Citizen Satisfaction and Influential Factors of E-Government Services During the COVID-19 Crisis: A Turkish Case Study

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Abstract: This study aimed to evaluate citizen satisfaction with e-Government (eGov) services in Turkey amid the COVID-19 pandemic and identify the key factors influencing satisfaction levels. Data were collected from a random sample of 396 citizens residing in Usak, Turkey, who utilized eGov services throughout the crisis. Factor analysis and multiple linear regression methods were employed to examine the gathered data. The results revealed that the performance of eGov services and citizens' trust in the government were significant predictors of satisfaction with eGov services in the context of a pandemic. These findings offer valuable insights into enhancing eGov implementation in Turkey and suggest potentially beneficial strategies for nations with similar eGov infrastructures and socio-economic development. The broader implications of these findings for both practical applications and future research are subsequently explored in this study.

Keywords: E-Government (eGov); Satisfaction; COVID-19; Turkey

1. Introduction

The prevailing technological paradigm has emerged as a catalyst for unveiling an interconnected global landscape, characterized by comprehensive regulation that encompasses resources, processes, relationships, and human interaction (Heidegger, 1977). This intricate interplay between regulation and disclosure has driven the adoption of Information Technology (IT) in public administration, particularly in the form of eGovernment (eGov) initiatives. Contemporary discourse emphasizes the potential of eGov to transcend mere information provision and interaction, proposing a transformative effect on the relationships between governments and citizens. This potential has been further accentuated in the context of the COVID-19 pandemic, which has significantly accelerated this evolution.

Evaluating an Information and Communication System (ICS) is of paramount importance for its subsequent enhancement. User satisfaction has been recognized as a prevalent framework for system appraisal (Farhan & Sanderson, 2010). In the realm of eGov, citizen satisfaction emerges as a critical determinant for continued usage, influencing the success or failure of eGov initiatives (Alawneh et al., 2013; Malik et al., 2016). As a result, citizen satisfaction surveys provide invaluable insights for policy-makers, planners, practitioners, and citizens alike. The findings of such research elucidate citizen satisfaction levels with eGov services and unveil key satisfaction determinants during periods of compulsory use, such as during a pandemic. This knowledge informs policy and practice, enabling improvement, and allows citizens to adjust their expectations of eGov services based on peer experiences. Satisfied citizens are more likely to persist in their use of eGov services and may even advocate for their peers to follow suit.

This empirical study aimed to determine the satisfaction levels of citizens utilizing the Turkish eGov portal (turkiye.gov.tr) during the COVID-19 pandemic and to identify factors influencing these satisfaction levels. The identified factors, performance, and trust in the government were assessed as dimensions of e-satisfaction, encompassing technical, economic, and behavioral aspects. The investigation, conducted between November 2020 and January 2021, explored citizen preferences for digital channels to access public services, their satisfaction level with eGov services, the factors influencing their satisfaction with the eGov portal, and the proportion of first-

time eGov portal users during the pandemic.

A survey involving 396 participants from Usak, Turkey, was conducted to address the study questions. In spite of ongoing social distancing measures, face-to-face contact was utilized to reach participants, ensuring diversity in the participant profile across demographics such as occupation, income, education, and age. The significance of participant profile diversity in eGov studies is highlighted by the demographic influence on the scope, acceptance, and use of eGov information and services (Banerjee & Chau, 2004), as well as satisfaction with these services. Consequently, this study deviated from some existing eGov studies by incorporating a broader range of age and occupational groups instead of focusing on specific demographics like university students or academics and administrators. This approach is considered more suitable for measuring satisfaction with eGov services during periods when usage is necessitated rather than voluntary (Chan et al., 2010).

2. Satisfaction with eGov

Satisfaction in the context of electronic governance (eGov) has increasingly been recognised as a crucial measure of success. A multitude of studies have aimed to assess this satisfaction, primarily focusing on voluntary eGov usage. However, the COVID-19 pandemic transformed this landscape, necessitating a transition from voluntary to mandatory eGov frameworks. Brown et al. (2002) argue that existing models do not adequately represent eGov in compulsory use settings. This discrepancy arises because the concept of "use," a dependent variable in the Technology Acceptance Model (TAM), does not translate effectively to mandatory use environments due to the inherent obligation of citizens and employees to utilise these systems without alternative options for their job functions.

Considering that citizen satisfaction serves as a critical indicator of eGov success (DeLone & McLean, 1992; Ives et al., 1983), it is imperative for government entities to understand the determinants of citizen satisfaction. This understanding encompasses expectations and experiences associated with system usage (Brown et al., 2002). Satisfaction with eGov plays a central role in driving the continuation of service usage by citizens.

