

Implementation of Digital Transformation and Employee Work Efficiency in Hospitals

Ida Ayu Galih Pertiwi¹, Dasrun Hidayat², Mira Veranita³

E-mail: galihpertiwi07@gmail.com

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Abstract

Digital transformation is expected to improve hospital operational efficiency; however, its implementation does not automatically resolve inefficiencies in daily service processes. At Kasih Ibu Tabanan General Hospital, inpatient handover duration from January to July 2025 ranged from 58 to 83 minutes, exceeding the hospital standard of ≤ 30 minutes. Delays were also found in both new and returning patient registration services, indicating that the use of digital systems had not yet been fully supported by integrated workflows, stable infrastructure, and adequate employee adaptation. This study aimed to analyze the effect of digital transformation on employee work efficiency and to explain the operational mechanisms underlying this relationship in a hospital setting. This study employed a mixed-methods approach using a sequential explanatory design. The quantitative phase involved a questionnaire survey of 72 employees at Kasih Ibu Tabanan General Hospital. The data were analyzed using exploratory factor analysis, reliability testing, classical assumption tests, simple linear regression analysis, and hypothesis testing. The qualitative phase involved in-depth interviews and observations with five purposively selected key informants. Qualitative data were analyzed using the Miles and Huberman interactive model through data reduction, data display, and conclusion drawing. The instrument demonstrated excellent adequacy and reliability, with a Kaiser–Meyer–Olkin value of 0.945, Bartlett’s Test of Sphericity significance of <0.001 , total explained variance of 89.12%, and Cronbach’s alpha values of 0.975 for digital transformation and 0.972 for work efficiency. The regression analysis showed that digital transformation had a positive and significant effect on employee work efficiency ($\beta=0.780$; $t=8.635$; $p<0.001$), with an R^2 value of 0.994. Qualitative findings confirmed that electronic medical records, online registration, digital queueing systems, and rapid access to examination results reduced manual workload, improved data accessibility, and created more systematic work processes. Nevertheless, network interruptions, non-integrated patient handover displays, and the use of multiple registration platforms remained barriers to optimal efficiency. The findings imply that hospital management should not focus solely on adopting digital technology. Sustainable efficiency requires reliable network infrastructure, integrated system design, simplified cross-unit workflows, and continuous digital competency development for employees. These improvements are necessary to ensure that digital transformation contributes to timely, accurate, integrated, and patient-centered hospital services.

Keywords: Digital Transformation, Work Efficiency, Hospital Operations, Information Systems. Electronic Medical Records

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Introduction

Work efficiency is a key indicator in hospital management because it reflects an organization's ability to optimize resources to deliver high-quality healthcare services (Sadeghi et al., 2022); (Rodrigues & Abbas, 2025). Digital transformation has emerged as an important strategy for converting manual service processes into information technology-based systems (Prasetyo, 2020), thereby enabling faster workflows (Chen et al., 2024) (Purwadhini et al., 2025). This transformation requires organizations to effectively align technology with the work behaviors of their human resources (Hidayat et al., 2025). Human capital theory emphasizes that individual skills and competencies (Lin et al., 2025) are strategic assets for improving performance and work efficiency (Sukmara & Priadana, 2025); (Matache, 2023). Employees with adequate digital skills are able to complete their work more quickly, accurately, and in accordance with service standards (Situmorang et al., 2023); (Yuantika & Pramono, 2024). This view is supported by Rusdiana et al. (2024), who found that employees' personal technical ability and education and training contributed to accounting information system performance. In addition, (Nugraha, 2024). showed that supervision is important for maintaining employee work quality, quantity, reliability, and attitudes. (Mardianti, 2024) further emphasized that interpersonal communication contributes to harmonious work relationships and improved employee performance (Ananda et al., 2025). Therefore, the efficiency benefits of digital transformation depend not only on technological availability but also on employees' digital competence, adequate training, managerial supervision, and effective communication across work units (Khathimah et al., 2025); (Rahman Sukmara et al., 2022).

Previous studies indicate that digital transformation contributes to improving the efficiency of hospital services (Nurfaidah et al., 2025); (Rahmayanti et al., 2023). However, most studies have focused on the macro level and have not empirically examined its relationship with employee work efficiency as a micro-level unit of analysis (Chen et al., 2024). This theoretical gap is reinforced by actual conditions at Kasih Ibu Tabanan Hospital from January to July 2025, which showed work inefficiency, as evidenced by inpatient handover times exceeding the established standard, ranging from 58 to 83 minutes (Daicampi et al., 2025). Similar barriers were also observed in the registration unit, where waiting times for both new and returning patients consistently exceeded the applicable standards (Kholis et al., 2025).

