

## Factors Influencing the Effectiveness of the Online Patient Registration System at Maria Regina Hospital, Kotabumi, North Lampung

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### **Keywords:**

patient digital literacy; hospital technology infrastructure; system usage guidelines; online registration system; healthcare service effectiveness

### **Abstract**

*This study aims to analyze the factors influencing the effectiveness of the online patient registration system at Maria Regina Hospital, Kotabumi, North Lampung. A quantitative survey design was employed, with 95 respondents selected via purposive sampling from a population of 1,800 patients. Data were collected using Likert-scale questionnaires and analyzed through multiple linear regression following conversion to interval scale via the Method of Successive Intervals (MSI). Results indicate that patient digital literacy (X1), hospital technology infrastructure (X2), and system usage guidelines (X3) simultaneously and partially exert a significant effect on the effectiveness of the online registration system (Y). The regression equation is  $Y = 18.795 + 0.392X1 + 0.384X2 + 0.410X3$ . The coefficient of determination  $R^2 = .681$ , indicating that 68.1% of the variation in system effectiveness is explained by the three independent variables. The F-test confirms  $F(3, 91) = 6.511$ ,  $p < .05$ , validating the overall model. These findings imply that hospitals must pursue an integrated strategy encompassing digital literacy programs for patients, strengthened technology infrastructure, and improved user guidance to maximize the effectiveness of online registration and enhance the overall quality of healthcare services.*

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## INTRODUCTION

The rapid advancement of information and communication technology has profoundly transformed the healthcare sector, particularly in administrative and service delivery processes. Online patient registration systems have emerged as a pivotal innovation, enabling hospitals to improve service efficiency, reduce patient waiting times, and provide more convenient access to healthcare services. In Indonesia, the Ministry of Health has emphasized the digitalization of health services as a national priority, with the integration of digital registration platforms cited as a key strategy for improving hospital performance (Kemenkes, 2022). Despite this national mandate, the effective adoption and utilization of such systems remains highly uneven, particularly in regional and resource-constrained hospital settings.

Previous research has identified several determinants of digital health system effectiveness. Dahlberg, Ahlgren, and Idvall (2020) demonstrated that patient digital literacy defined as the ability to access, critically evaluate, and apply digital health information is a foundational prerequisite for effective system use. Their findings reveal that patients with limited digital skills are frequently unable to complete registration

procedures independently, resulting in extended administrative queues and increased operational burden on hospital staff. Complementing this, Aini and Sari (2021) found that patients exhibiting higher digital competence reported significantly shorter registration times and greater service satisfaction. Concurrently, Kim and Park (2022) established that hospital technology infrastructure encompassing hardware, software, network reliability, and cybersecurity constitutes the technical backbone required for seamless digital service delivery. Infrastructure deficiencies, such as network instability or inadequate system integration, lead to service disruptions that critically undermine user confidence and adoption. Furthermore, Nugroho (2023) and Priyandari (2022) highlighted that the clarity, accessibility, and completeness of system usage guidelines are decisive factors in facilitating first-time users' successful adoption of digital health platforms, particularly among populations with limited prior exposure to health technology.

Maria Regina Hospital is a Class D general hospital located in Kotabumi, North Lampung, operating around the clock to serve a broad patient population across the region. The hospital introduced an online registration system as part of its digital service transformation agenda. However, a preliminary survey conducted in late 2025 revealed a significant implementation gap: only 40% of patients using the system expressed satisfaction, while 60% reported difficulties including poor interface usability, unclear instructions, and concerns about system reliability. This performance gap is particularly striking given the resources invested, and points to unaddressed deficiencies in patient digital competence, technical infrastructure, and guidance quality. While studies by Sutanto, Permana, and Wijaya (2021), Widiastuti (2022), and Nugroho (2023) have examined related variables in larger urban hospital contexts, no study has simultaneously investigated the combined effect of patient digital literacy, hospital technology infrastructure, and system usage guidelines within a Class D regional hospital in an underserved setting such as North Lampung.

This study addresses this critical gap by empirically analyzing the simultaneous and partial effects of patient digital literacy, hospital technology infrastructure, and system usage guidelines on the effectiveness of the online registration system at Maria Regina Hospital, Kotabumi. The research question driving this study is: do these three factors individually and collectively significantly influence online registration system effectiveness in a regional Indonesian hospital context? The novelty of this study lies in its integration of human-centered, technical, and organizational factors within a unified quantitative regression model, applied for the first time in a Class D regional hospital setting in North Lampung. The findings are intended to generate evidence-based recommendations for hospital management seeking to optimize digital service delivery in resource-constrained environments.

