

When digitalisation meets fragmentation: evidence from the Italian public healthcare sector

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Abstract

Purpose – This study aims to investigate how fragmentation in digital public service delivery reshapes the mechanisms through which citizens translate service quality into institutional trust and satisfaction.

Design/methodology/approach – A multi-group structural equation model based on the E-GovQual framework tests direct and mediated effects across two Italian regions with contrasting governance structures, namely Emilia-Romagna and Veneto.

Findings – Service quality positively relates to satisfaction in both regions. However, the underlying mechanism differs. In the integrated system, trust significantly mediates this relationship. In the fragmented system, trust plays a negligible role. Thus, fragmentation does not weaken the effect of service quality *per se* but alters the evaluative pathway through which quality translates into satisfaction.

Originality/value – This research advances existing views on regional disparities by theorising fragmentation as a condition that reshapes how citizens interpret and evaluate digital public services. Drawing on attribution theory, we argue that fragmentation disrupts the assignment of responsibility, thereby altering the mechanisms through which service quality translates into trust and satisfaction.

Keywords E-GovQual, Digital health service, Fragmentation, Trust, Public management, Citizens' satisfaction

Paper type Research article

1. Introduction

Digitalisation has transformed the delivery of public services, promising greater efficiency, accessibility, and citizen satisfaction. A substantial body of research demonstrates that the perceived quality of digital services plays a central role in shaping citizen responses, including satisfaction, trust in public institutions, and continued use (Alkrajji and Ameen, 2022; Lee-Geiller, 2024; Patergiannaki and Pollalis, 2024).

These relationships are theorised as stable across contexts and settings. However, this assumption of stability conceals an important theoretical gap. Existing research has treated contextual factors, such as digital literacy or socio-demographic characteristics, as moderators that strengthen or weaken established relationships. Much less attention has been devoted to understanding whether specific features of public service delivery systems may fundamentally alter the mechanisms through which citizens evaluate digital services. In particular, the role of fragmentation, defined as the dispersion of function, interfaces, and service provision across multiple actors without effective coordination (Rajala *et al.*, 2021; Siqueira *et al.*, 2021), remains under-theorised.

This omission is theoretically consequential. Evaluating public services is not merely a matter of assessing functional performance; it involves processes of attribution (Liang *et al.*, 2025; Mortensen, 2013; Piatak *et al.*, 2017), through which individuals assign responsibility, infer intentionality and form judgements. These processes presuppose a relatively clear and identifiable locus of agency (Harvey *et al.*, 2014). Yet, in fragmented environments, characterised by multiple portals, heterogeneous interfaces, and dispersed accountability,

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the conditions for such attribution may be fundamentally disrupted. As a result, the mechanisms linking perceived service quality to trust and satisfaction may be reconfigured altogether.

Building on this premise, this study asks: How does fragmentation in digital public service delivery reshape the mechanisms through which citizens translate service quality into trust and satisfaction? We argue that fragmentation should be conceptualised not as an individual-level moderator grounded in citizens' perceptions of how fragmented the system appears, but as a meso-level structural condition that reshapes the evaluative process itself, thus acting at the micro-level. Specifically, fragmentation obscures responsibility attribution, potentially limiting citizens' ability to translate positive service experiences into institutional trust. By contrast, integrated systems provide a coherent locus of agency, enabling citizens to generalise service encounters into broader evaluations of the public actor.

We examine this argument in the context of digital healthcare services, using the Italian National Health Service as an empirical setting. Italy provides a particularly suitable context due to its decentralised governance structure (Maino and Betti, 2026; Neri, 2008; Neri and Vicarelli, 2024), which generates significant variation in how digital services are implemented across and within regions (Garattini *et al.*, 2022; Mauro and Giancotti, 2023; Neri and Vicarelli, 2024). However, rather than treating Italy as the object of analysis, we use it as a setting to compare two contrasting configurations: an integrated model (Emilia-Romagna) and a fragmented model (Veneto), which are otherwise comparable in terms of economic capacity, infrastructure, and healthcare performance (Bucci, 2026; Ministero della Salute, 2025a, b).

Using survey data from over 1,000 citizens and a multi-group structural equation model based on the e-GovQual framework (Papadomichelaki and Mentzas, 2012), we find that service quality positively influences satisfaction in both systems. However, the underlying mechanism differs across regions. In the integrated system, trust in the public actor significantly affects satisfaction and mediates the relationship between service quality and satisfaction. In the fragmented system, by contrast, the role of trust is negligible: satisfaction is driven primarily by immediate, interface-level assessments, and trust fails to translate into satisfaction. This suggests that fragmentation does not weaken the impact of service quality *per se*, but rather alters the evaluative pathway: fragmentation decouples trust from satisfaction, rendering it inconsequential for citizens' immediate service evaluations.

2. Background and hypotheses

2.1 E-government service quality

E-Government involves the use of the internet to deliver government information and services to citizens, businesses, and other entities (Whitson and Davis, 2001). E-Government services are, at their core, an ICT innovation. As with other technological advances, the specific features that characterise these services, especially in the context of online public services, play a critical role in influencing utilisation (Teo *et al.*, 2008). Various frameworks have been developed to evaluate online services (Roy *et al.*, 2015). One suitable for public or governmental service is the one proposed by Papadomichelaki and Mentzas (2012), which introduces a scale specifically tailored to assess e-Government service quality, structured across four dimensions: efficiency, trust, reliability, and citizen support.

Efficiency focuses on ease of use, time efficiency in information retrieval, and the clarity and relevance of content provided (Papadomichelaki and Mentzas, 2012; Sharma, 2015). It encompasses elements such as intuitive navigation, effective search functionality, site organisation, personalisation options, timely and accurate information, and step-by-step guidance for completing online procedures. The trust dimension originally proposed by Papadomichelaki and Mentzas (2012), hereafter referred to as privacy [1], captures citizens' perceptions of the technical integrity and reliability of the digital service, with specific reference to the safeguarding of personal data and protection against unauthorised access. Perceptions of privacy and security are central to ensuring that users feel confident and

protected in their online interactions with public healthcare services (Fakhoury and Aubert, 2015). Reliability refers to the degree to which users perceive the online platform as capable of delivering accurate and timely services (Papadomichelaki and Mentzas, 2012). It reflects the e-government system's ability to meet expectations, keep service commitments, and ensure consistent and dependable delivery aligned with stated timelines (Collier and Bienstock, 2006). Finally, the citizen support dimension relates to the availability and responsiveness of human assistance to users during their engagement with digital public services. This may include help desks, live chat, call centres, or email support mechanisms that provide real-time aid to citizens as they navigate digital interfaces.

In terms of hypotheses, a vast literature links e-GovQual (or similar frameworks related to e-service quality and technology acceptance) to citizens' satisfaction, with this evidence appearing to be cross-national (see, for instance, Kumar *et al.*, 2023; Long *et al.*, 2026; Nguyen *et al.*, 2020; Patergiannaki and Pollalis, 2024; Pham *et al.*, 2023). Hence, we propose:

H1. e-Government service quality is positively related to service satisfaction.