Citizens perceive satisfaction in the context of eGov based on their interactions with the eGov portal, rather than its technical quality (Ives et al., 1983). Consequently, satisfaction levels correlate with the extent to which citizens believe the eGov portal meets their needs. An eGov portal that aligns with users' requirements enhances their satisfaction, influencing decisions to revisit, reuse, or recommend the portal, ultimately manifesting in satisfaction levels. Farhan & Sanderson (2010) posited that satisfaction contributes to increased loyalty to the eGov portal.

Several factors, including trust, privacy and security, accessibility, familiarity, awareness, and quality of public services, contribute to eGov satisfaction (Jaeger, 2003). Alawneh et al. (2013) identified privacy and security, trust, accessibility, public services awareness, and quality of public services as elements affecting Jordanian satisfaction with the eGov portal. Their empirical analysis, employing factor and multiple linear regression analyses, provided valuable insights. These findings can inform practitioners and policymakers in developing eGov portals by considering various technical, behavioural, managerial, and motivational aspects. Malik et al. (2016), in contrast, pinpointed accessibility, trust, privacy and security, quality of public services, public services awareness, computer anxiety, and citizen expectations as determinants of citizens' e-satisfaction when using the provincial portal in Punjab, Pakistan.

The COVID-19 pandemic has indisputably disrupted all aspects of human life, affecting social and economic development as well as public administration operations. To curb the virus's spread, social distancing and self-isolation emerged as the only viable strategies. Consequently, eGov was rendered universally accessible to ensure the continuity of public services. Hodžić et al. (2021) concluded, based on empirical results, that eGov is crucial in maintaining the efficient functioning of public administration amid the COVID-19 pandemic. It was emphasised that many public functions would be unattainable without robust online government services. Ullah et al. (2020) demonstrated that the development of internet technology and e-governance helps mitigate the impacts associated with COVID-19. Higgins (2021) indicated that the pandemic increased eGov services usage, and despite a reduction post-pandemic, usage remains higher than pre-pandemic levels.

Research conducted by Akinnuwesi et al. (2022) within the UTAUT model framework revealed that performance expectation, facilitating conditions, and social impact constitute key predictors of citizens' behavioural intention to adopt digital technologies during the COVID-19 pandemic. In summary, earlier literature underscores the importance of understanding e-satisfaction drivers, enabling the establishment of eGov portals that align with citizens' needs and expectations (Alawneh et al., 2013). Previous literature's noteworthy contribution lies in identifying a variety of antecedents influencing citizens' adoption of and satisfaction with eGov portals (Chan et al., 2010). However, given that many preliminary studies have examined eGov satisfaction in the context of normal periods and voluntary use, their applicability to the new normal period, characterised by compulsory use during and post-pandemic, remains ambiguous. This study endeavours to address this gap in the literature.

3. EGov During the COVID-19 Epidemic in Turkey

The COVID-19 pandemic has necessitated an accelerated adaptation to eGov across the globe, driving a rapid evolution towards digital governance. This worldwide trend was documented in the United Nations eGov Survey of 2020 (UNDESA, 2020), highlighting the intensified investment in online public services by various nations. A salient example of this global phenomenon is Turkey.

The Turkish eGov portal, known as the "E-Government Gateway", was launched in 2008, initially offering a limited scope of information and public services. However, it was observed that the onset of the pandemic prompted the rapid digital transformation of this platform, which led to a significant expansion in the range of available services and the number of registered users (Presidency of the Republic of Turkey, 2021). By 2021, during the peak of the pandemic, the platform was found to provide 5,746 distinct services from 791 different entities to a user base exceeding 54 million. As of 2023, the growth trajectory has persisted, with the portal now offering 6,821 services to 60,764,028 users (TUIK, 2022c).

This steep increase in user numbers can be attributed to the pandemic, reflecting a global trend wherein administrative processes and public services underwent a digital transformation. It was noted that investments were not confined to technology and artificial intelligence but also encompassed the establishment of the requisite legal infrastructure for effective digitalization. This approach enabled the integration of a greater number of institutions and services into the eGov portal, mirroring similar trends in numerous countries.

Presently, the variety of services accessible through the eGov portal at www.turkiye.gov.tr is extensive, catering to a user base that comprises a substantial portion of Turkey's 85 million population (TUIK, 2022a). Several methods for accessing the eGov Gateway were identified, including eGov passwords, e-Signatures, mobile signatures, electronic ID cards, or internet banking.

