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A study of user satisfaction and net benefits in indonesia through the DeLone and McLean Model for E-Government success

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Abstract
The current research examines the success of e-government systems by utilizing success-based techniques of information systems (IS) from the viewpoint of government personnel. Nine hypotheses were included to test the relationships among variables (information quality, service quality, system quality, behavioral intention, user satisfaction, and net benefits). The data acquired from 232 employees using e-government systems in Indonesia was analyzed using structural equation modeling (SEM) techniques. This study was a practical assessment of a model used to measure the effectiveness of e-government systems. The model used elements from the revised DeLone and McLean IS success model. Statistical analysis shows that seven out of nine hypothesized correlations between the seven success variables are statistically significant. The strongest correlation emerged between behavioral intention and net benefits, while the weakest correlation was between system quality and behavioral intention. The findings highlight the importance of intention and net benefits that can be utilized to evaluate the effectiveness of e-government systems in the context of developing countries, which are practical for SDG 16—Peace, Justice, and Strong Institutions. To better understand e-government user satisfaction, future studies should test the model in broader geographic contexts, especially in developing countries like Indonesia.

Keywords E-government systems, Economic growth, IS success model, Indonesia, User satisfaction, Net benefits

1 Introduction

The government's use of computers and the Internet to provide information and services to businesses, stakeholders, and citizens is known as electronic government or e-government [40]. Since many governments have realized the importance of employing information and communication technologies (ICT) to deliver effective and transparent government, e-government has drawn more attention in the last several decades. Technology enhances government services and fosters trust between the public and government employees and between the government and enterprises ([7], [45, 75]). Methods

for assessing and quantifying the effectiveness of e-government initiatives are a crucial area of e-government research, including the information system DeLone and McLean's (IS) success model [10, 40, 76]. Therefore, this study utilizes the IS Success Model to assess digital service delivery within the e-government framework. Although the model is utilized throughout multiple fields such as library systems [59], e-learning [14], learning management [3], artificial intelligence [74], there exists a deficiency in comprehending these dynamics inside e-government, where effective service delivery is essential. The current research seeks to address this gap by examining the interaction of these characteristics, providing insights for enhancing e-government systems.

Academically, the IS success model has been evaluated empirically in research to evaluate various systems. Researchers' interest in IS success models has increased; however, more studies are needed on the performance of public website systems, especially e-government. Some studies have evaluated the effectiveness of e-government systems merely through IS-success-based methodologies [3], [8, 40, 74]. Few studies have examined e-government systems from the viewpoint of government employees as their major users, particularly in developing countries. Therefore, more empirical research needs to be carried out to generalize the model validation in the context of e-government, and the empirical findings of earlier studies need to be confirmed in various user populations, contexts, and settings. An empirically proven approach for gauging the effectiveness of e-government systems from the viewpoint of employees is presented within this work.

This study used the IS success model [15, 25, 29]. A questionnaire was used to gather data from 232 local government employees of one Indonesian province, South Sulawesi. The employees were categorized as end users of the system, ruled by the Indonesian central government. By procuring a partial least squares structural equation modeling (PLS-SEM), we reported the findings by examining the measurement and structural model of the data. The study focuses on local government personnel as the major users, which differs from previous studies. The localized approach addresses the need for user-specific research in e-government systems by providing practical advice on improving Indonesian systems. This study is expected to improve South Sulawesi e-government systems to support SDG 16 by increasing public institution openness and efficiency. ICT infrastructure advancement promotes universal government service access, supports SDG 9, and reduces inequalities by providing equal access to digital services, aligning with SDG 10.

2 Literature review

2.1 Systems for e-government

The term "e-government" has gained popularity in public administration to refer to several functional areas, including accountability, decentralization, transparency, and interactive services [31, 46]. E-government also serves as a one-stop system for all parties involved. Technology, including e-government, is crucial to the growth of the public sector since it may both support and obstruct sustainability [2, 69]. Government to government (G2G), government to citizen (G2C), and government to business (G2B) are the three main categories of e-government systems [69]. Most research on e-government systems examined G2C [24]. Further, the most comprehensive range of services is provided to citizens through e-government applications [5, 53]. Thus, government employees must learn new skills to implement e-government systems and relevant applications.

Consequently, it is critical to investigate G2C e-government systems more from the standpoint of users and public personnel.

Local and provincial government employees have operational benefits from the use of e-government technologies, which have decreased paperwork, offered clients continuous service availability, speed up response times, and reduced error rates ([43, 52, 73]). Stakeholders' diverse interests and aims may influence the efficacy and adoption of the e-government system [62, 67]. E-government must be evaluated using various criteria since it is a complicated concept. While the success of e-government systems is still being studied, a broad study on IS success has been carried out for nearly thirty years. Earlier research on the effectiveness of e-government systems concentrated on various paradigms. Prior research investigated system elements in conjunction with user experience and meeting needs and how they affected the use of the e-government [1, 10, 47, 58].