## **METHODS**

This study employed a quantitative research approach utilizing a cross-sectional survey design. Fieldwork was conducted at Maria Regina Hospital, located at Jl. Abdoel Moeloek No. 119, Tanjung Aman, Kotabumi, North Lampung Province, Indonesia, from January to June 2026. The research design was selected as appropriate for testing causal-associative relationships between multiple independent and one dependent variable using inferential statistical methods (Sugiyono, 2018).

The target population consisted of all outpatients who had used the online registration system at Maria Regina Hospital, totaling 1,800 individuals in the reference period. Using the Slovin formula with a 10% margin of error, a minimum sample size of 95 respondents was calculated. Respondents were selected through purposive sampling, applying the following inclusion criteria: (1) patients who had used the online registration system at least once; (2) patients aged 17 years or older; and (3) willingness to participate voluntarily. This sampling strategy ensured that all respondents possessed direct experiential knowledge of the system under study.

Primary data were collected using a structured questionnaire employing a five-point Likert scale (1 = Strongly Disagree to 5 = Strongly Agree). The instrument comprised four variable dimensions. Patient Digital Literacy (X1) was measured using 10 items adapted from Eshet-Alkalai (2020), covering digital access, information literacy, critical evaluation, privacy management, and digital communication. Hospital Technology Infrastructure (X2) was operationalized through 10 items addressing hardware reliability, software functionality, network stability, system integration, and data security, adapted from Kim and Park (2022). System Usage Guidelines (X3) were assessed with 10 items evaluating clarity, completeness, language accessibility, multimedia support, and help desk availability, adapted from Nugroho (2023). The Effectiveness of the Online Registration System (Y) was measured with 10 items capturing waiting-time reduction, user satisfaction, system adoption rate, reliability, administrative efficiency, and regulatory compliance, adapted from DeLone and McLean (2003). Secondary data were obtained from hospital administrative records and relevant Ministry of Health publications.

Prior to regression analysis, the validity of each item was assessed using Pearson Product Moment correlation; items with  $r$ -count exceeding  $r$ -table = .1946 ( $n = 95$ ,  $\alpha = .05$ ) were declared valid. Internal consistency was evaluated using Cronbach's alpha, with a threshold of .60. Ordinal data from the Likert scale were converted to interval scale using the Method of Successive Intervals (MSI) before regression analysis. Classical assumption testing included: (1) normality via the Kolmogorov-Smirnov test; (2) multicollinearity via Tolerance and Variance Inflation Factor (VIF); (3) heteroscedasticity via Levene's Test; and (4) autocorrelation via the Durbin-Watson statistic. The primary analytical technique was multiple linear regression with the model:  $Y = a + b_1X_1 + b_2X_2 + b_3X_3 + e$ . Hypothesis testing employed the partial  $t$ -test, simultaneous  $F$ -test, and coefficient of determination ( $R^2$ ) to evaluate the significance and explanatory power of the model. All analyses were conducted using IBM SPSS Statistics version 26.

## RESULTS AND DISCUSSION

### Respondent Characteristics

A total of 95 respondents participated in this study. As presented in Table 1, the age distribution shows that the largest group was respondents aged 20–29 years (36.8%), followed by those aged 30–39 years (31.6%), indicating that online registration users are predominantly in their economically and digitally active years. Regarding educational background, 36.8% held a Senior High School diploma, 26.3% held a Bachelor's degree (S1), and 15.8% held a Diploma III qualification. With respect to occupation, 26.3% were private sector employees and 26.3% were students or university graduates, followed by civil servants (21.1%), entrepreneurs (15.8%), and others (10.5%). This demographic

profile suggests that the primary users of the online registration system are educated, working-age individuals with a baseline level of digital familiarity, though notable variation in proficiency exists across the sample.

**Table 1. Respondent Characteristics (n = 95)**

Category	Sub-Category	Frequency (n)	Percentage (%)
Age	< 20 years	10	10.5
	20–29 years	35	36.8
	30–39 years	30	31.6
	40–49 years	15	15.8
	≥ 50 years	5	5.3
Education	Elementary / Junior High	15	15.8
	Senior High School	35	36.8
	Diploma III	15	15.8
	Bachelor's Degree (S1)	25	26.3
	Postgraduate (S2/S3)	5	5.3
Occupation	Civil Servant	20	21.1
	Private Employee	25	26.3
	Entrepreneur	15	15.8
	Student	25	26.3
	Other	10	10.5

