

EVALUATION OF THE SUCCESS OF IMPLEMENTATION OF ELECTRONIC MEDICAL RECORDS AT RSUP Dr. SITANALA WITH USER SATISFACTION AS AN INTERVENING VARIABLE

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Abstract

This study aims to assess the success of EMR implementation based on user satisfaction and net benefits, as well as to determine the supporting and inhibiting factors in EMR implementation. This study uses a quantitative method with cross cross-sectional design. The research sample used purposive sampling with a total of 84 respondents (nurses who have worked for at least 3 years). The independent variables in this study are system quality, information quality, service quality, and user perception. The dependent variable is the net benefits, and the intervening variable is user satisfaction. Data analysis using SEM PLS. The results show that user satisfaction does not mediate the influence between system quality variables, information quality, service quality, and user perception of net benefits. System quality and information quality affect user satisfaction and net benefits. Service quality affects user satisfaction but does not affect net benefits. User perception does not affect user satisfaction and net benefits. User satisfaction affects net benefits. The most influential independent variable is information quality.

Keywords: Implementation success, medical records, customers

Abstrak

Penelitian ini bertujuan untuk mengevaluasi keberhasilan implementasi EMR berdasarkan kepuasan pengguna dan manfaat bersih, serta untuk mengidentifikasi faktor-faktor pendukung dan penghambat dalam implementasi EMR. Penelitian ini menggunakan metode kuantitatif dengan desain cross-sectional. Sampel penelitian menggunakan sampling purposif dengan total 84 responden (perawat yang telah bekerja minimal 3 tahun). Variabel independen dalam penelitian ini adalah kualitas sistem, kualitas informasi, kualitas layanan, dan persepsi pengguna. Variabel dependen adalah manfaat bersih, sedangkan variabel mediasi adalah kepuasan pengguna. Analisis data menggunakan SEM PLS. Hasil menunjukkan bahwa kepuasan pengguna tidak memediasi pengaruh antara variabel kualitas sistem, kualitas informasi, kualitas layanan, dan persepsi pengguna terhadap manfaat bersih. Kualitas sistem dan kualitas informasi mempengaruhi kepuasan pengguna dan manfaat bersih. Kualitas layanan mempengaruhi kepuasan pengguna tetapi tidak mempengaruhi manfaat bersih. Persepsi pengguna tidak mempengaruhi kepuasan pengguna dan manfaat bersih. Kepuasan pengguna

mempengaruhi manfaat bersih. Variabel independen yang paling berpengaruh adalah kualitas informasi.

Kata Kunci: Keberhasilan Implementasi, Rekam Medis, Pelanggan

INTRODUCTION

Hospitals are institutions that bear the responsibility of providing comprehensive health services in Indonesia (Law of the Republic of Indonesia, 2023). Advances in technology and information systems have had a significant positive impact on hospitals by transforming their business processes from manual or conventional to digital and automated (Gartee, 2007). One of the global trends in healthcare is the use of Electronic Health Records (EHR), which leverage information technology (Carter, 2001). EMR has become the primary choice in many hospitals worldwide as a replacement for traditional paper-based medical records. According to Hoyt & Yoshihashi (2014), discussions about electronic medical records include a comprehensive definition. They state that EMR is a computerized health information system used to store, record, and access patient medical data digitally. The government issued Regulation of the Ministry of Health of the Republic of Indonesia Number 24 of 2022, which mandates that healthcare facilities implement EMR by the end of 2023 at the latest. Every EMR system owned by healthcare facilities must be connected to the SATU SEHAT platform, adhering to the data standards and systems established by the Ministry of Health by December 31, 2023. Information technology is recognized as a valuable tool in improving patient safety and service quality (Carter, 2001). EHR is not only a tool for data storage but also a platform to enhance communication and coordination among healthcare providers, and it is crucial for healthcare integration and operational efficiency (Amatayakul, 2012).