This study was conducted to facilitate the use of the IS Success model theory to understand the success of e-government from the perspectives of Indonesian government employees from one province, South Sulawesi. Due to its key location and digital transformation activities, South Sulawesi's e-government use, acceptance, and satisfaction research is essential. South Sulawesi, a crucial Indonesian province, is poised to become a transformational hub, but inconsistent e-government adoption hinders governance efficiency and public service delivery. To overcome digital literacy, infrastructure, and cultural challenges to deployment, user acceptance and satisfaction must be understood. This research is crucial as governments use digital platforms to improve openness, accessibility, and citizen engagement, especially post-pandemic. It gives policymakers insights to adjust e-government systems to local needs, promote continuation intention, and improve service quality. A more inclusive and responsive digital governance framework in South Sulawesi promotes sustainable development and economic progress.

2.2 Indonesian e-governance

Indonesia has over 17,000 islands, including Java, Sumatra, Sulawesi, Kalimantan, and Bali. Famous for its cultural richness and natural beauty, it's the world's largest Muslim-majority nation with over 270 million people. The 1945 Constitution creates a presidential representative democratic republic. President Prabowo Subianto, elected for five-year terms in October 2024, is also head of state. Governors manage Indonesia's 38 provinces, with elections reflecting its decentralized democracy, including South Sulawesi. Developing e-government in developing countries like Indonesia is part of global efforts to utilize information and communication technology to improve the quality of public services and citizen participation in government. Since the early 2000s, Indonesia has adopted various e-government initiatives to improve public administration, strengthen transparency, and expand public access to government information and services. E-government integrates government processes with digital technology, makes it easier for citizens to access public services, and increases government operational efficiency.

The history of e-government development in Indonesia can be traced back to the early 2000s when the government realized the importance of information technology in modernizing public administration [27, 56]. Early initiatives often focused on building ICT infrastructure and online information portals as a first step towards digitizing public

services. Since then, various programs and policies have been implemented, including the development of an integrated government information system, an online public service portal, and a citizen participation platform [16, 18, 27]. For example, the *LAPOR* portal (https://www.lapor.go.id/) was launched as a means for citizens to submit complaints and suggestions to the government, strengthening accountability and transparency in government processes. The development of e-government in Indonesia is also supported by an adequate policy and regulatory framework, including Law No. 14 of 2008 concerning the Openness of Public Information and Law No. 25 of 2009 concerning Public Services. This policy provides a legal basis for implementing and developing electronic-based public services and strengthening citizens' rights to access public information. However, implementing e-government in developing countries faces various challenges, including ICT infrastructure gaps between regions, data security, privacy issues, and expanding digital literacy among citizens [16]. To address this, the government should continue of the countries to strive to improve ICT infrastructure, adopt strict cybersecurity standards, and implement educational programs to improve the digital capabilities of its citizens. This study aims to solve the widespread challenges of user adoption, infrastructural inadequacies, and service inefficiencies. The research intends to address these issues to yield insights that facilitate practical enhancements, hence improving public service delivery and user happiness, which are essential for the success and sustainability of e-government efforts in developing economies like Indonesia.

2.3 The DeLone & McLean IS success model

The DeLone & McLean (D&M) IS success model was initially introduced in 1992 [28]. Information quality, system quality, system use, use, individual impact, and organizational effect were the six interconnected components that established the taxonomy [28, 29, 54]. Many scholars criticized the original D&M IS Success model throughout the first ten years of its development and offered proposals for its expansion or change [29, 60]. A revised IS success model was published ten years later by DeLone and McLean [29]. This model combined the individual and organizational impact into a single construct known as "net benefit" (NB) and added an extra quality component called "service quality" [29]. The use of the system remained a dependent variable. One of the most popular models of IS success, the improved D&M model, has been used for several different information systems in various contexts and settings in recent years [4, 14, 48].

In the context of e-government, employees utilize web-based applications to take orders from residents for various services (such as renewing a license plate sticker and obtaining a tax certificate) and to enhance such services by cutting down on administrative expenses and time [11, 17]. The D&M IS success model has been revised and can be used to study such IS applications. Additionally, the original authors proposed that additional field research be done on their concept [29]. Therefore, the revised IS success model can be modified to measure system success from the employees' viewpoint in the e-government context. The NB in this study refers to the employee-perceived NB evaluation of a particular e-government system because the study focuses on measuring the effectiveness of e-government from the employees' perspective in Indonesia.

2.4 Proposed model

The D&M IS success model is widely used to measure the success of e-government systems by considering several interdependent dimensions [29, 30]. System quality refers to technical usability and reliability, essential to ensuring smooth interaction with the system. Information quality highlights the importance of providing accurate and timely data, which is critical for informed decision-making. User satisfaction is obtained from subjective experience and satisfaction with using the system. Behavioral intention reflects the frequency and depth of a user's interaction with a system, often related to the system's intuitiveness and efficiency. Net benefits establish increasing efficiency and effectiveness in achieving goals, and service quality concentrates on the customer support and technical assistance provided.

