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ORIGINAL

Leveraging Digital Tools for Enhancing Sustainable Healthcare Service Quality

Aprovechando las herramientas digitales para mejorar la calidad sostenible de los servicios de salud

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ABSTRACT

Introduction: this study aims to evaluate sustainable service quality in BPJS Ketenagakerjaan branch offices using a technologically-driven and multidisciplinary approach. The evaluation integrates qualitative and quantitative methods, including internal and external surveys, focus group discussions (FGDs), field observations, and expectation-performance matrices. The TERRA model (Tangibles, Reliability, Responsiveness, Assurance, and Empathy) is applied and complemented with additional dimensions such as Good Governance, Risk Management, and Control. This approach combines health management principles, public service theory, and technological innovation in assessing service quality.
Method: a mixed-methods design was employed, combining qualitative techniques (interviews, FGDs, document analysis) and quantitative surveys, with data collected from both staff and participant perspectives. The ServQual framework and computational analysis tools were used to identify service quality gaps across all dimensions.
Results: the analysis revealed notable gaps in service quality, particularly in the Tangibles, Reliability, and Responsiveness dimensions, where high participant expectations were not fully met. FGD findings highlighted physical discomfort, inefficient queue management, and inconsistent digital services as key issues. Assurance and Empathy dimensions were rated higher, reflecting staff professionalism and interpersonal skills, although personalized service and emotional responsiveness still require improvement.
Conclusions: while staff professionalism is generally positive, overall service delivery does not fully satisfy participant expectations. Recommendations include strengthening technological infrastructure, enhancing staff competencies in both technical and soft skills, improving governance and control mechanisms, and integrating innovative digital tools into service processes.

Keywords: Sustainable Service Quality; BPJS Employment; Public Service; Technological Innovation; Healthcare Service.

RESUMEN

Introducción: este estudio tiene como objetivo evaluar la calidad del servicio sostenible en las oficinas de BPJS Ketenagakerjaan mediante un enfoque multidisciplinario y tecnológico. La evaluación integra métodos cualitativos y cuantitativos, incluyendo encuestas internas y externas, discusiones en grupos focales (FGD), observaciones de campo y matrices de expectativa-desempeño. Se aplica el modelo TERRA (Tangibles, Confiabilidad, Capacidad de Respuesta, Garantía y Empatía) y se complementa con dimensiones adicionales como Buen Gobierno, Gestión de Riesgos y Control.

Método: se empleó un diseño de métodos mixtos, combinando técnicas cualitativas (entrevistas, FGD, análisis documental) y encuestas cuantitativas, con recolección de datos desde perspectivas del personal y de los participantes. Se utilizó el marco ServQual y herramientas de análisis computacional para identificar brechas de calidad de servicio en todas las dimensiones.
Resultados: el análisis reveló brechas significativas en la calidad del servicio, particularmente en las dimensiones de Tangibles, Confiabilidad y Capacidad de Respuesta, donde las expectativas de los participantes no se cumplieron completamente. Los resultados de FGD destacaron el malestar físico, la gestión ineficiente de colas y servicios digitales inconsistentes como problemas clave.
Conclusiones: aunque el profesionalismo del personal es generalmente positivo, la prestación general del servicio no cumple completamente con las expectativas de los participantes. Se recomienda fortalecer la infraestructura tecnológica, mejorar las competencias técnicas y blandas del personal, optimizar la gobernanza y los mecanismos de control, e integrar herramientas digitales innovadoras en los procesos de servicio.

Palabras clave: Calidad del Servicio Sostenible; BPJS Empleo; Servicio Público; Innovación Tecnológica; Servicio de Salud.

INTRODUCTION

The quality of healthcare services is a critical determinant of public trust, patient satisfaction, and overall health outcomes. In recent years, healthcare institutions have increasingly faced challenges in delivering efficient, patient-centered, and sustainable services due to rising demand, resource constraints, and complex operational environments.[1] The integration of technology into healthcare service processes has emerged as a pivotal strategy to enhance service quality, optimize workflow, and meet patient expectations.[2]

In Indonesia, social security and healthcare programs, such as those administered by BPJS Ketenagakerjaan, play a central role in ensuring access to essential health and social benefits for the workforce.[3] Despite substantial investments, participants frequently report service gaps related to physical facilities, queuing systems, staff responsiveness, and information reliability.[4] Mixed-methods assessments, including internal surveys, external surveys, and qualitative evaluations such as focus group discussions (FGDs), have highlighted persistent disparities between expected and actual service performance, emphasizing the need for systematic improvements.[5]

Digital transformation initiatives, including the adoption of electronic records, AI-assisted workflow optimization, and automated queue management, have been identified as effective solutions for bridging these service gaps.[6] Studies have shown that technological interventions not only improve operational efficiency but also enhance patient-centered outcomes, including perceived reliability, empathy, and assurance.[7] Furthermore, technology-driven data collection and analysis enable continuous monitoring of service quality, allowing organizations to identify performance bottlenecks and implement sustainable improvements.[8]

