# To what extent does digitalization affect the corruption rate in Kazakhstan?

by

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## Master's Project

Paper submitted in partial fulfillment of the

Degree of Master of Public Administration

Graduate School of Public Policy

Nazarbayev University

Astana, Kazakhstan

19 November 2023

**ABSTRACT**

In the search for economic growth drivers, scholars identify consistent and transparent public policy as the foundation in any stage of a country's economic development. Transparency of public decisions and policy processes leads to the trust between government and society along with the national integrity, impartiality, accountability and low corruption level. Transparent and non-corrupted governance in Kazakhstan is supposed to be achieved by the mechanism of digitalization of public services. However, Kazakhstan as a sub-regional leader in e-governance still remains the outlier in terms of corruption combating. This research is aimed at analysis of linkage between digitalization and the corruption level. In spite of an array of studies on this theme, findings still present ambiguous interpretations. Our study makes an effort to understand the impact of digitalization in public services' field on the corruption rate in Kazakhstan over the course of the last decade.

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## LIST OF ABBREVIATIONS

UN - United Nations

E-government - Electronic government

EGDI - E-Government Development Index

EPI - E-Participation Index

OECD - Organisation for Economic Co-operation and Development

UNDP - United Nations Development Programme

UNODC - United Nations Office on Drugs and Crime

ICT - Information and Communications Technology

NJSC - Non-Profit Joint-Stock Company

JSC - Joint-Stock Company

CPI - Corruption Perceptions Index

EU - European Union

WGI - World Governance Indicator

# INTRODUCTION

Kazakhstan declared its independence from the Soviet Union in 1991. For the last 31 years Kazakhstan has been developing in different aspects of the economy and public policy system. Substantial progress has been made in terms of public services provision. One of the remarkable reforms has taken place in the field of public services' digitalization with the initiation of the first "Electronic government" portal in 2006 (Electronic Government of the Republic of Kazakhstan, 2021). The portal has been aimed at "comfort, clear without obstacles communication between the state and the people" as well as "more effective, transparent and accessible work of government agencies" (Electronic government of the Republic of Kazakhstan, 2021).

According to the UN E-government Knowledgebase, Kazakhstan demonstrated drastic improvement within the last fourteen years from 81-st to 28-th position out of 193 countries, becoming the Sub-Region Leader in E-government Development (Central Asian region) (UN E-Government Knowledgebase, 2022).

Transparent work of government, assigned as one of the E-government portal's goals, recognized in world practice as a first step to fight corruption and "increase the trust in decision makers and public institutions" (Transparency International, 2008). Therefore, intense digitalization process in Kazakhstan should inevitably affect corruption through increasing transparency at all stages of interactions between government and citizens. High-level trust in government along with low-level corruption, in turn, will be establishing the foundation for the effective public policy system and economic growth.

However, corruption has still presented one of the massive and complicated obstacles for the nation, despite measures taken "to pursue the open government agenda" (including the initiative of e-governance) over the course of recent years (OECD report, 2022). According to an OECD report, Kazakhstan, in terms of corruption, "has achieved progress in some areas" by reforming current legislation, adopting the new anti-corruption strategy, implementing the action plan and e-governance program. As a result, in Transparency International's 2022 Corruption Perceptions Index (CPI) Kazakhstan ranked 102-nd out of 180 countries, rising from 145-th in 2008 (Transparency International, 2008).

Although those actions, which could be characterized as formal in some aspects, have had certain positive impact on corruption indicators as demonstrated above, corruption "is

deeply institutionalized in Kazakhstan and prevalent at high-levels of public authority" (OECD report, 2022). From this point of view, the anti-corruption policy should be pointed out as one of the critical issues for effective governance in Kazakhstan. This policy needs to be improved in terms of mechanisms of combating corruption through the digitalized systems of governance and public services.

In order to gain an understanding of such mechanisms as well as digitalization and corruption connections, previous studies have been examined. The literature review, at first, concentrates on analysis of international practice in terms of government policies in digitalization as well as correlations between corruption and digitalization (Cassandra et al. 2007). In particular, the international experience of developed (EU-members) and developing (Middle East and Africa) countries in anti-corruption policy is reviewed to identify the effective strategies and industries for digitalization (Schöberlein et al. 2019, Androniceanu et. al. 2022).

Second, the literature review will cover the policy steps in a macro and micro level, examined by OECD experts that provide the vision on how to implement effective digitalization reform. Along with the research of Kazakhstan's scholars Smagulova S.A., Imashev A.B., Yermukhanbetova A.Y., given studies could be used as a practical guidance in evaluation of digital platforms efficiency in anti-corruption strategy in Kazakhstan.

Third, the literature review will examine opposing effects of digitalization and e-government on the level of corruption across states, whether the effects are positive, negative, or neutral (Androniceanu et al. (2022), Korchagin et al (2020), Chen et al. (2019)). In accordance with the outcomes of this comparative analysis, the final paragraph will draw conclusions of the effectiveness of the digitization process in fighting corruption, as well as identify the gaps in the previous research to distinguish the area of the research of this study.

The study relies on the methodology of previous researchers that uses the four factors of correlations between e-government and corruption rate which are elimination of intermediaries between citizens and authorities, increasing transparency, increasing accountability and decreasing the gap between the government and citizens. Along with it, our approach will be based on analysis of primary data (received through conducting surveys, public officials and experts' interviewing) as well as secondary data (information retrieved from international organizations) of Kazakhstan digitalization reform and its impact on corruption level.