It was found that the utilization of eGov services is mandated at an early stage in the lives of Turkish citizens, as university students are required to make enrollment, scholarship, and dormitory applications through this platform. Consequently, a considerable proportion of eGov users are young individuals (TUIK, 2022b). The management of the portal is overseen by the Presidency of the Digital Transformation Office, while the Türksat Company is responsible for the development and operation of the system (Presidency of the Republic of Turkey, 2021).

A diverse range of services is offered via the EGov Gateway, encompassing Inquiry Services, Application Services, Documentation Services, Payment Services, Information Services, and Subscription Services. Moreover, the portal serves as a platform for the exchange of information and documents between public institutions. Among the most prominent service groups provided through the portal are Justice, Environment, Agriculture and Livestock, Education, Security, Job and Career, Personal Information, Health, Social Security and Insurance, Complaints and Information, Telecommunication, Traffic and Transportation, Taxes, Fees, and Fines (Presidency of the Republic of Turkey, 2021).

In response to the COVID-19 pandemic, new services were developed, such as the "Life Fits Home/Hayat Eve Sığar (LFH/HES) code application. Exclusively available through mobile and eGov applications, this code supplies data on the transmission and vaccination status of the virus and is required for entry into enclosed spaces, public institutions, and commercial premises. Consequently, security personnel must be provided with the code upon entry, rendering the eGov platform an essential instrument for service provision and regulation during the pandemic.

4. Methodology

In the realm of system outcomes, satisfaction serves as a valuable yet challenging-to-measure comprehensive indicator (Ives et al., 1983). Satisfaction can be perceived as an aggregation of an individual's attitudes or sentiments towards various factors involved in a given situation (Bailey & Pearson, 1983). According to Ajzen (2005), attitudes are dispositional responses that can be either positive or negative towards a stimulus. In the context of eGov satisfaction, it can be viewed as an aggregation of a citizen's reactions to several contributing factors. The combined expression of these factors constitutes the determinants of eGov satisfaction for this study.

Satisfaction displays a multidimensional structure, encompassing technical, behavioral, and economic aspects. Consequently, citizen satisfaction with eGov is influenced by numerous factors. Performance expectancy, effort expectancy, social influence, and facilitating conditions have been identified as independent factors (Chan et al., 2010). Trust and cost, in relation to system quality and information quality of eGov systems, have been examined for their impact on user satisfaction with eGov services (Weerakkody et al., 2016). Additional factors, such as efficiency, trust, reliability, convenience, citizen support, and transparency, have been acknowledged as contributors to eGov satisfaction (Nguyen et al., 2020). Accessibility, public service awareness, and public service quality have also been incorporated as factors within various satisfaction models, including the Canadian Common Measurement Tool (CMT), the American Customer Satisfaction Index (ACSI), the European Customer Satisfaction Index (ECSI), and the Swedish Customer Satisfaction Barometer model (SCSB) (Alawneh et al., 2013;

Malik et al., 2016).

   Despite the extensive coverage of previous studies, there remains a shortage of empirical research measuring citizen satisfaction under pandemic conditions with mandatory eGov use. This investigation aims to account for common motives for usage (performance, convenience) and non-usage (trust in technology and government) during typical periods, by assessing performance, convenience, trust in technology, and trust in government as determinants of eGov satisfaction. Factors and survey questions employed in this study are adopted from prior research: (AL Athmay et al., 2016; Alawneh et al., 2013; Bélanger & Carter, 2008; Malik et al., 2016; Mensah, 2019; Nguyen et al., 2020; Venkatesh et al., 2003; Verdegem & Verleye, 2009; Welch et al., 2005).

   The research model proposed in this study, illustrated in Figure 1, integrates these factors. The corresponding regression equation is as follows:

Model: $SAT = \beta_0 + \beta_1 * PERF_i + \beta_2 * TRU\text{-}GOV_i + \beta_3 * CON_i + \beta_4 * TRU\text{-}TEC_i + \varepsilon_i$
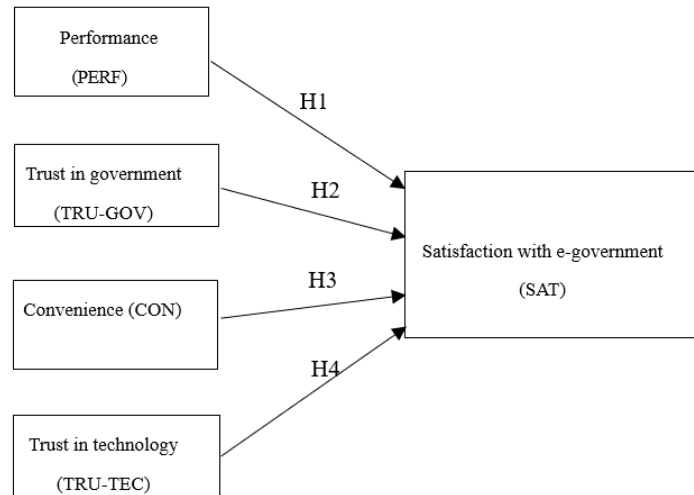