Evidence from recent global studies indicates that integrating digital tools in healthcare services supports sustainability goals by reducing resource inefficiencies, enhancing service predictability, and fostering patient engagement.[9] For instance, the use of digital dashboards, sentiment analysis, and AI-supported decision-making has proven effective in identifying priority areas for intervention and designing responsive service models.[10] These approaches align with contemporary frameworks for healthcare 4,0, which emphasize the synergy between human-centered service and advanced technology to achieve sustainable service excellence.[11]

The primary objective of this study is to evaluate healthcare service quality through technological approaches, identifying key gaps in performance, responsiveness, and participant satisfaction. By leveraging data from internal and external assessments alongside qualitative insights from FGDs, this research seeks to provide actionable recommendations for sustainable service improvement. The study further examines how technology can support staff competencies, optimize operational workflows, and enhance overall trust and satisfaction in healthcare service delivery.[12]

Ultimately, this research contributes to the literature on digital health transformation and sustainable healthcare service quality by providing empirical evidence from a large-scale public social security institution in Indonesia. It demonstrates how technology, when integrated strategically with human-centered practices, can drive measurable improvements in service quality, operational efficiency, and participant satisfaction.[13]

Healthcare service quality is a multidimensional construct encompassing tangibles, reliability, responsiveness, assurance, and empathy, as originally conceptualized in the SERVQUAL model.[14] Numerous studies have applied SERVQUAL in healthcare settings to identify service gaps and improve patient satisfaction.[15,16] In Indonesia, application of SERVQUAL to social security institutions like BPJS Ketenagakerjaan has revealed persistent disparities between participant expectations and service performance across all dimensions.[17] These gaps highlight the importance of systematic measurement tools and continuous monitoring to ensure sustainable service quality.

Healthcare 4.0 represents the integration of advanced technologies—such as AI, big data, IoT, and cloud computing—into healthcare service delivery.[18] This paradigm aims to enhance efficiency, accuracy, and patient-centered outcomes. Research shows that digital transformation facilitates real-time monitoring, predictive analytics, and workflow optimization, enabling institutions to reduce service delays, improve staff allocation, and maintain consistent quality.[20] In Indonesian healthcare services, ICT maturity is positively associated with the adoption of digital health initiatives and improved service quality.[21]

The Technology Acceptance Model (TAM) and its extended variants explain how perceived usefulness and ease of use influence technology adoption by healthcare providers and administrators.[22,23] Empirical studies demonstrate that staff acceptance of digital systems is critical for successful implementation and sustainable improvements in service quality.[24] In public social security institutions, TAM-based evaluations have shown that training, user-friendly interfaces, and real-time feedback mechanisms increase adoption rates and enhance operational performance.[25]

Sustainability in healthcare service quality involves maintaining high service standards while optimizing resources and minimizing waste.[26] Integration of technology supports sustainability by improving workflow efficiency, reducing patient waiting times, and ensuring reliable service delivery.[27] Global studies emphasize that sustainable service quality requires a combination of process innovation, digital tools, and human-centered strategies, ensuring long-term satisfaction and institutional trust.[28]

Empathy and assurance remain key predictors of patient satisfaction and loyalty.[29] While technology can automate processes and enhance information reliability, human factors such as personalized attention, effective communication, and psychological support are irreplaceable.[30] Literature suggests that AI-assisted sentiment analysis and digital monitoring can support staff in delivering more personalized, responsive, and empathetic care.[31] This hybrid approach ensures that patient-centered care is not compromised by automation.

Recent studies highlight the role of AI and advanced analytics in evaluating service quality and identifying performance gaps.[32,33] AI can analyze large datasets from internal and external surveys, social media sentiment, and operational logs to provide actionable insights for management. In BPJS Ketenagakerjaan, integrating AI-assisted evaluation with SERVQUAL metrics and FGD insights allows for dynamic, evidence-based improvements, strengthening reliability, responsiveness, and governance.[34]

Despite significant advancements in healthcare digitalization, many public institutions—including BPJS Ketenagakerjaan—continue to face problematic situations in aligning technological systems with on-the-ground realities. Field observations reveal challenges such as inconsistent service delivery across branch offices, varying levels of digital literacy among staff and participants, and limited integration between physical and online service platforms. These disparities create operational inefficiencies and impact participant perceptions of fairness, reliability, and accessibility. Addressing these challenges requires not only technical solutions but also organizational commitment to continuous learning, innovation, and adaptive governance that prioritizes both efficiency and empathy in service delivery.

Given these complex challenges, the investigation of sustainable service quality in this context becomes increasingly important. Understanding how technology, governance, and human interaction intersect in the field provides critical insights for designing more resilient and participant-oriented service systems. Therefore, this study aims to evaluate sustainable service quality in BPJS Ketenagakerjaan branch offices using a technologically-driven and multidisciplinary approach. The evaluation integrates qualitative and quantitative methods, including internal and external surveys, focus group discussions (FGDs), field observations, and expectation-performance matrices. The TERRA model (Tangibles, Reliability, Responsiveness, Assurance, and Empathy) is applied and complemented with additional dimensions such as Good Governance, Risk Management, and Control. This approach combines health management principles, public service theory, and technological innovation in assessing service quality, offering a comprehensive framework to inform policy and practice improvements.