2.4.1 Service quality

The D&M IS success model highlights the importance of service quality and customer support as key user satisfaction factors in e-government [12, 51]. Efficient customer service and reliable technical support are critical in enhancing user experience and ensuring they can use e-government services with minimal friction. Easy feedback facilities and smooth complaints procedures are essential in providing quality services. Responsive services solve technical problems and leave a positive impression on users, which can lead to greater trust and broader adoption of e-government services. Recent research shows the importance of service responsiveness to user satisfaction [19, 42]. Further, the service quality of e-government platforms contributes to positive user experiences ([44]). Meanwhile, Nawafleh and Khasawneh [49] examine how proactive customer service increases user loyalty to e-government platforms. Two hypotheses are proposed regarding the role of service quality on user satisfaction and behavioral intention.

H1: Service quality will significantly influence user satisfaction.

H2: Service quality will be a significant determinant of behavioral intention.

2.4.2 Information quality

Information quality plays a crucial role in e-government, facilitating transparency and strengthening public trust. Accurate, up-to-date, complete, and relevant information supports citizens in making decisions and increases their involvement in the democratic process. Simplicity in presenting information and ease of access is vital to ensure that all segments of society can utilize e-government services effectively. Abdulkareem and Mohd Ramli [1] describe the relationship between information quality and trust in e-government. The relevance of information impacts user satisfaction with digital public services [64]. Meanwhile, it is crucial to have timely information updates to increase public participation in e-government [41].

H3: Information quality will have a significant influence on user satisfaction.

H4: Information quality will be a strong determinant for behavioral intention.

2.4.3 System quality

System quality is very important in determining how technology is received and used. For e-government, this includes user-friendly interface design, system reliability, and round-the-clock service availability, all prerequisites for effective digital public services. High system quality helps build user trust and satisfaction, which in turn can increase engagement and use of the service. Alshira'H (2020) [13] explores the strong relationship between system quality and user satisfaction in e-government. Reliable e-government systems encourage further technology adoption among citizens [9], Alshira'H, 2020). The availability and responsiveness of e-government positively impact users' perceived value and satisfaction [55].

H5: A significant relationship will emerge between system quality and user satisfaction.

H6: System quality will strongly affect behavioral intention.

2.4.4 User satisfaction

In the context of e-government, user satisfaction in the DeLone and McLean model is often closely related to the ease of use of digital services, the efficiency of the time provided by the system, and the suitability of information to public needs. Features such as personalization and interactivity can increase perceived usability and user satisfaction [29, 61]. User satisfaction supports users' adoption of technology and active participation in digital democratic processes [29, 61]. Intuitive user interface design is the key to user satisfaction in e-government.

H7: User satisfaction will be a strong influencer for net benefits.

2.4.5 Behavioral intention

Within the D&M IS Success Model framework, behavioral intention pertains to the probability that an individual will engage with an information system. Many determinants impact it, encompassing user satisfaction, perceived utility, and user-friendliness. This intention is a crucial indicator of the system's effectiveness, as it is a major determinant of actual system usage ([6]). The model, which DeLone and McLean initially formulated, posits that users' intentions to interact with an information system substantially influence the system's overall efficacy and efficiency when implemented within an organization [20, 29]. Assessing behavioral intention provides insight into users' degree of acceptability and sustained utilization of IS.

H8: Behavioral intention will significantly influence user satisfaction.

H9: Behavioral intention will be a significant predictor of net benefits.

3 Method

3.1 Design

We used a survey in this study because it efficiently accumulated information from many respondents, allowing for various perspectives and generalizable results. Each survey indicator was assessed using a five-point Likert scale in the current investigation (ranging from 1 (strongly disagree) to 5 (strongly agree)). To ensure content validity, all

constructs and their corresponding measurement items were adapted from prior studies [29, 63, 68, 71, 72]. For e-government system evaluation, the DeLone and McLean IS Success Model was chosen for its complete framework, including system, information, service quality, usage, user satisfaction, and net benefits. Research shows its applicability in public sector situations, which supports our goals to assess user satisfaction and behavioral intentions [15, 70, 71]. The model's dimensions fit e-government's infrastructure and user expectations issues. This empirical validation across studies lends credibility and enables comparison (Fig. 1).

We divided the instrument into two sections. Demographic data were compiled, encompassing age, employee status, and gender. The second section of the instrument comprised the theoretical constructs of the model. To ensure consistency, the language experts translated the questionnaire from English to Indonesian. Additionally, we were granted interviews with a subset of them to validate the data. We piloted the instrument with 33 employees to determine its reliability using Cronbach's alpha. In light of the feedback obtained from the pilot study and interviews, we made revisions to particular items on the questionnaire to enhance its clarity and comprehensibility [22, 33]. Service quality and information quality were represented by five items (e.g., SQ1. The e-Government system is always ready to help, and IQ2. The e-Government system provides accurate information). For system quality, behavioral intention, and user satisfaction, three items were included (e.g., SyQ1. The e-Government system is easy to use, BI1. You depend on e-Government systems, and SAT2. High-quality e-Government system services). Meanwhile, the net benefits list four items (e.g., NB4. The e-Government system is useful for my work).