Figure 1. Research model

- Performance (PERF) is calculated as the average of service quality, service cost, efficiency, and easy access.
- Trust in government (TRU-GOV) is determined as the average of trust in institutions, protection of citizens' interests, trust in eGov, confidence in their ability to provide e-services, transparency, and trust in eGov.
- Convenience (CON) is obtained by averaging usability, service delivery capacity, ease of use, and transaction speed.
- Trust in technology (TRU-TEC) is assessed using the average of encryption-technological security and personal information-data security.

   The COVID-19 pandemic has had a considerable impact on public service delivery and the methods through which these services are accessed, particularly after March 2020, mandating the use of eGov services for citizens who had previously been hesitant. Factors such as social distancing and lockdown measures, as well as the exclusive availability of certain services through the eGov portal (turkiye.gov.tr) during the pandemic, contributed significantly to this shift.

   An eGov satisfaction scale, tailored to the objectives of this study, was developed. This instrument was designed to encompass various satisfaction factors derived from previous literature, in addition to the specific constraints imposed by the COVID-19 pandemic.

4.1 Sample Selection

   Due to budgetary and temporal constraints, the research was geographically limited to the province of Uşak, Turkey. The provincial population, as of February 2021, was 369,433 (TUIK, 2022a). The sample size was determined based on the total population, confidence interval, margin of error, and degree of variation within the population. The suggested sample size ranged from 385 to 400, with the actual sample consisting of 396 individuals from 13 selected neighborhoods. Stratified sampling was employed, taking into account socio-economic and demographic factors such as gender, age, education, and income levels. Despite pandemic conditions, face-to-face surveys were conducted, including individuals without email access, to address limitations such as restricted generalizability.

4.2 Pilot Testing

The survey questionnaire was subjected to expert review in accordance with the research objectives and questions, enabling the identification of potential improvements. Adjustments were made to the questionnaire to enhance clarity, and items exhibiting ambiguity, weakness, or complexity were removed. Subsequently, the surveys were administered to a random sample of 50 eGov users. The reliability of the questionnaire was validated using Cronbach's alpha, and it was then distributed to an additional 346 participants, reaching a total of 396 participants.

4.3 Data Collecting

Data collection occurred from November 2020 to January 2021 through face-to-face surveys of residents in Uşak. The questionnaire was divided into two sections: one focused on demographic information and eGov service usage, and the other comprising Likert scale-based questions measuring agreement levels with statements relevant to the four factors in the research model. The sections were devised to investigate citizens' satisfaction with eGov services.

4.4 Data Processing

Valid responses from 396 participants were input into the SPSS 26 software for analysis. The scale's reliability was evaluated using Cronbach's Alpha Test. Explanatory Factor Analysis (EFA) was employed to identify underlying structures and simplify the data. Correlation and Regression analyses were performed to examine the relationships between variables.

5. Results

5.1 Reliability Analysis

The reliability of a scale must be established prior to determining its validity. The aim is to create a consistent scale by selecting items that can be measured without confusing one construct with another. Therefore, an initial reliability analysis was conducted for the questionnaire. Reliability analysis verifies if all questions are uniformly interpreted by the respondents.

As depicted in Table 1 (case process summary), the questionnaire was completed by 396 participants with no missing values (100%). The Cronbach's Alpha value obtained from Table 2 (reliability statistics), which provides the reliability coefficient, is 0.933, exceeding the threshold value of 0.60. This indicates that the 17-item scale demonstrates satisfactory reliability.

Table 1. Case processing summary

		N	%
Cases	Valid	396	100.0
	Excluded	0	0
	Total	396	100.0

Table 2. Reliability statistics

Cronbach's Alfa	N of Items
.933	17

5.2 Factor Analysis

Factor analysis, a multivariate statistical technique, aims to identify a limited number of uncorrelated, conceptually significant new variables (factors, dimensions) by combining correlated measurable or observable variables. Its purpose is to reveal or test pre-existing models. In this study, an Exploratory Factor Analysis (EFA) was employed to confirm constructs that emphasize key factors explaining most of the data variance. The Kaiser-Meyer-Olkin (KMO) and Bartlett tests were initially used to determine the appropriateness of the EFA exploratory factor for the study.