METHOD

Research Design

This study employed a mixed-methods design, integrating both quantitative and qualitative approaches to provide a comprehensive evaluation of healthcare service quality at BPJS Ketenagakerjaan.[35] The mixed-methods approach was selected to ensure a holistic understanding of service gaps and opportunities for improvement, allowing the combination of measurable outcomes with contextual insights from both staff and participants. Quantitative analysis focused on assessing participant perceptions and service performance, while qualitative methods explored experiential and operational aspects of service delivery, providing deeper insights into the determinants of sustainable service quality.[36]

Internal Data Collection

Internal data were collected through a combination of in-depth interviews, focus group discussions (FGDs), document analysis, and employee surveys to gain a comprehensive understanding of internal service quality

dynamics. In-depth interviews were conducted with 12 managers representing both branch and regional offices, selected purposively based on their direct involvement in service delivery, decision-making, and operational supervision [36]. Focus group discussions (FGDs) with employees provided additional perspectives on staff experiences, organizational culture, and internal perceptions of service quality.[37] Document analysis of internal policies, standard operating procedures, and performance reports enabled evaluation of consistency, compliance, and alignment with established service standards.[38]

Additionally, an internal employee survey was distributed to 150 staff members across five branch offices, measuring self-assessed competency, efficiency, digital readiness, and perceived service gaps using a five-point Likert scale. The combination of these methods allowed triangulation of findings and increased reliability. The purposive and snowball sampling strategies were justified by the need to access informants with direct operational experience, while acknowledging in the study's limitations that the non-probability sampling approach may restrict generalizability of results beyond the studied branches.[36]

External Data Collection

External data were obtained through surveys conducted with participants based on the SERVQUAL framework, capturing their perceptions across the dimensions of tangibles, reliability, responsiveness, assurance, and empathy (TERRA dimensions).[39] A total of 200 participants from 11 regional offices were surveyed, providing a representative view of service quality from the user perspective. In addition, FGDs with participants were conducted to explore in-depth insights regarding their expectations, barriers to service access, and suggestions for improvement.[40] Sentiment analysis of public reviews and social media feedback complemented structured surveys and FGDs, capturing organically formed perceptions of service quality and providing an additional layer of external evaluation.

Data Analysis

Quantitative data were analyzed using expectation-performance matrices for each TERRA dimension to identify service gaps and priority areas for improvement. Descriptive statistics summarized overall satisfaction levels, while gap analysis highlighted the discrepancies between expected and perceived service quality.[39] Advanced AI-assisted analysis was applied to detect patterns, correlations, and trends within the survey and operational datasets, enabling evidence-based identification of high-priority issues and optimizing strategic decision-making.[41] Qualitative data from FGDs and interviews were thematically coded, with recurring issues and operational bottlenecks identified. Word cloud and sentiment analysis visualized key concerns related to office facilities, queuing systems, staff behavior, and overall comfort.[42] Triangulation of quantitative and qualitative findings was applied to ensure data validity, reliability, and the robustness of subsequent recommendations.

Ethical Considerations

Ethical procedures were rigorously maintained throughout the study. Informed consent was obtained from all participants, and anonymization protocols were applied to ensure confidentiality. Data security measures were implemented to protect sensitive information, and the research protocol received approval from the institutional review board at Padjadjaran University.[36]

Integration of Technology and AI

AI-assisted evaluation enabled real-time processing of survey and FGD data, highlighting performance gaps and patterns in participant sentiment.[41] Digital dashboards and analytics facilitated management decision-making by providing actionable, evidence-based insights. Additionally, the study incorporated Technology Acceptance Model (TAM) measures to assess the readiness and capacity of staff and participants to adopt digital tools, ensuring effective implementation and sustainability of technological interventions in service delivery.[43]

RESULTS

Table 1. Tangibles Dimension Expectation-Performance Matrix

Indicator	Expectation Score	Performance Score	Gap
Facility cleanliness	4,7	4,1	0,6
Equipment availability	4,5	3,8	0,7
Staff appearance	4,6	4,0	0,6
Digital kiosks	4,8	3,5	1,3

The Tangibles dimension assesses the physical and visible aspects of service quality, including facilities, equipment, staff appearance, and the integration of digital infrastructure. This dimension reflects how participants perceive the physical environment and technological readiness of service offices, which directly influence first impressions and perceived professionalism. Table 1 presents the comparison between expectation and performance scores across indicators within the Tangibles dimension.