3.2 Data collection

The data were collected from Indonesian government employees in one Indonesian province, South Sulawesi, from October to December 2024 [26]. The current study's population comprises more than 170,000 employees in South Sulawesi (BPS [23]. We

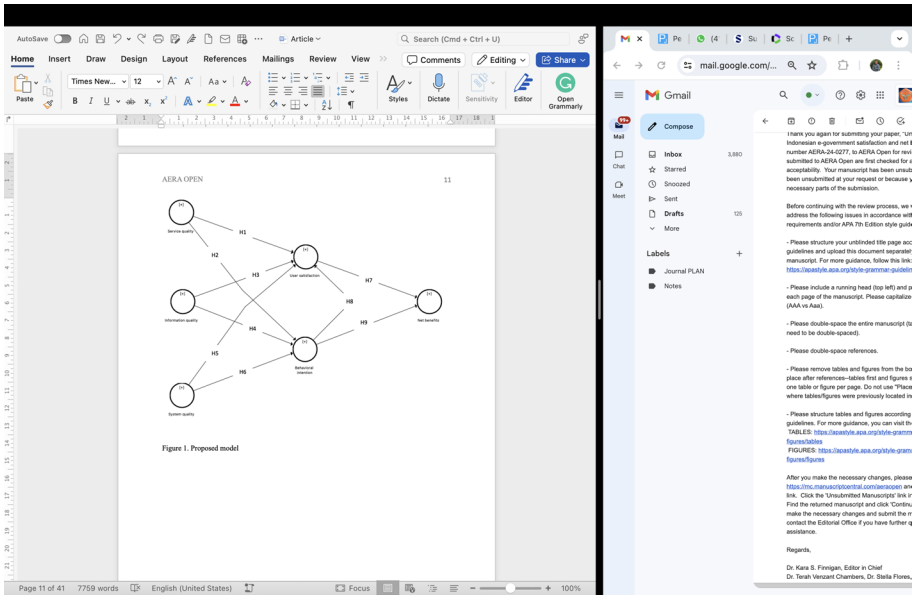

Fig. 1 Proposed model

shared the survey with 500 e-government users in South Sulawesi through random sampling,however, 250 respondents filled in the instrument. The clean data consisted of 232 responses (Table 1). Random sampling assures impartial, representative data by giving every unit an equal chance of selection. The technique allows accurate, reliable research in varied populations by reducing systematic mistakes, improving generalizability, and supporting correct statistical inferences [39]. The respondents' ages range from 20 to older than 40; most employees (165) are older than 40. One hundred seventy-nine respondents are civil servants, and 53 are non-civil servants. We utilized Google Forms to obtain the data by inviting respondents to complete the survey via direct messages on social media, phone calls, and email. We informed participants of the purpose of the study and deliberated on the instrument's variables and response categories at the outset of the procedure. We requested that the participants fill out the survey based on their expertise and experience with e-government. The responses that were submitted were assigned the same score across all categories. Responses deemed weak or limited (21 responses) were excluded from the analysis.

The current study is an in-depth investigation of the IS Success Model in the context of e-government in one Indonesian province, providing contextually rich and distinctive insights for South Sulawesi. By focusing on a single province (South Sulawesi), a thorough grasp of how system quality, information quality, service quality, use, user satisfaction, and net benefits interact in this context [38, 50]. The strategy addresses the feasibility of doing research with high-quality data and lays the groundwork for future comparative studies throughout Indonesian provinces. Indonesia's South Sulawesi was chosen due to the sample accessibility and feasibility of the study. The study's scientific rigor is maintained through a detailed assessment of local ICT infrastructure, policy, and demographic factors, making substantial additions to e-government research in a more focused context in the province (Table 1).

3.3 Data analysis

We employed PLS-SEM procedures, a multivariate approach used to examine the association between independent and dependent variables, to analyze the data [21, 34, 37]. PLS-SEM was adaptable and practical with small and large sample sizes because it does not require normal data distribution. Furthermore, the software is designed to be easy to use. We used SmartPLS to analyze the primary data and SPSS to assess the reliability of the pilot study. Two primary methodologies—measurement and structural models—were implemented based on the most-cited resource on PLS-SEM [32, 35, 36].