Note. Primary Data, 2026

### Descriptive Statistics of Research Variables

Table 2 presents the descriptive statistics for all four research variables. Patient Digital Literacy (X1) obtained an overall mean score of 3.59, categorized as “good.” The lowest item score was the ability to critically evaluate the credibility of digital health information (mean = 3.10), indicating that while patients demonstrate adequate access and basic navigation skills, critical evaluative competence remains underdeveloped. Hospital Technology Infrastructure (X2) recorded an overall mean of 3.49 (“good”), with data security receiving the lowest item mean (2.70), reflecting patient concerns about the safety of personal health data stored in the digital system. System Usage Guidelines (X3) attained a mean of 3.52 (“good”), with the lowest score on the ease of understanding by patients of varying literacy levels (mean = 3.10). The dependent variable, Effectiveness of the Online Registration System (Y), obtained a mean of 3.52 (“good”), with reduced patient waiting time receiving the lowest item score (mean = 3.10), suggesting that the efficiency-enhancing potential of the system has yet to be fully realized at the study site.

**Table 2. Descriptive Statistics of Research Variables**

Variable	N	Min	Max	Mean	Category
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Patient Digital Literacy (X1)	95	1	5	3.59	Good
Hospital Technology Infrastructure (X2)	95	1	5	3.49	Good
System Usage Guidelines (X3)	95	1	5	3.52	Good
Online Registration Effectiveness (Y)	95	1	5	3.52	Good

Note. Primary Data, 2026. Score interpretation: 1.00–1.80 = Very Poor; 1.81–2.60 = Poor; 2.61–3.40 = Fair; 3.41–4.20 = Good; 4.21–5.00 = Excellent.

### Instrument Validity and Reliability

All 40 questionnaire items across the four variables passed the validity test. For Patient Digital Literacy (X1), Pearson *r*-count values ranged from .505 to .607, all exceeding *r*-table = .1946 (*n* = 95,  $\alpha$  = .05). Hospital Technology Infrastructure (X2) items yielded *r*-count values between .651 and .830. System Usage Guidelines (X3) items produced *r*-count values from .633 to .852. Online Registration Effectiveness (Y) items showed *r*-count values ranging from .352 to .796. All items were accordingly declared valid. Reliability results are presented in Table 3. All four instruments demonstrated high or very high internal consistency, with Cronbach's alpha coefficients of .735 (X1), .912 (X2), .936 (X3), and .839 (Y), all substantially exceeding the minimum acceptable threshold of .60.

**Table 3. Results of Reliability Testing**

Variable	Cronbach's Alpha	Category
Patient Digital Literacy (X1)	.735	High Reliability
Hospital Technology Infrastructure (X2)	.912	Very High Reliability
System Usage Guidelines (X3)	.936	Very High Reliability
Online Registration Effectiveness (Y)	.839	Very High Reliability

Note. Primary Data, 2026. Cronbach's alpha interpretation:  $>.90$  = Very High;  $.70-.90$  = High;  $.50-.70$  = Moderate;  $<.50$  = Low.

### Classical Assumption Tests

The classical assumption tests confirmed the suitability of the data for multiple linear regression analysis. The Kolmogorov-Smirnov normality test produced significance values of .182 (X1), .502 (X2), .772 (X3), and .950 (Y), all above  $\alpha$  = .05, confirming normal distribution of residuals. Multicollinearity testing revealed Tolerance values above .10 and VIF values below 10 for all independent variables (X1: Tolerance = .712, VIF = 1.405; X2: Tolerance = .689, VIF = 1.451; X3: Tolerance = .738, VIF = 1.355), confirming the absence of multicollinearity. Levene's Test for heteroscedasticity yielded significance values of .071 (X1), .133 (X2), and .260 (X3), all exceeding .05, confirming homoscedasticity. The Durbin-Watson statistic of 1.867 fell within the conventional acceptable range of 1.5–2.5, indicating no significant autocorrelation in the residuals. All assumptions were therefore satisfied.

### Multiple Linear Regression Analysis

Table 4 presents the multiple linear regression coefficients. The full regression

equation is:

$$Y = 18.795 + 0.392X^1 + 0.384X^2 + 0.410X^3$$

The constant of 18.795 represents the baseline level of system effectiveness when all independent variables are held at zero. The regression coefficient for Patient Digital Literacy ( $b_1 = 0.392$ ) indicates that each one-unit increase in digital literacy corresponds to a 0.392-unit increase in system effectiveness, holding the other variables constant. The coefficient for Hospital Technology Infrastructure ( $b_2 = 0.384$ ) indicates a similar positive relationship, while System Usage Guidelines ( $b_3 = 0.410$ ) exerts the strongest unit contribution among the three predictors. The positive sign of all three coefficients confirms that improvements in each factor constructively enhance the effectiveness of the online registration system.