2.2 Trust in the public actor

Parallel to the emphasis on service quality, citizen trust in government has attracted considerable scholarly attention over the years (Dalton, 2005; Tolbert and Mossberger, 2006; van der Meer, 2010; Vigoda-Gadot and Talmud, 2010). Trust in the public actor is a citizen's belief that public institutions will act in their best interests. This trust is grounded in perceptions of the government's ability, integrity, and benevolence, including the commitment not to abuse e-government services to harm citizens (Nookhao and Kiattisin, 2023). At its core, trust involves a fundamental dyadic relationship between the trustor and the trustee (Bélanger and Carter, 2008; Papadopoulou *et al.*, 2010). It signifies the extent to which commitments are honoured, and interactions are conducted fairly (Zaheer and Venkatraman, 1995). According to Mayer *et al.* (1995), trust refers to an individual's willingness to be vulnerable to another party's actions, based on the expectation that the party will fulfil specific obligations, regardless of the individual's ability to monitor or control the party.

In the domain of e-governance, citizens' trust is often examined as a consequence of service quality. Tan *et al.* (2008) found that high-quality e-government services are crucial for enhancing citizens' trust in public e-services, a relationship corroborated by several other studies (Alkrajji and Ameen, 2022; Carter and Bélanger, 2005; Fakhoury and Aubert, 2015; Tisland *et al.*, 2022; Vigoda-Gadot, 2006). The underlying mechanism follows Mayer *et al.*'s (1995) proposition that trust is a function of the trustee's perceived ability, benevolence, and integrity [2]; this, in our case, translates into the fact that high-quality e-government services, carried out to meet citizen needs, foster trust in both the specific digital service and the government as a whole. Following this rationale, we propose:

H2. e-Government service quality is positively related to trust in the public actor.

In terms of its consequences, trust is widely recognised as a critical facilitator for the effective adoption and implementation of technological innovations (Shirish and Thompson, 2005; Warkentin *et al.*, 2002). Tolbert and Mossberger (2006) argue that e-government can enhance process-based trust by improving citizen interactions and satisfaction. Recent empirical work confirms that citizen trust acts as a mediator in the relationship between service quality and citizen satisfaction (Long *et al.*, 2026). These findings align with appraisal theory: individuals evaluate utilitarian service attributes (e.g. quality) before forming affective or moral judgements (e.g. trust). Consequently, we propose the following hypotheses:

H3. Trust in the public actor is positively related to service satisfaction.

2.3 Fragmented and integrated systems

Fragmentation represents not merely an organisational limitation but a structural condition with direct and far-reaching consequences, potentially influencing citizens. Fragmentation can be understood as the division of functions (e.g. financing, provision) or agents (e.g. payers, providers) within a system or its subsystems, without explicit mechanisms of coordination (Siqueira *et al.*, 2021). It manifests as separate financing arrangements, heterogeneous information systems, and a lack of a unified architecture for access channels. It further entails a dispersion of goals and performance measures across units that provide distinct services to the same citizen base (Rajala *et al.*, 2021).

We argue that fragmentation, which usually occurs at the regional level, can also be observed within regional systems, and that the online booking systems for health services in the Veneto and Emilia-Romagna epitomise fragmented and integrated systems, respectively. Looking at these systems within these two Italian regions, we can observe that Veneto's exhibits internal fragmentation through parallel apps, portals related to the individual local health units (called ASL, *Aziende Sanitarie Locali*), services in perpetual experimentation, and variable implementation. In contrast, Emilia-Romagna presents an integrated model in which the regional FSE (*Fascicolo Sanitario Elettronico*, i.e. Electronic Health Record), the CUPWeb platform, and the ER-Salute app form a coherent, standardised digital pathway. In a few words, one is more fragmented, the other more integrated. In the Case Selection section and in [supplementary material S1](#), we provide more details on regional fragmentation.

Past evidence shows that fragmented service delivery generates duplication, gaps in treatment, misaligned incentives, inability to coordinate across units, and inefficiencies (Agha *et al.*, 2023; Enthoven, 2009; Gómez-Dantés *et al.*, 2023; Rajala *et al.*, 2021). However, we argue that fragmentation can also affect users' experience. Navigating a labyrinth of portals and options can impose significant burdens on citizens, eroding ease of use, fostering frustration, and diminishing trust in the system's reliability and the competence of its providers. To frame the effects of fragmentation, we rely on attribution theory (Weiner, 1985). This theory addresses the inferences individuals make to explain others' actions and the ways they attribute responsibility for specific events. Largely used in management and organisational studies (see Harvey *et al.*, 2014), attribution theory is also applied in studies regarding public administration and management (e.g. Leland *et al.*, 2021; Liang *et al.*, 2025; Piatak *et al.*, 2017). We argue that fragmentation disrupts the process by which citizens assign responsibility to public institutions.

Regarding the relationship between e-GovQual, trust and satisfaction, we posit that fragmentation weakens these links. Attribution, whether positive or negative, requires a clear identification of the responsible actor (i.e. a clear locus of causality, Harvey *et al.*, 2014). In a fragmented or multi-agent system, citizens cannot clearly attribute merit or demerit to a specific agent (Mortensen, 2013). This mechanism may be important in the quality-satisfaction relationship. Recent marketing evidence suggests that provider identity disclosure (i.e. establishing the responsible actor) is associated with higher satisfaction in service recovery settings (Chung *et al.*, 2025). Conversely, the "locus-of-responsibility shift" observed in multi-actor service platforms can be framed as an attempt to redirect dissatisfaction: a "collateral" provider may be blamed to protect the reputation of the actor actually responsible for the poor performance (Fu *et al.*, 2026). Attribution, or the lack of it, may indeed alter the quality-to-satisfaction paths. Thus, we propose:

H2a. The positive relationship between e-Government service quality and trust in the public actor will be significantly weaker in the fragmented system.

More than that, fragmentation may also undermine intentionality: the degree to which an outcome is attributed to deliberate agency rather than to unintentional or accidental action (Harvey *et al.*, 2014). Without a clear attribution of intentionality, users might perceive service efficiency as accidental or task-specific instead of a sign of commitment. This lack of perceived intent can prevent service quality from fostering trust, thereby hindering the trust-facilitating role. Exemplifying, in Veneto, a citizen may use the regional FSE to find a booking service and be redirected to the individual ASL portal. Even if the experience is positive, i.e. the siloed portal offers a quality service, this still fails to update their trust beliefs toward the “leading” public actor, which is the region. This parallels, albeit in the opposite direction, the “blame games” played in multi-level systems (Heinkelmann-Wild and Zangl, 2020). As a result, the fragmented system becomes a “trust dissipator” in which the “credit for quality” is lost across the various actors involved. In sum, fragmentation may negatively affect the formation of trust and impair the positive, direct or strengthening effects that past literature states it has on citizens’ satisfaction. So, we propose:

H3a. The positive relationship between trust in the public actor and service satisfaction will be significantly weaker in the fragmented system.