The results indicate that participants generally perceive the physical facilities and staff appearance as adequate, with moderate gaps of 0,6–0,7 between expectations and actual performance. However, the largest gap (1,3) appears in the indicator related to digital kiosks, suggesting that technological features have become a key expectation among participants. This finding implies that while traditional physical aspects remain important, participants increasingly value modern, technology-enabled services that enhance convenience and efficiency. The data highlight the necessity for BPJS Ketenagakerjaan to prioritize digital infrastructure modernization—such as upgrading self-service kiosks, integrating online systems, and ensuring user-friendly digital interfaces—to align with the expectations of a progressively tech-oriented workforce.[52]

Table 2. Reliability Dimension Expectation-Performance Matrix

Indicator	Expectation Score	Performance Score	Gap
Consistency of service	4,8	4,2	0,6
Accuracy of information	4,7	4,1	0,6
Timeliness of benefits	4,9	4,0	0,9
Complaint follow-up	4,6	3,9	0,7

The findings show that reliability remains a critical area for improvement, with all indicators displaying noticeable gaps between expectations and performance. The highest expectation score (4,9) was recorded for *timeliness of benefits*, yet this indicator also shows the largest gap (0,9), indicating that delays or inefficiencies in benefit processing significantly affect participant satisfaction. Similarly, the consistency of service and accuracy of information both show moderate gaps of 0,6, suggesting that participants generally trust the institution's reliability but still perceive inconsistencies across branches or transactions. The complaint follow-up indicator, with a gap of 0,7, reflects the ongoing challenge in maintaining responsive feedback mechanisms and transparent communication.

Overall, the data reveal that while BPJS Ketenagakerjaan has established a relatively dependable service framework, participants expect a higher standard of punctuality, accuracy, and continuity. The largest gap in benefit timeliness underscores the need for digital monitoring systems and workflow automation to minimize administrative delays and improve reliability across all service touchpoints.[53]

Table 3. Responsiveness Dimension Expectation-Performance Matrix

Indicator	Expectation Score	Performance Score	Gap
Speed of response	4,9	4,0	0,9
Problem resolution	4,8	3,9	0,9
Emergency requests	4,9	3,7	1,2
Staff initiative	4,7	4,0	0,7

The responsiveness dimension shows relatively high participant expectations across all indicators, particularly for *speed of response* (4,9) and *emergency requests* (4,9), reflecting the growing demand for prompt and proactive service. However, performance scores are notably lower, ranging from 3,7 to 4,0, resulting in substantial gaps—0,9 for both *speed of response* and *problem resolution*, and the widest gap of 1,2 for *emergency requests*. This indicates that participants perceive delays and limited agility in handling urgent or complex cases. The smaller gap in *staff initiative* (0,7) suggests moderate satisfaction with employee willingness to assist, yet the data overall highlight that response time and decisiveness remain key weaknesses. To strengthen responsiveness, BPJS Ketenagakerjaan should enhance real-time communication channels, establish clearer escalation procedures, and leverage digital tools such as automated ticketing or AI-assisted support to ensure faster, more consistent service delivery.[54]

Table 4. Assurance Dimension Expectation-Performance Matrix

Indicator	Expectation Score	Performance Score	Gap
Staff competence	4,8	4,3	0,5
Safety of service	4,7	4,2	0,5
Digital guidance	4,9	3,8	1,1
Procedural clarity	4,8	4,0	0,8

The Assurance dimension demonstrates generally strong participant confidence in staff capability and service safety, with *staff competence* and *safety of service* showing high performance scores (4,3 and 4,2) and relatively small gaps of 0,5 each, indicating adequate professionalism and reliability in face-to-face interactions. However, substantial discrepancies appear in digital guidance (gap 1,1) and procedural clarity (gap 0,8), revealing that participants experience difficulties navigating digital systems and understanding administrative procedures. The highest gap in digital guidance suggests that while participants value secure and competent staff interactions, they also expect clear, user-friendly digital support. These results emphasize the urgent need for BPJS Ketenagakerjaan to strengthen digital communication channels through interactive online tutorials, AI-assisted FAQs, and intuitive service interfaces to ensure consistent assurance across both physical and digital touchpoints.[55]

Table 5. Empathy Dimension Expectation-Performance Matrix

Indicator	Expectation Score	Performance Score	Gap
Personalized attention	4,8	4,0	0,8
Understanding participant needs	4,9	4,1	0,8
Emotional support	4,7	4,0	0,7
Communication quality	4,8	4,0	0,8

The empathy dimension shows high expectations (4,7–4,9) but lower performance (4,0–4,1), producing moderate gaps of 0,7–0,8 across indicators. The widest gaps in personalized attention, understanding participant needs, and communication quality (0,8) indicate limited individualized service. These results emphasize the need for staff training in emotional intelligence and AI-based sentiment analysis to enhance empathetic and responsive interactions.[56]

Table 6. Good Governance Dimension Expectation-Performance Matrix

Indicator	Expectation Score	Performance Score	Gap
Transparency	4,8	4,1	0,7
Accountability	4,7	4,0	0,7
Efficiency	4,8	4,0	0,8
Participation	4,6	3,9	0,7

