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UNFULFILLED PROMISES OF BACK-OFFICE E-GOVERNMENT SYSTEMS: EMPLOYEE PERCEPTIONS AND DIGITAL TRANSFORMATION IN TURKISH MUNICIPALITIES

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ABSTRACT

Aim/Purpose	To diagnose the internal state of municipal digital transformation by identifying and characterizing the perception gaps between employees' current and targeted states of back-office e-government systems (process efficiency, data integration, technological competence, digital stress).
Background	Despite large investments in municipal ICT and national digital strategies, back-office integration remains understudied; employee experiences may reveal implementation shortfalls that system metrics alone miss. This paper mobilizes a socio-technical and public-value perspective to address that gap.
Methodology	Online survey of municipal employees (final analysis, N = 386) using 30 paired Likert items (current vs. targeted). Quantitative analyses included paired-samples t-tests, effect sizes (Cohen's d), exploratory factor analysis (EFA), K-means clustering, MANOVA/MANCOVA, and linear discriminant analysis (LDA). Missing data and standard diagnostics were reported and handled as described in the manuscript.
Contribution	Provides a diagnostic assessment of employee perceptions, offering an informative foundation for understanding the discrepancies between digital policy goals and operational realities.
Findings	Large perception gaps exist in all four dimensions: process efficiency, data integration (the largest gap), technological competence, and digital stress (current

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	stress > target). Gaps vary by municipality type (districts have larger gaps than metros) and department (IT has smaller gaps). EFA supported three latent constructs; clustering yielded four user profiles (optimistic adapters, process challengers, technology strugglers, comprehensive gap experiencers).
Recommendations for Practitioners	Prioritize cross-departmental data integration, adopt a process-first IS redesign, expand distributed competence-building beyond IT units, and implement design/support measures to monitor and reduce digital stress, with a special focus on district municipalities.
Recommendations for Researchers	Use longitudinal and mixed methods designs to triangulate subjective perceptions with objective usage logs and performance metrics; evaluate targeted interventions experimentally; and conduct cross-national comparisons to assess contextual generalizability.
Impact on Society	Closing identified gaps can increase operational efficiency, equity of access, and public value of municipal services; failure to act risks deepening service inequalities and producing persistent administrative burdens and employee burnout.
Future Research	Longitudinal studies tracking perception change after targeted interventions; integration of system logs and outcome indicators; causal evaluation of training/process-redesign programs; and comparative studies across governance contexts.
Keywords	back-office e-government, digital transformation, perception gap analysis, data integration, socio-technical systems

THEORETICAL FRAMEWORK AND LITERATURE REVIEW

DIGITAL TRANSFORMATION AS A GOVERNANCE SHIFT

The digital transformation in public administration is increasingly recognized as the means of rethinking government beyond mere automation, i.e., how it operates with society (Margetts & Dunleavy, 2013; OECD, 2018, 2023). This change is comparable to a governance paradigm shift ushered in by NPM, which introduced integration, data-based policy and program decisions, and networked/service-delivery modes (Pollitt & Bouckaert, 2017). Accordingly, digital transformation in the public sector should be conceptualized as a socio-technical transition involving governance structures, organizational processes, and human actors, rather than as a linear process of technological adoption (Kompella, 2017).

In Turkey, digital transformation has been implemented through such strategies as the e-Transformation Turkey Project and the establishment of the Presidency's Digital Transformation Office (Dijital Dönüşüm Ofisi, 2023). A high-profile portal like e-Devlet Kapısı always catches public attention. However, this study aims to bring into focus those understudied back-office systems that are critically important for operational efficiency (Arslan, 2006, 2008; Tutar et al., 2023). The three frameworks used both diagnostically and analytically to organize employee perception data collected in this article are: Digital Era Governance (DEG), Socio-Technical Systems (STS), and Public Value.

Digital Era Governance (DEG): Macro-Level Diagnosis

Based on the above study, the macro-level diagnosis is rooted in the Developmental and Evolutionary Governance (DEG) paradigm. DEG's model calls for a shift away from the fragmentation of public services toward reintegration and digitization enabled by technological advances made possible by the Internet (Dunleavy et al., 2006).

- *Reintegration* – Shared information systems and interoperable databases functioning across departmental silos eliminate the barriers that exist today (Margetts & Dunleavy, 2013). Thus, reintegration of data via integration of the data integration gap.
- *Needs-based Holism* – Services should be designed to meet the needs of citizens, regardless of the manner in which the services are delivered by a government agency (Dunleavy et al., 2006).
- *Digitization* – Workflows should be redesigned to leverage the capabilities of digital technologies, including real-time data sharing and automated compliance (OECD, 2023). This provides a basis for identifying and defining a Process Efficiency Gap.

Socio-Technical Systems (STS) Theory: Meso-level assessment

DEG addresses the structural elements of organizations, while STS Theory concerns itself with the dynamic relationship between the Technical Subsystem (the processes and workflows) and the Social Subsystem (the People and Culture) (Trist & Bamforth, 1951).

- *Technology Enactment*: This research uses Fountain's (2004) distinction between objective technology and enacted technology to understand how capabilities are enacted and utilized in practice, or how they are resisted.
- *Social Coordination*: Rigid routines and competing interests of Departments can restrict the enacted use of Technology (Hofstede, 2001). In the Turkish public sector, these constraints are further reinforced by organizational culture patterns that shape attitudes toward ICT adoption and change (Özkan, 2015). This is part of the Technological Competence Gap Diagnosis.

Public Value Framework: Micro-level evaluative criteria

Public Value theory provides the normative lens for evaluating perceived outcomes, shifting the focus from efficiency alone to broader value creation in e-government contexts, where value is understood as a combination of operational, social, and human-centered outcomes (Moore, 1997; Twizeyimana & Andersson, 2019). Public value perspectives have also been operationalized as evaluation frameworks for assessing e-government performance across efficiency, service quality, and citizen-oriented outcomes (Bai, 2013). Therefore, values can be tracked at different dimensions:

- *Operational Value:* Automatically realized workflow operations and integrated databases that reduce processing time (Westholm, 2005).
- *Political and Social Value:* Legitimacy through increasing the level of transparency in emphasizing equity of service delivery (Bannister & Connolly, 2014).
- *Human-Centered Value:* "Digital administrative burdens" (Peeters, 2023) is a catchy way to summarize what badly designed government systems and platforms can impose on their users. This paper frames digital stress as an important diagnostic indication of unfulfilled public value.