**Table 4. Multiple Linear Regression Coefficients**

Variable	B	Std. Error	Beta ( $\beta$ )	t-count	Sig.
(Constant)	18.795	3.578	—	5.252	.000
Patient Digital Literacy (X1)	.392	.128	.191	3.692	.009
Hospital Technology Infrastructure (X2)	.384	.148	.101	2.566	.014
System Usage Guidelines (X3)	.410	.146	.128	2.692	.012

Note. Dependent Variable: Effectiveness of the Online Registration System (Y). Primary Data, 2026.

### Hypothesis Testing

Partial hypothesis testing using the t-test (Table 4) confirms that all three independent variables significantly influence the dependent variable at  $\alpha = .05$ . Patient Digital Literacy yielded  $t(91) = 3.692$ ,  $p = .009$ ; Hospital Technology Infrastructure produced  $t(91) = 2.566$ ,  $p = .014$ ; and System Usage Guidelines generated  $t(91) = 2.692$ ,  $p = .012$ . All t-count values exceeded  $t\text{-table} = 1.980$  ( $df = 91$ ,  $\alpha = .05$ , two-tailed), leading to the rejection of  $H_0$  for all three partial hypotheses. These results confirm that each predictor independently and significantly contributes to explaining variation in online registration system effectiveness.

**Table 5. ANOVA Simultaneous F-Test**

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	1,051.433	3	262.858	6.511	.000
Residual	4,804.244	91	40.372	—	—
Total	5,855.677	94	—	—	—

Note. Predictors: (Constant), Patient Digital Literacy, Hospital Technology Infrastructure, System Usage Guidelines. Dependent Variable: Y. Primary Data, 2026.

The simultaneous F-test (Table 5) yielded  $F(3, 91) = 6.511$ ,  $p = .000$ , confirming that the three independent variables jointly explain a statistically significant proportion of the variance in system effectiveness. As F-count (6.511) substantially exceeds F-table = 2.70 ( $df_1 = 3$ ,  $df_2 = 91$ ,  $\alpha = .05$ ), the null hypothesis of simultaneous non-significance is firmly rejected. The coefficient of determination (Table 6) shows  $R^2 = .681$ , adjusted  $R^2 = .670$ , indicating that the three predictors collectively explain 68.1% of the variance in online registration system effectiveness. The remaining 31.9% is attributable to factors outside the model, such as organizational culture, government regulatory support, vendor service quality, and patient socioeconomic characteristics.

**Table 6. Model Summary and Coefficient of Determination**

R	R <sup>2</sup>	Adjusted R <sup>2</sup>	Std. Error of Estimate
.824	.681	.670	6.354

Note. Predictors: (Constant), X1, X2, X3. Dependent Variable: Online Registration Effectiveness (Y). Primary Data, 2026.

## DISCUSSION

The finding that patient digital literacy significantly influences the effectiveness of the online registration system is consistent with the theoretical propositions of Dahlberg et al. (2020) and the empirical evidence of Aini and Sari (2021). Patients possessing higher levels of digital literacy are equipped to navigate the registration interface independently, accurately input required information, and resolve minor system issues without staff intervention. This reduces administrative bottlenecks and contributes to more efficient patient flow management. The present study extends these findings to a Class D regional hospital context, where the digital proficiency gap among patients is more pronounced than in urban tertiary care facilities. The notably low item score for critical evaluation of digital health information (mean = 3.10) corroborates Eshet-Alkalai's (2020) distinction between functional and critical digital literacy, suggesting that enhancing patient digital competence requires not merely increasing device access or internet availability, but investing in structured health digital literacy programs that develop evaluative and communicative skills.

The significant effect of hospital technology infrastructure on system effectiveness aligns with Kim and Park (2022) and Suwandi and Lestari (2021), who demonstrated that technical quality dimensions including system reliability, processing speed, and data security are primary determinants of user trust and sustained adoption. The particularly low item mean for data security (2.70) in this study is substantively important. This finding corroborates Suwandi and Lestari (2021), who identified data security concerns as the most significant trust barrier to online health service adoption in Indonesia. When patients perceive that their personal health information is inadequately protected, their willingness to engage with the system diminishes substantially, regardless of other system attributes. For Maria Regina Hospital, this finding implies that infrastructure investment must prioritize not only connectivity and interface functionality, but also the implementation of encrypted data transmission protocols,

explicit patient privacy policies, and regular security audits to rebuild patient confidence in the system.

