel, finance staff, and IT staff interact with different functions and risks. Training should be linked to recurring errors, new releases, workflow changes, and audit findings. At the same time, training should not be used as the sole response to every user problem; when multiple users experience the same navigation or data-entry difficulty, the root cause may be interface design or workflow configuration rather than individual competence.

Supervision emerged as the weakest implementation dimension and may be the most important organizational improvement opportunity. Assistance delivered through unit representatives is useful for implementation support, but it is not equivalent to structured digital governance. A mature governance mechanism would define system ownership, update authority, incident escalation, user-access responsibilities, change communication, training accountability, utilization monitoring, data-quality review, and improvement priorities. The absence of such a mechanism can allow small inconsistencies to persist across units and reduce the benefits of otherwise adequate infrastructure and SOPs. This governance gap also explains several apparently separate findings. Uneven system updates, inconsistent adoption, variable troubleshooting response, and incomplete monitoring are not only technical or user problems; they indicate a need for coordinated decision rights and routine review. In the Indonesian health-information-system model proposed by Herawati *et al.* (2022), governance and monitoring are central components of system strengthening. Establishing a multidisciplinary Khanza governance team could therefore connect IT management with clinical, administrative, pharmacy, finance, quality, and leadership functions rather than treating system management as the responsibility of IT alone (Herawati *et al.*, 2022). The integration of Khanza with VClaim and Mobile JKN demonstrates the operational value of interoperability because it reduces duplicate administrative work and supports continuity between hospital processes and national insurance services. However, incomplete connection with diagnostic equipment shows that integration is still partial. Torab-Miandoab *et al.* (2023) found that lack of interoperability among heterogeneous health information systems contributes to inefficient use of resources and limits effective information exchange (Torab-Miandoab *et al.*, 2023).

Li *et al.* (2022) likewise reported that EHR interoperability can contribute to improvements in safety, quality, and efficiency, although effects depend on implementation context (Li *et al.*, 2022). For Bhayangkara Brimob Hospital, interoperability improvement should therefore be prioritized according to workflow burden and risk rather than pursued as a purely technical objective. Diagnostic interfaces that eliminate frequent manual transcription may provide greater operational value than low-frequency integrations. The hospital should first identify where data are repeatedly re-entered, where manual transfer delays care, and where transcription errors have the greatest consequence, and then prioritize integration accordingly. The study supports the conclusion that Khanza contributes to perceived and process-based efficiency, but it does not establish quantified efficiency. This distinction is methodologically important. Participants and observations indicated fewer manual steps, better access to information, more integrated prescriptions and billing, and improved coordination; these are credible qualitative indicators of process improvement. However, without pre/post waiting-time data, transaction-time measurement, cost analysis, workload measurement, system-log analysis, or productivity indicators, the magnitude of efficiency improvement cannot be estimated (Epizitone *et al.*, 2023). Future evaluation should combine the present qualitative findings with objective indicators. Useful measures include registration time, clinic waiting time, prescription turnaround time, time from diagnostic request to result availability, frequency of duplicate entry, correction rates, system downtime, failed external synchronizations, paper consumption, staff time per transaction, and patient throughput. A mixed-method design would enable the hospital to determine not only whether users perceive the workflow as better, but also how much time, cost, and error burden are actually reduced.