Comparative perspectives and contextual definitions

Numerous studies globally are consistent with the findings of this research that show how technical integration cannot be accomplished until there is congruency between governance and organisational processes (Bekkers, 2007; Kubicek et al., 2011).

- *International Patterns:* The experiences of the United Kingdom and South Korea demonstrate that whilst consolidation initiatives can produce operational benefit, the ability to transform back-office processes is hindered by complexities associated with existing technologies and the lack of alignment between the various roles of employees involved (Kang et al., 2008; Margetts & Naumann, 2017).
- *Defining the Back-Office:* The term back office refers to the digital systems municipalities use to support their day-to-day activities. Examples include areas such as HR and finance, as well as

the variety of systems used to facilitate workflow. In other words, these are areas of technology that assist municipalities in their daily activities, but are not visible to citizens (Bekkers, 2005; Westholm, 2005).

The importance of back-office integration

The objectives of public administration are service delivery and the efficient operations of internal functions (Westholm, 2005). Historically, e-government initiatives aimed at reorganizing government for quality service inculcate a culture and reduce "red tape" (Lips, 2024; Pribadi, 2024; Sundberg, 2019). While many front-facing services have successfully migrated online (see Table 1), an internal reorganization remains a primary challenge (Azelmad, 2024; Haug et al., 2024; Panayiotou & Stavrou, 2021). Politically, technical complexities and cultural inertia are painted to prevent e-government from developing beyond a technical solution into a holistic organizational transformation. There is, hence, always that gap between the vision of a seamless digital bureaucracy and the operational reality experienced by employees, within which a diagnostic assessment of these 'unfulfilled promises' becomes instrumental. Recent evidence from the shared services literature further suggests that consolidating back-office functions can generate administrative cost reductions and efficiency gains, although such benefits depend heavily on organizational integration and process alignment (Goth et al., 2025).

Table 1. What has changed with e-Government from 2022 to 2024 in 193 UN Nations?

Service	2022	2024	% Change
Register a business	177	177	0%
Apply for business license	151	173	+14.5%
Apply for government vacancies	168	168	+4%
Pay for utilities (electricity/gas)	151	162	+7%
Apply for birth certificate	161	161	+3%
File company/business taxes online	154	157	+2%
Apply for personal identity card	151	154	+2%
Apply for building permit	149	152	+2%
Apply for driver's license	149	152	+2%
Apply for marriage certificate	151	152	+1%
Submit income taxes	164	151	–8%
Apply for death certificate	140	151	+8%
Pay for utilities (water)	149	151	+1%
Apply for land title registration	141	147	+4%
Submit Value Added Tax	143	147	+3%
Apply online for disability compensation	136	143	+5%
Apply for environmental permit	135	139	+3%
Apply online for child benefits	127	129	+2%
Apply online for maternal/newborn benefits	125	128	+2%
Apply or file for unemployment benefits	110	113	+3%
Apply for visa	99	105	+6%
Declare to police	98	105	+7%
Apply online for retrenchment/severance	93	93	0%
Register a motor vehicle	83	87	+5%
Submit change of address	80	84	+5%

Source: UN E-Government Survey (2024). Accelerating digital transformation for sustainable development with the addendum on artificial intelligence

Research Objectives and Questions

While the literature recognizes that back-office integration is a determinant of e-government success, there is scant empirical evidence on whether such integration has occurred from the perspective of the employees who operate these systems. This paper seeks to fill this gap by exploring Turkish municipal employees' perceptions of the progress and effectiveness of back-office e-government systems. More than 10 years after municipalities began investing in digital tools, have any supposed benefits of public-sector process management and information system maturity been realized through better-integrated back offices?

To fulfil the study's diagnostic objectives, we pose the following research questions to map the internal digital landscape of Turkish municipalities.

RQ1: To what extent do municipal employees perceive a discrepancy between the current and targeted states of back-office process efficiency?

RQ2: What is the magnitude and nature of the perceived gap regarding data integration and accessibility within municipal systems?

RQ3: How do employees characterize the shortfall in technological competence required for effective back-office operations?

RQ4: Is there a systematic misalignment between currently experienced digital stress and the levels deemed acceptable by staff?

RQ5: How do this diagnostic perception gaps vary across organizational contexts, such as municipality type and departmental function?

METHODOLOGY

Participants and Sampling

We used the master list of municipal civil servants in metro and district municipalities (N = 109, 499). First, we applied a probabilistic method by selecting 900 employees through computer-assisted simple random sampling. However, actual participation was based on willingness, resulting in a purposive-voluntary sample of 391 respondents (response rate: 43%). For this size of the population, a sample between 386-391 gives a 95% confidence level with about ±5% margin of error, which is quite strong statistically for a diagnostic inquiry (Fowler, 2013; Lohr, 2021). The first batch of 391 responses was screened for data quality to arrive at an analytic final sample size result: five cases were dropped because they had too much missing data (over 10%) in the paired-item sections or failed internal consistency checks, such as "straight-lining" (giving the same response to all Likert items irrespective of question).

The participants represented a wide range of roles, including finance, administration, and project coordination. While "educational level" and "departmental affiliation" were recorded (Table 2), the study acknowledges that departmental categorization (e.g., IT/Technical vs. Administrative) serves as a proxy for professional field and information system (IS) competence. This allows for a diagnostic comparison between those with specialized technical roles and those in general administrative or citizen-facing functions.

Sample characteristics

Table 2 presents the participants' demographic characteristics, including municipality types and educational backgrounds. The sample shows a balanced representation across gender and education levels, with 59.3% of respondents originating from district municipalities and 40.7% from metropolitan areas.