H4a. The mediating effect of trust in the relationship between quality and satisfaction will be significantly weaker in the fragmented system.

2.4 Proposed theoretical model

Our theoretical model (Figure 1), grounded in previous hypotheses, conceptualises e-GovQual as a second-order construct comprising three first-order constructs: efficiency, privacy, and reliability. This is linked to trust in public institutions, which in turn affects satisfaction with digital healthcare booking services. The model was tested through a multi-group analysis

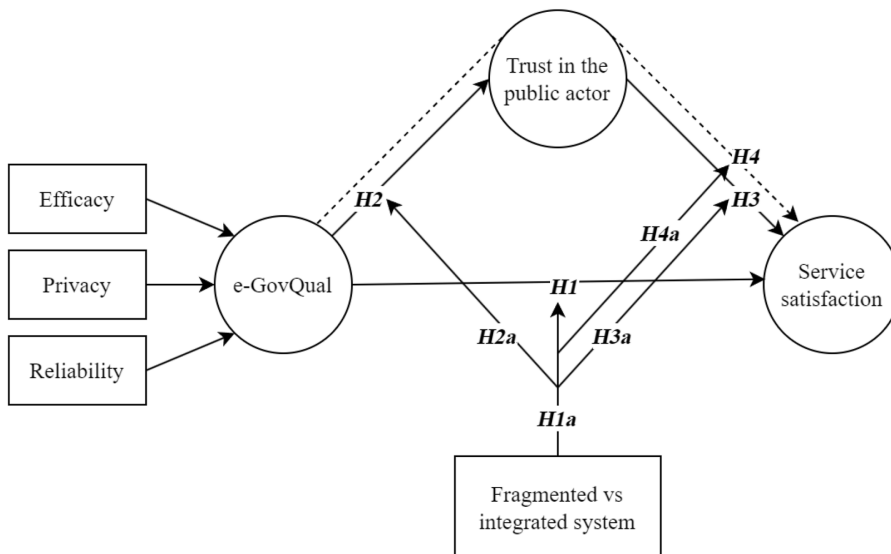


Figure 1. Proposed theoretical model. **Note 1:** The model includes the following control variables: sex, age category, booking platform (mobile app vs. website), attitude towards the booking service, and computer anxiety. For clarity, these are not depicted in the figure. **Source:** Authors’ own work

comparing the two regional governance systems (Veneto, the fragmented one and Emilia-Romagna, the integrated one) to examine how different institutional contexts shape these relationships. The model incorporated sex, age (categorised), and the platform used the most to book (mobile application vs website) as covariates. These covariates are included because of their established effects on technology adoption and service evaluation in prior digital government research ([Chan et al., 2021](#); [Fan et al., 2022](#); [Lee-Geiller, 2024](#); [Surya Bahadurm et al., 2024](#)). Additionally, computer anxiety ([Lester et al., 2005](#)) and attitude towards the service ([Ajzen, 2001](#)) were included as latent covariates in both the structural and measurement models to account for individual psychological differences in technology interaction.

3. Methodology

3.1 Case selection

We propose a comparison of exemplary cases: the already mentioned Veneto and Emilia-Romagna. These two represent similar yet different types of governance within the Italian health system. In terms of similarities, these two regions have nearly identical population sizes (approx. 5 million inhabitants each) and GDP per capita (40k Veneto and 43k Emilia), and top-tier performance in national healthcare quality rankings ([Ministero della Salute, 2025a, b](#)). Moreover, both regions are national leaders in digital infrastructure and broadband penetration ([Bucci, 2026](#)). However, this similarity does not imply equivalence; rather, it provides a unique opportunity to compare two distinct governance models, integrated vis-à-vis fragmented, within a high-performance context.

According to [Neri \(2008\)](#), while both regions belong to the “Integration Model” of healthcare governance, they represent two contrasting variants. In Emilia-Romagna, emphasis is placed on negotiated programming through contractual agreements between the purchaser (the region) and providers of health (public hospitals and accredited private facilities). Integration is achieved horizontally through concertation with all stakeholders. In contrast, Veneto follows a top-down, centralised managerial model: while strategic planning (and financing) is conducted at the regional level, service supply management relies on internal managerial control mechanisms within individual ASLs, which are responsible for organising existing services ([Garattini et al., 2022](#)). This creates a structural paradox: high-level regional centralisation paired with unit-based execution.

We argue, seeking to substantiate this claim in [supplementary material S1](#), that this difference is reflected in the architecture of the digital platforms. In Emilia-Romagna, the FSE and the integrated booking platform (the CUPWeb) serve as a technological embodiment of a cohesive network. Here, the booking process is embedded within a single regional ecosystem, providing a seamless user experience in which the “public actor” is perceived as a unified entity. In contrast, in Veneto, the digital interface often appears to citizens as a collection of “corporate” silos: the FSE provides, at times, a common access point, yet the users are frequently redirected to diverse local platforms managed by individual ASL. This heterogeneity of interfaces embodies the fragmentation we aim to test.

In summary, by selecting two regions, we aim to neutralise, to the best of our ability, external confounding variables (such as economic wealth or overall efficiency), thereby isolating the impact of their divergent governance architectures on the citizen evaluation mechanism of the health booking service.

3.2 Data collection

The study draws on data collected through an online survey conducted in February 2024 across two northern Italian regions, Veneto and Emilia-Romagna. Participants were recruited through a convenience sampling, with support from regional contacts, including professionals working within local ASLs and direct peers residing in the two regions. The survey targeted individuals

with prior experience of digitalised public healthcare services and was administered via an online questionnaire. Overall, 1,637 responses were collected (564 from Veneto and 1,083 from Emilia-Romagna). As part of the survey design, respondents were asked whether they had used an online booking service for public healthcare services at least once in the previous year. Those who reported no such use were excluded. Additional exclusions were applied to failed attention checks and to inattentive respondents, following data-quality screening procedures (Arthur *et al.*, 2021). The final analytical sample, therefore, consisted of 1,041 valid responses.

The questionnaire comprised two main sections. The first captured socio-demographic characteristics, including age, gender, and occupational status, while the second measured the study's core constructs using validated scales adapted to the Italian healthcare context. All items were measured on a 7-point Likert scale (1 = absolutely disagree; 7 = absolutely agree). Participants were given approximately 10 min to complete the survey. The final sample was predominantly female (73.78%), employed (45.53%), and aged 30 years or older (59.37%). Further details are provided in [supplementary materials S2](#). The measures of service quality -efficiency, privacy, and reliability [3] -were adapted from the e-GovQual framework (Papadomichelaki and Mentzas, 2012). Trust in public actors was measured using items derived from Teo *et al.*'s (2008) trust-in-government scale. Service satisfaction was assessed through a modified version of Li and Shang's (2020) scale. All analyses were performed using R (R Core Team, 2022).