The good governance dimension shows high expectations (4,6–4,8) but lower performance (3,9–4,1), creating gaps of 0,7–0,8 across indicators. The widest gap in *efficiency* (0,8) indicates participants' concern over bureaucratic delays, while *transparency*, *accountability*, and *participation* each show gaps of 0,7, reflecting limited openness and engagement. These results highlight the importance of implementing digital dashboards and automated reporting systems to enhance transparency, efficiency, and participatory governance.[57]

Table 7. Risk Management Dimension Expectation-Performance Matrix

Indicator	Expectation Score	Performance Score	Gap
Risk identification	4,7	4,2	0,5
Risk mitigation	4,8	4,0	0,8
Communication of risks	4,9	3,9	1,0
Contingency planning	4,8	4,1	0,7

The risk management dimension records high expectations (4,7–4,9) with performance scores slightly lower (3,9–4,2), resulting in gaps of 0,5–1,0. The largest gap in communication of risks (1,0) indicates insufficient transparency in conveying potential issues to participants, while risk mitigation (0,8) and contingency planning (0,7) highlight weaknesses in preparedness and response consistency. These findings underscore the need for AI-enabled monitoring and automated alert systems to strengthen early warning, mitigation communication, and overall institutional resilience.[58]

Table 8. Control Dimension Expectation-Performance Matrix

Indicator	Expectation Score	Performance Score	Gap
Policy enforcement	4,8	4,1	0,7
Compliance consistency	4,7	4,0	0,7
Oversight effectiveness	4,9	4,0	0,9
Documentation audits	4,6	3,9	0,7

The control dimension shows high expectations (4,6–4,9) but lower performance (3,9–4,1), producing gaps of 0,7–0,9 across indicators. The widest gap in *oversight effectiveness* (0,9) indicates a perceived lack of consistent supervision and follow-up, while *policy enforcement*, *compliance consistency*, and *documentation audits* each show gaps of 0,7, suggesting uneven implementation of established standards. These results highlight the urgency of adopting automated compliance tracking and digital audit systems to enhance transparency, accountability, and uniformity in service delivery.[59]

External Survey Results

Table 9. Responsiveness Dimension Expectation-Performance Matrix

Indicator	Expectation Score	Performance Score	Gap
Response speed	4,9	4,0	0,9
Accuracy of solutions	4,8	4,1	0,7
Urgent requests	4,9	3,8	1,1
Proactive communication	4,7	4,0	0,7

The responsiveness dimension shows high expectations (4,7–4,9) but lower performance (3,8–4,1), resulting in gaps of 0,7–1,1. The widest gap in *urgent requests* (1,1) and *response speed* (0,9) indicates delays in handling priority cases, while *accuracy of solutions* and *proactive communication* (0,7 each) reflect limited consistency and follow-up. These findings emphasize the need for real-time monitoring, staff training, and AI-assisted workflow systems to enhance speed, accuracy, and timely communication.[60] Furthermore, gaps in proactive communication were noted, indicating that participants expect timely updates regarding their requests and status notifications. Integrating automated alerts and predictive systems could improve anticipation of participant needs, leading to a more seamless experience.[61]

Finally, the overall gap underscores the importance of responsiveness in perceived service quality. Organizations must balance efficiency with personalized attention, ensuring that speed does not compromise empathy or accuracy.[62]

Table 10. Assurance Dimension Expectation-Performance Matrix

Indicator	Expectation Score	Performance Score	Gap
Staff knowledge	4,8	4,2	0,6
Information reliability	4,9	3,9	1,0
Procedural clarity	4,8	4,0	0,8
Safety measures	4,7	4,1	0,6

The assurance dimension records high expectations (4,7–4,9) but lower performance (3,9–4,2), creating gaps of 0,6–1,0 across indicators. The largest gap in *information reliability* (1,0) and *procedural clarity* (0,8) shows participants' difficulty in accessing accurate and comprehensible information without staff assistance. Meanwhile, smaller gaps in *staff knowledge* and *safety measures* (0,6 each) indicate general confidence in staff

competence and service security, though improvements in digital information accuracy remain crucial.[63]

AI-assisted tools, including interactive guidance, chatbots, and real-time FAQs, can reduce uncertainty and enhance participant confidence. Staff competency must be complemented by technological solutions to maintain consistent assurance.[64]

Ensuring information accuracy and clear procedural instructions is crucial, as it directly impacts participant trust, perceived fairness, and willingness to continue using services. High assurance reduces complaints and improves overall satisfaction metrics.[65]

Table 11. Empathy Dimension Expectation-Performance Matrix

Indicator	Expectation Score	Performance Score	Gap
Personalized attention	4,8	4,0	0,8
Understanding needs	4,9	4,1	0,8
Emotional support	4,7	3,9	0,8
Quality of communication	4,8	4,0	0,8