While examining qualitative and quantitative information, international practice and perception-based views, this project is concentrated on the analysis of digitalization of services by public sectors (provision of public services, healthcare, education, procurement, etc.) in Kazakhstan, evaluation of the conducted reform in the digitalization field and recognition of its role in the anti-corruption policy. The objective of this research is an effort to identify the correlation (positive, negative) between digitalization and corruption rate in various public services' sectors.

Based on findings derived from project, the further recommendations on public policy measures have been formulated in the following aspects:

● which field of public services' digitalization has the highest and lowest correlation with the corruption rate;

● which field of public services is more responsive to digitalization (easy to digitize and shows high return in the form of corruption cases' reduction change) and could spread the influence on other interconnected areas?

● future policy steps to effectively meet the goals of corruption combating through digitalization of certain "the most prevalent" public policy services.

# LITERATURE REVIEW

The common definition of corruption is "misuse of entrusted power for private gains" (UNDP, 2008). Corruption can take place in different forms, be it bribery, theft, abuse of discretion, or favoritism (UNODC, 2004). Klitgaard (2008) argues that corruption can be simplified into an equation: "corruption equals monopoly plus discretion minus accountability." He proposes that instead of blaming individual actors, corruption should be seen as a breakdown of governing structures. The spread of corruption is generally considered as a factor undermining the development of national institutions, businesses, and the inflow of investments, which overall deteriorates trust and creates wrongful incentives. A country with a high corruption level is faced with wide economic inefficiency and inequality in society (UNDP, 2008; Dirienzo et al., 2007).

Corruption has been often explained by a principal-agent theory (Klitgaard, 1988). Public servants in the role of intermediary agents between principals (elected officials) and clients (citizens) often take advantage of the entrusted power and act more in their own interest (UNDP, 2008). According to this model, in order to reduce corruption, it is important to reshape the principal-agent-client relationship to adjust the amount of monopoly, discretion, and accountability agents possess (Klitgaard, 1988; Van Duyne et al., 2004; Pani, 1998; Fabrizi et al., 2012).

From this point of view, e-government can play a crucial role in reducing the amount of corruption given that it is efficiently used to alter the relationship in the model (Mahmood, 2004). E-government is supposed to minimize interaction between public servants and citizens, and thus decrease dependence on the discretion of officials. It can also develop accountability and transparency through widespread information dissemination (Elbahnasawy, 2014). In the Kazakhstani context, Smagulova et al. (2019) argue that the implementation of e-government initiatives and the incorporation of digital technologies in Kazakhstan have been observed to promote transparency and deter opportunities for corrupt practices through the elimination of interpersonal interaction.

One of benefits from digitalization might be improving transparency and reducing corruption (Bhatnagar and Apikul, 2006; Andersen, 2009; Elbahnasawy, 2014). According to Bhatnagar and Apikul (2006), information and communication technology has substantially exerted influence on the provision of public services. Bertot et al. (2012) argued that the usage of e-government might potentially improve transparency and stimulate anti-corruption actions.

Especially, Bhatnagar and Apikul (2006) emphasize four strategic implications of e-governance. The first strategy implies <u>preventive measures</u> through reducing bureaucracy, simplifying policies and procedure, and decreasing intermediate parties. The second strategy utilizes <u>the pressure mechanism</u>, that is improving transparency, thus creating an environment where citizens can monitor government actions. According to the work of Bertot et al. (2011), governments leverage social media and information technology as tools to enhance transparency, which refers to the state of openness in which the general public can access information regarding governmental actions, such as the allocation of funds and awarding of contracts. The third, an accountability strategy, increases <u>access to public information</u> through data publicity. Tolbert and Mossberger (2006) suggest that there exists a statistically significant correlation between trust and the utilization of online platforms offered by local governments, along with favorable evaluations of both federal and local governing bodies. The fourth strategy develops <u>digital literacy among citizens</u>, thus minimizing the factor of corruption among public servants. Some of these strategies might be used to reduce principal-agent-client relationship that we discussed above. Through reduction of interactions, transparency and accountability, the role of intermediaries will both be diminished and visible.

There are numerous cases of particular countries implementing digitalization in combat against corruption. While supporting the idea of the necessity of public services' digitalization for enhancing transparency and accountability based on numerous cases all over the world (UNDP, 2008; Kudo, 2008), authors provide different points on the final impact that digitalization demonstrates. Such impacts of digitalization as growth of the quality of public services in India or South Korea (UNDP, 2008) could be opposed to small-scale effects on accountability and public management quality as in Italy, Japan and Uzbekistan (Kudo, 2008; Kuldosheva, 2021).

Consistent with the idea of national context that matters a lot for the success of digital reforms against corruption, Schoberlein et al (2019) and Spacek et al.(2020) point out that western policy experience to some extent is irrelevant in developing countries, whether in post-soviet area (Spacek et al., 2020) or in Middle East and North Africa region (Schoberlein et al., 2019). In particular, authors state that existing obstacles as lack of political will, improper evaluation and monitoring, institutional shortcomings, lack of citizens' involvement (Schoberlein et al., 2019) along with the insufficient legislation, lack of coordinated state agencies' policy (Spacek et al., 2020) hinder the adoption of western practices and successful implementation of anti-corruption policy through digitalization.

Overall, some researchers on e-government indicate that there is a clear correlation between the increase of e-government application and reduction in corruption in both developed and developing countries. According to Andersen (2009), moderately, the increase in the e-government distribution from the 10th percentile to the 90th percentile is correlated with the increase of "control of corruption" from the 10th percentile to the 23th percentile. While highlighting a correlation between e-government, internet adoption and perceived corruption (Lio et al, 2011; Elbahnasawy, 2014), based on analysis of data on 70 countries from 1998 to 2005 Lio et al. (2011) mention conditions such as minimal democracy, perception of crisis, new ideology, and political will to be met to reduce corruption.