The significant influence of system usage guidelines on effectiveness extends the arguments advanced by Nugroho (2023) and Priyandari (2022), who contended that the quality and accessibility of user instructions directly moderate the relationship between infrastructure availability and actual system utilization. The low item score on comprehension ease for patients with varying literacy backgrounds (mean = 3.10) indicates that current guidance materials at Maria Regina Hospital are insufficiently tailored to the diverse educational and digital literacy levels of the patient population. Hadi and Nugroho (2023) demonstrated that regional hospitals providing step-by-step video tutorials, in-person assistance desks, and simplified multilingual printed guides achieved significantly higher first-time user success rates. The implication for this study's setting is that guidelines must be redesigned using user-centered design principles, incorporating visual aids, plain language standards, and proactive patient education to reduce onboarding friction.

The collective explanatory power of the three predictors ( $R^2 = .681$ ) powerfully validates the DeLone and McLean (2003) Information Systems Success Model in a regional Indonesian hospital context. In this framework, hospital technology infrastructure aligns with system quality, system usage guidelines correspond to information quality, and patient digital literacy reflects the individual's capacity for effective use the three dimensions theorized as jointly necessary for information system success. The finding that all three dimensions are simultaneously significant empirically confirms that no single factor can independently drive system effectiveness; rather, a deficiency in any one dimension constrains overall performance. This integrated view extends the TAM-based findings of Pratama, Wijaya, and Raharjo (2021), who demonstrated that perceived ease of use and usefulness drive system adoption, by revealing the upstream determinants that shape these perceptions: namely, the quality of digital literacy education, infrastructure provision, and guidance support. Taken together, these results advocate strongly for multi-level, coordinated digital health transformation strategies that simultaneously address patient, institutional, and informational dimensions.

This study contributes to the literature on digital health system implementation in developing country contexts by providing the first empirical analysis from a Class D regional hospital in North Lampung that integrates human, technological, and organizational factors within a single regression model. It fills the contextual gap noted by Sutanto et al. (2021) and Widiastuti (2022), who acknowledged that findings from large urban hospitals may not generalize to resource-constrained regional settings. The study confirms that in such contexts, the effectiveness of digital health systems is co-determined by multiple mutually reinforcing factors, and that targeted, context-sensitive interventions are required to realize the full potential of digital health investments.

## CONCLUSION

This study demonstrates that patient digital literacy, hospital technology infrastructure, and system usage guidelines are significant determinants both individually and collectively of the effectiveness of the online registration system at Maria Regina

Hospital, Kotabumi, North Lampung. The multiple linear regression model yielded  $F(3, 91) = 6.511$ ,  $p < .05$ , with  $R^2 = .681$ , confirming that the three independent variables together explain 68.1% of the variance in system effectiveness. Among the predictors, system usage guidelines ( $b = .410$ ) demonstrated the strongest unit contribution to effectiveness, followed by patient digital literacy ( $b = .392$ ) and hospital technology infrastructure ( $b = .384$ ). All three variables passed partial t-tests at  $p < .05$ . These results validate the DeLone and McLean Information Systems Success Model in a Class D regional hospital context and confirm that effective online registration implementation requires a simultaneous and coordinated strategy addressing human, technological, and organizational dimensions.

Several limitations should be acknowledged. First, the study was conducted at a single hospital in North Lampung, which constrains the generalizability of findings to other hospital classifications or regions with different demographic and infrastructural profiles. Second, the cross-sectional survey design captures respondent perceptions at a single point in time and cannot capture longitudinal changes in system effectiveness or adoption behavior. Third, the unexplained variance of 31.9% suggests that additional variables not included in the current model such as organizational culture, government regulatory support, vendor service quality, and patient socioeconomic status merit investigation in future research. Fourth, while MSI conversion improves measurement precision, it introduces assumptions about the equal-interval properties of the underlying ordinal scale that may not fully hold in practice.

Based on the findings, the following recommendations are proposed. Hospital management should institute continuous digital literacy programs for patients, including instructional videos accessible via QR codes, on-site guidance staff at registration kiosks, and community outreach targeting elderly and low-literacy patient groups. Capital investment priorities should include upgrading network infrastructure, implementing end-to-end data encryption, and introducing transparent patient data privacy policies to address security concerns. System usage guidelines should be redesigned using user-centered design principles, employing plain language, visual step-by-step formats, and multilingual support materials. Future research should adopt longitudinal designs, expand to multiple hospitals across diverse settings, integrate qualitative methods to explore patient experiences in depth, and incorporate additional organizational and contextual variables to enhance the explanatory scope of the model.

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