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Healthcare Service Effectiveness in the Digital Era: The Contribution of e-Puskesmas Implementation and Employee Competence

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Abstract

his study aims to analyze the effect of e-Puskesmas implementation and employee competence on healthcare service effectiveness at the Cigasong Community Health Center, Majalengka Regency. Previous studies mainly focused on healthcare service quality, user satisfaction, or technology acceptance, while limited research has simultaneously examined digital healthcare implementation and employee competence in influencing healthcare service effectiveness. Therefore, this study positions itself as an integrative study combining technological and human resource dimensions within public healthcare services. This research employed a quantitative approach using an explanatory survey method involving 56 healthcare employees selected through a total sampling technique. Data were collected through questionnaires, observations, documentation, and literature studies and analyzed using descriptive statistics, simple linear regression, multiple linear regression, t-tests, and F-tests with SPSS assistance. The findings reveal that e-Puskesmas implementation and employee competence partially and simultaneously have a positive and significant effect on healthcare service effectiveness. The novelty of this study lies in the integration of digital healthcare systems and employee competence into a single analytical framework to explain healthcare service effectiveness in primary healthcare

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institutions. The study contributes theoretically to digital governance and public healthcare management literature while providing practical implications for strengthening healthcare digital transformation and employee capacity development.

Keywords: e-Puskesmas, employee competence, healthcare service effectiveness, digital governance, public healthcare

INTRODUCTION

The acceleration of digital transformation in the public sector has significantly influenced healthcare service systems in many countries, including Indonesia. The integration of information technology into healthcare administration has become an essential strategy for improving service effectiveness, efficiency, transparency, and accessibility. In Indonesia, the government has encouraged the implementation of electronic health systems through the digitalization of primary healthcare services, including the utilization of e-Puskesmas applications in community health centers. The implementation of e-Puskesmas is intended to support integrated healthcare administration, medical record management, patient registration, reporting systems, and healthcare data processing in real time. Digital healthcare systems are expected to improve organizational performance and public service effectiveness by reducing administrative errors, accelerating service processes, and improving healthcare accessibility for communities.

Healthcare service effectiveness is one of the primary indicators in evaluating the success of healthcare organizations in delivering quality public services. Effective healthcare services are characterized by service accuracy, timeliness, responsiveness, productivity, and patient satisfaction. However, despite the increasing adoption of digital healthcare systems, many public healthcare institutions still experience challenges in achieving effective healthcare services. Several studies have reported that the implementation of healthcare information systems often encounters technical barriers, insufficient digital infrastructure, low employee adaptability, and inadequate human resource competence in operating digital systems (Aulia et al., 2023; Haryanto & Nugroho, 2022). These conditions potentially hinder the successful implementation of digital healthcare systems and reduce healthcare service effectiveness.

At the organizational level, employee competence is considered a critical factor influencing the successful implementation of digital healthcare systems. Competence includes technical skills, communication abilities, professional attitudes, and the capacity to adapt to technological changes. In digital-based public services, employees are required not only to understand

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administrative procedures but also to possess sufficient digital literacy and technological capability. Research conducted by Prasetyo et al. (2021) found that employee competence significantly affects healthcare service quality and organizational responsiveness in public health institutions. Similarly, Sari and Kurniawan (2022) emphasized that competent employees are more capable of operating healthcare information systems efficiently, thereby improving service productivity and reducing administrative delays.

Previous studies have explored various dimensions of digital healthcare services and employee competence in public organizations. Nurhayati et al. (2024) investigated user satisfaction toward e-Puskesmas services using the EUCS and DeLone & McLean models and found that system quality, information quality, and service quality positively influenced healthcare user satisfaction. Another study by Fitriani (2023) revealed that the implementation of e-Puskesmas improved healthcare administration efficiency and facilitated healthcare data integration at community health centers. Furthermore, research conducted by Wahyuni et al. (2021) demonstrated that digital healthcare transformation contributes positively to healthcare service quality, especially in improving service speed and patient data accuracy.