Table 1 Participants of the study (n.232)

Category	Total	Percentage
Age		
20–30	18	7.76%
31–40	49	2.12%
>40	165	71.12%
Employee status		
Civil servant	179	77.16%
Non-civil servant	53	22.84
Gender		
Female	117	50.43%
Male	115	49.57%

We provided the results of the assessment model's discriminant validity through cross-loading and heterotrait-monotrait ratio (HTMT), convergent validity (average variance extracted, AVE), and composite reliability (CR) for transparency. Subsequently, the path coefficients (β) and effect size (f2) were computed for the structural model, in addition to the coefficient of determination (R2).

4 Findings

4.1 Model of measurement

Table 2 shows the results of the reliability and validity evaluation for the measurement model using PLS-SEM method. For behavioral intention, high factor loading values were obtained for the three items (BI1, BI2, BI3) with values of 0.857, 0.877, and 0.853, respectively. This indicates that the items consistently represent the behavioral intention construct. Composite reliability (CR) and average variance explained (AVE) were also above academically recognized thresholds of 0.897 and 0.744, indicating good construct reliability and validity. information quality recorded high factor loadings on all its items (IQ1-IQ5), with values ranging from 0.884 to 0.907, confirming that each item effectively describes information quality. The reliability and AVE scores show satisfactory values, respectively 0.953 and 0.801. Network benefits and user satisfaction also show very high factor loadings and strong reliability scores, confirming the model's strength in measuring these two aspects. Specifically, network benefits has item loads from 0.929 to 0.948 and User Satisfaction from 0.905 to 0.930. For service quality, although the SQ1 item showed a slightly lower loading (0.776), the other item values and the AVE score (0.702) still showed sufficient constructive validity. Finally, system quality stands out with high and consistent load values, ensuring reliability in measuring the efficiency and effectiveness of the assessed system. The results of this evaluation confirm the reliability and

Table 2 Loading values and reliability evaluation

	Item	Load	Alpha	rho_A	CR	AVE
Behavioral intention	BI1	0.857	0.829	0.831	0.897	0.744
	BI2	0.877				
	BI3	0.853				
Information quality	IQ1	0.884	0.938	0.939	0.953	0.801
	IQ2	0.901				
	IQ3	0.889				
	IQ4	0.907				
	IQ5	0.892				
Net benefits	NB1	0.931	0.929	0.929	0.955	0.876
	NB3	0.948				
	NB4	0.929				
User satisfaction	SAT1	0.930	0.909	0.909	0.943	0.846
	SAT2	0.924				
	SAT3	0.905				
Service quality	SQ1	0.776	0.893	0.894	0.921	0.702
	SQ2	0.829				
	SQ3	0.858				
	SQ4	0.877				
	SQ5	0.845				
System quality	SyQ1	0.957	0.914	0.914	0.946	0.855
	SyQ2	0.944				
	SyQ3	0.870				

validity of the measurement model used, indicating that the variables measured can reliably describe the phenomena examined in the study (Table 2).

Cross-loading evaluate discriminant validity, namely the ability of each item to measure its construct compared to other constructs in the model (Table 3). The cross-loading table shows that each item has a higher loading on its construct than others, indicating good discriminant validity. For example, the items from the behavioral intentions construct (BI1, BI2, BI3) showed the highest loadings on their construct, with values of 0.857, 0.877, and 0.853, respectively, while the values for the other constructs were lower. Something similar is seen in the information quality construct (IQ1-IQ5), where each item has a higher loading on its construct, confirming that these items correlate more with information quality than other constructs in the model. Network Benefits (NB1, NB3, NB4) also show the same trend, with the highest loading values on the construct itself, indicating that these items effectively measure the targeted construct. user satisfaction (SAT1, SAT2, SAT3), service quality (SQ1-SQ5), and system quality (SyQ1-SyQ3) also show similar patterns, where the loadings on their respective constructs are higher compared to the loadings on other constructs, supporting validity discriminant of the model used. Cross-loading results indicate that the items in the model have stronger associations with their respective constructs than with other constructs (Table 3).

HTMT matrix is used to evaluate the discriminant validity between constructs in the model, with an HTMT value below 0.90 or 0.85 as an indicator that the constructs are sufficiently discriminative. In the Table 4, the HTMT value between Behavioral Intention and Information Quality is 0.739, which shows a good distinction between these two constructs. Meanwhile, Network Benefits has a higher HTMT value for Behavioral Intention and Information Quality but is still below commonly used thresholds,