On the other hand, some scholars argue that petty corruption may be reduced but grand corruption will remain (Knox and Janenova, 2019). Kizabekova and Chernyshenko (2020) claim that governments need to develop a strategic vision of open government institutions and the necessity to develop citizen-oriented E-government platforms. Examining the correlation between digitalization and corruption in Estonia, Karv (2015) concludes that with the development of e-government in Estonia the corruption rate dropped due to elimination of intermediaries between the government and citizens. In fact, the number of corruption cases might have decreased because of the decrease of face-to-face contacts. In addition, over time trust in government significantly increased and the government became more accountable.

Furthermore, based on the strong correlation between two variables (Androniceanu et al., 2022; Sheriyazdanova et al., 2016) Alaa and Misko (2022) determine the new Correlation index for corruption and digitalization which could be used for different states and countries. In particular, there is strong evidence that "the greater the digitalization is, the greater the quality of public administration is" (Alaa, Misko, 2022), therefore, digitalization leads to a transparent, competitive economy and lower corruption.

Some other aspects of correlation between digitalization and corruption are examined by Dobroluybova et al. (2019), Tolbert and Mossberger (2006). Dobroluybova et al. (2019) point out that although there is a statistically significant positive correlation between government digitalization and public administration performance, this relationship is stronger for government effectiveness, control of corruption, and doing business and weaker for e-participation, voice and accountability, and efficiency of public spending. Results of the other research (Tolbert and Mossberger, 2006) show that there is a statistically significant

relationship between trust and the use of a local government Web site, as well as other positive assessments of federal and local governments.

There are several studies, however, demonstrating opposite results. Kim et al. (2009) point out that not always information technologies can reduce corruption efficiently. Heeks (1998) based on data of five cases on ICT and corruption concludes that not only ICT novelty can have insignificant results, it can even develop new conditions for corruption. Wescott (2011) argues that information technology can lead corruption to a higher level and decrease competition for upskilled corrupt civil servants. Mahmood (2004) claims that most corruption reduction cases due to digitalization happen in developed countries, whereas reduction of corruption in developing countries is doubtful.

Digital transformation of public administration has a positive impact on the government effectiveness, quality and accessibility of public services, control of corruption, and doing business and weaker for e-participation, accountability and transparency, and efficiency of public spending, and economic competitiveness (Androniceanu et al., 2022; Chen & Aklikokou, 2019; Dobrolyubova et al., 2019; Kudo, 2008). Another research (Basyal et al., 2018) indicates that statistical results of 176 countries from 2003 to 2014 do not show any positive correlation between e-government and corruption reduction. The results of the research refute the general hypothesis about the impact of e-government on corruption levels by increasing transparency, accountability, and efficiency. However, the research confirms the contribution of effective governance, political stability, and economic status. Bekkers et al. (2007) argue that the belief that digitization itself can transform the government into citizen-oriented apparatus is a common myth. When implementing new technologies governments should consider other factors because the expected outcome might not be as expected. According to Dada (2006), e-government does not introduce obvious benefits for developing countries because it requires political and social changes.

Several authors provide research on digitization in post-Soviet countries, including Kazakhstan. Digitization can be beneficial in post-Soviet space for making their businesses more efficient through improved access to information technology platforms, virtual services, and new values that are created with this digital transformation (Nosova et al., 2018). In Uzbekistan, the improvement of digitization is associated with technological development rather than the digitization of the public sector itself (Kuldosheva, 2021).

Satpayev (2014) argues that in Kazakhstan state officials and informal pressure groups are involved in the shadow economy through unmonitored transfers from the national fund which causes corruption in the country. Although the Kazakhstani government has made significant progress in implementing e-government systems and they can seriously lead to corruption decrease, the lack of understanding and awareness among citizens about e-government can lead to low usage and adoption rates. Other factors that decelerate the adoption of e-government are prior poor ICT infrastructure, the digital literacy of citizens, the level of economic development, and the political and legal framework (Brimkulov & Baryktabasov, 2018).

Sheriyazdanova et al. (2016) claim that in general e-government reduces petty corruption and bureaucracy in Kazakhstan. Knox and Janenova (2019) argue that although digitization has been significant in Kazakhstan, its impact is minor in combating big corruption. OECD report (2017) highlights the lack of regular assessments of anti-corruption actions in Kazakhstan, especially in terms of impact on qualitative and quantitative aspects of corruption while there are positive changes in a number of sectoral studies of corruption.

In general, corruption is considered as a factor deteriorating the economic development and stability of the government. In order to reduce corruption researchers suggest diminishing the role of intermediary agents in the principal-agent-client relationship. E-government can diminish the relationship by reducing bureaucracy, and improving transparency and accountability. Researchers agree that the potential use of technology might reduce corruption, however, it might also develop new conditions for corruption. There is doubt among researchers on the efficiency of digitalization for corruption reduction. Although several studies on e-government in Kazakhstan have been conducted, they do not consider the latest efforts of the country to develop e-government.