3.3 Measurement model: reliability and method variance

To assess the goodness of our measures, we conducted Confirmatory Factor Analysis (CFA) using Lavaan and semTools packages to test our model (Jorgensen *et al.*, 2023; Rosseel, 2012). Given the ordinal nature of our Likert-scale data and the expected deviations from multivariate normality, we used the robust maximum likelihood estimator.

The measurement model showed an acceptable fit ($\chi^2 = 988.760$, $df = 262$, $RMSEA = 0.052$ [90% CI: 0.049; 0.055], $CFI = 0.948$, $TLI = 0.941$, $SRMR = 0.051$) (Table 1). Convergent validity was evaluated through composite reliability (CR), average variance extracted (AVE), and standardised factor loadings (λ), all of which exceeded the required thresholds (Hair *et al.*, 2018).

Discriminant validity was assessed using three established procedures. First, we applied the Fornell-Larcker criterion (Fornell and Larcker, 1981), confirming that the square root of the AVE for each construct was greater than its highest correlation with any other construct. Second, we examined the Heterotrait-Monotrait (HTMT) ratio of correlations, with all values remaining below the conservative threshold of 0.85 (Henseler *et al.*, 2015). Finally, we verified that the correlations between all pairs of constructs were below 0.90, indicating no excessive linearity (Rönkkö and Cho, 2022). Collectively, these tests provided robust evidence for the discriminant validity of our measurement model. Details are in Table 2.

We tested for common method variance using the unmeasured latent factor method (Podsakoff *et al.*, 2003). A model including a method factor with equal loadings on all indicators was compared to the baseline measurement model. The Satorra-Bentler χ^2 difference test was non-significant (χ^2 -diff (1) = 0.041, $p = 0.839$), and differences in fit indices were negligible ($\Delta CFI = 0.000$, $\Delta RMSEA = 0.000$), indicating that common method bias does not substantially affect our results.

3.4 Invariance of the measures

To investigate how governance models shape user satisfaction, we first established measurement invariance, ensuring our constructs were perceived and measured equivalently across regions. This was a necessary prerequisite for our multi-group analysis because it ensures that any observed differences in the structural model can be attributed to genuine differences in how the two groups experience the systems, rather than to fundamental

Table 1. Measurement model

Construct	Measurement items	λ	CR	AVE
<i>Efficacy</i> (first-order of e-GovQual)		<i>0.836</i>	0.888	0.713
	The website's structure is clear and easy to follow	0.898		
	The website map is well organised	0.914		
	The information displayed on the website is up to date	0.716		
<i>Privacy</i> (first-order of e-GovQual)		<i>0.750</i>	0.818	0.599
	The acquisition of username, password, and other sensitive information on the website is secure	0.786		
	Only the personal data necessary for the booking is requested	0.743		
	The data provided by users is stored securely	0.788		
<i>Reliability</i> (first-order of e-GovQual)		<i>0.909</i>	0.828	0.616
	The website is available and accessible whenever you need it	0.764		
	This website completes the booking service on the first attempt	0.761		
	The website works properly with its default browser	0.836		
<i>Trust in the public actor</i>			0.913	0.693
	I believe I can trust the online services provided by public operators	0.737		
	I am confident that public operators will protect my personal data collected through interactions with online public services	0.804		
	I believe public operators try to act in ways that take my interests and needs into account	0.805		
	I feel confident that public operators will act in the best interests of making online public services more user-friendly	0.925		
	Overall, I am confident that public operators will create online services that better serve me	0.868		
<i>Service satisfaction</i>			0.948	0.857
	I am satisfied with the online booking service offered by [Emilia-Romagna/Veneto]	0.945		
	Overall, I am satisfied with the online booking service provided by [Emilia-Romagna/Veneto]	0.965		
	The online booking service has met my requests and needs	0.869		
<i>Computer Anxiety</i> (Latent covariate)			0.856	0.595
	Using online booking services makes me anxious	0.769		
	I am wary of using online booking services because I fear not having all the necessary information	0.714		
	Using online booking services frightens me	0.805		
	I am sceptical about using online booking services because I fear making mistakes that I cannot correct	0.805		
<i>Attitude towards the service</i> (Latent covariate)			0.902	0.694
	I enjoy using online booking services	0.840		
	Using online booking services is pleasant for me	0.876		
	The idea of using online booking services is excellent, in my opinion	0.807		
	I find it convenient to use online booking services	0.796		

Note(s): The composite reliability of the second-order factor E-gov-qual was 0.808. In the table, the loadings shown in italics represent the loadings of the first-order factors on the second-order construct

Source(s): Authors' own work

differences in how they interpret the survey questions. Without this step, observed differences in structural relationships could reflect measurement artefacts rather than factual distinctions. Following established procedures for multi-group analysis (Chen, 2007), we conducted a multi-group confirmatory factor analysis to test for measurement equivalence before comparing the structural model across regions.

Measurement invariance was tested sequentially using Chen's (2007) thresholds for large samples ($n > 300$ per group; Veneto: 389; Emilia-Romagna: 652). Configural invariance

Table 2. Discriminant validity: correlations, square roots of AVE, and HTMT values

Construct	1	2	3	4	5	6	7	8
e-GovQual [1]	–	–	–	–	–	–	–	–
Efficacy [2]	0.836	<i>0.845</i>	0.689	0.769	0.457	0.731	0.184	0.486
Privacy [3]	0.750	0.648	<i>0.774</i>	0.669	0.555	0.565	0.268	0.534
Reliability [4]	0.909	0.756	0.669	<i>0.785</i>	0.476	0.773	0.217	0.525
Trust in the public actor [5]	0.566	0.447	0.552	0.479	<i>0.833</i>	0.574	0.289	0.513
Service satisfaction [6]	0.814	0.688	0.599	0.761	0.589	<i>0.926</i>	0.246	0.567
Computer anxiety [7]	–0.256	–0.182	–0.262	–0.226	–0.260	–0.244	<i>0.711</i>	0.577
Attitude towards the service [8]	0.596	0.463	0.524	0.535	0.488	0.566	0.559	<i>0.833</i>

Note(s): The square root of AVE on the diagonal is in *italic*, and the inter-construct correlation is under the diagonal; HTMT correlations are above the diagonal

In line with Rönkkö and Cho (2022), all inter-construct correlations reported below the diagonal (excluding those involving the second-order E-gov-qual construct) were confirmed to be significantly below the 0.90 threshold via χ^2 tests ($p < 0.001$)

Source(s): Authors' own work

(Model 1) showed excellent fit: χ^2 (524) = 1350.808, CFI = 0.944, TLI = 0.936, RMSEA = 0.055, SRMR = 0.053. Metric invariance (Model 2) held, with negligible changes ($|\Delta\text{CFI}| = 0.000$, $|\Delta\text{RMSEA}| = 0.001$, $|\Delta\text{SRMR}| = 0.001$; χ^2 -diff (21) = 21.630, $p = 0.421$). Scalar invariance (Model 3) was also supported despite a significant χ^2 difference (χ^2 -diff (17) = 43.602, $p < 0.001$), as all fit index changes remained below critical thresholds ($|\Delta\text{CFI}| = 0.002$, $|\Delta\text{RMSEA}| = 0.000$, $|\Delta\text{SRMR}| = 0.000$).