The implementation of a Hospital Management Information System has not necessarily accelerated service delivery in practice when it is not accompanied by adequate human resource readiness (Kholis et al., 2025); (Pratama & Purwanto, 2023). Staff competency in operating information systems directly contributes to improved work productivity (Tangel et al., 2023); (Mintawati et al., 2024). Complaints from service users on the Google Maps platform further support the indication that efficiency barriers are systemic throughout the service pathway, ranging from online registration via Mobile JKN, which still requires additional waiting time, to errors in pharmacy dispensing (Muhajir et al., 2023). These findings confirm that digital infrastructure alone has not fully reduced service time without integrated work processes and adequate human resource preparedness (Jogiyanto, 2018).

A mixed-methods approach using a sequential explanatory design was employed to address the limitations of previous studies that have not examined the direct relationship between digital transformation and work efficiency at the micro level (Toyon, 2021). The combination of quantitative and qualitative analyses can generate a more comprehensive understanding because the two types of data complement each other's strengths (Minc et al., 2023). The quantitative phase identifies statistical



relationships among variables, whereas the qualitative phase explains the underlying mechanisms and contextual barriers encountered in practice. This methodological integration enhances the validity of the findings in portraying the complexity of work-efficiency issues within the hospital setting (Brancalion & Lima, 2022).

The urgency of this study is increasing in line with the demand for timely and accurate healthcare services amid the complexity of hospital operations (Darmawan & Aliya, 2024). Employee work inefficiency may compromise service quality and patient safety if left unaddressed without appropriate evaluation (Fadhli & Khusnia, 2021). The empirical evidence generated by this study is expected to formulate strategies for improving work efficiency that are aligned with technological development and human resource capacity at Kasih Ibu Tabanan Hospital.

Methods

This study employed a mixed-methods approach with a sequential explanatory design, combining quantitative and qualitative methods in consecutive phases (Sugiyono, 2022). The first phase involved the collection and analysis of quantitative data through a questionnaire survey administered to 72 employees at Kasih Ibu Tabanan General Hospital. Statistical analyses included classical assumption tests, multiple linear regression analysis, and partial and simultaneous hypothesis testing to examine the relationship between, and the effect of, digital transformation on work efficiency (Handayani, 2021).

The subsequent phase involved qualitative data collection through in-depth interviews and observations of five key informants selected using purposive sampling. Qualitative data were analyzed using the Miles and Huberman interactive model, which includes data reduction, data display, and conclusion drawing. This approach was used to further explore and explain the quantitative findings. The integration of both methods enabled the researchers to statistically examine causal relationships while also exploring the contextual mechanisms underlying hospital operations.

Before the instrument was used for the main data collection, construct validity was assessed through Exploratory Factor Analysis (EFA). The analysis showed a Kaiser–Meyer–Olkin (KMO) value of 0.945, a Bartlett’s Test of Sphericity significance level of less than 0.001, and four principal factors explaining 89.12% of the total variance. Reliability testing produced Cronbach’s alpha coefficients of 0.975 for digital transformation and 0.972 for work efficiency, indicating that all instrument items were valid and demonstrated excellent internal consistency.

Results and Discussion

Quantitative Findings

Classical Assumption Tests

Normality Test

Table 1. Results of the Normality Test

Variabel	Kolmogorov-Smirnov Statistic	df	Sig.	Shapiro-Wilk Statistic	df	Sig.
Unstandardized Residual	0.068	72	0.200*	0.967	72	0.055

Based on the normality test results using the Kolmogorov–Smirnov and Shapiro–Wilk methods, the Kolmogorov–Smirnov significance value was 0.200, while the Shapiro–Wilk significance value was 0.055. Both values were greater than the 0.05 significance level. Therefore, it can be concluded that the residual data in this study were normally distributed. These results indicate that the multiple linear regression model used in this study satisfied the normality assumption. Accordingly, the regression analysis could proceed to the next stage without violation of the normality assumption.

Multicollinearity Test

Table 2. Results of the Multicollinearity Test

Variabel	B	Std. Error	Beta	t	Sig.
(Constant)	-0.690	1.328	-	-0.519	0.605
Transformasi Digital	-0.086	0.043	-0.198	-1.977	0.052

Based on the results of the coefficient test presented in the table, the Digital Transformation variable had a Tolerance value of 0.050 and a Variance Inflation Factor (VIF) of 1.002. The VIF value was far below the commonly accepted threshold of 10, indicating no multicollinearity in the regression model. Although the Tolerance value for the Digital Transformation variable was relatively close to the minimum threshold of 0.10, it was generally still considered acceptable, particularly because it was supported by a very low VIF value, close to 1. This indicates that the relationship among the independent variables was not sufficiently strong to interfere with the model (Chanis & Tsamadias, 2022).