Table 2. Demographic characteristics of participants

Characteristic	Category	n	%
Municipality Type	Metropolitan	157	40.7
	District	229	59.3
Department	IT/Technical	83	21.5
	Administrative	124	32.1
	Citizen Services	97	25.1
	Finance	45	11.7
	Other	37	9.6
Education Level	High School	78	20.2
	Bachelor's Degree	243	63
	Postgraduate	65	16.8
Age Group	18–30	94	24.4
	31–40	147	38.1
	41–50	103	26.7
	51+	42	10.9
Gender	Male	231	59.8
	Female	155	40.2

Note. N = 386. Percentages may not sum to 100% due to rounding.

Potential for non-response bias

As participation was voluntary, the study assessed potential non-response bias by comparing the demographic distribution of respondents with the known characteristics of the broader municipal workforce, where available (Fowler, 2013). While the sample aligns with general workforce trends in terms of gender and education, the voluntary nature of the survey suggests that results should be interpreted as a diagnostic map of perceptions among active users rather than an exhaustive census.

Data Collection Instrument

The survey instrument consisted of 30 paired items that measured the perceptions of the current and targeted states of back-office e-government systems. Each item was presented twice: once to assess the current state ("Mevcut") and once to assess the targeted or ideal state ("Hedeflenen"). Responses were recorded on a 5-point Likert scale (1 = strongly disagree, 5 = strongly agree). The survey instrument items were mainly constructed along four dimensions corresponding to our research questions: (1) public sector process efficiency (10 items), (2) data integration and accessibility (7 items), (3) technological competence (7 items), and (4) digital stress (6 items). The instrument was developed from the existing literature, as detailed in Table 3, on e-government implementation and public sector process management. It was slightly modified to suit the Turkish municipal context. The survey was available online from February to March 2024 and took about 15 minutes to complete on average.

Table 3. Literature-item correspondence table

Survey statement (translated)	Literature source	Thematic focus
The speed of performing daily tasks has become sufficient.	Westholm (2005); Bekkers (2005)	Operational efficiency
We have achieved increased task performance.	Kubicek et al. (2007); Irani et al. (2023)	Service quality and performance
We have minimized error rates.	Lam (2005); Gil-Garcia et al. (2016)	Accuracy and process control
Bureaucratic procedures have been reduced.	Sun et al. (2015); Bekkers (2007)	Bureaucracy reduction

Survey statement (translated)	Literature source	Thematic focus
Our workload has decreased.	Irani et al. (2023); Peeters (2023)	Process optimization
Work processes have been improved.	Kubicek et al. (2007); Lips (2024)	Process redesign
We have reorganized work processes for efficiency.	Sun et al. (2015); Homburg and Bekkers (2002)	Reorganization and integration
Document costs have been minimized.	Lam (2005); Brusa et al. (2007)	Cost efficiency
Optimized archiving is being used.	Kubicek et al. (2011); Brusa et al. (2007)	Data management
Waste reduction has been achieved.	Marchiori et al. (2024)	Sustainability and efficiency
Increasing technology complexity increases workload.	Peeters (2023); Lips (2024)	Digital stress
Our institution changed its culture to utilize technology effectively.	Pollifroni et al. (2021); Marchiori et al. (2024)	Organizational culture change
Automation only targets speed.	Irani et al. (2023); Cordella and Tempini (2015)	Automation scope
E-government increased the flexibility of the work environment.	Bekkers (2007); Sun et al. (2015)	Flexibility and work-life
Work processes were redesigned before automation.	Bekkers (2005); Lam (2005)	Process-first approach
Work processes are now better than before.	Kubicek et al. (2007)	Organizational performance
I can access all necessary data to solve citizen problems.	Nam and Pardo (2014); Homburg and Bekkers (2002)	Data accessibility
All necessary data is provided.	Brusa et al. (2007)	Information flow
Cloud systems are being used.	Irani et al. (2023); Ly (2025)	Infrastructure and technology adoption
It is easy to access the data needed for my work.	Lam (2005); Gil-Garcia et al. (2016)	Data usability
I do not have enough information to use the technology properly.	Peeters and Widlak (2023); Irani et al. (2023)	Digital readiness
It takes too long to learn new technology and limited digital competencies and organizational resistance hinder technology adoption.	Ly (2025); Peeters (2023)	Skill development barriers
I haven't had time to update my tech knowledge.	Irani et al. (2023); Lips (2024)	Capacity building
My colleagues are more knowledgeable about the technology.	Cordella and Tempini (2015)	Peer disparity and training needs
I find the technology I use complex	Peeters (2023); Lips (2024)	Usability & interface complexity
Fast-paced tech demands stress me.	Peeters (2023); Irani et al. (2023)	Time pressure
I feel stressed by tech-induced workload increases.	Peeters and Widlak (2023)	Job stress and digital load

Survey statement (translated)	Literature source	Thematic focus
Rigid tech schedules stress me.	Lips (2024); Irani et al. (2023)	Flexibility constraints
Adapting to new tech habits causes stress.	Peeters (2023); Polli-froni et al. (2021)	Behavioral change and stress

Basic constructs of key concepts were developed from earlier literature: operational efficiency, process redesign, data access, and errors (Bekkers, 2005; Kubicek et al., 2007). The statements are intended to capture the actual (real) perception and the ideal (target) perception of system functionalities and readiness at organizational levels. A total of 30 paired items have been drafted, each statement explicitly based on thematic insights from previous empirical and theoretical contributions. For instance, Westholm (2005) and Bekkers (2007) provide benefits regarding operation, while recent findings provide stresses due to technology toward adaptation (Panayiotou & Stavrou, 2021; Peeters, 2023). Three academic peers with expertise in digital governance checked the items for content validity. This process ensured alignment between the theoretical constructs and the practical realities of municipal e-government implementation. The items were measured twice on a 5-point Likert scale, once for the current situation and again for the desired target situation, to allow a perception gap analysis.