## THEORETICAL FRAMEWORK

Through the use of the theoretical framework described in Karv's research (2015), in which he uses the method of comparison and distinguishes four factors of correlation of e-government to reduce corruption, we are able to examine the correlation between digitalization and corruption rates in Kazakhstan. In case there is a positive correlation between two phenomena, the objective in examining the causal relationship will be relevant and add an external value to our research. According to Karv, there are four "intersection points" or mediators between e-government and reduction in corruption:

§ **elimination of intermediaries between citizens and authorities** (reduction in the number of "middlemen" or public sector employees that play a role of intermediary agents in provision of government services). With elimination of intermediaries, corruption opportunities decrease since citizens are able to receive services directly from the government.

§ **increasing transparency.** Establishment of E-government may lead to the disclosure of information about processes that take place within the public service system and thus transparency will be increased.

§ **increasing accountability.** Access to the information about activities and transactions made by public officials through transparent and open data from e-government will lead to greater accountability due to the emergence of opportunities for citizens to monitor the public sector's performance. This, in turn, increases government efficiency.

§ **reducing the gap between the government and citizens.** Increase in transparency and accountability caused by E-government will lead to increase in trust of citizens to public officials.

This paper's research framework is shown in Fig.1.
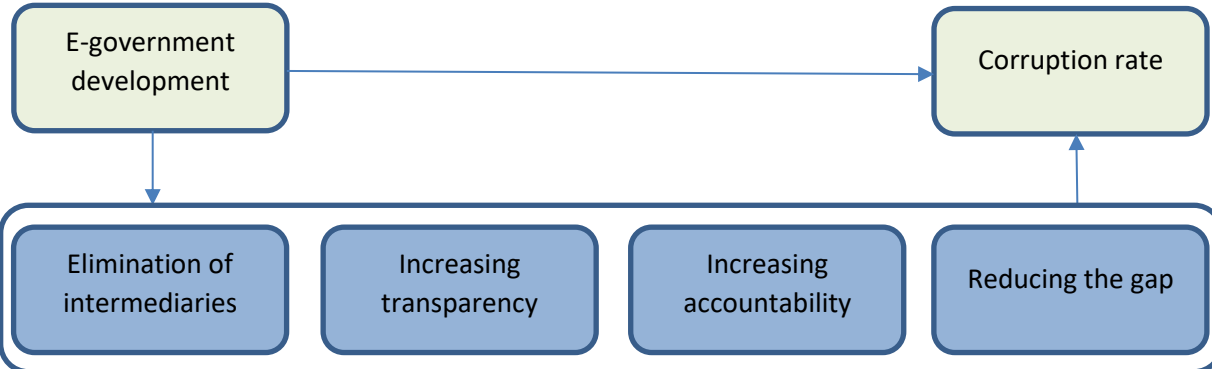
# METHODOLOGY

## Research hypothesis

Given the theoretical framework, here are the hypotheses to be tested in the research:

H1: The level of E-government negatively correlates with the perception of corruption level;

H2a: The elimination of intermediaries between the government and citizens positively mediates the relationship between e-government and corruption;

H2b: The increase in transparency positively mediates the relationship between e-government and corruption;

H2c: The increase in accountability positively mediates the relationship between e-government and corruption;

H2d: Reduction in the information gap between government and citizens positively mediates the relationship between e-government and corruption.

## Empirical model

To test whether the digitalization level has a correlation with corruption level and whether the mediators have an effect on the relationship between e-government and corruption, the following set of models are constructed for linear regression:

M1: $Corr.lvl = \beta_0 + \beta_1 Control$

M2: $Corr.lvl = \beta_0 + \beta_1 Egov$

M3: $Corr.lvl = \beta_0 + \beta_1 Egov + \beta_2 Control$

M4: $Corr.lvl = \beta_0 + \beta_1 Egov + \beta_2 Mediators \times Egov + \beta_2 Control$

Where *Corr.lvl* represents the perceived level of corruption by citizens; *Egov* is a set of variables, including the frequency of e-government usage, efficiency, speed, quality and reliability of e-government services, that represent the level and effectiveness of e-government in Kazakhstan; *Mediators* is a sum of mediating variables, including the elimination of intermediaries, increasing transparency, increasing accountability and decreasing the information gap between the government and citizens; *Control* represents control variables,

including age, gender, city, education, work, income, and marital status. Multiple regression models were designed for comprehensive analysis of interrelation among listed variables.

In the event that regression analysis does not yield significant results for the variables of interest, we have conducted a Structural Equation Modeling (SEM) analysis to more thoroughly examine the interrelationships and correlations between e-government variables and corruption.

**Data and sample selection**

The first model was used as a baseline for our regression analysis. The second model was used to test whether the coefficient β1 in M2 was significant. If it is significant, it means that E-government effectiveness has an effect on perceived corruption level, and if it is not significant, then we proceed to M3 and M4 for further analysis. The third model was used to reduce omitted variable bias, isolate independent variables, *Egov*, and increase precision of the analysis. The fourth and the full model was used to test whether coefficients β1and β2 in M4 are significant. The significance test of β1 was mentioned in M2. If β2 is significant, mediators might have a mediating effect between the level of perceived corruption and the effectiveness of e-government services provision.

In order to measure the degree of perceived level of corruption, e-government effectiveness and the effect of meidators, we conducted a survey among citizens of Kazakhstan. In addition to the questions designed to estimate aforementioned variables, several survey questions were designed to give an insight to crucial information, including the sectors of public service associated with corruption, frequently used types of E-government services, types of corruption prevalent in Kazakhstan, and perceived dynamics of corruption over the last 5 years. Our study has been done under several limitations such as non-performance of random sampling due to financial and time constraints, and relatively low number of respondents. Survey questions are shown in the Appendix section.