Research findings (literature review) by Pamuji et al. (2024) indicate that to achieve success in RME implementation, several supporting factors are required, which can be categorized as man, money, method, and machine. Man refers to human resources (HR) who operate RME (user satisfaction, perceived benefits and ease of use, attitudes, and interest). Money relates to economics. The method relates to organizational policies. Machine includes factors such as performance, information quality, control, system quality, and services. Meanwhile, the results of a literature study by Putri (2023) classify the challenges in implementing RME into four main aspects, namely legal aspects, human resources, technology, and infrastructure. Dr. Sitanala General Hospital is located in Tangerang City and is one of the Ministry of Health's Class B hospitals with legal status as a Public Service Agency (BLU). The hospital is one of the healthcare institutions that has been using RME for a long time. The first use of RME at Dr. Sitanala General Hospital was in 2014 as a pilot project tested in the Outpatient Department. Following that, in 2015, RME was implemented in the cashier department, Patient Registration Center (TPP), and Inpatient Ward. At that time, the development of RME at Dr. Sitanala General Hospital appeared to progress slowly, as it had not yet become a necessity. It was only after 2018 that RME began to develop more effectively, eventually becoming mandatory.

Based on the pre-research survey conducted, the results indicated that there were several issues faced by RME users, particularly doctors and nurses at Dr. Sitanala General Hospital, mainly related to system quality and service support. The survey results showed that the RME system at Dr. Sitanala General Hospital still did not meet users' expectations for a reliable information system. These challenges pose a significant obstacle for Dr. Sitanala General Hospital in implementing RME, as user satisfaction is a critical factor in the success of RME implementation. To date, no assessment has been conducted regarding the success of RME implementation at Dr. Sitanala General Hospital. Therefore, research on the assessment of the success of RME implementation in terms of user satisfaction and its benefits for individuals and organizations is very important to be conducted, so that it can serve as feedback for hospital management to make improvements. The general objective of this study is to evaluate the success of RME implementation at Dr. Sitanala General Hospital by analyzing the influence of system quality, information quality, service quality, and user perceptions on net benefits mediated by user satisfaction, as well as to identify the supporting and hindering factors in the success of RME implementation.

METHOD

This study was conducted at Dr. Sitanala General Hospital, Tangerang City, Banten Province. The research design was quantitative using a cross-sectional approach. The target population in this study was all nurses in the Outpatient and Inpatient Units of Dr. Sitanala General Hospital, Tangerang, totaling 132 people. In this study, sample collection was conducted using the purposive sampling technique, which is a technique for selecting samples based on specific considerations/criteria (having worked using RME for at least 3 years). Therefore, the sample in this study consisted of 84 people, in accordance with the number of samples that met the inclusion criteria. In this quantitative study, variables such as system quality, information quality, service quality, user perception, *net benefit*, and user satisfaction were collected using a questionnaire, which included several closed-ended statements and one open-ended question. Each statement in the closed-ended questionnaire was accompanied by response options in the form of a Likert scale, where respondents could rate their responses using a scale from one to four.

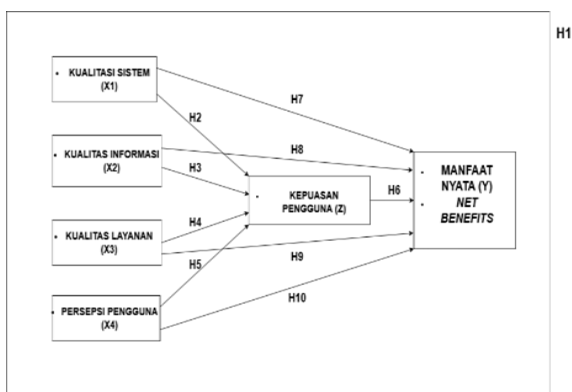


Figure 1. Research Constellation

RESULTS AND DISCUSSION

The respondents in this study are nurses at Dr. Sitanala Tangerang Hospital in the Outpatient and Inpatient Installation with a minimum working period of 3 years totaling 84 nurses. The number of respondents in this study was dominated by female respondents, which was 90.5%, all of whom were of productive age and the most were aged 19-44 years (adults) which was 76.2% and the most worked in the inpatient unit which was 66.7%. Based on the length of work, the most worked for 3-10 years, which is 47.6%, with the highest level of education being D3 graduates, which is 70.2%, then S1 Nurse graduates are 16.7% and S1 Kep graduates are 13.1%.

Data Analysis

The research objects in this study are system quality (X1), information quality (X2), service quality (X3), and user perception (X4) as exogenous latent variables, user satisfaction (Z) as latent mediating variables, and *net benefits* (Y) as endogenous latent variables. The analysis method used in this study to answer the research hypothesis is *Partial Least Square - Structural Equation Modelling* (PLS-SEM) using SmartPLS statistical software version 4. The series of data management processes includes measurement model testing and structural model testing.