Table 3 Cross-loading

	Behavioral intention	Information quality	Net benefits	Service quality	System quality	User satisfaction
BI1	0.857	0.522	0.559	0.552	0.479	0.614
BI2	0.877	0.549	0.644	0.553	0.575	0.658
BI3	0.853	0.618	0.709	0.601	0.626	0.617
IQ1	0.610	0.884	0.625	0.666	0.667	0.604
IQ2	0.601	0.901	0.655	0.646	0.707	0.617
IQ3	0.595	0.889	0.624	0.679	0.629	0.664
IQ4	0.545	0.907	0.629	0.64	0.641	0.563
IQ5	0.577	0.892	0.640	0.712	0.631	0.62
NB1	0.681	0.689	0.931	0.727	0.658	0.746
NB3	0.714	0.656	0.948	0.677	0.672	0.689
NB4	0.691	0.647	0.929	0.649	0.684	0.749
SAT1	0.687	0.630	0.746	0.637	0.644	0.930
SAT2	0.651	0.626	0.706	0.639	0.626	0.924
SAT3	0.677	0.641	0.694	0.606	0.653	0.905
SQ1	0.539	0.562	0.597	0.776	0.485	0.566
SQ2	0.550	0.587	0.628	0.829	0.559	0.57
SQ3	0.567	0.618	0.633	0.858	0.566	0.596
SQ4	0.573	0.655	0.626	0.877	0.520	0.553
SQ5	0.533	0.71	0.577	0.845	0.519	0.571
SyQ1	0.608	0.665	0.670	0.580	0.957	0.640
SyQ2	0.584	0.641	0.637	0.565	0.944	0.631
SyQ3	0.616	0.72	0.678	0.609	0.870	0.658

Table 4 HTMT and model fit

	Behavioral intention	Information quality	Net benefits	Service quality	System quality	Category	Value
						SRMR	0.065
Information quality	0.739					d_ULS	1.056
Net benefits	0.842	0.76				d_G	0.581
Service quality	0.766	0.817	0.803			Chi-Square	787.762
System quality	0.745	0.789	0.777	0.700		NFI	0.845
User satisfaction	0.841	0.743	0.846	0.758	0.764		

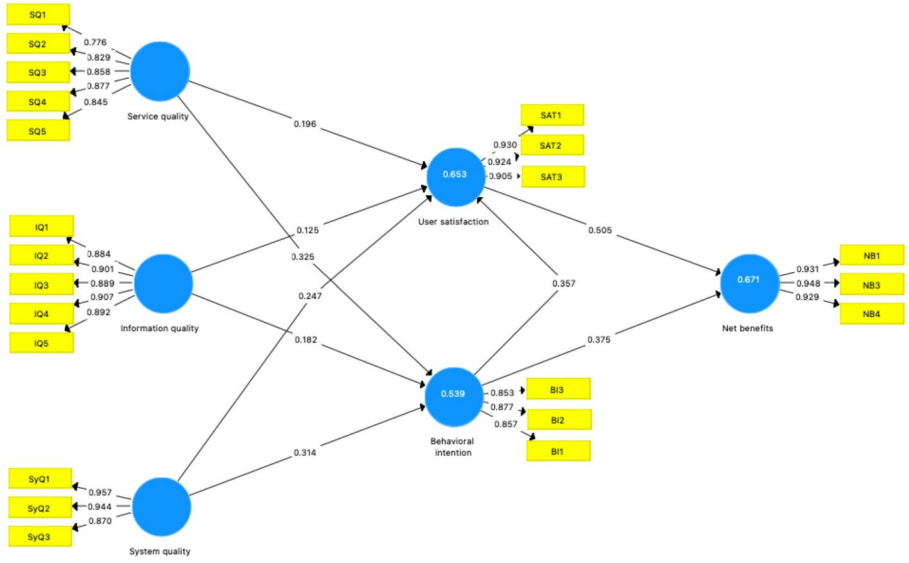

Fig. 2 Measurement model

indicating that there is still sufficient differentiation between these variables. these variables. The result also presents model fit measures such as SRMR (Standardized Root Mean Square Residual), d_ULS, d_G, Chi-Square, and NFI (Normed Fit Index). SRMR with a value of 0.065 indicates that the residual between the observed and model-predicted covariance is relatively low, indicating a good fit. A high Chi-Square reflects a deviation from perfect fit, but this can be influenced by sample size. The NFI of 0.845 also supports the idea that the model is a good fit for the data. Thus, these measures help confirm that the proposed model can effectively represent the data structure (Table 4 and Fig. 2).

4.2 Structural model

Analysis using PLS-SEM of this study has revealed a significant relationship between service quality, systems, user satisfaction, behavioral intentions, and network benefits. Specifically, service quality on user satisfaction shows a path coefficient of 0.196. This indicates that improving service quality can significantly increase user satisfaction, a key element for successful e-government implementation. A similar effect is also seen in the relationship between service quality and user behavioral intentions, with a higher path coefficient of 0.325, indicating a stronger relationship. strong and vital in influencing users' decisions to continue using e-government services.

Furthermore, system quality also significantly contributes to user satisfaction and behavioral intentions, with a path coefficient for user satisfaction of 0.247. Meanwhile, for behavioral intentions, the path coefficient is 0.314. These results confirm that the technical and operational aspects of a sound e-government system are vital to meeting user expectations and encouraging continued use of the system. Finally, the relationship between user satisfaction and network benefits is robust, with a path coefficient of 0.505, a very high t-value of 7.65, a *p*-value close to zero, and a large effect size (f2 = 0.361) (Table 5). This shows that user satisfaction significantly accelerates the perceived benefits of using e-government, underscoring the importance of user experience in designing and implementing e-government services to achieve desired outcomes in public services (Table 5).