DATA ANALYSIS

Data analysis was carried out in several stages using SPSS version 26.0. This is broadly described as mapping the magnitude and pattern of perception gaps:

- *Descriptive statistics:* Means, standard deviations, and frequencies were computed for all variables to show general patterns of discrepancy between current and targeted states.
- *Paired t-tests:* To answer RQ1–RQ4, paired-samples t-test means comparisons between present and desired states for each dimension have been conducted. Cohen's d has been used to determine the effect size of these diagnostic gaps, with values of 0.2, 0.5, and 0.8 corresponding to small, medium, and large effects, respectively.
- *Exploratory Factor Analysis (EFA):* The perception gap data were subjected to an exploratory factor analysis using the principal components extraction method with a varimax rotation to assess construct validity by identifying latent dimensions within the tool.
- *K-means Clustering:* K-means clustering was applied to determine the number of distinct user profiles based on patterns in their perception gaps, to characterize workforce diversity.
- *Contextual Comparative Analysis (RQ5):* Independent samples, t-tests, and one-way ANOVA were used to compare gaps across municipality types and departments.
- *Multivariate Diagnostics:* A MANOVA tested the joint effect of municipality type and department on all four perception gap dimensions at the same time. Significant multivariate effects were followed by linear discriminant analysis (LDA) to determine which specific dimensions are most clearly separate organizational groups.

Data cleaning and consistency

The data were first screened for outliers and missing values. To make the reporting of results more comparable, missing data, less than 5% per variable, were handled in the following way:

- *Pairwise deletion* was used for the paired t-tests so as to fully exploit all available information pertaining to specific dimensions.
- *Mean substitution* was used in multivariate procedures (EFA, MANOVA, clustering), thereby imposing an invariant sample size on all these highly composite models.
- *Case exclusion* – five cases were permanently removed from the analytic sample prior to these procedures due to "straight-lining" patterns or missing more than 10% of their responses, ensuring the reliability of the diagnostic results.

Departments were later collapsed into five functional categories (IT/technical, finance, administrative, citizen services, and other), both for the purposes of any meaningful group comparisons and to ensure sufficient group sizes for statistical power.

Ethical Considerations

The study implemented high ethical standards from its conceptualization through data collection and analysis. Ethics committee approval was secured from the relevant department of Piri Reis University before any data collection activities commenced, to ensure adherence to all applicable national and international regulations on human subjects' research (E-57297403-604-E224596). Participants were informed about the purpose of the study, what their participation would involve, how long it would take them to complete the survey instrument, and that they could discontinue participation at any time without suffering any consequences or loss of benefits to which they might otherwise be entitled. All participants gave explicit consent just before starting the survey; in most cases, through a preliminary statement within an online survey tool that required them to agree to continue explicitly. To protect the privacy and confidentiality of the participants, data anonymity has been strictly ensured. No personally identifiable information (names or specific employee IDs) was collected. The respondents were assured that their answers would be aggregated and reported in a manner that would preclude individual identification. All collected data were stored on password-protected servers with access limited to the research team, thereby emphasizing data security and confidentiality. The research team would use the data solely for academic purposes, as stated in the informed consent process.

RESULTS

This section presents the results of the data analysis, answering the research questions and providing a diagnostic assessment of back-office e-government transformation. The results are presented in the following order: descriptive statistics, the main diagnostic analysis of perception gaps (RQ1–RQ4), and multivariate and exploratory analyses that mainly focus on contextual variations (RQ5).

Descriptive Statistics

Table 4 presents descriptive statistics on employees' perceptions of both the existing and intended states for the four main dimensions of back-office e-government systems, along with the computed perception gaps. A substantial difference appears between the mean scores for present conditions and those for future preferred conditions in all dimensions. The largest gap was found in Data Integration and Accessibility. While still large, the smallest gap was Public Sector Process Efficiency. For Digital Stress, a lower score was desired, so this gap shows that current levels of stress are much higher than what is supposed to be an acceptable level.

Table 4. Descriptive statistics for current state, targeted state, and perception gaps

Dimension	Current state M (SD)	Targeted state M (SD)	Perception gap M (SD)
Public Sector Process Efficiency	3.12 (0.87)	4.38 (0.64)	1.26 (0.94)
Data Integration & Accessibility	2.98 (0.93)	4.45 (0.59)	1.47 (0.99)
Technological Competence	3.05 (0.91)	4.29 (0.67)	1.24 (0.96)
Digital Stress	3.42 (1.02)	2.18 (0.83)	-1.24 (1.09)

Note. N = 386. Scales range from 1 to 5. The perception gap for Digital Stress is negative, indicating current stress is higher than the targeted level.

Diagnostic Analysis of Perception Gaps

Paired-samples t-tests were conducted to determine the degree of difference in perceived gaps across the dimensions of perceived process efficiency.

RQ1: *Public Sector Process Efficiency*. There is a huge gap between the mean score of the present state (M = 3.12, SD = 0.87) and intended target state (M = 4.38, SD = 0.64) on process efficiency, t(385) = 26.78, p < .001. A very large effect size (d = 1.36; 95% CI [1.17, 1.35]) supported by this disparity provides an empirical answer to RQ1; hence, a perceived efficiency gap exists.

RQ2: *Data Integration and Accessibility*. The results show a statistically significant difference between the perceived level of data integration for current processes (M = 2.98, SD = 0.93; t(385) = 29.34, p < .001) and the targeted level of data integration (M = 4.45, SD = 0.59). This dimension shows the largest effect size (d = 1.49, 95% CI [1.37, 1.57]), confirming a significant perceived efficiency gap.

RQ3: *Technological Competence*. The results reveal a statistically significant difference between the perceived level of technological competence for current processes (M = 3.05, SD = 0.91; t(385) = 25.47, p < .001) and the targeted technological competence (M = 4.29, SD = 0.67). The substantial effect size (d = 1.30, 95% CI [1.14, 1.34]) indicates a significant number of perceived deficiencies in technological competencies and, therefore, answers RQ3 empirically and confirms the existence of a significant perceived efficiency gap.

RQ4: *Digital Stress*. A significant difference was found between the currently experienced digital stress (M = 3.42, SD = 1.02) and the targeted acceptable level (M = 2.18, SD = .83), t(385) = -22.65, p < .001. The negative t-value means that the current stress level is much higher than the desired level. This large effect size (d = -1.15, 95% CI [-1.35, -1.13]) provides an empirical answer to RQ4 and confirms the existence of a substantial perceived efficiency gap.

Contextual Variations (RQ5)

The magnitude of these diagnostic gaps varies significantly based on organizational contexts.