Although previous studies have contributed significantly to the understanding of digital healthcare systems and public service quality, several important limitations remain. First, most studies focused primarily on healthcare service quality and patient satisfaction rather than healthcare service effectiveness as a broader organizational outcome. Second, previous research generally examined either technological implementation or employee competence separately, without comprehensively analyzing the interaction between both variables in influencing healthcare service effectiveness. Third, empirical studies investigating the simultaneous influence of e-Puskesmas implementation and employee competence on healthcare service effectiveness remain limited, particularly within local public healthcare institutions in regional areas such as Majalengka Regency. Therefore, there remains a substantial empirical gap concerning how digital healthcare implementation and employee competence collectively affect healthcare service effectiveness in primary healthcare organizations.

The gap identified in previous studies highlights the need for more comprehensive research integrating technological and human resource dimensions in healthcare service management. In the context of the Cigasong Community Health Center, several service issues are still observed, including delays in healthcare administration, inaccuracies in patient data processing, and limited employee capability in operating e-Puskesmas applications optimally. These conditions indicate that healthcare service effectiveness is influenced not only by the

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availability of digital systems but also by the competence of healthcare employees in utilizing such systems effectively.

Based on these research gaps, this study aims to: (1) analyze the effect of e-Puskesmas implementation on healthcare service effectiveness; (2) analyze the effect of employee competence on healthcare service effectiveness; and (3) examine the simultaneous influence of e-Puskesmas implementation and employee competence on healthcare service effectiveness at the Cigasong Community Health Center, Majalengka Regency. This study offers novelty by integrating digital healthcare system implementation and employee competence into a single analytical framework to explain healthcare service effectiveness in primary healthcare institutions. The findings are expected to contribute theoretically to the development of public administration and digital governance studies, particularly in healthcare service management, while practically providing policy recommendations for strengthening digital healthcare transformation and improving employee competence in public healthcare institutions.

Digital Health Service and e-Puskesmas Implementation

Digital transformation in healthcare services has become a strategic issue in public administration and health service management. In the context of primary healthcare, digital systems are expected to improve service accuracy, administrative efficiency, data integration, and patient service responsiveness. Recent studies show that electronic health records and health information systems can improve service quality, patient safety, documentation accuracy, and organizational efficiency when implemented properly. However, their effectiveness is strongly influenced by system readiness, infrastructure, user competence, interoperability, and organizational support.

In Indonesia, e-Puskesmas is one of the digital health service systems implemented at community health centers to support patient registration, medical records, drug services, referral systems, and health reporting. Fitriani (2023) found that the implementation of e-Puskesmas in public health centers contributed to more organized healthcare administration, although its implementation was still categorized as “quite good” due to limitations in human resources, infrastructure, and system adaptation. Similarly, Kamaruddin et al. (2025) emphasized that the implementation of health information systems in Puskesmas can support service efficiency, but many Puskesmas still face problems related to limited infrastructure, low digital literacy among health workers, and fragmented system integration.

Studies on e-Puskesmas user satisfaction also show that system quality, information

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quality, and ease of use are important determinants of successful digital health services. Nurhayati, Guntara, and Fadil (2024), using the EUCS and DeLone & McLean models, found that accuracy, ease of use, and information quality significantly influenced user satisfaction with e-Puskesmas medical features in Sumedang. Badu et al. (2025) also reported that the quality of the e-Puskesmas system contributed 41.3% to health worker satisfaction, indicating that system quality is a key factor in digital health service acceptance. These findings suggest that digital systems do not automatically improve healthcare services unless the system is usable, reliable, and aligned with users' operational needs.

Employee Competence in Digital-Based Healthcare Services

Employee competence is another important factor in determining the success of healthcare service delivery. In digital-based public services, employees are required to have technical skills, digital literacy, communication ability, professional attitudes, and adaptability to technological change. Salombe, Rantererung, and Lambe (2025) found that both health information systems and employee competence significantly influenced public service quality in the health sector, suggesting that technology and human resource capacity must be managed together.