Table 3 shows that, with a KMO sample adequacy value of 0.937 (exceeding 0.5) and a significant Bartlett Test (SIG(P) of 0.000, less than 0.05), the scale items were considered suitable for factor analysis. Additionally, the Bartlett Test resulted in x2 (136) equating to 4602.392. A finding of $p < 0.05$ indicated that the correlations among the items were strong enough for EFA. The KMO and Bartlett Test values confirm a good fit for factor analysis.

The construct validity of the scale requires examination through factor analysis and item-total correlations. Items with a corrected item-total correlation of less than 0.30, items with a factor load value of less than 0.45, and overlapping items with a difference of less than 0.10 between the load values of two factors should be excluded from the scale.

To determine the number of factors, those with an eigenvalue greater than 1 were considered. This analysis discovered that only the eigenvalues of four factors exceeded 1. The number of factors and the explained variance percentages of the dataset are presented in Table 4.

Upon inspection of the item-total correlations in Table 5, it can be observed that no item necessitates elimination from the scale, as all values surpass 0.30. This result implies a significant correlation between the data, suitable for factor analysis.

Table 3. Sample size test of items

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy		.937
Bartlett's Test of Sphericity	Approx. Chi-Square	4602,392
	df	136
	Sig.	.000

Table 4. Total variance explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings
	Total	% of Varience	Cumulative %	Total	% of Varience	Cumulative %	Total
1	8,332	49,013	49,013	8,332	49,013	49,013	6,057
2	2,387	14,043	63,056	2,387	14,043	63,056	3,218
3	1,370	8,061	71,117	1,370	8,061	71,117	2,183
4	1,105	6,502	77,619	1,105	6,502	77,619	1,737
5	.776	4,562	82,182				
6	.605	3,561	85,743				
7	.456	2,682	88,425				
8	.357	2,100	90,525				
9	.345	2,028	92,554				
10	.288	1,693	94,246				
11	.258	1,520	95,766				
12	.193	1,138	96,904				
13	.146	.856	97,760				
14	.140	.821	98,581				
15	.103	.603	99,184				
16	.091	.533	99,717				
17	.048	.283	100,000				

Table 5. Factor analysis findings

Items	Component			
	1	2	3	4
Service quality increased in the public sector with eGov	.892			
It is possible to get 24/7 service through the eGov application	.862			
EGov app lets me get things done faster	.843			
The eGov application is useful in my works related to the public sector	.842			
Costs of services in the public sector decreased with eGov	.816			
I encounter less bureaucratic procedures in eGov application	.790			
I access public services more easily by using the eGov application	.784			
EGov application increases efficiency	.744			
EGov is transparent, being able to follow transaction processes increases my trust in the government		.896		
I trust the ability of government agencies to deliver eGov services effectively and securely		.863		
I think I can trust government agencies when using the eGov application		.812		
I think that the eGov application increases the confidence of the citizens in the government		.716		
EGov application is useful, easy to process			.761	
The services offered via eGov meet my needs, I do not have to go to the institution			.729	
My applications and transactions through eGov are concluded very quickly			.658	
EGov is reliable, encryptions and other technological tools are sufficient to ensure my security				.812
Technological infrastructure is sufficient for eGov				.736
Eigenvalues	8,332	2,387	1,370	1,105
Variance Explained	49,013	14,043	8,061	6,502
Total Variance Explained	77,619			

The 17-item scale was found to comprise a structure with four sub-dimensions (factors), collectively accounting for approximately 78% of the total variance. This result supports the assertion of scale validity. Furthermore, the variance explained by each sub-dimension was as follows: the first accounted for 49%, the second for 14%, the third for 8%, and the fourth for 6.5%. The allocation of items according to factor and their factor loads are represented in Table 5.

The Factor Analysis table adopted a cut-off value of 0.40 for factor load. As observed in Table 5, the sub-dimensions consist of 8, 4, 3, and 2 items, respectively. The lowest factor load was determined to be 0.658. Given that factor loads of 0.40 and above are deemed ideal (Field, 2009), those below 0.40 were subtracted, and it was inferred that the items displayed in the table significantly contribute to the factors. Additionally, it was noted in the table that no item loaded on more than one factor, and each formed a stable, consistent structure under its own factors. That is, correlations with their own items were high, while correlations with other items were minimal. The factor loads of all the items in the table are above 0.60, which is considered very good. The factors were subsequently designated as performance, trust in government, convenience, and trust in technology, in that order.