- *Municipality Type*. There are significant differences in perceptions of public sector process efficiency (t(384) = 3.42, p < .001) and data integration (t(384) = 2.98, p = 0.003) between metro and district municipalities. In both cases, it is evident that employees of district municipalities report significantly larger gaps than those of metro municipalities.
- *Department Type*. One-way ANOVA showed significant differences in perception gaps across departments for technological competence and digital stress (F(4, 381) = 5.67, p < 0.001); (F(4, 381) = 4.89, p = 0.001). IT/Technical departments reported significantly smaller technological competence gaps as compared to administrative and citizen services departments (p < .01). Contextual variations were found in different departmental experiences of digital transformation that "this analysis identifies as significant."

RQ5 states that the perception gaps vary by municipality type. The main text confirms this and notes that "data integration" is the biggest differentiator. Table 5 drills down even further and shows which individual survey questions are most powerful at distinguishing between a metropolitan and a district municipality employee. For example, the item "Gap_19_Any kind of data that will be useful for my work …" is shown to be a very strong predictor. This is the item-level evidence that proves how the experience differs between municipality types.

Table 5. Standardized canonical discriminant function coefficients

Perception gap variable	Coefficient
Gap_3_Opportunity to increase task performance ...	0.859
Gap_19_Any kind of data that will be useful for my work ...	-0.733
Gap_21_Any kind of resource/tool I can use to get my work done ...	0.664
Gap_8_Business processes for efficiency ...	0.591
Gap_1_Ease of performing daily tasks ...	-0.560
Gap_27_Technologies I generally use ...	-0.480
Gap_24_Technological knowledge level required to update myself ...	-0.454

Note. The table shows the seven variables with the highest absolute coefficients, sorted in descending order of absolute value. These coefficients represent the relative contribution of each variable to the discriminant function separating municipality types.

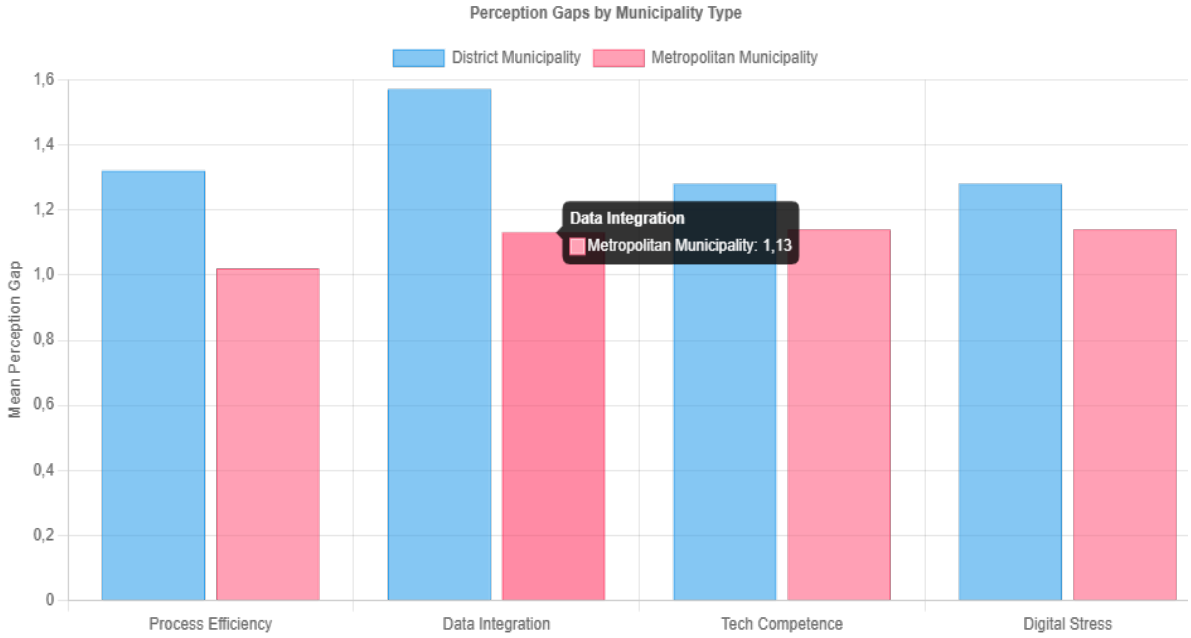

Figure 1. Bar chart of perception gaps across four dimensions by municipality type

As shown in Figure 1, the comparative analysis of mean perception gaps reveals a consistent trend where district municipalities exhibit higher levels of perceived deficiency across all dimensions, with the most pronounced disparity occurring in data integration.

Multivariate and Exploratory Analyses

To further explore the structure of the perception gaps, a series of multivariate and exploratory analyses was conducted.

- *Exploratory Factor Analysis (EFA).* Data suitability assessment preceded factor analysis. The assessment results indicated excellent conditions for factor analysis of the perception gaps in e-municipality. The Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy was 0.928, classified as "marvellous" and also above a 0.90 threshold provided by Hair et al. (2009). Bartlett's test of sphericity was significant, $\chi 2 = 7671.74$ with $p<0.001$, thus proving inter-

item correlations were sufficient for factor extraction. While using Kaiser's rule to determine the number of factors suggested four, an inspection of explained variance ratios retained a three-factor solution accounting for 62.83% of total variance, which is consistent with the factor-determination criteria proposed by Costello and Osborne (2005). The suitability of the data was checked before running the factor analysis. The results of this test show excellent conditions for factor-analyzing perception gaps in e-municipality. The Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy result is 0.928, classified as 'marvellous' and above the 0.90 threshold recommended by Hair et al. (2009). Bartlett's test of sphericity is significant, $\chi 2 = 7671.74$ ($p<0.001$), proving inter-item correlations are sufficient for factor extraction using Kaiser's criterion. This suggests four factors, but the explained variance ratios indicate that a three-factor solution was retained, accounting for 62.83% of the total variance, consistent with the determination criteria provided by Costello and Osborne (2005).

- *Multivariate Analysis of Variance (MANOVA).* A MANOVA was used to test the joint effect of municipality type on all four perception gap dimensions. The results were significant (Wilks' $\lambda = 0.932$, $F(4, 362) = 6.61$, $p < 0.001$, partial $\eta^2 = 0.068$) (Table 6). Therefore, the combined profile of perception gaps differs significantly between metropolitan and district municipalities.