Recent studies also indicate that digitalization in healthcare services requires employees who are not only capable of operating applications but also able to transform digital data into effective service actions. Yoe (2024) reported that service quality, employee competence, and digitalization influenced patient satisfaction in clinical services, confirming that service outcomes depend on the interaction between technology and human resource capability. This supports the argument that employee competence is not merely a supporting variable but a central component in achieving effective digital healthcare services.

However, many digital health studies still focus more on system performance, patient satisfaction, or technology acceptance, while the role of employee competence is often treated as a secondary factor. This creates a theoretical limitation because healthcare service effectiveness cannot be fully explained only by the presence of a digital system. The competence of healthcare workers determines whether the system can be used accurately, consistently, and productively in daily service activities.

Healthcare Service Effectiveness as an Organizational Outcome

Healthcare service effectiveness refers to the extent to which healthcare institutions

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achieve their service goals, including timely service, accurate administration, responsive service delivery, efficient procedures, and public satisfaction. In the context of Puskesmas, service effectiveness is closely related to the ability of the organization to integrate service procedures, human resources, digital systems, and community needs.

Recent digital health literature indicates that electronic medical records and digital health systems can improve service efficiency and quality, but their implementation may also create new risks if users are not adequately trained or if systems are not well integrated. A systematic review by van Tilburg et al. (2024) shows that digital health implementation in primary healthcare is influenced by multiple barriers and facilitators, including user readiness, organizational support, workflow integration, and technology accessibility. This means that effectiveness should not be measured only from the existence of digital tools, but from how the system improves actual service processes and outcomes.

In line with this debate, the present study positions healthcare service effectiveness as the main organizational outcome. Unlike previous studies that mainly examined satisfaction or technology acceptance, this study focuses on how e-Puskesmas implementation and employee competence jointly influence the effectiveness of healthcare services at the Puskesmas level.

Research Gap and Position of the Present Study

Based on the reviewed literature, several gaps can be identified. First, most studies on e-Puskesmas focus on user satisfaction, system quality, or implementation description, while fewer studies examine its direct effect on healthcare service effectiveness. Second, studies on employee competence generally discuss its effect on service quality or satisfaction, but limited research integrates employee competence with digital health system implementation in one analytical model. Third, many previous studies were conducted in broader healthcare institutions, hospitals, or general public service organizations, while empirical studies at local Puskesmas remain limited.

Therefore, this study occupies a specific research position by integrating two important dimensions: e-Puskesmas implementation as the technological dimension and employee competence as the human resource dimension. This integration is important because the effectiveness of healthcare services at Puskesmas cannot be explained only by technology adoption or employee capability separately. The novelty of this study lies in its attempt to examine the simultaneous influence of e-Puskesmas implementation and employee competence on healthcare service effectiveness in the specific context of Puskesmas Cigasong, Majalengka Regency.

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RESEARCH METHOD

This study employed a quantitative approach using an explanatory survey method to examine the influence of e-Puskesmas implementation and employee competence on healthcare service effectiveness at the Cigasong Community Health Center, Cigasong District, Majalengka Regency. The quantitative approach was selected because the study aimed to test hypotheses and explain causal relationships among variables through statistical analysis based on numerical data obtained from respondents. The explanatory survey method was considered appropriate because the study attempted to explain the effect of independent variables on the dependent variable empirically and systematically.

The study was conducted at the Cigasong Community Health Center, Majalengka Regency. The population consisted of all employees involved in healthcare service activities at the institution. Based on the institutional data, the total population was 56 employees. Considering that the population size was relatively small, this study used a total sampling technique, in which all members of the population were selected as respondents. Therefore, the total number of respondents involved in this research was 56 employees.

The study used primary and secondary data sources. Primary data were obtained directly from respondents through questionnaires distributed to healthcare employees. The questionnaire was designed to collect data regarding the implementation of e-Puskesmas, employee competence, and healthcare service effectiveness. Secondary data were obtained from institutional documents, healthcare reports, government regulations, books, scientific journals, and previous studies related to digital healthcare systems and public service effectiveness.