5.3 Reliability Analysis

To evaluate the internal consistency of the scale, a reliability analysis employing Cronbach's Alpha was conducted. The overall reliability of the scale was determined to be α=0.933, indicating a high level of internal consistency. Furthermore, the reliability coefficients for the sub-dimensions were as follows: performance α=0.923, trust in government α=0.923, convenience α=0.724, and trust in technology α=0.719. Given that a Cronbach's Alpha value of 0.70 or higher signifies satisfactory reliability for a measurement tool (Büyüköztürk, 2011), these results were deemed acceptable.

Based on the reliability measures, a novel research model was developed, consisting of one dependent variable and four independent variables:

$$SAT = \beta_0 + \beta_1 * PERF_i + \beta_2 * TRU\text{-}GOV_i + \beta_3 * CON_i + \beta_4 * TRU\text{-}TEC_i + \varepsilon_i$$

The objective was to assess the predictive capacity of performance, trust in government, convenience, and trust in technology concerning satisfaction with eGov services. Consequently, the following hypotheses were proposed:
H1a: Performance exerts a positive and significant influence on satisfaction with eGov services.
H1b: Trust in government exerts a positive and significant influence on satisfaction with eGov services.
H1c: Convenience exerts a positive and significant influence on satisfaction with eGov services.
H1d: Trust in technology exerts a positive and significant influence on satisfaction with eGov services.

5.4 Correlation Analysis

In order to examine the relationships between the variables in the model, the Pearson correlation test was utilized. A low correlation (0.80 or below) between the independent variables indicated that multicollinearity issues were unlikely to be present. As shown in Table 6, when considering the relationships between the independent variables and the dependent variable (satisfaction), the following correlations were identified: performance and satisfaction (r=0.41), trust in government and satisfaction (r=0.40), convenience and satisfaction (r=0.35), and trust in technology and satisfaction (r=0.34). Although these values were similar, the strongest relationship was observed between performance and satisfaction, while the weakest correlation was found between trust in technology and satisfaction. It was inferred that all four independent variables exhibited a linearly positive correlation with the dependent variable (satisfaction). The statistical significance of these correlations was supported by a p-value of 0.000, and a Pearson Correlation coefficient ranging from 0.342 to 0.412, indicative of a moderate correlation.

Table 6. Mean, standard deviation and correlation values of the variables

		Mean	Std. Deviation	1	2	3	4	5
			Correlation					
Pearson Correlation	1. SAT	4.17	.820	1				
	2. PERF	4,1294	.75414	.412	1			
	3. TRU-GOV	3,8984	.90511	.392	.688	1		
	4. CONV	3,8022	.88582	.353	.631	.541	1	
	5. TRU-TEC	3,7058	.89085	.342	.552	.530	.628	1
Sig.	SAT			.				
	1. PERF			.000				
	2. TRU-GOV			.000				
	3. CONV			.000				
	4. TRU-TEC			.000				

5.5 Regression Analysis

In a multiple regression equation, there exists more than one estimation variable. The formula is presented as:

$$Y_i = b_0 + b_1 X_1 + b_2 X_2 + \ldots b_n X_n + \varepsilon_i$$

where, Y denotes the dependent variable, b_0 represents the intersection point of the y-axis of the regression curve, X_1 and X_2 are coefficients of the first and second prediction variables b_1 and b_2, respectively, and ε_i is the difference between the predicted value of Y and the observed value for the ith participant.

$$\text{Satisfaction} = b_0 + b_1 * \text{performance} + b_2 * \text{trust in government} + b_3 * \text{convenience} + b_4 * \text{trust in technology} + \varepsilon_i$$
$$\text{SAT} = \beta_0 + \beta_1 * \text{PERF}_i + \beta_2 * \text{TRU-GOV}_i + \beta_3 * \text{CONV}_i + \beta_4 * \text{TRU-TEC}_i + \varepsilon_i$$

To determine the existence of a correlation between the error terms, Durbin-Watson statistics were employed. The error term value of 1.743, which falls between 1 and 3, indicates that regression analysis can be performed (Field, 2009). As presented in Table 7, the adjusted R^2 demonstrates the model's generalizability, explaining 20% of the total variance.