Table 6. Summary of multivariate analysis of variance (MANOVA) for perception gaps by municipality type

Test statistic	Value	F	df	Error df	p	Partial η^2
Wilks' Lambda	0.932	6.61	4	362	< 0.001	0.068

- *Linear Discriminant Analysis (LDA).* LDA followed up on the significant MANOVA result to determine which dimensions best separated municipality types. It found that the data integration gap was the strongest discriminating variable (standardized coefficient = 1.36), followed by technological competence (-0.57) and digital stress (0.26). The process efficiency gap contributed negligibly.

Table 7. Standardized coefficients from linear discriminant analysis

Perception gap dimension	Standardized coefficient
Data Integration & Accessibility	1.364
Technological Competence	-0.566
Digital Stress	0.258
Public Sector Process Efficiency	0.006

Note. Coefficients indicate the relative contribution of each dimension to discriminating between metropolitan and district municipalities.

- *Controlling for Demographic Factors (MANCOVA).* To ensure that differences found between types of municipalities and departments were not due to demographic factors, a Multivariate Analysis of Covariance (MANCOVA) was conducted. The analysis re-estimated the effects of independent variables by controlling for the covariates of employee age and education level. The model in general remained statistically significant (Wilks' $\lambda = 0.566$, $F(124, 1070.4) = 1.32$, $p = 0.015$). After controlling for covariates, age did not have any significant effect on items of perception gaps; however, education had a significant effect on two specific items related to technological perceptions.

Table 8. MANCOVA analysis with age and education controls

Test	Value	F	df1	df2	p-value	Significant variables
Hotelling's T^2	0.614305	–	–	–	–	–
Wilks' Lambda	0.566404	1.3182	124	1070	0.015015	Age: 0/31, Education: 2/31
Pillai's Trace	0.527283	–	–	–	–	–
Roy's Largest Root	0.205436	–	–	–	–	–

- *K-means Clustering.* The K-means clustering analysis helped identify distinct user profiles based on how they perceived the gaps between their expectations (perception) and actual experiences (feedback). The dataset included 31 features and 307 observations. To create comparable values across all variables in the dataset, all values were standardized (Z-scores normalized) using the Standard Scaler. This helped reduce biases associated with having very different ranges between variables, thereby eliminating scaling effects on clusters when applying K-means clustering. The K-means algorithm was used for clustering based on the Euclidean distance as the similarity measure, and K-means++ for selecting initial points (centroids). To further improve the stability of the clustering outcome, the K-means algorithm was run with a fixed random seed of 42 and repeated 10 times until it reached convergence after 9 iterations. The validity of the clustering solution was evaluated using a number of different validity indices to check for robustness. The Silhouette Score was 0.2936, indicating a moderate level of separation among the clusters. The Calinski–Harabasz Index was 79.66, showing an acceptable cluster structure, and the within-cluster sum of squares (Inertia) was 5320.46, describing the compactness of the partitions. Four different user profiles were found based on these results. The biggest cluster contains 31.5% and is described as "Technology Strugglers," thus highlighting a substantial group from among the respondents who reported large gaps in technological competence, together with high digital stress. In the end, four unique profiles emerged:

  1. **Optimistic Adapters (28.2%):** Represent successful STS alignment, reporting small gaps across all dimensions.
  2. **Process Challengers (23.6%):** Highlight failures in DEG-informed process redesign, specifically in efficiency.
  3. **Technology Strugglers (31.5%):** Represent a failure in the STS, characterized by high competence gaps and high digital stress.
  4. **Comprehensive Gap Experiencers (16.7%):** Reflect a systemic public value failure, where technical, organizational, and human dimensions are all misaligned.

DISCUSSION

This study aimed at identifying perception gaps between the current and target states of back-office e-government systems in Turkish municipalities. Findings indicate that municipal employees perceive large deficits across all four dimensions: process efficiency, data integration, technological competence, and digital stress. However, the nature of these gaps varies widely by municipality type and the department to which an employee belongs. Closing the identified gaps is expected to yield multidimensional public value such as improving operational efficiency, equity of access, and user-centered outcomes, consistent with public value frameworks in the e-government literature (Twizeyimana &

Andersson, 2019). The results have significant theoretical and practical implications for addressing perennial challenges in public-sector information system management.

The discussion interprets these findings under three core themes: the persistence of basic challenges, the crucial nature of the socio-technical dimension, and practical implications for specific public management.

Theme 1: The persistence of foundational challenges

The answers to RQ1 through RQ4 reveal a key fact often masked by the general rhetoric surrounding e-government implementation: outcomes are not automatically achieved simply by deploying technology. This helps explain why expected efficiency gains do not automatically materialize: as shown in the shared services literature, cost and efficiency benefits from back-office consolidation remain contingent on deep process integration rather than formal centralization alone (Goth et al., 2025). The large gap identified in this study regarding public sector process efficiency (RQ1) aligns with previous literature, which argues that a fundamental overhaul of processes is needed to sustain the realized efficiency gains from e-government implementation (Atkinson, 2021; Eggers, 2020). This means that just blatantly copying ineffective paper-based workflows into digital ones will not unleash the type of transformation assumed possible through information systems.

The largest identified gap in data integration and accessibility (RQ2) is fundamentally a basic-level challenge in the process of maturing e-government, since siloed information systems block the seamless flow of data required for cross-departmental operations, which set the preconditions for advanced levels of e-government (Kubicek et al., 2007). This was more apparent among district municipalities, possibly reflecting a resource-based and technical infrastructural disparity between them and their metropolitan counterparts, as also observed earlier in Turkish e-government by Arslan (2006) and Arslan (2008). The MANOVA result, reinforced by subsequent discriminant analysis, clearly highlights this point by identifying a single most powerful factor that differentiates between the two types (data integration). In other words, data integration could be seen as an indicator of IS maturity in this context, consistent with earlier stage-based evaluations of Turkish e-government development emphasizing back-office integration as a critical transition threshold (Arslan, 2006).