**Variable definitions**

**Table 1**

Variable definitions

| Variable | Definition | Symbol | Survey question |
| --- | --- | --- | --- |

| | | | |
|---|---|---|---|
| Dependent variable | Corruption rate in Kazakhstan | *Corr_lvl* | On a scale of 1 to 10, where 1 means "not at all corrupt" and 10 means "extremely corrupt," how would you rate the current level of corruption in Kazakhstan? |
| Independent variable | Frequency of E-gov usage | *Freq_egov* | How often do you use electronic government services? |
| | Efficiency of E-gov usage | *Efficiency* | How would you rate the effectiveness of e-government platforms in delivering services? |
| | Speed of e-gov services delievery | *Speed* | Please rate the following aspects of e-government services: [Speed of service] |
| | Quality of e-gov services | *Quality* | Please rate the following aspects of e-government services: [Service Quality] |
| | Reliability of e-gov services | *Reliability* | Please rate the following aspects of e-government services: [Reliability] |
| Mediating variable | Average of the sum of all mediators | *MO_sum* | 1. The use of an e-government platform **reduces the need for intermediaries** (public service centers, offices, etc.) when accessing government services<br>2. The e-government platform provides **clear and open information** about processes in the public service system<br>3. You feel **more informed** about government **activities and transactions** thanks to the e-government platform<br>4. The e-government platform allows citizens to effectively **monitor and evaluate the performance** of government officials<br>5. Thanks to the **transparency** that an e-government platform provides, government officials appear more accountable for their decisions and actions<br>6. The e-government platform creates a feeling of **greater connection and participation** in government activities<br>7. The e-government platform promotes a **sense of collaboration and partnership** between **citizens and the government** |
| Control variable | Age | *Age* | Your age |

| | | |
|---|---|---|
| Gender | *Gender* | Your gender |
| City of living | *City* | Where do you live? |
| Education level | *Education* | What education do you have? |
| Occupation | *Work* | Your employment |
| Income level | *Income* | What is your monthly income (after taxes)? |
| Marital status | *Marital* | What is your marital status? |

# FINDINGS

## Descriptive statistical analysis

**Table 2**

Summary table of sample responses

| Variable | Observations | Mean | Std. Dev. | Min | Max |
|---|---|---|---|---|---|
| Corruption level | 180 | 7.855556 | 1.882356 | 1 (Low) | 10 (High) |
| Personally encountered corruption over the past year | 180 | 0.627778 | 0.484746 | 0 (No) | 1 (Yes) |
| Frequency of using e-gov | 180 | 2.461111 | 0.800586 | 1 (Daily) | 4 (Rarely) |
| Efficiency of e-gov | 180 | 2.122222 | 0.737318 | 1 (Very efficient) | 5 (Very inefficient) |
| Speed of e-gov | 180 | 2.188889 | 0.92627 | 1 (Excellent) | 5 (Very poor) |
| Quality of e-gov | 180 | 2.222222 | 0.875205 | 1 (Excellent) | 5 (Very poor) |
| Reliabilty of e-gov | 180 | 2.311111 | 0.953025 | 1 (Excellent) | 5 (Very poor) |
| The role of E-government in reducing corruption level: | 180 | 16.00556 | 4.101365 | 6 | 28 |
| *Reduces the need for intermediaries* | 180 | 1.938889 | 0.826677 | 1 (Totally agree) | 5 (Totally disagree) |
| *Provides clear and open information* | 180 | 2.538889 | 0.905377 | 1 (Totally agree) | 5 (Totally disagree) |

| | | | | | |
|---|---|---|---|---|---|
| *Allows to effectively monitor and evaluate the performance* | 180 | 3.027778 | 1.010728 | 1 (Totally agree) | 5 (Totally disagree) |
| *Government officials appear more accountable* | 180 | 2.994444 | 1.054372 | 1 (Totally agree) | 5 (Totally disagree) |
| *Creates a feeling of greater connection and participation* | 180 | 2.811111 | 0.938255 | 1 (Totally agree) | 5 (Totally disagree) |
| *Promotes a sense of collaboration and partnershipt* | 180 | 2.694444 | 0.903731 | 1 (Totally agree) | 5 (Totally disagree) |
| | | | | | |
| Age | 180 | 3.033333 | 1.061779 | 0 | 5 |
| Below 18 | 180 | 0.016667 | 0.128376 | 0 | 1 |
| 18-24 | 180 | 0.011111 | 0.105114 | 0 | 1 |
| 25-34 | 180 | 0.305556 | 0.461927 | 0 | 1 |
| 35-44 | 180 | 0.361111 | 0.481663 | 0 | 1 |
| 45-54 | 180 | 0.2 | 0.401116 | 0 | 1 |
| 55 and above | 180 | 0.105556 | 0.308125 | 0 | 1 |
| | | | | | |
| Gender | 180 | 0.411111 | 0.493408 | 0 | 1 |
| Male | 180 | 0.588889 | 0.493408 | 0 | 1 |
| Female | 180 | 0.411111 | 0.493408 | 0 | 1 |
| | | | | | |
| City | 180 | 1.205556 | 0.457064 | 1 | 3 |
| Astana, Almaty, Shymkent | 180 | 0.816667 | 0.388019 | 0 | 1 |
| Other cities (more than 200 thousand people) | 180 | 0.161111 | 0.368659 | 0 | 1 |
| Rural areas (less than 200 thousand people) | 180 | 0.022222 | 0.147817 | 0 | 1 |
| | | | | | |
| Education | 180 | 3.288889 | 0.75108 | 1 | 5 |
| High school graduate | 180 | 0.05 | 0.218553 | 0 | 1 |
| College/technical training | 180 | 0.005556 | 0.074536 | 0 | 1 |
| Undergraduate degree holder | 180 | 0.572222 | 0.496137 | 0 | 1 |