Evaluation of Measurement Models (*Outer Model*)

The first stage of *PLS-SEM* analysis is to test the measurement model (measurement model) or outer model. The evaluation of the measurement model or *measurement model* aims to see the validity of the indicator and its reliability. In this study, all latent variables are formed with reflective indicators. In the reflective relationship model, the *measurement evaluation model* consists of convergent validity, discriminant validity, and reliability (Hair *et al.*, 2014). Based on the results of the measurement model, it is known that all indicators have an *outer loading/factor loading* value of more than 0.7. In addition, each latent variable has an AVE value greater than 0.5. Thus, it can be concluded that the model has met the convergent validity. Based on the results of the *Fornell-Larcker criterion test*, it can be seen that the square root value of AVE of each construct is greater than the correlation value between the constructs and other constructs in the model. So that the requirements for discriminatory validity have been met. Based on the results of the HTMT test, it shows that all HTMT values are less than 0.9, then it can be stated that all constructs have validity. The results of the analysis showed that all research variables had a value of *Cronbach's alpha* and *composite reliability* of more than 0.7. Thus, it can be concluded that all indicator constructs have met the required reliability so that the analysis can be carried out to the next stage, namely the *structural model*.

Evaluation of Structural Models (*Inner Model*)

In the second part of the PLS SEM analysis, namely the evaluation of the structural model, or inner model, consists of the evaluation of the structural model and the level of significance of the path coefficient. Structural model evaluation is carried out to ensure that the structural model built is robust and accurate by looking at several indicators including the model fit test (Goodness of Fit) through the Standardized Root Mean Square

Residual (SRMR) value, Q-Square predictive relevance (Q2), the inner model multicollinearity test through the VIF (Variance Inflation Factor) test, and the R-Square determination coefficient (R2). Furthermore, the evaluation of the structural model also looked at the significance level of the path coefficient used for hypothesis testing, namely predicting the relationship between latent variables (Hair et al, 2014). The results of the model's Goodness of fit test showed that the SRMR value of the model in saturated was 0.080 (<0.1). Thus, it can be concluded that the model is declared fit and feasible to test the research hypothesis. Based on the results of the analysis, the endogenous variable user satisfaction has a Q2 value of 0.323, and the endogenous net benefits variable has a Q2 value of 0.444. The calculation results show that the prediction of the relevance value (Q2) to the endogenous variable is more than 0, so that the model can be said to have a relevant prediction value or the model is fit or worthy of hypothesis testing.

VARIABLE ENDOGENOUS	R SQUARE (R ²)	CRITERION
USER SATISFACTION	0,562	Moderate
NET BENEFITS	0,677	Strong

Table 1. Value R Square (R²)

Based on the table above, it can be stated that system quality, information quality, service quality, and user perception simultaneously affect the user satisfaction variable, which is 0.562 or 56.2%, while the remaining 43.8% is influenced by other factors outside the model. Furthermore, system quality, information quality, service quality, and user perception mediated by user satisfaction affected the *net benefits* variable by 0.677 or 67.7%, while the remaining 32.3% was influenced by other factors outside the model.

Significance Rate of Path Coefficient (Hypothesis Testing)

The analysis of the significance level of the pathway coefficient in PLS-SEM was carried out using *the bootstrapping technique* which aims to determine the direction of the relationship and the significance of the relationship between exogenous latent variables and endogenous latent variables. Based on the R Square Value table, the R square (R2) *actual use* value is 0.465, so that the simultaneous influence of system quality, information quality, service quality, user perception, and user satisfaction on *net benefits* can be done by calculating f-statistic or f-statistics using the formula as below:

R2 = 0.465, with k (number of variables) = 6 and n (amount of data) = 84

$$F \text{ count} = \frac{\frac{R^2}{(k)}}{(1-R^2)/(n-k-1)}$$

$$F \text{ count} = \frac{\frac{0,677}{(6)}}{(1-0,677)/(84-6-1)}$$

F count = 26.89

HIPOTESIS		PATH COEFFI CIENT	SAMP LE MEA N	STAND ARD DEVIAT ION	T STATIS TICS	P VALUE S
DIRECT INFLUENCE						
H2	System Quality -> User Satisfaction	0,269	0,281	0,109	2,475	0,007*
H3	Quality of Information -> User Satisfaction	0,321	0,319	0,103	3,132	0,001*
H4	Quality of Service -> User Satisfaction	0,260	0,249	0,139	1,873	0,031*
H5	User Perception -> User Satisfaction	-0,019	-0,012	0,103	0,183	0,427
H6	User Satisfaction -> Net benefits	0,202	0,215	0,088	2,288	0,011*
H7	System Quality -> Net Benefits	0,281	0,289	0,099	2,853	0,002*
H8	Quality of Information -> Net Benefits	0,388	0,383	0,088	4,430	0,000*
H9	Quality of Service -> Net benefits	-0,044	-0,060	0,117	0,377	0,353
H10	User Perception -> Net benefits	0,092	0,100	0,095	0,970	0,166

***P values <0.05 (hypothesis accepted)**

Table 2. Hypothesis Testing Results

DIRECT RELATIONSHIPS			INFLUENCE	MEDIATION INFLUENCE RELATIONSHIP			CONCLUSI ON OF MEDIATIO N EFFECTS
PATH COEF F	P values	T values	Var. Mediation	Path Coeff	P values	T value s	
0,281	0,002*	2,853	KS → KP → NB	0,054	0,038*	1,781	No Mediation
0,388	0,000*	4,430	KI → KP → NB	0,065	0,049*	1,652	No Mediation
-0,044	0,353	0,377	KL → KP → NB	0,052	0,116	1,196	No mediation
0,092	0,166	0,970	PP → KP → NB	-0,004	0,434	0,167	No mediation

Table 3. Results of the analysis of direct and indirect influences

The results of the analysis through calculation obtained an F value of 26.898, which is greater than the F table ($\text{FINV}(0.05; 5; 78) = 2,332$). This means that $F \text{ calculates} > F \text{ Table}$, so that it can be stated that there is an influence of system quality, information quality, service quality, user perception and user satisfaction on *net benefits* simultaneously. The information from the results of the analysis of direct and indirect influences is as follows:

- a. It is known that the results of the calculation of the indirect influence of System Quality (KS) \rightarrow User Satisfaction (KP) \rightarrow *Net benefits* (NB) have a coefficient value of 0.054 which means that the result is smaller than the direct influence of System Quality (KS) \rightarrow Net Benefit (NB) of 0.281. So it can be interpreted that user satisfaction is not able to be an intervening variable or mediating between system quality and real benefits (*Net benefits*).
- b. It is known that the results of the calculation of the indirect influence of Information Quality (KI) \rightarrow User Satisfaction (KP) \rightarrow *Net benefits* (NB) have a coefficient value of 0.049 which means that the result is smaller than the direct influence of Information Quality (KI) \rightarrow *Net benefits* (NB) of 0.388. So it can be interpreted that user satisfaction is not able to be an intervening variable or mediate between the quality of information and the *net benefits*.
- c. It is known that the relationship between Quality of Service (KL) and $>$ Net benefit (NB) has a t-value of 0.377 ($\leq t \text{ table} = 1.645$) with a p-value of 0.353 (≥ 0.05), which means that H_0 is accepted and H_a is rejected. And from the results of the calculation of the indirect influence of the relationship between Quality of Service (KL) \rightarrow User Satisfaction (KP) \rightarrow *Net benefits* (NB) have a t-value of 1.196 ($\leq t \text{ table} = 1.645$) with a p-value of 0.116 (≥ 0.05). So it can be interpreted that user satisfaction is not able to be an intervening variable between service quality and *net benefits*.

It is known that the relationship between User Perception (PP) and $>$ User Satisfaction (KP) has a t-value of 0.183 ($\leq t \text{ table} = 1.645$) with a p-value of 0.427 (≥ 0.05), which means that H_0 is accepted and H_a is rejected. And from the results of the calculation of the indirect influence, it is known that the relationship between User Perception (PP) \rightarrow User Satisfaction (KP) \rightarrow *Net benefits* (NB) has a t-value of 0.167 ($\leq t \text{ table} = 1.645$) with a p-value of 0.434 (≥ 0.05). So it can be interpreted that user satisfaction is not able to be an intervening variable or mediate between user perception and *net benefits*.