The empathy dimension shows uniformly high expectations (4,7–4,9) but lower performance (3,9–4,1), resulting in consistent gaps of 0,8 across all indicators. the largest concerns lie in *personalized attention* and *emotional support*, indicating participants' desire for more genuine, relational engagement beyond transactional service. these findings highlight the need for improved interpersonal communication skills and empathetic service approaches to strengthen participant connection and trust.[66]

Enhancing empathy requires structured staff training in emotional intelligence and communication skills. AI-based sentiment analysis can assist by identifying participant dissatisfaction signals and guiding staff responses.[67] A consistent focus on empathy improves participant perception of service quality, reinforcing loyalty and satisfaction. Digital support should complement, not replace, human-centered interactions.[68]

Table 12. Good Governance Dimension Expectation-Performance Matrix

Indicator	Expectation Score	Performance Score	Gap
Transparency	4,8	4,0	0,8
Accountability	4,7	4,1	0,6
Efficiency	4,8	4,0	0,8
Stakeholder participation	4,6	3,9	0,7

The good governance dimension reflects high expectations (4,6–4,8) but lower performance (3,9–4,1), producing gaps of 0,6–0,8. The widest gaps occur in *transparency* and *efficiency* (0,8 each), indicating participants' demand for clearer, faster, and more open service processes, while *stakeholder participation* (0,7) and *accountability* (0,6) show moderate shortfalls. Strengthening digital transparency through real-time dashboards, automated feedback, and online reporting can enhance fairness and institutional credibility.[69]

Transparency increases trust and supports sustainable decision-making, while participatory mechanisms can enhance engagement and accountability. The digitalization of governance processes offers opportunities to strengthen these areas without overburdening staff.[70]

Efficient governance practices aligned with AI-supported reporting can reduce bottlenecks and ensure timely, consistent, and credible service delivery.[71]

Table 13. Risk Management and Control Dimension Expectation-Performance Matrix

Indicator	Expectation Score	Performance Score	Gap
Risk identification	4,7	4,1	0,6
Mitigation strategies	4,8	3,9	0,9
Policy compliance	4,9	4,0	0,9
Monitoring and evaluation	4,8	4,1	0,7

The risk management and control dimension shows high expectations (4,7–4,9) but lower performance (3,9–4,1), yielding gaps of 0,6–0,9. The widest gaps in *mitigation strategies* and *policy compliance* (0,9 each)

indicate weaknesses in proactive risk handling and consistent enforcement of regulations, while smaller gaps in *risk identification* (0,6) and *monitoring and evaluation* (0,7) reflect moderate performance. These findings underscore the need for stronger compliance oversight and integrated digital monitoring systems to ensure timely mitigation and accountability.[72] AI-driven monitoring and predictive analytics can enhance early risk detection and proactive interventions.

Effective control systems reduce variability in service delivery and improve consistency across branch offices. Automated reporting and audit tracking can ensure adherence to protocols while maintaining transparency.[73] Strengthened risk management and control measures support participant trust, minimize service errors, and reinforce long-term sustainability of service quality.[74]

FGD Results

Branch Office Area and Physical Environment

FGD participants highlighted physical conditions as a significant factor affecting service experience. Words such as *"crowded," "hot,"* and *"narrow"* frequently appeared in the word cloud, indicating that limited space and inadequate ventilation create discomfort during visits.[75] Participants reported that such environmental factors increase stress, reduce concentration, and negatively influence perceptions of service quality. This aligns with Tangibles dimension gaps identified in table 1, emphasizing the need for infrastructure improvements to meet participant expectations.

Participants emphasized seating arrangements as a critical concern. Many branch offices lack sufficient seating, forcing participants to stand while waiting. The scarcity of ergonomic chairs and absence of climate-controlled spaces were repeatedly mentioned, highlighting the mismatch between expectations and actual performance.[76] To address this, participants suggested reorganizing office layouts, improving air conditioning, and introducing ergonomic furniture to enhance comfort and reduce fatigue.

Moreover, participants noted that environmental factors such as lighting, noise control, and spatial organization directly affect staff efficiency and interaction quality. A well-designed physical environment can improve workflow, minimize errors, and enhance participant satisfaction.[77] These findings suggest that investing in branch office facilities is crucial for sustainable service quality.

Queuing System, Access, and Signage

Participants identified challenges with the queuing system and navigation within branch offices. Words such as *"queue," "number,"* and *"confusing signage"* were prevalent in the FGD discussion.[78] Participants described difficulties in tracking their turn due to unclear queue numbers or ineffective speaker systems, which contributed to frustration and extended perceived waiting times. This finding mirrors gaps observed in the Reliability and Responsiveness dimensions (tables 2 and 3).

Access and directional guidance were also highlighted as issues. New visitors often struggle to locate counters or specific service points because of insufficient signage and unclear spatial information. This problem reduces operational efficiency and increases cognitive load for participants.[79] Participants recommended clearer, standardized signage, floor markings, and digital wayfinding solutions to facilitate navigation.