Overall, measurement invariance at the scalar level across regions confirmed that observed structural differences reflect genuine differences between models rather than measurement bias. More details are offered in Table 3.

4. Results

4.1 Path model results

Table 4 presents the results for the global model (full sample) and the multi-group structural model (regional subsamples). We employed bootstrapping with 5,000 resamples.

Table 3. Invariance tests among respondents from Veneto and Emilia-Romagna

Invariance level	χ^2	df	CFI	TLI	Rsmear	SRMR
Configural (M1)	1350.808	524	0.944	0.936	0.055	0.053
Metric (M2)	1371.999	545	0.944	0.938	0.054	0.054
Scalar (M3)	1415.451	562	0.942	0.938	0.054	0.054

χ^2 difference test and absolute differences across global fit indexes

	χ^2 -diff (df)	p	$ \Delta\text{CFI} $	$ \Delta\text{TLI} $	$ \Delta\text{RMSEA} $	$ \Delta\text{SRMR} $
M1 against M2	21.630 (21)	0.421	0.000	0.002	0.001	0.001
M2 against M3	43.602 (17)	<0.001	0.002	0.000	0.000	0.000

Note(s): The reported robust χ^2 -diff has been computed using the Satorra-Bentler correction. It is not the plain χ^2 difference between the original model and the respecified ones

For loading invariance, a change of 0.010 in CFI, 0.015 in RMSEA or 0.030 in SRMR indicates non-invariance. Likewise, for intercept invariance, a change of 0.010 in CFI, 0.015 in RMSEA or 0.010 in SRMR indicates non-invariance

Source(s): Authors' own work

Table 4. Structural model: global sample and multi-group across regions

	Complete sample (n. = 1,041)				Service satisfaction											
	Trust in the public actor															
	β	SE	LLCI	ULCI	β	SE	LLCI	ULCI								
<i>Direct effects</i>																
e-Gov-Qual	0.439	0.047	0.349	0.532	0.661	0.042	0.580	0.743								
TPA	–	–	–	–	0.166	0.035	0.097	0.235								
<i>Controls</i>																
CAX	–0.028	0.045	–0.120	0.059	0.027	0.030	–0.032	0.085								
ATT	0.208	0.060	0.084	0.322	0.114	0.046	0.024	0.205								
Male	–0.035	–0.089	0.019	0.028	–0.039	0.021	–0.081	0.002								
Age [18–30]	0.016	–0.082	0.109	0.049	–0.091	0.034	–0.158	–0.025								
Age [31–40]	0.021	–0.058	0.097	0.040	–0.083	0.028	–0.137	–0.031								
Age [41–50]	0.044	–0.041	0.125	0.043	–0.125	0.030	–0.184	–0.064								
Age [51–60]	–0.007	–0.087	0.069	0.040	–0.086	0.028	–0.143	–0.030								
Website	0.038	–0.016	0.094	0.028	0.053	0.021	0.013	0.094								
<i>Indirect and total effects</i>																
	Indirect: e-Gov-Qual → TPA				0.073	0.016	0.043	0.107								
	Total: e-Gov-Qual → SAT				0.734	0.037	0.663	0.808								
<i>Multi-group model: Veneto sample (n. = 389)</i>					<i>Multi group model: Emilia-romagna sample (n. = 652)</i>											
	To trust in the public actor				To trust in the public actor				To service satisfaction							
	β	SE	LLCI	ULCI	β	SE	LLCI	ULCI	β	SE	LLCI	ULCI	β	SE	LLCI	ULCI
<i>Direct effects</i>																
e-Gov-Qual	0.425	0.071	0.291	0.567	0.667	0.074	0.529	0.815	0.448	0.326	0.568	0.061	0.654	0.053	0.554	0.759
TPA	–	–	–	–	0.106	0.061	–0.021	0.224	–	–	–	–	0.204	0.041	0.121	0.284
<i>Controls</i>																
CAX	–0.033	0.072	–0.177	0.106	0.023	0.045	0.062	0.116	–0.016	0.059	–0.137	0.096	0.031	0.042	–0.049	0.113
ATT	0.269	0.101	0.053	0.452	0.156	0.079	–0.003	0.305	0.170	0.070	0.030	0.301	0.098	0.061	–0.024	0.218

(continued)

(continued)

Table 4. Continued

<i>Multi-group model: Veneto sample (n. = 389)</i>									<i>Multi group model: Emilia-romagna sample (n. = 652)</i>							
To trust in the public actor					To service satisfaction				To trust in the public actor				To service satisfaction			
	β	SE	LLCI	ULCI	β	SE	LLCI	ULCI	β	SE	LLCI	ULCI	β	SE	LLCI	ULCI
Male	−0.015	0.045	−0.105	0.072	−0.016	0.035	−0.084	0.050	−0.056	0.036	−0.128	0.014	−0.061	0.028	−0.115	−0.007
Age [18–30]	0.074	0.068	−0.062	0.204	−0.038	0.054	−0.141	0.067	−0.033	0.065	−0.159	0.096	−0.116	0.042	−0.200	−0.032
Age [31–40]	0.052	0.062	−0.072	0.172	−0.070	0.050	−0.164	0.033	−0.002	0.054	−0.106	0.107	−0.088	0.032	−0.149	−0.021
Age [41–50]	0.066	0.066	−0.063	0.194	−0.086	0.050	−0.184	0.016	0.018	0.055	−0.092	0.127	−0.152	0.037	−0.223	−0.078
Age [51–60]	0.048	0.066	−0.084	0.176	−0.072	0.049	−0.168	0.025	−0.052	0.050	−0.150	0.047	−0.092	0.033	−0.115	−0.024
Website	−0.008	0.044	−0.093	0.077	0.014	0.031	−0.048	0.076	−0.056	0.034	−0.013	0.120	0.042	0.025	−0.008	0.089
<i>Indirect and total effects</i>																
	Indirect: e-Gov-Qual → TPA				0.045	0.028	−0.009	0.110	Indirect: e-Gov-Qual → TPA				0.092	0.021	0.052	0.135
	Total: e-Gov-Qual → SAT				0.712	0.065	0.584	0.837	Total: e-Gov-Qual → SAT				0.745	0.047	0.656	0.840
Note(s): All standard errors (SE) and confidence intervals (LLCI and ULCI) are derived from bootstrap estimates TPA denotes trust in the public actor, CAX denotes computer anxiety, and ATT denotes attitude towards the service																
Source(s): Authors’ own work																

The global model demonstrated a good fit to the data ($\chi^2 = 1593.228$, $df = 400$, $RMSEA = 0.054$ [90% CI: 0.051, 0.056], $CFI = 0.938$, $TLI = 0.931$, $SRMR = 0.047$). Path analysis revealed that e-GovQual had a significant positive relationship with trust in the public actor ($\beta = 0.439$; 95% CI: 0.349, 0.532) and a significant positive relationship with service satisfaction ($\beta = 0.611$; 95% CI: 0.580, 0.743), supporting [H1](#) and [H2](#). Trust in the public actor had a significant direct relationship with service satisfaction ($\beta = 0.166$; 95% CI: 0.097, 0.235), confirming [H3](#). The indirect effect from e-GovQual to service satisfaction via trust was significant ($\beta = 0.073$; 95% CI: 0.043, 0.107), supporting [H4](#).