| | | | | | |
|---|---|---|---|---|---|
| Postgraduate degree holder | 180 | 0.35 | 0.4783 | 0 | 1 |
| Doctorate or professional degree | 180 | 0.022222 | 0.147817 | 0 | 1 |
| Work | 180 | 4.238889 | 1.317539 | 1 | 5 |
| Unemployed | 180 | 0.027778 | 0.164794 | 0 | 1 |
| Student | 180 | 0.2 | 0.401116 | 0 | 1 |
| Retired | 180 | 0.005556 | 0.074536 | 0 | 1 |
| Self-employed | 180 | 0.038889 | 0.193869 | 0 | 1 |
| Employed | 180 | 0.727778 | 0.446345 | 0 | 1 |
| Income | 180 | 5.044444 | 2.281385 | 1 | 9 |
| Less or equal to 70 000 tenge | 180 | 0.083333 | 0.277156 | 0 | 1 |
| 70 001-150 000 tenge | 180 | 0.083333 | 0.277156 | 0 | 1 |
| 150 001 – 250 000 tenge | 180 | 0.127778 | 0.334773 | 0 | 1 |
| 250 000 – 350 000 tenge | 180 | 0.072222 | 0.259578 | 0 | 1 |
| 350 001 – 500 000 tenge | 180 | 0.161111 | 0.368659 | 0 | 1 |
| 500 001 – 800 000 tenge | 180 | 0.2 | 0.401116 | 0 | 1 |
| 800 001 – 1 500 000 tenge | 180 | 0.144444 | 0.35252 | 0 | 1 |
| Higher than 1 500 000 tenge | 180 | 0.044444 | 0.206655 | 0 | 1 |
| Prefer not to say | 180 | 0.083333 | 0.277156 | 0 | 1 |
| Marital status | 180 | 1.722222 | 1.052029 | 1 | 6 |
| Single | 180 | 0.505556 | 0.501364 | 0 | 1 |
| Married | 180 | 0.4 | 0.491265 | 0 | 1 |
| Divorced | 180 | 0.033333 | 0.180006 | 0 | 1 |
| Widowed | 180 | 0.005556 | 0.074536 | 0 | 1 |
| In a domestic partnership | 180 | 0.038889 | 0.193869 | 0 | 1 |
| Prefer not to say | 180 | 0.016667 | 0.128376 | 0 | 1 |

Table 2 provides a comprehensive overview of data collected from a survey conducted among 180 citizens in Kazakhstan. The survey aims to explore the relationship between the development level of e-government services and corruption levels in the country. The data is broken down into several categories, including demographics, education and employment, and specific metrics related to e-government usage, corruption level perception.

**Demographics**

The demographic analysis of participants in the survey about electronic government services in Kazakhstan presents a nuanced picture of the respondents. The gender distribution skewed towards female participants, who constituted 59% of the sample. This gender representation may reflect differing levels of engagement with electronic government services across genders.

In terms of age distribution, the survey captured a diverse range of age groups, predominantly consisting of younger participants. The most represented age group was 25 to 34 years, comprising 36% of the respondents, followed closely by the 18 to 24 years age group at 31%. The representation decreased progressively in older age brackets, with 20% in the 35 to 44 years range and 11% in the 45 to 54 years group. Participants above 55 years and those younger than 18 years were the least represented, each constituting less than 3% of the sample. This age distribution suggests a higher engagement with electronic government services among younger populations.

The majority of participants resided in large urban centers, with 82% living in major cities such as Astana, Almaty, or Shymkent. This urban predominance might influence the accessibility and usage patterns of electronic government services. The remaining participants were distributed between other large (16%) and small (2%) settlements, indicating a broader reach of these services across different urban and semi-urban areas.

Regarding educational background, a significant portion of the survey participants held higher education degrees. Those with a bachelor's or specialist's degree formed 57% of the respondents, followed by 35% with postgraduate (master's) degrees. This high level of educational attainment among the participants could correlate with their ability to access and utilize electronic government services effectively.

The abovementioned may suggest that e-government services are currently more accessible or popular among younger, urban, and educated populations. While this high accessibility among

a tech-savvy cohort is positive, it raises questions about the inclusivity of e-government platforms. The underrepresentation of older, rural, and less-educated demographics indicates areas for improvement in accessibility and outreach.

The employment status of the respondents varied, with a substantial majority (69%) being fully employed. Students constituted 19% of the sample, indicating the inclusion of the younger, academically engaged demographic. Self-employed individuals and part-time workers formed a smaller segment of the respondents. The variation in employment status provides insights into the diverse usage of electronic government services across different occupational sectors.

Income levels among the participants also showed diversity. The most common income bracket was between 500,001 to 800,000 tenge, reported by 20% of the respondents. This was followed by income ranges of 350,001 to 500,000 tenge and 800,001 to 1,500,000 tenge. This income distribution suggests the accessibility of electronic government services across various economic strata.

Marital status further diversified the demographic profile, with a slight majority (51%) of participants not being married. Approximately 40% were married, while the rest were in civil partnerships, divorced, or widowed. The variation in marital status underscores the widespread applicability and relevance of electronic government services to individuals in different life stages.

**E-government usage**

Starting with the frequency of use, we see that survey participants demonstrate a diversity in their engagement with electronic government services. Many of them resort to these services several times a year, indicating that digital channels have become an important part of their interaction with government structures. However, a significant portion of participants also indicated regular use of these services, which may reflect a deeper integration of digital solutions into citizens' daily lives.