Additionally, participants emphasized the need for digital queue management systems integrated with mobile notifications. Such technologies could provide real-time updates on waiting times and counter availability, thus reducing anxiety and improving satisfaction. These recommendations reflect the increasing expectation for technology-enabled service enhancements.[80]

Comfort and Staff Interaction

Participants consistently mentioned discomfort in waiting areas. Words such as *"standing," "uncomfortable chairs," "loud,"* and *"crowded"* reflected dissatisfaction with seating capacity, noise levels, and overall space management.[81]These issues reinforce gaps identified in the Tangibles and Empathy dimensions (tables 1 and 5). Addressing comfort requires physical improvements alongside interventions in staff-patient interactions.

Regarding staff interaction, participants acknowledged professionalism but stressed the importance of personalized attention. High expectation–moderate performance gaps in the Empathy and Assurance dimensions (tables 4 and 5) indicate that participants desire staff who engage more empathetically and address individual needs.[82] Emotional responsiveness was highlighted as key to enhancing trust and perceived service quality.

Participants suggested structured training programs in emotional intelligence and customer service, complemented by AI-assisted sentiment monitoring. These tools could identify participant dissatisfaction early, guiding staff to adjust interactions in real time. Improved comfort combined with empathetic service can strengthen participant loyalty and satisfaction.[83]

Digital Service and Information Access

Digital services were another major theme. Participants reported difficulties in using online platforms for claims tracking, accessing documents, and receiving notifications. Words such as *"unclear instructions," "hard*

to use app," and *"missing info"* were repeatedly mentioned.[84] These issues align with Assurance dimension gaps in table 4, indicating that digital guidance and clarity remain inadequate.

Participants recommended simplifying user interfaces, providing clear step-by-step instructions, and deploying AI chatbots to assist participants in real time. The adoption of digital solutions should account for varying levels of digital literacy among participants, ensuring inclusivity.[85]

Furthermore, participants emphasized that digital solutions should complement human service rather than replace it. A hybrid approach, integrating automated support with personalized staff interactions, ensures both efficiency and relational quality. This approach aligns with current literature emphasizing human-centered digital transformation in public services.[86]

Governance, Risk, and Control

Participants expressed moderate satisfaction with governance but highlighted gaps in transparency, risk communication, and consistency of control mechanisms. Statements such as *"unclear reporting," "slow feedback,"* and *"lack of updates"* were frequently mentioned.[87] These concerns reflect the Good Governance, Risk Management, and Control dimension gaps (tables 6, 7 and 8).

Participants suggested implementing digital dashboards and automated reporting systems to provide real-time updates on governance and risk management activities. Transparent communication and consistent monitoring could increase participant trust and improve the perception of service quality.[88]

Finally, participants highlighted the link between governance transparency, risk management, and overall satisfaction. Ensuring timely, consistent, and reliable processes enhances participant confidence and fosters sustainable service quality. These findings reinforce the importance of integrating AI and digital tools into governance and control mechanisms.[89]

DISCUSSION

Tangibles Dimension

The Tangibles dimension reflects the physical aspects of BPJS Ketenagakerjaan branch offices, including facilities, seating, cleanliness, and equipment. Both internal surveys (tables 1 and 9) and FGD findings[75,76] indicate that gaps persist between participant expectations and actual performance. High-expectation–low-performance elements were observed in waiting room comfort, availability of ergonomic furniture, and adequacy of office layout. Participants highlighted that crowded, poorly ventilated, or noisy environments reduce comfort and increase stress, which in turn negatively affects service perception.

Improving tangibles is crucial for sustaining participant satisfaction. The integration of technology, such as smart climate control, automated check-in kiosks, and AI-assisted facility monitoring, can optimize environmental comfort while maintaining operational efficiency.[77,78] FGD participants emphasized that such investments would not only improve comfort but also enhance the perceived professionalism of staff and credibility of the institution.

Moreover, the tangibles dimension interacts with other service dimensions, such as Empathy and Responsiveness. Comfortable physical environments support staff efficiency, enabling more attentive interactions and faster response times. Therefore, investments in infrastructure should be accompanied by staff training and digital tools to maximize the impact on service quality.[78]

Reliability and Responsiveness

Reliability and Responsiveness are critical for building trust and loyalty among participants. Tables 2, 3, and 9 show persistent gaps in service consistency, timeliness, and the handling of urgent requests. Participants in FGDs[78,79] reported delays in service, unclear queue numbers, and slow responses to inquiries, confirming quantitative survey findings. These gaps indicate a need for process optimization and effective monitoring systems.

Enhancing reliability requires systematic staff training, standardized protocols, and real-time digital tracking of service requests. AI-assisted predictive systems can anticipate peak periods and allocate resources efficiently, ensuring timely service delivery.[60,61] Responsiveness, particularly in urgent or high-priority cases, can be improved by integrating workflow automation and real-time notifications to both participants and staff.[62]

The combination of improved reliability and responsiveness strengthens participant trust and reduces dissatisfaction. When services are predictable, timely, and responsive, participants perceive higher quality, which can enhance institutional reputation and encourage continued engagement.[63] FGD insights emphasize that technological support must complement human interaction to maximize the effectiveness of service improvements.[75]

Assurance and Empathy

Assurance and Empathy address participants' confidence in staff competence, procedural clarity, and personalized care. Tables 4, 5, 10, and 11 reveal moderate-to-high expectation gaps, particularly in information

accuracy, emotional support, and individualized attention. FGD participants[82,83] stressed that staff knowledge is valued, but effective communication and emotional responsiveness remain inconsistent.