DISCUSSION

This study aims to examine the influence of system quality, information quality, service quality, and user perception on user satisfaction and net benefits from the use of Electronic Medical Records (EMR) at Dr. Sitanala Regional General Hospital. The main focus of this study is on the mediating role of user satisfaction in bridging the relationship between independent variables and the net benefits of EMR. The results of the study indicate that the hypothesis regarding the mediating role of user satisfaction is not accepted. This means that user satisfaction has not been able to function as an effective mediator in influencing the relationship between system quality, information quality,

service quality, and user perceptions toward the net benefits of EMR use. This finding aligns with Seddon's (1997) critique of the DeLone and McLean model, which emphasizes that not all variables in the model are directly correlated across various implementation contexts of information systems.

Seddon states that user satisfaction is more appropriately considered an attitude variable that emerges as a result of system quality and information quality, rather than an intermediary factor that bridges input and output variables in an information system framework. Therefore, efforts to improve the RME system at Dr. Sitanala General Hospital must be comprehensive and not solely focused on improving user satisfaction. Challenges that arise, such as technical constraints, limited facilities, and suboptimal human resources, need to be addressed immediately with a more integrated approach. Management support is crucial for improving infrastructure, enhancing user training, and strengthening the information technology team to ensure that the RME system can deliver optimal benefits in practice. The need for system quality improvement is critical, as research findings indicate that system quality has a positive and significant impact on RME user satisfaction at Dr. Sitanala General Hospital. The better the system quality, the higher the satisfaction levels reported by nurses, who are the primary users of the RME system.

These findings align with the Information System Success Model (ISSM) framework developed by DeLone and McLean (2003) and the perspectives of Hamilton and Chervany (1981), who state that a successful system is one that effectively meets user needs. A reliable, flexible, and secure system is essential in supporting healthcare staff performance and enhancing the efficiency and effectiveness of hospital services. Good system quality not only contributes to increased user satisfaction but also strengthens the sustainability of information systems in the long term. In addition, information quality was found to have a positive and significant influence on RME user satisfaction. This indicates that the higher the quality of information produced by the system, the higher the level of user satisfaction with the system. Good information quality encompasses the accuracy, relevance, completeness, and timeliness (up-to-date) of the data available within the RME. When the information available in the RME system meets these criteria, nurses can perform their clinical and administrative tasks more effectively and efficiently. This, in turn, enhances trust in the system and the satisfaction felt by users. These findings support the ISSM framework proposed by DeLone and McLean (2003), which identifies information quality as one of the key dimensions in determining the success of an information system. In the context of Dr. Sitanala General Hospital, accurate and relevant information can accelerate medical and administrative decision-making and minimize the risk of errors in healthcare services.

Furthermore, service quality has also been proven to have a positive and significant influence on RME user satisfaction. This means that the services provided by the information technology team, including technical support, availability of assistance, and responsiveness to user problems, contribute to increasing user satisfaction with the RME system. These findings are in line with the views of DeLone and McLean (2003), who state that service quality is one of the important elements in determining the level of user

satisfaction with information systems. In the context of healthcare, where the availability and stability of information systems are crucial, responsive and high-quality technical support services are an urgent need that must be met by hospital management. However, users' perceptions of the RME system did not significantly influence user satisfaction. This indicates a mismatch between users' expectations of the system and their actual experiences. According to the Technology Acceptance Model (TAM) proposed by Davis (1989), perceptions of the ease of use and benefits of a system should have a positive impact on users' attitudes and their level of acceptance of the system. However, in this study, users' high expectations of RME were not met by reality, as indicated by various technical constraints and facility limitations experienced during system use. As a result, the positive perceptions initially held by users were not sufficient to increase their satisfaction with RME. Factors such as system failures, slow access, or lack of technical training could be the main causes of the insignificant influence of user perceptions on satisfaction in the context of Dr. Sitanala General Hospital.