In the context of preferred services, state service portals such as e-Gov and Kaspi occupy a central place in usage, highlighting their importance as primary access points to governmental functions and services. The inclusion of citizen complaint platforms and informational portals in the analysis also reveals a desire among citizens for active participation in governance processes and access to information.

The assessment of the effectiveness of these services shows that the majority of participants find them effective or very effective. This could reflect the successful adoption and implementation of digital solutions in public administration in Kazakhstan. However, a small number of participants expressed opinions about the ineffectiveness of some aspects, representing an important signal for further development and improvement.

Analysis of individual aspects such as ease of use, speed and quality of service, and reliability, shows a generally positive picture. Most participants noted a high ease of use and good quality of service. However, some responses indicate the need for improvement, especially in terms of reliability and service speed.

Individual comments from participants further enrich this picture, presenting opinions ranging from high praise for convenience and accessibility to criticism related to technical problems, user interface, and data security issues. These comments represent a valuable source of information for further improvement and adaptation of services to user needs.

**Corruption Perception**

Measuring corruption perception level, the average ranking is at 7.86 out of 10, where 10 is extremely high. This general trend closely aligns with the Corruption Perception Index provided by Transparency International for 2022 (36 out 100).

A notable trend in the responses is the recurrent mention of the police and law enforcement and judicial system, either in combination with each other or with other sectors like healthcare and education. This pattern suggests a public perception that these areas are particularly susceptible to corrupt practices. Additionally, there were individual responses that broadly stated corruption is prevalent in all sectors or did not specify any particular sector.

Most of respondents or their acquaintances have faced corrupt practices (63%). Many experienced a range of negative effects, from financial costs to barriers in legal, educational, and professional areas. This diversity in responses underscores the varied and complex ways in which corruption can infiltrate and affect different aspects of daily life.

The survey's exploration into how the citizens of Kazakhstan perceive the changes in corruption levels over the past five years reveals a nuanced view of the country's anti-corruption landscape. While there is no overwhelming consensus on whether corruption is increasing (21.7%) or decreasing (26.7%), the diverse views underscore the varied experiences and interpretations of

corruption among the populace. The perception of unchanged corruption levels being the most common response (51.7%) may point to a need for more visible and impactful anti-corruption initiatives to shift public perception and more effectively tackle the issue.

In response to the open-ended question about additional comments on corruption and its consequences in Kazakhstan, participants provided a variety of perspectives and insights. respondents provided insightful observations that reveal a nuanced understanding of the issue. Many characterized corruption as a systemic problem, deeply embedded in the societal structure, akin to a legacy issue impeding fairness and equity. The responses included personal stories highlighting the impact of corruption in critical sectors like healthcare and education, where bribery and favoritism often obstruct justice and equal opportunities. Some comments emphasized the need for a shift in both administrative strategies and societal attitudes to effectively combat corruption. Amidst these perspectives, there were expressions of resignation, highlighting the widespread and discouraging nature of corruption, along with concerns about its enduring impact on future generations. This mix of views paints a complex picture of a society confronting the multifaceted challenges of corruption, with a clear call for comprehensive and sustainable solutions.

**Role of intermediaries.**

Most of the respondents (more than 80%) believe that using E-government helps to reduce the need for intermediaries and minimizes the opportunity for corruption. Therefore, the development of electronic services and platforms could be assumed as the tool for further eliminating intermediaries and reducing the scale of corrupted areas.

While more than half of the responses show the perception of increasing transparency due to the introduction of E-government, about 40% of the interviewees remain neutral regarding the positive impact of E-government on accountability of the government.

Similar results (the majority of neutral responses) are received from the evaluation of the level of citizens' engagement with the government that the E-government platform provides. Along with it, most of the respondents mentioned that this service strengthens the sense of collaboration between the government and population.

**Empirical results and analysis**

**Correlation test**

The empirical investigation into the association between e-governance variables, mediators, and the perceived level of corruption in Kazakhstan yielded ambiguous results. Table 3 shows the first step of the analysis – correlation table, which is used to preliminarily investigate correlations between variables of interest.

**Table 3.**

Correlation table

| | Corr_lvl | Pers_Exp | Freq_egov | Effici~y | Speed | Quality | Reliab~y | MO_sum | Age |
|---|---|---|---|---|---|---|---|---|---|
| Corr_lvl | 1 | | | | | | | | |
| Pers_Exp | 0.0693 | 1 | | | | | | | |
| Freq_egov | 0.1075 | -0.1455 | 1 | | | | | | |
| Efficiency | 0.198 | 0.0186 | 0.1785 | 1 | | | | | |
| Speed | 0.1984 | 0.0953 | 0.0627 | **0.5304*** | 1 | | | | |
| Quality | **0.2739*** | 0.0775 | 0.0842 | **0.5550*** | **0.7060*** | 1 | | | |
| Reliabilty | 0.2432 | 0.0828 | 0.0672 | **0.5339*** | **0.5090*** | **0.5931*** | 1 | | |
| MO_sum | **0.3033*** | 0.0123 | 0.0758 | **0.3138*** | 0.2306 | **0.2611*** | **0.3383*** | 1 | |
| Age | 0.1226 | -0.1169 | -0.1168 | 0.0304 | -0.0292 | 0.0641 | -0.0213 | -0.0462 | 1 |
| Gender | -0.0019 | 0.1295 | -0.1007 | 0.0454 | 0.0614 | 0.1236 | -0.0003 | -0.0674 | 0.0057 |
| Education | -0.0889 | -0.0713 | -0.0184 | -0.0944 | -0.1351 | -0.1492 | -0.0638 | -0.0404 | **0.2751*** |
| Income | -0.0883 | 0.0403 | -0.1336 | -0.1693 | -0.123 | -0.0106 | -0.0424 | -0.0442 | **0.3015*** |
| City | 0.0542 | -0.1066 | -0.062 | 0.0079 | 0.0397 | -0.0031 | -0.0322 | 0.0113 | 0.0203 |
| Work | -0.1031 | -0.0524 | -0.0785 | 0.0905 | -0.0418 | -0.0172 | -0.0462 | -0.0364 | **0.4256*** |
| Marital | 0.0445 | 0.0262 | -0.0726 | 0.1088 | 0.0255 | 0.0978 | 0.0254 | -0.0916 | **0.3684*** |