Regarding covariates, attitude had a significant positive effect on both trust and service quality. Age was also a significant predictor of satisfaction: using the 61+ age group as the reference category, all younger cohorts reported significantly lower satisfaction levels (β ranging from -0.083 to -0.125), with the 41–50 age group showing the most substantial negative effect. Finally, users who booked via the website reported higher satisfaction levels than those who used the mobile application.

[Table 4](#) also presents the results for the multi-group model. The model fit was adequate ($\chi^2 = 2,197.260$, $df = 800$, $RMSEA = 0.058$ [90% CI: 0.055–0.061], $CFI = 0.929$, $TLI = 0.920$, $SRMR = 0.052$), and some interesting variations emerged. In Veneto, e-GovQual exerted a strong positive effect on trust in the public actor ($\beta = 0.425$; 95% CI: 0.291–0.567) and an even stronger one on service satisfaction ($\beta = 0.667$; 95% CI: 0.529–0.815). Trust in the public actor had a small, non-significant direct effect on satisfaction ($\beta = 0.106$; 95% CI: -0.021 –0.224). The indirect path from e-GovQual to satisfaction via trust was weak and non-significant ($\beta = 0.045$; 95% CI: -0.009 –0.110). In Emilia-Romagna, e-GovQual again predicted trust in the public actor robustly ($\beta = 0.448$; 95% CI: 0.326–0.568) and satisfaction ($\beta = 0.654$; 95% CI: 0.554–0.759). Unlike Veneto, however, trust in the public actor also exerted a significant positive effect on satisfaction ($\beta = 0.204$; 95% CI: 0.121–0.284), and the indirect effect of e-GovQual on satisfaction was significant ($\beta = 0.092$; 95% CI: 0.052–0.135).

To gain confidence in these results and formally test hypotheses [H1a](#)–[H4a](#), we performed a series of χ^2 difference tests, constraining the structural paths to equality across the two samples (see [supplementary materials S3](#)). The results led to the rejection of [H1a](#) and [H2a](#), as the direct effects of e-GovQual on satisfaction ($\Delta\chi^2 = 0.061$, $p = 0.803$) and on trust ($\Delta\chi^2 = 0.238$, $p = 0.625$) were invariant across regions. In contrast, support for [H3a](#) and partial support for [H4a](#) were found. The relationship between trust and satisfaction was significantly stronger in the integrated region ($\Delta\chi^2 = 4.176$, $p < 0.05$), and this divergence was also reflected in the mediated path. While the χ^2 difference test for the indirect effect only approached statistical significance ($\Delta\chi^2 = 2.973$, $p = 0.084$), it is still notable that the trust-mediated mechanism was significant in Emilia-Romagna and non-significant in Veneto. Substantively, this sheds light on how the quality-satisfaction link operates. In the fragmented system, evaluations of service tend to translate directly into satisfaction, rather than being part of a broader trust-related mechanism. In contrast, in the integrated system, citizens can link service experiences to institutional evaluations, allowing trust to serve as a mechanism that translates perceived service quality into an overall higher satisfaction.

Regarding the control variables, attitude is positively associated with trust in both samples, with slightly robust effects in Veneto. Age effects are minor overall, although younger respondents in Emilia-Romagna tend to report lower satisfaction levels. One possible explanation of the latter is that the greater standardisation of the integrated system may generate higher expectations among younger, more digitally experienced users, making them more critical in their evaluations.

As a final robustness check, the structural model was re-estimated by allowing all paths to vary freely across booking channels (web vs mobile application), and alternative structural specifications were examined to rule out plausible rival models ([supplementary materials S4](#)).

5. Discussion and implications

Based on survey data from 1,041 citizens, this study aimed to investigate an underexplored dynamic: how service delivery fragmentation shapes the mechanisms underlying the relationships among e-government quality, trust, and citizen satisfaction. We conducted a comparative analysis of online healthcare booking systems in two Italian regions: Veneto, characterised by a fragmented, multi-portal ecosystem, and Emilia-Romagna, which offers a more vertically integrated, unified digital pathway for booking health services.

The results highlight that e-GovQual strongly influences service satisfaction in both regions. The role of trust, instead and importantly, is region-dependent. In the integrated system, trust had a significant direct effect and acts as a mediator between service quality and satisfaction. In contrast, in Veneto, trust played a negligible role. Here, citizen satisfaction appears to be driven primarily by immediate, interface-level evaluations of the service: what “works here and now.” Fragmentation, thus, may generate inconsistent signals. Citizens may be unable to identify who is “speaking” to them clearly: the region, the ASL via a local portal, or another dedicated portal. This ambiguity does not prevent trust from forming, but it renders that trust inconsequential for satisfaction; it fails to enhance citizens’ evaluations of the specific service encounter.

These findings resonate with several streams of literature. First, the robust relationship between e-GovQual and satisfaction confirms that quality is a central driver of citizen evaluations regardless of institutional settings (Kumar *et al.*, 2023; Papadomichelaki and Mentzas, 2012; Patergiannaki and Pollalis, 2024). Second, the failure of trust to mediate in Veneto can be understood through attribution theory. Attribution requires a clear locus of causality (Harvey *et al.*, 2014; Weiner, 1985). In Veneto’s fragmented landscape, dictated by the adopted governance model (Garattini *et al.*, 2022; Neri, 2008), citizens cannot reliably attribute the quality of their digital interactions to a coherent public actor, disrupting the process through which trust reinforces satisfaction (Alkraihi and Ameen, 2022; Tisland *et al.*, 2022; Topuz *et al.*, 2025). Like multi-actor environments, fragmentation seems to complicate responsibility attribution (Leland *et al.*, 2021; Piatak *et al.*, 2017). By contrast, Emilia-Romagna’s integrated architecture provides the requisite institutional visibility, enabling citizens to interpret positive encounters as signals of the regional health system’s ability (Bélanger and Carter, 2008; Fakhoury and Aubert, 2015). In short, fragmentation operates not merely as a simple individual-level moderator but as a meso-level condition that alters the links among service quality, trust, and satisfaction.