We also calculated coefficient determination (R^2) and predictive relevance (Q^2) values for the three primary constructs in the SEM analysis model: behavioral intention, network benefits, and user satisfaction. These values are essential indicators for assessing the quality of the model in explaining and predicting data. The R^2 value or coefficient of determination shows the percentage of variance in the dependent variable that can be explained by the independent variables connected in the model. For Behavioral Intention, the R^2 value is 0.539, which means that approximately 53.9% of the variability in Behavioral Intention can be explained by the independent variables involved in this model. Meanwhile, Network Benefits has a higher R^2 value of 0.671, indicating that approximately 67.1% of the variance in Network Benefits can be explained, indicating strong predictions by the model. User satisfaction has an R^2 value of 0.653, which means that the model can explain approximately 65.3% of the variability in User satisfaction. The Q^2 value, on the other hand, is used to assess the model's predictive ability through cross-validation techniques. A positive Q^2 value indicates that the model has good predictive reliability. For behavioral intention, the Q^2 value is 0.377, for network benefits (0.578), and for user satisfaction (0.538). All these values indicate that the model can explain the data and has good predictive capabilities, which is essential in empirical research to confirm that the findings can be applied beyond the data sample used for model estimation (Fig. 3).

Table 5 Structural model, f^2, R^2, and Q^2

	Relationship	Path	t value	*p* values	f^2		R^2	Q^2
H1	Service quality→user satisfaction	0.196	2.646	0.008	0.043	Behavioral intention	0.539	0.377
H2	Service quality→behavioral intention	0.325	4.317	0.000	0.097	Net benefits	0.671	0.578
H3	Information quality→user satisfaction	0.125	1.155	0.248	0.015	User satisfaction	0.653	0.538
H4	Information quality→behavioral intention	0.182	1.349	0.177	0.024			
H5	System quality→user satisfaction	0.247	2.356	0.019	0.072			
H6	System quality→behavioral intention	0.314	2.186	0.029	0.096			
H7	User satisfaction→net benefits	0.505	7.65	0.000	0.361			
H8	Behavioral intention→user satisfaction	0.357	4.761	0.000	0.169			
H9	Behavioral intention→net benefits	0.375	5.305	0.000	0.199			

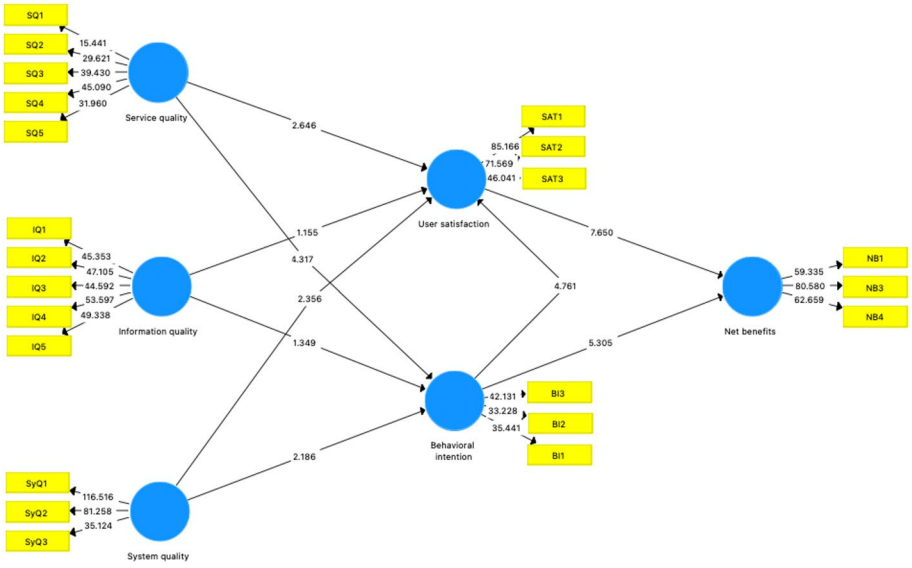

Fig. 3 Structural model assessment

5 Discussion

The current research reveals several key relationships that provide in-depth insight into the factors that influence the satisfaction and behavior of e-government service users. One of the key findings is the significant influence of service quality on user satisfaction, which is consistent with the results of previous research, which shows that service quality is the primary determinant factor in increasing user satisfaction in e-government services [19, 42]. This finding is reinforced by recent research, which also emphasizes the importance of aspects such as timeliness, information accuracy, and system responsiveness in building user satisfaction [12, 19, 44]. In addition, service quality has been proven to have a strong relationship with behavioral intentions, indicating that improving service quality directly influences user satisfaction and increases their intention to continue using e-government services. This phenomenon is supported by theory, which states that positive perceptions of service quality can improve users' trust and, as a result, increase their desire to adopt the service on an ongoing basis [19, 42].