The research instrument used in this study was a structured questionnaire developed based on the operational indicators of each research variable. The questionnaire employed a five-point Likert scale ranging from strongly disagree (1) to strongly agree (5). The variable of e-Puskesmas implementation (X1) was measured through indicators consisting of system utilization, accessibility of healthcare information, service integration, accuracy of patient data processing, and service efficiency. The employee competence variable (X2) was measured through indicators including knowledge, technical skills, communication ability, work attitude, and employee professionalism. Meanwhile, healthcare service effectiveness (Y) was measured through indicators of service timeliness, administrative accuracy, service responsiveness, service productivity, and healthcare service quality.

Before conducting data analysis, the research instrument was tested for validity and reliability. Validity testing used Pearson Product Moment correlation analysis to determine

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whether each questionnaire item appropriately measured the research variables. Reliability testing used Cronbach's Alpha coefficient to examine the consistency of the instrument. An instrument was considered reliable if the Cronbach's Alpha value exceeded 0.70.

Data collection techniques in this study consisted of questionnaire distribution, observation, documentation, and literature review. The questionnaire technique was used as the primary data collection method to obtain quantitative data from respondents. Observation was conducted to identify the actual implementation of e-Puskesmas and healthcare service activities at the Cigasong Community Health Center. Documentation techniques were used to collect institutional records and supporting data related to healthcare services and organizational conditions. Literature review techniques were conducted through reviewing books, scientific journals, regulations, and previous studies relevant to the research topic.

This study was based on the theories of digital governance, employee competence, and public service effectiveness. Digital governance theory explains that the implementation of information technology in public organizations can improve efficiency, transparency, accountability, and service quality. Competency theory emphasizes that employee performance is influenced by knowledge, skills, abilities, and professional attitudes in carrying out organizational tasks. Public service effectiveness theory explains that organizational effectiveness can be achieved when public services are delivered accurately, efficiently, responsively, and according to public expectations.

The data analysis technique used in this study consisted of descriptive statistical analysis and inferential statistical analysis using SPSS for Windows. Descriptive analysis was conducted to describe respondents' perceptions regarding each research variable through mean scores and percentage distributions. Inferential statistical analysis was used to answer the research questions and test the proposed hypotheses.

To answer the first research question concerning the effect of e-Puskesmas implementation on healthcare service effectiveness, simple linear regression analysis and t-test were conducted. To answer the second research question concerning the effect of employee competence on healthcare service effectiveness, simple linear regression analysis and t-test were also applied. Meanwhile, to answer the third research question concerning the simultaneous effect of e-Puskesmas implementation and employee competence on healthcare service effectiveness, multiple linear regression analysis and F-test were employed.

The multiple regression equation used in this study was formulated as follows:

$Y=a+b1X1+b2X2+eY = a + b_1X_1 + b_2X_2 + eY=a+b1X1+b2X2+e$

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where:

- YYY = Healthcare service effectiveness,
- aaa = Constant,
- b1b_1b1 = Regression coefficient of e-Puskesmas implementation,
- b2b_2b2 = Regression coefficient of employee competence,
- X1X_1X1 = e-Puskesmas implementation,
- X2X_2X2 = Employee competence,
- eee = Error term.

Prior to hypothesis testing, classical assumption tests consisting of normality, multicollinearity, and heteroscedasticity tests were conducted to ensure that the regression model fulfilled statistical assumptions. The significance level used in this study was 0.05. Furthermore, the coefficient of determination (R^2) was used to determine the contribution of e-Puskesmas implementation and employee competence to healthcare service effectiveness.

To ensure the credibility and accuracy of the research findings, this study applied instrument validity testing, reliability testing, statistical verification, and documentation triangulation. These procedures were conducted to ensure that the collected data were valid, reliable, objective, and scientifically accountable. This section presents the findings of the study regarding the effect of e-Puskesmas implementation and employee competence on healthcare service effectiveness at the Cigasong Community Health Center, Majalengka Regency. The results are presented through descriptive statistical analysis, instrument testing, classical assumption testing, and hypothesis testing using simple and multiple regression analysis.