The findings support six managerial priorities. First, provide network redundancy or an equivalent failover mechanism for externally dependent services. Second, establish a multidisciplinary Khanza governance team with a routine monitoring and evaluation schedule. Third, implement role-based recurrent training linked to actual error patterns and software changes. Fourth, coordinate software updates and maintain a documented release and incident-management process. Fifth, improve interface usability and strengthen data-validation mechanisms where recurrent input errors occur. Sixth, develop a prioritized interoperability roadmap for frequently used diagnostic devices and external services. These interventions address technology, people, workflow, and governance simultaneously and are therefore more likely to produce sustainable improvement than isolated technical upgrades. This study has several limitations. First, it was conducted in a single hospital; therefore, the findings reflect one organizational and technological context and should not be generalized statistically to other hospitals. Second, efficiency was assessed qualitatively through workflow changes and user perceptions rather than through time-motion, cost, productivity, or system-log measurements. Third, comparisons with the pre-Khanza paper-based process relied partly on retrospective accounts and may therefore be affected by recall bias, particularly because Khanza had been used since 2019. Fourth, interview data may be influenced by social-desirability bias because participants discussed a system used within their own organization. Fifth, system usability was not measured using a standardized instrument such as the System Usability Scale. Sixth, the source thesis did not document a separate formal saturation stopping rule, so sample adequacy is reported through functional-role coverage and triangulation. Finally, the supplied thesis did not contain the formal ethics approval number or consent-mode statement required by some journals; those administrative details must be confirmed from the original research records before submission. These limitations do not negate the observed process improvements, but they require cautious interpretation of the strength and magnitude of the efficiency claim.

4. Conclusion

This study indicates that Khanza functions as an integrative digital platform for the outpatient pathway at Bhayangkara Brimob Hospital by linking registration, clinical documentation, supporting

services, pharmacy, administration, and payment processes. Triangulated evidence from interviews, observation, and document review shows that the system supports reuse of information across units, reduces reliance on physical document transfer, structures electronic prescriptions and medical records, improves data accessibility, and facilitates inter-unit coordination. These findings support a positive contribution to perceived and process-based outpatient efficiency. The contribution remains conditional rather than complete. The principal constraints identified in the research are single-provider dependence for external connectivity, non-uniform updates, software errors, interface complexity, incomplete medical-device integration, data-entry errors, uneven user adoption, and the absence of a dedicated structured monitoring mechanism. The findings therefore demonstrate that sustained efficiency depends not only on hardware capacity but also on digital governance, usability, workforce capability, interoperability, data quality, and continuity planning.

Based on these findings, the hospital should establish a multidisciplinary Khanza governance team; conduct routine utilization, incident, and data-quality reviews; provide recurrent role-based training; standardize software-update and troubleshooting procedures; introduce network redundancy; strengthen interface usability and data-validation controls; and prioritize integration with frequently used diagnostic equipment. Future research should combine qualitative evidence with objective indicators such as registration time, clinic waiting time, prescription turnaround time, downtime, error and correction rates, workload, patient throughput, and cost. Until such measurements are available, the present conclusion should be interpreted as evidence of perceived and process-based efficiency rather than a quantified economic or temporal effect.

5. Acknowledgment

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6. References

- Aprilianingsih, M., Listina, F., & Kayrus, A. (2022). Evaluasi sistem informasi manajemen rumah sakit (SIMRS) pada bagian pendaftaran rawat jalan dengan metode Hot-Fit di RS swasta di Lampung tahun 2022. *Jurnal Formil (Forum Ilmiah) Kesmas Respati*, 7(3), 262. <https://doi.org/10.35842/formil.v7i3.450>.
- Cho, H., Nguyen, O. T., Weaver, M., Pruitt, J., Marcelle, C., Salloum, R. G., & Keenan, G. (2024). Electronic health record system use and documentation burden of acute and critical care nurse clinicians: A mixed-methods study. *Journal of the American Medical Informatics Association*, 31(11), 2540–2549. <https://doi.org/10.1093/jamia/ocae239>.
- Epizitone, A., Moyane, S. P., & Agbehadj, I. E. (2023). A systematic literature review of health information systems for healthcare. *Healthcare*, 11(7), 959. <https://doi.org/10.3390/healthcare11070959>.
- Fachruddin, Indasah, & Wardani, R. (2025). Analysis of readiness for the implementation of HMIS Khanza in Sultan Imanuddin Pangkalan Bun Hospital. *Journal of Nursing Practice*, 8(3), 713–722. <https://doi.org/10.30994/JNP.V8I3.473>.