Theme 2: The critical socio-technical dimension

The huge gap in technological competence (RQ3) speaks to the socio-technical nature of digital transformation. From a broader perspective, e-government initiatives can be understood as socio-technical transitions rather than purely technical upgrades, unfolding across multiple organizational and institutional levels (Kompella, 2017). Advanced systems mean little if users lack the skills to leverage them effectively (Fayoumi & Williams, 2021). The fact that competence gaps were lowest within IT departments and highest among citizen-facing and administrative roles is quite telling. It implies technical know-how is still largely hoarded, creating an organization-wide capability gap that could result in bottlenecks and restrict the even diffusion of best practices.

At the end, a pronounced gap in digital stress (RQ4) reveals a crucial human-centered aspect that is often left out. High levels of techno-induced strain make people unproductive and dissatisfied with their work; hence, efficiency becomes another wasted effort added to the many quests for government systems through e-government implementations. The finding aligns with new research on digital administrative burdens, which highlights the psychological costs imposed by poorly designed or implemented digital systems (Peeters, 2023).

The main findings were robust to a MANCOVA check, which revealed that significant differences between organizational groups persisted even after controlling for employees' age and education. This allows us to strongly link the observed perception gaps to organizations and systems rather than individual demographics. However, the analysis found a minimal yet significant effect on specific items related to the adequacy of workplace technology education. While issues at higher levels, such

as data integration across all employees' work processes, affect everyone equally regardless of educational background or other personal characteristics, perceptions of lower-level, more immediate tool-specific aspects may still be influenced by these characteristics.

Theme 3: Implications for Targeted Public Management

The four clusters or user profiles give public managers a powerful strategic tool. It moves beyond the monolithic concept of "the user" and allows targeted, data-driven interventions. The Optimistic Adapters (28.2%) prove that success is possible, and work contexts should be studied to identify best practices. On the contrary, the other profiles pose specific managerial challenges:

- Process Challengers (23.6%) need workflow redesign and business process re-engineering.
- Technology Strugglers (31.5%), the largest proportion, indicate a desperate need for training programs targeting the development of competencies, intuitive user interface design, and easily accessible technical support.
- Comprehensive Gap Experiencers (16.7%) have displayed an area where the system has failed holistically, thus needs a holistic intervention covering technology, process, and people.

This study reduces the univariate results to a single clear instruction through multivariate analysis. The lack of integrated data, particularly among district municipalities, is the main blocking factor; hence, interventions should focus on introducing integrated cross-departmental data systems, while another human-centered approach should build organization-wide technological competence and actively manage digital stress as insurance for the full realization of benefits from these technical investments.

Lastly, the summary of all answers to our RQs is presented in Table 9.

Table 9. Summary of research question findings

RQs	Description	Analysis method	Key statistical result	Diagnostic finding
RQ1	Public sector process efficiency perception gap	Paired-samples t-test	$t(385) = 26.78$, $p < 0.001$, $d = 1.36$	Substantial gap identified.
RQ2	Data integration and accessibility perception gap	Paired-samples t-test	$t(385) = 29.34$, $p < 0.001$, $d = 1.49$	Critical gap identified.
RQ3	Technological competence perception gap	Paired-samples t-test	$t(385) = 25.47$, $p < 0.001$, $d = 1.30$	Substantial gap identified.
RQ4	Digital stress perception gap	Paired-samples t-test	$t(385) = -22.65$, $p < 0.001$, $d = -1.15$	Significant misalignment (current > target).
RQ5	Variation of perception gaps by contextual factors			Significant variation observed.
	By municipality type	Independent-samples t-test	Significant difference found for process efficiency ($p < 0.001$) and data integration ($p = 0.003$)	Gaps are significantly wider in district municipalities.
	By department type	One-way ANOVA	Significant difference found for technological	IT departments show smaller

RQs	Description	Analysis method	Key statistical result	Diagnostic finding
			competence ($p <$ 0.001) and digital stress ($p = 0.001$)	competence gaps than other units.

Note. d = Cohen's d. Results indicate that perception gaps are systemic across all measured dimensions, with the magnitude of these gaps varying significantly by organizational context.

IMPLICATIONS FOR PUBLIC ADMINISTRATION AND IS MANAGEMENT

The findings of this research have two direct implications for public managers. First, by a cluster analysis that groups users' responses into four profiles, from which the implementation challenge can be better understood than an undifferentiated conception, there is potential to develop targeted interventions. For example, training and user support initiatives should address "Technology Strugglers" (31.5%), the largest group; workflow redesign and business process re-engineering must satisfy "Process Challengers," while practices of "Optimistic Adapters" identified through their enabling conditions could provide best practice guidelines for dissemination within the organization since they appear to suffer comprehensively from gaps reported by a systemic failure requiring holistic multi-pronged intervention.

Second, it brings out as yet another investment priority in foundational infrastructure, particularly data integration at smaller district-level municipalities. Integrated data ecosystems are a mandate for middle-layer managers seeking to increase process efficiency or improve service delivery quality. Third, human capital development must be strategically focused on baseline competence, not confined to IT departments, but also spread throughout the organization through digital literacy and system-specific skills, formal training, and an enabling environment for continuous learning. Finally, the well-being of users has to become a core consideration in government systems design and management, intuitive interfaces, logical workflows, and readily available support that will reduce digital stress, measured and monitored as one more standard component in information system evaluation within the public sector.

THEORETICAL IMPLICATIONS

This paper contributes to the emerging theoretical understanding of information system management in public-sector digital transformation. First, it empirically justifies and demonstrates the usefulness of applying socio-technical systems theory to back-office e-government implementation projects, highlighting interdependencies among technical information systems, organizational processes, and human factors. Second, three perception gap dimensions identified (operational process improvement, technological competence, and digital stress) develop a more detailed framework for challenges associated with digitizing public sector processes within public organizations. Third, and most importantly from an academic perspective, variation across organizational contexts in perception gaps supports a contingency perspective on information system management, suggesting that effective approaches must be tailored to specific organizational characteristics and contexts.