Theoretically, according to (Ghozali, 2018) a regression model is considered free from multicollinearity when the Tolerance value is greater than 0.10 and the VIF value is less than 10. This view is also supported by (Chaerudin et al., 2020) who stated that a low VIF value indicates the absence of strong correlations among the independent variables. Therefore, it can be concluded that there was no multicollinearity problem in the regression model used in this study.

Heteroscedasticity Test

Table 3. Results of the Heteroscedasticity Test

Variabel	B	Std. Error	Beta	t	Sig.
(Constant)	-0.690	1.328	-	-0.519	0.605
Transformasi Digital	-0.086	0.043	-0.198	-1.977	0.052

Heteroscedasticity was tested using the Glejser test by regressing the absolute residual values on the independent variable, namely digital transformation. Based on the test results, the significance value for the digital transformation variable was 0.052. This value was greater than the significance level of 0.05, indicating that the regression model did not exhibit heteroscedasticity.

Hypothesis Testing**Simple Linear Regression Analysis****Table 4. Results of the Simple Linear Regression Analysis**

Variabel	B	Std. Error	Beta	t	Sig.
(Constant)	-4.210	2.662	-	-1.582	0.118
Transformasi Digital	0.749	0.087	0.780	8.635	<0.001

Based on the analysis results, the following regression equation was obtained:

Work Efficiency = $-4.210 + 0.749(\text{Digital Transformation})$

The constant value of -4.210 indicates that when the Digital Transformation variable is equal to zero, Work Efficiency is predicted to be -4.210 . However, this constant was not statistically significant ($\text{Sig.} = 0.118 > 0.05$); therefore, it does not have a strong statistical interpretive meaning.

The Digital Transformation variable had a regression coefficient of 0.749 , with a significance value of < 0.001 . This result indicates that Digital Transformation has a positive and statistically significant effect on Work Efficiency. In other words, a one-unit increase in Digital Transformation is associated with a 0.749 -unit increase in Work Efficiency, assuming that other variables remain constant. The standardized beta coefficient of 0.780 further indicates that this variable had the most dominant effect in the model.

t-Test**Table 5. t-Test Results**

Variabel	B	Std. Error	Beta	t	Sig.
(Constant)	-4.210	2.662	-	-1.582	0.118
Transformasi Digital	0.749	0.087	0.780	8.635	<0.001

The t-test results showed that Digital Transformation had a t-value of 8.635 and a significance value of < 0.001 . Since the significance value was below the 0.05 threshold, the results confirm a positive and statistically significant effect of Digital Transformation on Work Efficiency. A higher level of digital transformation implementation was empirically associated with increased work efficiency at Kasih Ibu Tabanan Hospital.

Coefficient of Determination**Table 7. Results of the Coefficient of Determination Test**

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.997 ^a	.994	.994	.442



Based on the analysis results, the R Square (R^2) value was 0.994, while the Adjusted R Square value was also 0.994. The identical values of Adjusted R Square and R Square (0.994) indicate that the regression model was highly robust and stable, with no meaningful bias resulting from the inclusion of the independent variable. In addition, the R value of 0.997 indicates a very strong relationship between the independent variable and the dependent variable.

Qualitative Findings

The implementation of digital technologies, including electronic medical records, online registration, and digital radiology, has significantly transformed conventional work patterns into automated processes (Sari et al., 2023). Informant N01 (Head of Unit) described the comprehensive use of these systems as follows:

“In our unit, Vesalius has been used comprehensively, from patient registration and electronic medical records to the reporting system. In addition, a digital queueing system is available to help manage patient flow.”

This finding was supported by nursing and medical support staff, who reported substantial improvements in documentation processes and data accessibility. Faster access to examination results has become a key driver of efficiency in patient care. As stated by Informant N04:

“Examination results can now be accessed directly without having to wait for a long time, so the workflow is much faster.”

In general, informants agreed that digitalization reduced the burden of manual work, although an adaptation period was required during the initial implementation phase. This transformation has made work processes more systematic and measurable. Informant N03 from the administrative department highlighted the improved organization of data:

“The workflow has become more systematic and organized because all data are stored in the system and can be easily retrieved.”