Furthermore, the research results indicate that user satisfaction has a positive and significant influence on the net benefits of using RME. This means that the higher the level of user satisfaction, the greater the actual benefits obtained from using the RME system. This finding supports DeLone and McLean's (2003) ISSM framework, which emphasizes that net benefits are the end result of an information system that successfully meets the needs of its users. In the hospital context, net benefits include increased work productivity, improved decision-making, service efficiency, and overall improvement in the quality of healthcare services. User satisfaction can be a key driver in achieving successful information system implementation, as satisfied users are more motivated to use the system and integrate it into their daily work practices. Additionally, system quality has a significant direct impact on the net benefits of RME. This indicates that a well-designed, stable, and user-centric system can provide substantial value to an institution, both in terms of process efficiency and improved service quality. This finding reinforces DeLone and McLean's ISSM framework, which states that the net benefits of an information system can be measured by its contribution to improving organizational effectiveness and efficiency. At Dr. Sitanala General Hospital, the existence of a high-quality RME system can accelerate access to patient medical data, improve coordination between units, and reduce errors in patient recording and handling, which ultimately impacts patient satisfaction and overall institutional performance.

Information quality has also been proven to have a significant influence on the net benefits of RME use. When the information generated by the system is accurate, complete, and relevant, users can work more efficiently and make better decisions. In the context of hospitals, high-quality information enables medical staff to make appropriate clinical decisions, accelerate diagnosis, and optimize patient treatment plans. This indicates that the net benefits of RME systems are highly dependent on how well the system can provide the information needed by users at the right time and in an easily understandable format. However, service quality does not have a significant influence on the net benefits of RME. This result can be explained through Richard Oliver's Expectancy Disconfirmation Theory (EDT) (1980), which states that user satisfaction and

perceived benefits depend on the comparison between expectations and reality. In this case, although the quality of IT services at Dr. Sitanala General Hospital is considered quite good, the fact that there are still many unresolved technical issues prevents the services from having a tangible impact on the net benefits of RME. Therefore, improvements in infrastructure facilities, the addition of competent technical staff, and ongoing user training are necessary to ensure that service quality can truly contribute significantly to enhancing the net benefits of the system.

User perceptions of the RME system also do not significantly influence net benefits. This finding is supported by Hassenzahl's (2008) User Experience (UX) theory, which emphasizes that user experience is not only determined by functionality or ease of use but also by emotions and feelings that arise during and after using the system. At Dr. Sitanala General Hospital, negative experiences such as technical barriers, infrastructure limitations, and lack of operational support caused users to not feel the benefits they should have received despite their initial positive perceptions of RME. This mismatch between expectations and reality became the primary factor leading to the rejection of the hypothesis regarding the influence of user perceptions on net benefits. Overall, this study provides important insights into the factors influencing the success of health information system implementation, particularly RME, in a hospital setting. The findings indicate that the success of an information system is not determined by a single aspect but rather the result of complex interactions between various elements, including system quality, information, services, and user perceptions. In the context of Dr. Sitanala General Hospital, an increase in the net benefits of RME can only be achieved through a holistic approach that includes technical improvements, managerial support, human resource development, and enhanced interaction between users and the system. Therefore, comprehensive strategic policies are needed to ensure that RME can maximize its impact on the quality of healthcare services at this hospital.

CONCLUSION

Based on the results of this study, it can be concluded that user satisfaction has not been able to function effectively as a mediator between the variables of system quality, information quality, service quality, and user perceptions of the net benefits of using Electronic Medical Records (EMR) at Dr. Sitanala General Hospital. This means that although these variables have a direct relationship with net benefits, user satisfaction has not been able to bridge this relationship significantly. To improve user satisfaction, improvements in system quality, information quality, and service quality are important steps that can be taken by EMR system managers. Good system quality will create a more stable, efficient, and user-friendly experience, while high information quality will ensure the accuracy and relevance of data presented in the system, thereby facilitating the medical decision-making process. Service quality, which includes technical support and assistance to users, can also increase comfort and trust in the system. The results of the study also indicate that system quality and information quality have a significant influence on the net benefits perceived by users. This emphasizes the importance of building a reliable and informative information system so that its positive impacts can be felt in healthcare services. Conversely, service quality does not have a significant effect

on net benefits, indicating that efforts to improve services must be accompanied by improvements in other technical and operational aspects. On the other hand, positive user perceptions of the RME system do not necessarily increase their satisfaction or perceived net benefits. These findings reveal a gap between user expectations and the reality of system usage in practice, necessitating a comprehensive evaluation of user experiences when interacting with the system.

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