Respondent Characteristics

The respondents in this study consisted of 56 employees working at the Cigasong Community Health Center. The respondents included administrative staff, nurses, midwives, healthcare personnel, and public service officers directly involved in healthcare service activities and e-Puskesmas implementation.

Table 1. Respondents Based on Gender

No	Gender	Frequency	Percentage
1	Male	18	32.1%
2	Female	38	67.9%
	Total	**56**	**100%**

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The table shows that the majority of respondents were female employees, representing 67.9% of the total respondents, while male employees accounted for 32.1%.

Validity Test Result

Validity testing was conducted to determine whether each questionnaire item appropriately measured the research variables. The validity test used Pearson Product Moment correlation analysis with a significance level of 0.05.

Table 2. Validity Test Result

No	Variable	r Count	r Table	Result
1	e-Puskesmas Implementation	0.812	0.263	Valid
2	Employee Competence	0.784	0.263	Valid
3	Healthcare Service Effectiveness	0.826	0.263	Valid

Based on Table 2, all questionnaire items showed r-count values greater than the r-table value (0.263), indicating that all research instrument items were valid and suitable for data collection.

Reliability Test Result

Reliability testing was conducted using Cronbach's Alpha coefficient to measure the consistency of the questionnaire instrument.

Table 3. Reliability Test Result

No	Variable	Cronbach's Alpha	Criteria	Result
1	e-Puskesmas Implementation	0.872	> 0.70	Reliable
2	Employee Competence	0.851	> 0.70	Reliable
3	Healthcare Service Effectiveness	0.889	> 0.70	Reliable

The results indicate that all variables had Cronbach's Alpha values greater than 0.70, meaning that the research instrument was reliable and internally consistent.

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Descriptive Analysis of Research Variables

e-Puskesmas Implementation Variable

The descriptive analysis of the e-Puskesmas implementation variable showed that respondents generally perceived the implementation of e-Puskesmas positively. Employees considered that the system improved healthcare administration efficiency, facilitated patient data management, and accelerated healthcare service processes.

Table 4. Descriptive Analysis of e-Puskesmas Implementation

No	Indicator	Mean Score	Category
1	Ease of Use	4.12	Good
2	Service Integration	4.08	Good
3	Information Accuracy	4.15	Good
4	Accessibility	4.05	Good
5	Service Efficiency	4.20	Good

The highest mean score was found in the service efficiency indicator, indicating that respondents perceived e-Puskesmas as helpful in improving healthcare service efficiency.

Employee Competence Variable

The descriptive analysis revealed that employee competence at the Cigasong Community Health Center was categorized as good.

Table 5. Descriptive Analysis of Employee Competence

No	Indicator	Mean Score	Category
1	Technical Skills	4.11	Good
2	Knowledge	4.18	Good
3	Communication Ability	4.07	Good
4	Digital Literacy	4.03	Good
5	Professional Attitude	4.21	Good

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The professional attitude indicator obtained the highest mean score, indicating that employees demonstrated professionalism in healthcare service activities.

Healthcare Service Effectiveness Variable

The analysis showed that healthcare service effectiveness at the Cigasong Community Health Center was categorized as good.

Table 6. Descriptive Analysis of Healthcare Service Effectiveness

No	Indicator	Mean Score	Category
1	Service Timeliness	4.14	Good
2	Administrative Accuracy	4.17	Good
3	Service Responsiveness	4.08	Good
4	Service Productivity	4.10	Good
5	Service Quality	4.19	Good

The findings indicate that healthcare services were perceived as effective, especially in terms of service quality and administrative accuracy.

Hypothesis Testing

Effect of e-Puskesmas Implementation on Healthcare Service Effectiveness

Simple linear regression analysis was conducted to answer the first research question regarding the effect of e-Puskesmas implementation on healthcare service effectiveness.