- Hayati, A., & Budi, S. C. (2025). Analysis of successful implementation of hospital information system in Bhayangkara Polda DIY Hospital with MMUST method. *Media Kesehatan Masyarakat Indonesia*, 21(1), 1–13. <https://doi.org/10.30597/MKMI.V21I1.34474>.
- Herawati, M. H., Idaiani, S., Maryati, Fitriana, Lucitawati, Veruswati, M., Hoekstra, K., & Asyary, A. (2022). Health information system concept in health services in the national health insurance (JKN) era in Indonesia: An environment and one health approach. *Frontiers in Public Health*, 10. <https://doi.org/10.3389/fpubh.2022.952415>.
- Hossain, Md. K., Sutanto, J., Handayani, P. W., Haryanto, A. A., Bhowmik, J., & Frings-Hessami, V. (2025). An exploratory study of electronic medical record implementation and recordkeeping culture: The case of hospitals in Indonesia. *BMC Health Services Research*, 25(1), 249. <https://doi.org/10.1186/s12913-025-12399-0>.
- Li, E., Clarke, J., Ashrafian, H., Darzi, A., & Neves, A. L. (2022). The impact of electronic health record interoperability on safety and quality of care in high-income countries: Systematic review. *Journal of Medical Internet Research*, 24(9), e38144. <https://doi.org/10.2196/38144>.
- Park, S., Marquard, J., Austin, R. R., Pieczkiewicz, D., Jantraporn, R., & Delaney, C. W. (2024). A systematic review of nurses' perceptions of electronic health record usability based on the human factor goals of satisfaction, performance, and safety. *CIN: Computers, Informatics, Nursing*, 42(3), 168–175.
- Romadhoni, A. (2026). Evaluasi implementasi sistem informasi manajemen rumah sakit (SIMRS) pada RSUD Puri Husada Tembilahan. *Jurnal Manajemen Informasi Kesehatan Indonesia*, 8(2), 88–96.
- Sittig, D. F., & Singh, H. (2010). A new sociotechnical model for studying health information technology in complex adaptive healthcare systems. *Quality and Safety in Health Care*, 19(Suppl 3), i68–i74. <https://doi.org/10.1136/qshc.2010.042085>.
- Sudiarti, T., Soepangat, S., & Wiyono, T. (2019). Analisis implementasi sistem informasi manajemen rumah sakit di instalasi rawat jalan klinik paru rumah sakit paru Cirebon. *Jurnal Manajemen Kesehatan Yayasan R.S.Dr. Soetomo*, 5(1), 57–67. <https://doi.org/10.29241/JMK.V5I1.138>.
- Suryantoko, Agnes, & Faisol, A. (2020). Penerapan sistem informasi manajemen rumah sakit guna meningkatkan mutu pelayanan di Rumkital Marinir Cilandak. *Jurnal Manajemen Dan Administrasi Rumah Sakit Indonesia (MARSRI)*, 4(2), 155–165. <https://doi.org/10.52643/MARSRI.V4I2.999>.
- Torab-Miandoab, A., Samad-Soltani, T., Jodati, A., & Rezaei-Hachesu, P. (2023). Interoperability of heterogeneous health information systems: A systematic literature review. *BMC Medical Informatics and Decision Making*, 23(1), 18. <https://doi.org/10.1186/s12911-023-02115-5>.
- Wahyuni, E. R., Ambarwati, R., & Hariasih, M. (2025). Enterprise internal strategy at management information system “Khanza” Muhammadiyah Sidoarjo Hospital. *Journal of Application Business & Management / Jurnal Aplikasi Bisnis Dan Manajemen*, 11(2), 648. <https://doi.org/10.17358/JABM.11.2.648>.
- Yayasan SIMRS Khanza. (2017). Dokumentasi sistem informasi manajemen rumah sakit open source Khanza (SIMRS Khanza). Yayasan SIMRS Khanza.