Table 7. Model summary

Model	R	R^2	Adjusted R^2	Std. Error of the Estimate	Durbin-Watson
	0.454	0.206	0.198	.735	1.743

Table 8. ANOVA

Model	Sum of Squares	df	Mean Square	F	p
Regression	54,707	4	13,677	25.349	.000
Residual	210,957	391	.540		
Total	265,664	395			

A multiple linear regression analysis was conducted to ascertain if performance, trust in government, convenience, and trust in technology significantly predicted satisfaction with eGov services. As illustrated in Table 8, the model was found to be significant (F=25.349; p=.000). Evaluation of the R^2 value indicated that the variables of performance, trust in government, convenience, and trust in technology accounted for 20% of the variance in satisfaction with eGov services. In this context, satisfaction with eGov services was significantly and positively predicted by performance (β=.20, p < 0.001) and trust in government (β=.16, p < 0.001). However, convenience (β=.08, p >.001) and trust in technology (β=.10, p >.001) were not identified as significant predictors. As a result, hypotheses H_1 and H_2 were supported, while hypotheses H_3 and H_4 were rejected.

Table 9. Multiple regression analysis results for predicting

Model		B	Std. Error	β
	(Constant)	2.101	.213	
	Performance	.214	.075	.197
	Trust in Government	.146	.058	.161
	Convenience	.074	.060	.080
	Trust in Technology	.090	.056	.098

Model: R^2=0.198 (p<0.001)

$$Y_i = b_0 + b_1 X_1 + b_2 X_2 + \ldots b_n X_n + \varepsilon_i$$

$$\text{SAT} = 2.10 + (0.20 * \text{PERF}_i + 0.16 * \text{TRU-GOV}_i + 0.08 * \text{CONV}_i + 0.10 * \text{TRU-TEC}_i + \varepsilon_i$$

Table 9 assesses the importance of the independent variables using the Standardized Beta value, revealing that satisfaction is most significantly influenced by performance (b_2=0.20), followed by trust in government (b_2=0.16). Considering the positive betas, it can be inferred that increases in performance and trust in government are associated with enhanced satisfaction with eGov services. On the other hand, convenience and trust in technology were not observed to be important predictors of satisfaction with eGov services, particularly during the COVID-19 outbreak. Consequently, hypotheses H_1 and H_2 were supported, but hypotheses H_3 and H_4 were rejected.

6. Discussion

Since the inception of eGov initiatives in the late 1990s, numerous nations have sought to leverage technology to enhance responsiveness and increase efficiency (Chen & Gant, 2001). eGov has been praised by some scholars for its effectiveness in improving efficiency and the quality of service delivery (Androniceanu & Georgescu, 2021; Bwalya, 2009; Ciborra, 2009; Fang, 2002; Gil-García & Pardo, 2005; Janita & Miranda, 2018; Manoharan, 2014; Ndou, 2004; Nguyen et al., 2020; Osei-Kojo, 2016; Rana & Dwivedi, 2015, Twizeyimana & Andersson, 2019). On the other hand, it has been posited that eGov can act as a catalyst for establishing credible institutions and promoting or restoring citizen trust in government authorities (Elsheikh & Azzeh, 2014; Fakhoury & Aubert, 2015; Janssen et al., 2017; Myeong & Ahn, 2017; Ndou, 2004; Nguyen et al., 2020; Othman et al., 2020; Parent et al., 2005; Rodrigues et al., 2016; Tolbert & Mossberger, 2006; Twizeyimana & Andersson, 2019; West, 2004). Nevertheless, eGov should not be considered as a replacement for government; rather, it carries similar expectations as those attributed to traditional public service institutions.

The present study aimed to investigate the influence of citizens' perceived efficiency/performance, convenience, trust in government, and trust in technology when using eGov on their level of satisfaction. Conducted during the COVID-19 pandemic, this research sought to elucidate the needs of citizens in times of unprecedented crisis. The findings revealed that perceived efficiency/performance, convenience, trust in the government, and trust in technology were the most significant factors influencing citizens' decision to use or avoid eGov services. These factors consequently shed light on citizens' expectations from eGov and, by extension, the government.

To understand the drivers of citizen satisfaction with eGov services during extraordinary circumstances, performance and trust in government were identified as significant predictors, while convenience and trust in technology did not show statistical significance. eGov, as an application of information technology, mainly telecommunications, has been demonstrated to enhance the efficiency of service and information delivery to citizens, employees, businesses, and government agencies (Carter & Bélanger, 2003). Consequently, the relationship between efficiency and eGov services is evident. Performance, which can be equated with efficiency, acts as a primary motivation for the adoption of eGov services (Chen & Gant, 2001). This finding is consistent with previous studies (AlAwadhi & Morris, 2009; Alawneh et al., 2013; Kurfalı et al., 2017; Malik et al., 2016; Mensah, 2019; Nguyen et al., 2020; Papadomichelaki & Mentzas, 2012; Venkatesh et al., 2003; Zeithaml, 2002), which also reported a positive and significant influence of performance on satisfaction with eGov services.