5.1 Theoretical implications

The main theoretical contribution of our work is challenging the view that the mechanisms linking service quality, institutional trust, and citizen satisfaction are stable across institutional settings. Prior research has consistently found this mechanism (or a comparable one) across different services (Alkraihi and Ameen, 2022; Bélanger and Carter, 2008; Carter and Bélanger, 2005; Patergiannaki and Pollalis, 2024; Tisland *et al.*, 2022; Topuz *et al.*, 2025). Our findings, however, suggest that this mechanism may be contingent upon the characteristics of the service delivery system. Specifically, the mediating and direct roles of trust collapse in fragmented contexts, thereby questioning the universality of the process underlying existing e-government models. By highlighting this, we respond to calls in public administration to move beyond “methodological nationalism” and to reconsider how regional configurations and local actors shape the settings that influence citizen responses (Greer *et al.*, 2015).

This has important implications for how trust in public institutions is theorised. Rather than assuming that trust automatically enhances satisfaction once formed, our results suggest that trust’s consequences depend on the clarity of the institutional attribution. Drawing on attribution theory (Harvey *et al.*, 2014; Weiner, 1985), we argue that for trust to inform satisfaction meaningfully, citizens must be able to connect their institutional confidence to a coherent and recognisable public actor. In fragmented systems, this connection becomes

ambiguous. Citizens may generally trust the public actor, as evidenced by the significant effect of service quality on trust, even in Veneto. Still, they struggle to see how that trust should bear upon their evaluation of a specific, localised service encounter. In this sense, fragmentation dissipates the positive effects of trust, making it irrelevant even if present. This interpretation resonates with, yet refines, [Mortensen's \(2013\)](#) notion of “credit slippage.” Mortensen argues that decentralisation may cause credit for positive outcomes to slip away from central authorities. Our findings suggest a related but distinct phenomenon: in fragmented digital ecosystems, the credit for service quality does reach the regional government in the form of trust, but that trust remains inert, unable to shape citizens’ satisfaction. The system thus suffers not from a lack of trust, but from the decoupling of trust from the everyday service experiences that constitute citizens’ encounters with the state.

Conversely, the integrated system appears to function as an environment of “trust accumulation”; it enables that trust to translate meaningfully into satisfaction. In coherent and standardised service architectures, citizens can connect their institutional confidence to a recognisable public actor, thereby allowing trust to reinforce and amplify their service evaluations. This distinction reframes trust as a phenomenon whose relevance depends not only on performance but also on the organisational coherence and visibility of the service provider. In doing so, our study extends existing research on accountability and attribution in public services ([Leland et al., 2021](#); [Liang et al., 2025](#); [Piatak et al., 2017](#)) by showing that the capacity to assign responsibility is a precondition not for the formation of trust *per se*, but for the effective mobilisation of trust in shaping citizens’ satisfaction. The architecture of service delivery systems thus governs whether trust remains inert or becomes an active ingredient in the citizen’s evaluative calculus.

More broadly, these insights help bridge the divide between system-level analyses of public administration and micro-level studies of citizen behaviour. While fragmentation has been widely examined as a source of inefficiency and idiosyncrasies ([Cejudo and Michel, 2017](#); [Rajala et al., 2021](#); [Siqueira et al., 2021](#)), its implications for citizen cognition and evaluation have remained underexplored. Our findings suggest that fragmentation operates as a meso-level structural mechanism that shapes micro-level evaluative processes by influencing how citizens assign credit and construct institutional trust. In this sense, local entities (*i.e.* ASL) should be understood not merely as operational units but as key actors in the construction of attribution, whose degree of coordination and consistency determines whether service experiences are perceived as isolated and episodic or as expressions of a coherent public system ([Garattini et al., 2022](#); [Maino and Betti, 2026](#); [Neri and Vicarelli, 2024](#)). This directly engages with the implementation literature, which emphasises the active and interpretive role of local actors in shaping policy outcomes ([Castelnovo and Sorrentino, 2024](#)), by showing that their actions also influence how citizens cognitively reconstruct the institutional environment.

To summarise, our contributions point toward an “integration versus fragmentation” lens for e-government research, which shifts the focus from performance-based explanations of citizen satisfaction to the structural conditions that enable or inhibit the translation of trust, or other relevant elements, into service satisfaction. By pointing this out, we suggest that the effectiveness of digital public services may depend not only on their technical quality but also on the clarity of attribution.

5.2 Practical implications

This study highlights the importance of managerial capacity for building integrated, comprehensible, and reliable service ecosystems. Regions that have built unified digital infrastructures and consistent interfaces, such as Emilia-Romagna, appear better equipped to ensure that institutional trust translates meaningfully into citizen satisfaction, thereby stabilising the quality–satisfaction relationship. Conversely, where organisational fragmentation persists, as observed in Veneto, public managers face the challenge of compensating for it through more transparent communication, harmonised procedures,

and more explicit governance coordination. Although service quality fosters trust in both settings, fragmentation prevents that trust from translating into greater satisfaction. That said, several managerial levers at the ASL level can play a decisive role in reconnecting trust and satisfaction. These include standardising informational templates and booking flows across portals, inter-ASL cooperation on authentication mechanisms, and coordinated governance of digital content and access channels.

From a policy-making perspective, regional authorities should transition from a technology-centric approach that emphasises implementation to one rooted in harmonisation. This entails introducing interoperability standards as a prerequisite for local digital infrastructure. By doing so, policy makers can prevent the emergence of new information silos and ensure that every local service is natively integrated into the national or regional electronic health record system (Causio *et al.*, 2025; The Lancet Regional Health – Europe, 2025). Furthermore, since there is a national, robust digital identity for Italian citizens (i.e. the CIE [4]), enforcing this as a sign-on protocol across all instances could help eliminate fragmented login experiences that can frustrate citizens. Beyond technical aspects, policymakers could link managerial incentives and bonuses to indicators of perceived institutional coherence and trust, rather than focusing exclusively on raw usage volumes.

Also at a more managerial level, local directors and hospital administrators should prioritise harmonisation, ensuring that the trust generated by positive service interactions translates into enhanced satisfaction with the public system. An immediate, actionable step is to standardise templates and booking flows across different local health units, making the transition between administrative portals seamless for users. This reduces citizens' cognitive load and reinforces a sense of "public ownership" of the service. This is also relevant from a reputational perspective: ensuring consistent "institutional branding" across all digital touchpoints would help citizens connect their institutional confidence to specific service encounters, so that positive outcomes are attributed to the public actor rather than to an isolated technological tool.

Beyond the more managerial ones, our findings also carry some societal implications. Digital fragmentation risks become an invisible barrier, selectively filtering out those who are not digitally native. While expert users may successfully navigate a patchwork of portals, digitally marginalised populations (i.e. older adults or citizens with lower digital literacy) are more likely to withdraw from such complexity. In this sense, fragmented systems may not only cause friction but also inadvertently deepen the digital divide, turning public services into unintended engines of citizen disengagement with new tools.