PRACTICAL IMPLICATIONS

Our research findings indicate a number of ways that you can implement an effective information systems design, and thus improve the information systems maturity of your local e-Government through the implementation of the following suggestions:

- *IS Design for Process-Centricity:* Rather than implementing a technology-centric approach to IS, municipalities need to shift their focus from the technology to the IS, and begin with a full

view of all of the existing public sector processes, and then design IS to support those processes with digitisation as the next step in the process from design through implementation. In addition, an IS design that aligns with processes will lead to greater IS maturity in terms of process efficiency.

- *Integrated IS Architecture for Data Flow:* In district municipalities, creating an IS architecture that facilitates seamless data transfer across departments and functions should be a priority. Integration of IS is a key component of an organisation's maturity level. The larger the integration gaps in an organisation, the less effective IS will be in providing accurate and comprehensive data.
- *Distributed IS Competence Development*: Training and technical support should be provided to departments outside IT, as well as to the IT staff themselves, on digital information systems. A program that increases the maturity of all users' competence across the organization is essential for lowering technological barriers.
- *IS Design for Digital Well-Being*: Recognize the stress associated with digital information systems and reduce it by decreasing time pressure and simplifying complex IS interfaces as a supporting means during adaptation periods. Thoughtful IS design can reduce this kind of digital stress and improve user adoption toward a mature environment.
- *Contextual IS Adaptation*: The approach towards the design and implementation of information systems should be contextualized to different municipal environments, particularly between metro and district municipalities, as well as across various departmental functions. A flexible and adaptive IS strategy is an essential component for achieving high levels of IS maturity across varying public sector environments.

LIMITATIONS AND FUTURE RESEARCH

The survey allowed results to be split by department (IT or Administrative), even though the relationship between departments and professional fields can only ever be approximate. It becomes more precise if IT/Technical departments are treated as a separate group, thus presumably containing people with special IS competence. In any case, this paper offers an interesting perspective on Turkish municipal perceptions of back-office e-government systems. More importantly, however, is its own admitted limitation. The gap analysis is based on cross-sectional data that capture the nature of perception gaps at a single point in time; hence, no causality can be established with either antecedents or consequents regarding any identified gap. Future research may use a longitudinal design to examine changes in perceptions over time and to provide an understanding of the dynamic interplay among factors that influence back-office digitalization.

Second, since this study used self-reported data collected through surveys, it is prone to different response biases such as social desirability bias, acquiescence bias, and common method bias. Even though care was taken to keep responses careful and to provide opportunities for truthful reporting, a participant could have given a more positive, rather than realistic, picture of their perceptions of their organization or of how they were performing within it. Future studies could include a combination of data types (performance metrics, system usage logs, and/or observations), along with employee perceptions, to validate or clarify perceptions versus objective performance measures. The triangulation will build a stronger, holistic understanding of the current state of back-office digitalization.

Third, since the study was conducted among Turkish municipalities, generalizing its findings beyond national or even regional contexts may be limited by several factors that vary substantially across countries' e-government implementation, organizational culture, regulatory frameworks, and technological infrastructure (Lips, 2024). While socio-technical systems theory is universal, specific manifestations, gaps, and barriers may be particular to the Turkish context. Cross-country or cross-regional

studies can determine contextual and universal factors influencing back-office digitalization. In summary, though the study ensured representation of both metropolitan and district municipalities through a stratified random sampling approach, possible non-response bias was introduced because participation in the survey was voluntary. Employees with either strong positive or negative perceptions were more willing to participate. Future studies should develop strategies to increase responses and analyze possible non-responses using demographic data compared to the intended population.

This research, therefore, provides a basis for understanding the internal complexities of government transformation. Future studies may expand on this study by specifically examining intervention strategies to close the identified perception gaps, analyzing the role of leadership and organizational culture in the success or failure of back-office digitalization efforts, and developing advanced models to predict and explain employee perceptions in this highly important context.

CONCLUSION

The study aimed to determine the perception gaps in back-office e-government systems of Turkish municipalities, covering issues related to Public-Sector process efficiency, data integration, techno-competence, and digital stress. It found large gaps in all dimensions with variations by type of municipality and department. Therefore, the results show a multifaceted challenge in information system management during the transformation of the public sector into an enterprise driven by digital means and emphasize technical information systems and human factors, without adopting a socio-technical perspective.

This paper develops an understanding of perception gaps by specifying their dimensions and profiling users. This is a state-of-the-art, nuanced account of back-office e-government in Turkish municipalities that can be translated into approaches to information systems that focus on specific challenges across different organizational contexts to attain high levels of IS maturity. As governments continue investing in digital transformation, immediate attention should be paid to back-office processes, information system designs, and employee perceptions to harness the full potential of e-government initiatives. Municipalities shall improve public-sector process efficiencies through enhanced implementation that bridges current-to-targeted-state gaps across multiple dimensions; they will consequently better serve citizens while fulfilling their public mission.

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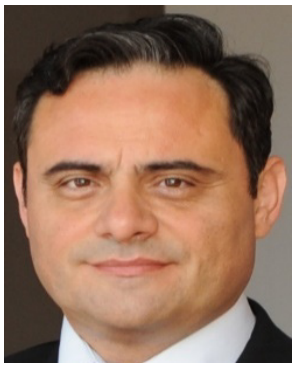

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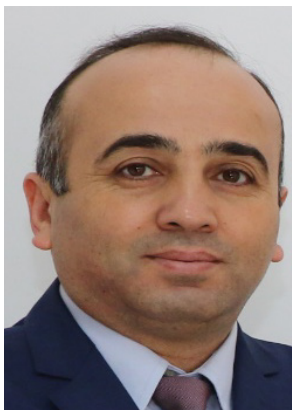
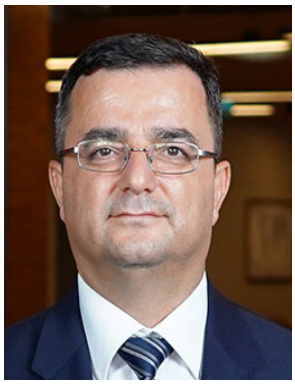


Professor Dr Serdar Yener, a faculty member at Sinop University, has contributed to several peer-reviewed journals in the fields of organizational behavior, business ethics, and management. With a strong academic background, he has led numerous academic projects and contributed to high-impact, peer-reviewed publications.



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