In this study, participants perceived eGov services as beneficial, due to the quality of service, 24/7 availability, reduced bureaucracy, ease of access, cost-effectiveness, efficient service delivery, transparency, and trust in government. These sentiments are supported by the findings of Nguyen et al. (2020), where all six factors – performance/efficiency, trust, reliability, convenience, citizen support, and transparency – were found to be significant in satisfaction with eGov. Performance/efficiency emerged as the most influential factor on citizen satisfaction.

Regarding the role of eGov in fostering trust in government, participants believed that eGov not only enhances trust in government but also benefits the government itself. According to the Field (2003), ICTs, primarily the internet, are used to achieve better governance. eGov thus plays a crucial role in increasing efficiency, effectiveness, transparency, and reducing corruption in public administration (Androniceanu & Georgescu, 2021). This research concurs with prior works by Anwer Anwer et al. (2016), Nguyen et al. (2020), and Welch et al. (2005), all of which identified trust in government as a positive and significant predictor of satisfaction with eGov.

Contrarily, convenience was not found to be a critical determinant of satisfaction in this research, considering the mandatory implementation of eGov during the pandemic.

In the ongoing COVID-19 situation, trust in technology/privacy and security did not emerge as a significant factor affecting satisfaction with eGov services. This finding is in line with the results of Papadomichelaki and Mentzas (2012), Alawneh et al. (2013), and Malik et al. (2016), who reported that trust in technology was not a significant predictor of eGov satisfaction. Instead, citizens who had previously avoided using eGov due to mistrust in technology appeared to prioritize their health over the security of their personal data. Consequently, the influence of the pandemic supplanted trust in technology as a key determinant of eGov satisfaction. As a result, trust in technology was deemed an ineffective factor on eGov satisfaction.

It is noteworthy that this finding contrasts with several studies in the literature (Kurfalı et al., 2017; Mensah, 2019) that asserted a positive impact of trust in the internet and technology on satisfaction with eGov services.

7. Conclusions

This study has provided several valuable contributions to researchers, decision-makers, and practitioners in the field of eGov services. Firstly, a definition of citizen satisfaction in eGov services was established, encompassing the weighted sum of a citizen's positive or negative responses to performance, trust in government, convenience, and trust in technology, as delineated by the four-factor statements. Another significant contribution of this research is the transformation of the satisfaction definition into a valid and reliable measurement tool. The validity

and reliability of the questionnaire were demonstrated through various statistical tests, leading to the conclusion that citizen satisfaction with eGov services can be measured as defined.

Nonetheless, there are some limitations to this study. One limitation is the focus on respondents' evaluation of their satisfaction with eGov services during the pandemic; satisfaction levels were not measured prior to the pandemic, making it difficult to discern the impact of the pandemic on satisfaction.

The second limitation arises from the nature of the research itself. Assessing the reliability of an instrument, such as an attitude scale or knowledge test, and disseminating or generalizing measurement results is challenging due to the constant change of human experience (Taber, 2018). For example, a citizen's response to the survey may be based on their satisfaction with the eGov service experience at the time; however, their response could differ after a day, a week, or a month, depending on their subsequent experiences. Consequently, satisfaction with eGov services represents a transient situation for the same participant, highlighting the necessity to approach this and similar studies with caution and avoid generalizing the results.

The current study presents a measurement tool/model that accounts for approximately 78% of the variance in citizen satisfaction with eGov services. While this tool contributes to other eGov satisfaction surveys, it also encourages further exploration and integration of additional satisfaction constructs. In light of the well-founded criticism of Ives et al. (1983) and the contribution of this model, it is plausible that future researchers will develop a more comprehensive and standardized approach to the eGov services satisfaction model. Furthermore, this measurement tool was employed to identify factors influencing satisfaction with eGov services under COVID-19 conditions. However, it can also be utilized for measuring average satisfaction levels post-COVID-19 and in other situations. To overcome the second limitation mentioned above, future research may consider users' experience frequency and their intention to continue using eGov services when measuring satisfaction with eGov services.

Author Contributions

Conceptualization, F.Akyıldız; methodology, F.Akyıldız; validation, F.Akyıldız and İ.Can; formal analysis, F.Akyıldız and İ.Can; investigation, F.Akyıldız and İ.Can; supervision, F.Akyıldız. All authors have read and agreed to the published version of the manuscript. The relevant terms are explained at the CRediT taxonomy.

Data Availability

This article used the survey data of the master thesis prepared by İ.Can under the consultancy of F.Akyıldız.

Acknowledgements

The authors would like to thank Serpil Ünal for her comments and constructive criticism.

Conflicts of Interest

The authors declare no conflict of interest.

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