The relationship between system quality and user satisfaction also shows significance. System quality, including reliability, speed, and ease of use, is an essential factor influencing user satisfaction in information technology. In the context of e-government, recent research also emphasizes the importance of providing efficient and accessible systems to facilitate better interactions between government and society [9, 13, 57]. Although information quality did not significantly influence this study, this aspect is still important to consider. In some cases, this could indicate that users may already have high expectations for the quality of the information, service, and system provided by e-government services, more dominant in influencing their satisfaction [1, 64, 65].

The influence of behavioral intention on network benefits is significant, indicating that when users have a firm intention to use e-government services, they tend to experience more substantial benefits. This relationship illustrates the importance of building and maintaining positive intentions among users to maximize the benefits of e-government implementation [20, 29, 66]. User satisfaction has a strong relationship with the network benefits they obtain, indicating that the more satisfied users are with e-government

services, the greater the benefits they experience. This is an essential indicator that user satisfaction must be the main focus in e-government development strategies because it directly impacts users' perceived benefits [29, 61]. The findings prove that service quality, system quality, and user satisfaction are essential elements that must be considered when developing and implementing e-government services in Indonesia. By improving these areas, governments can increase user satisfaction and expand the perceived benefits of e-government services. Based on the findings, the policy recommendations include improving the quality of services, systems, and information in Indonesian e-government platforms. Governments ought to put money into substantial infrastructure to enhance the dependability and accessibility of their systems. In addition, using user-centric design and continuous feedback mechanisms can significantly increase user happiness, which will broaden the perceived benefits of e-government services.

6 Conclusion

The conclusions of this research confirm the importance of service quality, system quality, and information quality in increasing user satisfaction and strengthening behavioral intentions in the context of e-government in Indonesia. The results show that service and system quality significantly influence user satisfaction and intention to use e-government services on an ongoing basis. In contrast, information quality does not show a significant influence. This may indicate that other factors may be more dominant in influencing user satisfaction or that users already have high expectations for the information they receive. This study has several limitations that need to be noted. The results may not be generalizable to other contexts or countries without modification. Second, these studies rely on quantitative data that may not fully capture the nuances of user perceptions or the qualitative factors that influence satisfaction and behavioral intentions. Based on these results and limitations, a recommendation for future research is to integrate qualitative methods to more deeply understand how and why service and system quality influence user experience. Further research could be directed towards testing the model in different geographic contexts and sectors to validate and expand these findings. In addition, it is crucial to further explore the role of information quality and identify specific factors that can increase its influence on user satisfaction and behavioral intentions.

The study's novel implementation of the IS Success Model to South Sulawesi e-government sheds light on how local variables affect system success. Theoretically, testing the model in a unique context may refine or extend theories. By suggesting areas for development, the findings can directly affect South Sulawesi's e-government efforts to promote user satisfaction and net benefits. The study's methodological innovation suggests combining quantitative and qualitative methodologies to better understand user experiences. The findings address local data gathering issues, making it useful for similar study situations. Future research should examine multiple situations to show the study's continued influence and promote e-government success across contexts. This strategy addresses the concerns about the research's uniqueness and theoretical and practical consequences. South Sulawesi e-government use, acceptance, and satisfaction research can improve digital governance. It can discover usability, trust, and accessibility variables influencing adoption, helping policymakers develop better user-friendly e-government platforms. Service quality gaps can be identified by satisfaction levels, improving

efficiency, transparency, and public participation. The current study's findings can help South Sulawesi's different socio-economic and cultural environments develop inclusive digital divide strategies. The research guides resource allocation, civil servant training, and technology infrastructure investments. Encouraging citizen participation and trust in government promotes sustainable governance.

Supplementary Information

The online version contains supplementary material available at https://doi.org/10.1007/s43621-025-01645-4.

Additional file 1.

Funding
This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

Data availability
The dataset of the study is publicly available in the figshare repository, as part of this record: https://figshare.com/s/6802e41ad35c359cf746.

Declarations

Ethics approval
The Ethics Committee of the Research Center at Universitas Jambi has waived ethical approval for the study. This decision is based on the study's minimal risk to participants, adherence to ethical standards, and use of anonymized data. The research ensures confidentiality, informed consent, and compliance with institutional guidelines. The waiver allows timely research progress while maintaining transparency, accountability, and alignment with Universitas Jambi's ethical policies.

Informed consent
Informed Consent was obtained from all the participants involved in the study.

Clinical trial number
Not applicable.

Consent to publish
Not applicable.

Competing interests
I declare that the authors have no competing interests as defined by Discover, or other interests that might be perceived to influence the results and/or discussion reported in this paper.

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Received: 9 November 2024 / Accepted: 21 July 2025
Published online: 28 July 2025

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