All in all, we suggest that digital transformation is also a governance challenge, not only a purely technological one. Local and regional managers should treat digital service design as a strategic opportunity to strengthen multi-level coordination, reduce institutional complexity, and promote interoperability across ASLs and municipalities. Importantly, fallback channels such as telephone booking or assisted support should not be treated as parallel or alternative systems, but instead governed as integrated components of the same service ecosystem, reinforcing continuity and reliability for citizens.

6. Future research and limitations

Despite its contributions, this study opens several avenues for future research that extend beyond methodological refinement and speak directly to the theoretical development of fragmentation and citizen evaluation mechanisms. While our cross-sectional design is consistent with established models linking service quality, trust, and satisfaction (Patergiannaki and Pollalis, 2024; Teo *et al.*, 2008; Tolbert and Mossberger, 2006), it does not fully capture the temporal dynamics of attribution and trust formation. Future research could move beyond static representations of these relationships by theorising and empirically examining how evaluation mechanisms evolve, particularly in contexts where digital service architectures are changing. For instance, the transition from fragmented to integrated systems

may not simply strengthen existing relationships but fundamentally alter how citizens learn to attribute responsibility and infer intentionality, suggesting a need for longitudinal, process-based theorising of trust formation in digital public services.

Related to these temporal dynamics, a long-term perspective remains absent from the literature. From a policy feedback lens (Mettler and Soss, 2004), persisting with fragmented designs may not merely obstruct the immediate mechanism that translates trust into satisfaction; it may also alter citizens' broader evaluative schema. Locking individuals into a fragmented condition may push them to evaluate public services solely at the local interface scale. This may ultimately sever the link between service quality and institutional trust, even when the capacity to deliver high-quality outcomes originates with a higher-level actor (e.g. the regional government), thereby impairing institutional legitimacy, affecting citizens' willingness to adopt novel public service delivery systems and even their political engagement at the regional level. Future research is thus invited to explore these effects.

Another issue that future research can tackle concerns our operationalisation of fragmentation. Our specification of it as a dichotomous variable reflects a theoretically guided decision to capture analytically meaningful distinctions between system-level configurations, rather than to exhaust all possible dimensions of fragmentation. Such an approach is consistent with the principle that multidimensional concepts should be operationalised by focusing on relevant elements while abstracting from dimensions that are common across cases (Goertz, 2012). That said, future research could unpack its multidimensional nature by distinguishing between different forms of fragmentation, such as interface fragmentation, organisational fragmentation, and informational fragmentation, and examining how each dimension differentially affects citizens. Such work would help move fragmentation from a largely descriptive concept to a more analytically precise construct.

In addition, we highlight the importance of attribution as a central mechanism linking system-level structures to individual-level evaluations, yet this mechanism remains only theorised and untested. Future research could more explicitly integrate insights from attribution theory and related perspectives (Harvey *et al.*, 2014; Weiner, 1985) to explore how citizens infer causality about public service performance in complex governance environments. In particular, further work is needed to understand the conditions under which citizens can assign responsibility to public actors and how this shapes not only trust but also legitimacy, accountability, and fairness (Leland *et al.*, 2021; Liang *et al.*, 2025; Mortensen, 2013; Piatak *et al.*, 2017).

Relatedly, the distinction we identify between contexts in which institutional trust actively informs citizen satisfaction and those in which trust remains inert raises a more general theoretical question about the relationship between institutional coherence and the formation of evaluative judgements. Future research could extend this insight by examining whether similar mechanisms operate in other multi-actor or platform-based service environments, such as public-private partnerships, digital marketplaces, or cross-agency service ecosystems. This would allow the assessment of the generalisability of the integration-fragmentation lens and the theorisation of how organisational architectures shape the translation of performance into institutional evaluations across different governance settings (Palm *et al.*, 2025; Rajala *et al.*, 2021).

Furthermore, while our study focuses on a transactional service context, future research could explore whether the effects of fragmentation become more pronounced in complex, high-stakes, or relational services, where the need for trust, continuity, and accountability is greater. In such contexts, fragmentation may not only disrupt attribution but also undermine the perceived legitimacy and reliability of the system as a whole, raising important questions about the limits of digitalisation in public service delivery. Investigating these dynamics would contribute to a more nuanced understanding of when and how fragmentation becomes a critical barrier to effective governance, rather than merely a source of inefficiency.

In examining other contexts, future research could address an additional limitation of our study: the use of a non-probabilistic convenience sampling strategy for recruiting users, which resulted in a skewed demographic distribution and, consequently, limits the generalisability of

our findings. Although we controlled for several covariates, future studies should consider employing stratified or quota sampling to ensure greater representativeness across user groups and socio-economic strata within the service population under investigation. Method-wise, it is also important to note that we adapted the scales to the Italian context. While minimal, adaptation may affect comparability with prior or future studies based on the full scale or modified versions.

Finally, although we sought to isolate the effects of fragmentation in our empirical setting, future research could extend the theoretical framework across different institutional environments to examine how cultural, political, and administrative traditions interact with system architecture to shape citizen evaluations. Furthermore, future studies could employ multi-level modelling techniques to examine within-region variation across individual local health authorities. Such an approach would allow researchers to disentangle the effects of regional governance models from more localised practices, thereby providing a more fine-grained understanding of how fragmentation operates at multiple levels of the service delivery ecosystem. Such comparative work would not only strengthen the external validity of the integration–fragmentation lens but also contribute to ongoing debates on regionalism and multi-level governance in public administration (Greer *et al.*, 2015), moving the field beyond assumptions of homogeneity toward a more context-sensitive understanding of public services.

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Notes

1. To avoid terminological overlap with the construct of trust in the public actor, examined later in this study, the original “trust” dimension of eGovQual is relabelled as privacy. This choice reflects our distinction between trust in the institutional actor and privacy/security perceptions of the service’s technological infrastructure. To better grasp this distinction, readers should consider the items for the two constructs reported in Table 1.
2. We acknowledge that the directionality of the relationship between trust, service quality and satisfaction can be debatable. For instance, in Teo *et al.* (2008), institutional trust serves as a precursor to citizens’ evaluations of digital services. Our point of view, however, differs, and, following Mayer *et al.*’s (1995) model, it treats service quality as an antecedent of trust. In our model, the interaction (i.e. the quality of this interaction) serves as the signal of ability, which in turn updates the citizen’s beliefs (see, for instance, Topuz *et al.*, 2025). That said, as a robustness test, we have specified alternative models; the results are reported in supplementary material S4.
3. The attentive reader may have noticed that we excluded the eGovQual sub-dimension of citizen support: the specific online booking services under investigation, at the time of writing, do not offer any human support options; we excluded this sub-dimension.
4. CIE (*Carta d’Identità Elettronica*) is the official digital identity systems in Italy. They allow citizens to securely access online public services with a single login, without needing separate credentials for each portal.

Supplementary material

The supplementary material for this article can be found online.

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