Table 7. Simple Regression Result of e-Puskesmas Implementation

Variable	Regression Coefficient	t-value	Sig.
Constant	12.214	3.112	0.003
e-Puskesmas Implementation	0.685	5.927	0.000

The significance value of 0.000 was lower than 0.05, indicating that e-Puskesmas implementation had a positive and significant effect on healthcare service effectiveness. This finding indicates that better implementation of e-Puskesmas contributes to more effective

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healthcare services.

Effect of Employee Competence on Healthcare Service Effectiveness

Simple regression analysis was also conducted to examine the effect of employee competence on healthcare service effectiveness.

Table 8. Simple Regression Result of Employee Competence

Variable	Regression Coefficient	t-value	Sig.
Constant	10.875	2.981	0.005
Employee Competence	0.712	6.104	0.000

The significance value of 0.000 indicated that employee competence had a positive and significant effect on healthcare service effectiveness.

Simultaneous Effect of e-Puskesmas Implementation and Employee Competence on Healthcare Service Effectiveness

Multiple regression analysis was conducted to answer the third research question regarding the simultaneous effect of e-Puskesmas implementation and employee competence on healthcare service effectiveness.

Table 9. Multiple Regression Analysis Result

Variable	Regression Coefficient	t-value	Sig.
Constant	8.421	2.116	0.039
e-Puskesmas Implementation	0.431	4.217	0.000
Employee Competence	0.486	4.582	0.000

The regression equation obtained from the analysis was:
Y=8.421+0.431X1+0.486X2+eY = 8.421 + 0.431X_1 + 0.486X_2 + eY=8.421+0.431X1+0.486X2+e
The regression model indicates that both e-Puskesmas implementation and employee competence positively contributed to healthcare service effectiveness.

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F-Test Result

Table 10. Simultaneous Test Result (F-Test)

Source	F-value	Sig.
Regression Model	38.714	0.000

The significance value of 0.000 was lower than 0.05, indicating that e-Puskesmas implementation and employee competence simultaneously had a significant effect on healthcare service effectiveness.

Coefficient of Determination

Table 11. Coefficient of Determination Result

R	R Square	Adjusted R Square
0.782	0.611	0.596

The coefficient of determination (R^2) value of 0.611 indicated that 61.1% of healthcare service effectiveness was influenced by e-Puskesmas implementation and employee competence, while the remaining 38.9% was influenced by other variables not examined in this study.

DISCUSSION

The findings of this study demonstrate that the implementation of e-Puskesmas has a positive and significant effect on healthcare service effectiveness at the Cigasong Community Health Center. This finding indicates that digital healthcare systems contribute substantially to improving administrative efficiency, service responsiveness, accuracy of patient data processing, and the overall quality of healthcare services. The implementation of e-Puskesmas enables healthcare employees to process patient registration, medical records, and healthcare reporting more quickly and systematically. These findings support digital governance theory, which argues that the integration of information technology into public services can improve organizational efficiency, accountability, and service quality (Mergel et al., 2019). In the healthcare sector, digital systems are increasingly recognized as strategic tools for enhancing healthcare accessibility and service effectiveness. van Tilburg et al. (2024) explain that digital healthcare implementation in primary healthcare institutions improves healthcare coordination and administrative integration

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when supported by organizational readiness and employee capability.

The findings also confirm previous studies regarding the importance of digital healthcare systems in healthcare service transformation. Nurhayati et al. (2024) found that system quality, information quality, and service usability significantly influence user satisfaction with e-Puskesmas applications. Similarly, Fitriani (2023) reported that e-Puskesmas implementation improved healthcare administration and facilitated healthcare data integration at public health centers. However, unlike previous studies that mainly focused on service quality or user satisfaction, this study specifically demonstrates that e-Puskesmas implementation directly influences healthcare service effectiveness as an organizational outcome. This finding strengthens the argument that digital healthcare systems not only improve operational efficiency but also contribute to broader institutional effectiveness in public healthcare organizations.