Digital solutions can enhance these dimensions through AI-driven guidance, chatbots, and real-time information verification systems. Such tools reduce errors and provide participants with reliable, transparent information.[84,85] However, human empathy remains irreplaceable; staff must complement digital tools with personalized interactions, addressing both cognitive and emotional needs of participants.[86]

The interplay between Assurance and Empathy is critical. While technology ensures accuracy and procedural clarity, empathetic human interaction fosters trust, satisfaction, and loyalty. FGD participants highlighted that personalized attention, active listening, and emotional sensitivity significantly enhance perceived service quality.[83] Therefore, digital transformation should aim to augment rather than replace human relational capacities.

Governance, Risk, and Control

Tables 6, 7 and 8, 12, and 13 show that participants recognize governance, risk management, and control efforts but note gaps in transparency, consistency, and mitigation effectiveness. FGD insights[87,89] corroborate these findings, indicating that participants desire real-time reporting, clear accountability, and effective monitoring mechanisms. Participants emphasized that opaque or inconsistent processes undermine trust and satisfaction.

Implementing AI-supported dashboards, automated reporting, and predictive risk analytics can enhance transparency and control. Such systems provide continuous oversight, identify deviations early, and allow for timely corrective actions.[88,89] Digital governance solutions also enable participatory engagement, allowing stakeholders to track progress and provide feedback, which strengthens accountability.

Effective governance, risk management, and control create a foundation for sustainable service quality. When processes are transparent, monitored, and consistently enforced, participants perceive the organization as reliable and credible. This trust reinforces satisfaction across all service dimensions and supports long-term institutional sustainability.[87]

Integration of Digital Technology and AI in Service Improvement

Across all dimensions, FGD findings and survey results suggest that digital technology and AI play a pivotal role in bridging expectation–performance gaps. Participants[84,86] emphasized the importance of user-friendly interfaces, automated notifications, and real-time feedback mechanisms to enhance service reliability, responsiveness, and assurance.

AI can also support staff decision-making by predicting high-demand periods, flagging potential service bottlenecks, and monitoring participant sentiment. This facilitates proactive interventions, ensuring that service quality remains consistent even under high operational pressure.[87] Furthermore, integrating AI with human-centered service strategies enhances both efficiency and relational quality, addressing both procedural and emotional participant needs.[88,89,90]

The findings highlight that technology adoption is not merely a convenience but a strategic necessity for sustainable service quality. Combined with targeted staff training and organizational reforms, AI-supported solutions can significantly reduce service gaps, enhance participant satisfaction, and ensure the long-term sustainability of BPJS Ketenagakerjaan services.[91,92,93]

Limitations

This study has several limitations. The use of purposive and snowball sampling restricts the generalizability of the findings, as data were collected only from selected BPJS Ketenagakerjaan branch offices. The reliance on self-reported surveys and interviews may also introduce bias, particularly in participants' perceptions of service performance. Additionally, data were obtained within a limited period in 2025, which may not fully reflect ongoing institutional or technological developments. Future studies should include larger and more diverse samples, longitudinal data, and cross-institutional comparisons to enhance validity and applicability of the results.

CONCLUSIONS

This study demonstrates that sustainable service quality in healthcare and social security institutions requires an integrated approach, combining physical infrastructure, staff competence, governance, and digital technology. Tangibles, such as comfortable facilities and clear signage, significantly influence participant perceptions and overall satisfaction. Reliability and responsiveness are essential for maintaining trust, ensuring timely service delivery, and managing participant expectations effectively.

Assurance and empathy highlight the importance of both technical competence and human-centered interaction. While digital tools can enhance accuracy, transparency, and process efficiency, personalized attention and emotional responsiveness remain indispensable for fostering participant loyalty and confidence.

Governance, risk management, and control mechanisms provide a critical foundation for sustainable service delivery, ensuring transparency, accountability, and consistency across organizational operations.

The study also underscores the pivotal role of digital technology and AI in bridging service gaps. Integrating automated systems with human-centered strategies allows organizations to anticipate participant needs, monitor service performance in real time, and implement proactive interventions. This holistic approach not only improves operational efficiency but also strengthens relational quality, trust, and long-term sustainability.

In summary, sustainable service quality in healthcare and social security institutions is achieved through a balanced combination of infrastructure, competent and empathetic personnel, robust governance, and strategic technological adoption. Implementing these elements collectively ensures that services meet participant expectations while fostering trust, satisfaction, and continuous improvement.

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CONFLICT OF INTEREST

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