However, this study also identified that work efficiency remained highly dependent on the stability of the technological infrastructure. Technical issues, such as network disruptions or unresponsive systems, constituted major barriers that temporarily required staff to revert to manual procedures. Informant N05 from the registration unit stated:

“The system sometimes goes down, so we have to return to manual procedures temporarily.”

The identified barriers were not limited to technical or infrastructural issues, such as network disruptions. Further analysis revealed structural and functional constraints related to system workflow design that had not fully accommodated operational needs in specific units. In the nursing unit, the handover process between shifts was hindered because the Vesalius system displayed patients' clinical data separately across different menus. Nurses were required to open records individually before conducting a comprehensive handover, meaning that information was not presented in a single integrated view. This condition directly contributed to the prolonged handover duration reported in Table 1.1, where actual times ranged from 58 to 83 minutes—nearly two to three times the established standard of ≤ 30 minutes. This finding was also confirmed by questionnaire data, in which the nursing



unit recorded one of the lowest mean scores for item X1_10 among all job categories (3.50), indicating that employees in this unit perceived system integration and ease of navigation less favorably.

A similar problem emerged in the registration unit, although in a different form. The patient registration process required the simultaneous use of more than one system, requiring staff to switch between platforms within a workflow that should ideally be completed through a single integrated system. This fragmented process extended service time per patient and contributed to registration delays, as shown in Table 1.2, where the actual registration time for both new and returning patients consistently exceeded the established standard. The questionnaire data reinforced this finding: the registration unit recorded the lowest X1_10 score across all job categories (3.45). These findings confirm that, although digital transformation had an overall positive effect, gaps in system optimization remained—particularly regarding the integration of data displays for nursing staff and the consolidation of platforms for registration staff. Addressing these gaps should be prioritized in future improvement initiatives.

Discussion

The findings from qualitative data reduction, qualitative data display, and statistical analysis demonstrate that digital transformation played a significant and positive role in improving work efficiency at Kasih Ibu Tabanan General Hospital. The implementation of the Vesalius electronic medical record system from online registration to the digitalization of supporting services—has transformed manual operations into integrated automation. The quantitative regression analysis showed that the Digital Transformation variable had a t-value of 8.635 with a significance value of < 0.001 , indicating that it was the most dominant factor affecting work efficiency.

The average inpatient handover duration from January to July 2025 ranged from 58 to 83 minutes, exceeding the established standard of ≤ 30 minutes. Delays in patient registration also confirmed the initial challenges of restructuring work processes. Strengthening digital aspects in a planned and systematic manner was shown to be a critical solution for addressing these inefficiencies.

These findings are highly consistent with Davis's Technology Acceptance Model (TAM) (Musa et al., 2024), in which the perceived usefulness of digital systems contributes to improved organizational performance (Panggulu et al., 20022). Informant N04's statement regarding the ease of accessing laboratory results reinforces the view that efficiency arises from improvements in individual productivity. The findings also support (Saputra, 2025) study concerning the reduction of human error and improved cost efficiency, and are aligned with (Wulandari et al., 2025), who identified digitalization as a solution to conventional bureaucratic processes. This implementation also supports Indonesia's national health digitalization policy, which emphasizes rapid and accurate data integration. (Almehwari et al., 2024)

The influence of technology in this context can be understood through its role as a single source of truth, eliminating data silos across units. Statements from Informants N01 and N03 confirm that real-time data access reduced coordination waiting times. The use of electronic medical records reduced employees' cognitive workload, minimized the risk of lost records, and improved legal and administrative compliance in support of patient safety. Nevertheless, dependence on stable network infrastructure, as described by Informant N05, represents a technical challenge and a key distinguishing feature of this study compared with research conducted in other hospitals (Batbuall, 2021).

This study contributes to a clearer understanding of the mechanisms through which technology affects hospital work efficiency. The mixed-methods sequential explanatory approach successfully strengthened the quantitative findings through qualitative evidence. Investment in the Vesalius system



and network infrastructure should therefore become a strategic foundation for the management of Kasih Ibu Tabanan General Hospital. Strengthening the network, improving the digital handover workflow, consolidating registration platforms, and providing continuous employee training are practical measures needed to manage increasing patient volumes and the growing complexity of modern healthcare services.

Conclusion

In conclusion, digital transformation had a significant effect on work efficiency at Kasih Ibu Tabanan Hospital. Statistical testing identified digital transformation as the primary determinant of improved operational efficiency through electronic medical records and digital registration systems. Nevertheless, further improvement is required in the integration of handover data displays and the consolidation of registration platforms. Modern system infrastructure can support a highly accurate

efficiency model, creating hospital operational workflows that are structured, systematic, and aligned with healthcare service standards.

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