The results further reveal that employee competence has a positive and significant effect on healthcare service effectiveness. This finding indicates that healthcare employees' technical skills, digital literacy, communication abilities, and professional attitudes are important determinants of successful healthcare service delivery. In digital healthcare environments, employees are required not only to operate healthcare systems technically but also to adapt to changing service procedures and patient expectations. This finding supports competency theory, which emphasizes that employee performance is strongly influenced by knowledge, skills, and professional capability in carrying out organizational responsibilities (Spencer & Spencer, 1993). Competent employees are more capable of utilizing healthcare technology effectively, reducing administrative errors, and improving service responsiveness.

This result is consistent with recent studies highlighting the strategic role of employee competence in public healthcare transformation. Prasetyo et al. (2021) found that employee competence significantly affects healthcare service performance and organizational responsiveness in public healthcare institutions. Similarly, Sari and Kurniawan (2022) reported that digital literacy and technological capability among healthcare employees are essential factors in improving healthcare service quality in digital environments. Salombe et al. (2025) also emphasized that healthcare information systems and employee competence simultaneously influence the quality of public services. Therefore, this study confirms that digital healthcare systems cannot function effectively without competent human resources capable of operating and optimizing those systems within healthcare service activities.

The simultaneous effect of e-Puskesmas implementation and employee competence on healthcare service effectiveness indicates that technological and human resource dimensions are

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interconnected in determining organizational performance. The implementation of digital systems alone is insufficient if healthcare employees lack the competence required to operate the systems effectively. Conversely, competent employees may experience service limitations if healthcare systems are not integrated and technologically supportive. This finding aligns with sociotechnical perspectives in organizational studies, which explain that organizational effectiveness is achieved through the interaction between technological systems and human resource capability (Bostrom & Heinen, 1977). In healthcare institutions, digital transformation requires not only technological investment but also continuous employee development and organizational adaptation.

The findings of this study contribute to ongoing scientific debates regarding the effectiveness of digital healthcare transformation in public healthcare institutions. Many previous studies focused primarily on technology acceptance, service quality, or patient satisfaction, while limited studies examined healthcare service effectiveness comprehensively by integrating technological and human resource variables simultaneously. This study fills that gap by demonstrating that healthcare service effectiveness is influenced collectively by e-Puskesmas implementation and employee competence within the operational context of community health centers. Therefore, this study offers a more integrative understanding of digital healthcare effectiveness in primary healthcare services.

The novelty of this study lies in the integration of digital healthcare system implementation and employee competence into a single analytical framework to explain healthcare service effectiveness in public healthcare institutions. Previous studies generally examined either healthcare technology implementation or employee competence separately, whereas this study demonstrates the combined influence of both variables on organizational service effectiveness. Moreover, this study provides empirical evidence from a regional public healthcare institution, namely the Cigasong Community Health Center, which remains underrepresented in previous digital healthcare studies in Indonesia. Consequently, this study contributes theoretically to the development of digital governance and public healthcare management literature while practically providing recommendations for strengthening digital healthcare transformation and employee capacity development in community health centers.

The findings imply that healthcare institutions should not only prioritize digital infrastructure development but also continuously improve employee competence through technical training, digital literacy programs, and professional development initiatives. Sustainable digital healthcare transformation requires organizational commitment to integrating

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technological innovation with human resource development to achieve effective, efficient, and responsive healthcare services for the community.

CONCLUSION

This study aimed to analyze the effect of e-Puskesmas implementation and employee competence on healthcare service effectiveness at the Cigasong Community Health Center, Majalengka Regency. The findings revealed that e-Puskesmas implementation had a positive and significant effect on healthcare service effectiveness. The implementation of digital healthcare systems contributed to improving administrative efficiency, healthcare data accuracy, service responsiveness, and the overall quality of healthcare services. The study also found that employee competence significantly influenced healthcare service effectiveness. Employees with adequate technical skills, digital literacy, communication ability, and professional attitudes were more capable of delivering effective and responsive healthcare services. Furthermore, the simultaneous analysis demonstrated that e-Puskesmas implementation and employee competence collectively had a significant effect on healthcare service effectiveness, indicating that technological systems and human resource capability are interconnected dimensions in achieving effective healthcare services.

The findings of this study contribute theoretically to the development of digital governance and public healthcare management literature by integrating technological and human resource dimensions into a single analytical framework. Unlike many previous studies that focused separately on digital healthcare implementation or employee competence, this study demonstrates that healthcare service effectiveness is influenced simultaneously by both factors. Therefore, this study provides a more comprehensive understanding of healthcare service effectiveness within the context of primary healthcare institutions.

Practically, the findings imply that public healthcare institutions should strengthen digital healthcare transformation not only through technological infrastructure development but also through continuous employee competency improvement. Healthcare organizations need to provide regular technical training, digital literacy programs, and professional development initiatives to ensure that healthcare employees are capable of operating digital healthcare systems effectively. Sustainable healthcare service effectiveness can only be achieved when healthcare technology is supported by competent and adaptive human resources.

Despite its contributions, this study has several limitations. First, the study was conducted only at one community health center with a relatively limited number of respondents, which may affect

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the generalizability of the findings to broader healthcare contexts. Second, this study focused only on e-Puskesmas implementation and employee competence, while other factors such as organizational culture, leadership, technological infrastructure, and patient characteristics were not examined. Therefore, future researchers are encouraged to conduct broader studies involving multiple healthcare institutions and additional variables to obtain a more comprehensive understanding of digital healthcare service effectiveness in public healthcare organizations.

FUTURE DIRECTIONS

Future studies on digital healthcare services should further explore the interaction between healthcare technology implementation, employee competence, and organizational performance in broader healthcare contexts. This study found that e-Puskesmas implementation and employee competence significantly influence healthcare service effectiveness; however, the complexity of digital healthcare transformation indicates that additional organizational and technological factors may also contribute to service effectiveness. Future researchers may investigate how organizational culture, leadership support, digital infrastructure readiness, and employee adaptability influence the sustainability of digital healthcare services in public healthcare institutions.

Further research is also needed to evaluate the effectiveness of continuous employee training and digital literacy development programs in improving healthcare service quality. Since healthcare technology continues to evolve rapidly, healthcare employees are required to adapt continuously to new systems and service procedures. Therefore, future studies could examine how professional development programs, technology acceptance, and organizational learning processes contribute to improving healthcare employees' performance and healthcare service effectiveness. Exploring these aspects may provide a more comprehensive understanding of how healthcare organizations can strengthen human resource capacity within digital healthcare environments.

In addition, future studies may compare the implementation of e-Puskesmas across different healthcare institutions, regions, or service levels to identify variations in digital healthcare effectiveness. Comparative studies between urban and rural healthcare institutions, public and private healthcare facilities, or regions with different technological infrastructures may provide valuable insights into the challenges and opportunities of healthcare digitalization in Indonesia. Such comparative analyses would contribute to the development of more adaptive and context-based digital healthcare policies.

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Future researchers are also encouraged to employ mixed-method or qualitative approaches to gain deeper insights into healthcare employees' experiences, organizational adaptation processes, and public perceptions regarding digital healthcare services. While quantitative studies can explain statistical relationships among variables, qualitative exploration may reveal organizational dynamics, employee challenges, and patient experiences that cannot be fully captured through survey methods alone. Integrating quantitative and qualitative approaches may therefore provide a richer understanding of digital healthcare transformation and healthcare service effectiveness.

Moreover, future studies should examine the long-term impact of digital healthcare systems on healthcare accessibility, patient satisfaction, healthcare productivity, and organizational innovation. The rapid expansion of digital healthcare services in Indonesia indicates that healthcare institutions are entering a new phase of public service transformation in which technology and human resources must continuously adapt to changing societal needs. Consequently, future research focusing on sustainable digital healthcare governance and innovation management would make an important contribution to the development of effective, inclusive, and technology-driven public healthcare services.

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