| | Gender | Educat~n | Income | City | Work | Marital_st~s |
|---|---|---|---|---|---|---|

| | | | | | | |
|---|---|---|---|---|---|---|
| Gender | 1 | | | | | |
| Education | 0.0094 | 1 | | | | |
| Income | 0.1276 | 0.3055* | 1 | | | |
| City | 0.0195 | 0.0213 | -0.1481 | 1 | | |
| Work | 0.02 | 0.3646* | 0.3421* | 0.0757 | 1 | |
| Marital_st~s | 0.0383 | 0.0244 | 0.2007 | 0.1194 | 0.2738* | 1 |

A positive correlation was observed between the quality of e-government services and the perceived level of corruption (r=0.2739, p<0.05), e-government mediators and the perceived level of corruption (r=0.3033, p<0.05). Correlation table suggests that enhancements in e-gov quality may have a positive effect on the reduction of perceived corruption rate, and that this effect may occur through mediating variables, such as the elimination of intermediaries, transparency, accountability, and reduction of the gap between citizens and the government. In addition, the table indicates a significant correlation between e-government variables (r=0.5304, r=0.5550, r=0.5539, r=0.7060, r=0.5090, r=0.5931, p<0.05) and a significant correlation between e-government variables and e-government mediators (r=0.3138, r=0.2611, r=0.3383). These correlations suggest that the areas of e-government development might be interconnected and occur simultaneously, also enhancing aforementioned factors of mediation.

**Regression analysis**

Table 4 illustrate the estimated results of testing whether the whether the digitalization level has a correlation with corruption level and whether the mediators have an effect on the relationship between e-government and corruption, as discussed in the methodology part of the study.

**Table 4**

Regression analysis

| | M1 | M2 | M3 | M4 |
|---|---|---|---|---|
| | Corrupt_lvl | Corrupt_lvl | corrupt_lvl | corrupt_lvl |
| Age | 0.470** | | 0.447** | 0.506*** |

| | | | |
|---|---|---|---|
| | (3.09) | (2.83) | (3.57) |
| Gender | 0.119 | 0.0497 | 0.149 |
| | (0.42) | (0.18) | (0.55) |
| Education | -0.15 | -0.0676 | -0.0501 |
| | (-0.73) | (-0.31) | (-0.23) |
| Income | -0.0971 | -0.0778 | -0.0667 |
| | (-1.37) | (-1.11) | (-0.97) |
| 1.City | 0 | 0 | 0 |
| | (.) | (.) | (.) |
| 2.City | -0.338 | -0.175 | -0.286 |
| | (-0.63) | (-0.36) | (-0.62) |
| 3.City | 1.452* | 1.354* | 1.525* |
| | (2.59) | (2.29) | (2.01) |
| 1.Work | 0 | 0 | 0 |
| | (.) | (.) | (.) |
| 2.Work | -1.311 | -1.003 | -1.102 |
| | (-1.96) | (-1.30) | (-1.27) |
| 3.Work | -1.456 | -1.342 | -1.206 |
| | (-1.97) | (-1.58) | (-1.23) |
| 4.Work | -2.584** | -2.383** | -2.634** |

| | | | | |
|---|---|---|---|---|
| | (-3.25) | | (-2.91) | (-2.71) |
| 5.Work | -1.846** | | -1.605* | -1.839* |
| | (-3.03) | | (-2.37) | (-2.28) |
| Freq_egov | | 0.189 | 0.166 | -0.0361 |
| | | (1.05) | (0.96) | (-0.04) |
| Efficiency | | 0.0495 | 0.0656 | -0.778 |
| | | (0.21) | (0.28) | (-0.70) |
| Speed | | -0.0351 | -0.0236 | 0.76 |
| | | (-0.18) | (-0.12) | (0.66) |
| Quality | | 0.426* | 0.337 | 1.426 |
| | | (1.98) | (1.43) | (1.21) |
| Reliabilty | | 0.234 | 0.254 | 0.135 |
| | | (1.37) | (1.45) | (0.15) |
| MO_sum | | | | 0.203 |
| | | | | (1.55) |
| c.MO_sum#c.Freq_egov | | | | 0.0126 |
| | | | | (0.23) |
| c.MO_sum#c.Efficiency | | | | 0.0444 |
| | | | | (0.75) |
| c.MO_sum#c.Speed | | | | -0.0432 |

| | | | | |
|---|---|---|---|---|
| | | | | (-0.67) |
| c.MO_sum#c.Quality | | | | -0.0665 |
| | | | | (-0.98) |
| c.MO_sum#c.Reliability | | | | 0.000908 |
| | | | | (0.02) |
| _cons | 9.101*** | 5.873*** | 6.730*** | 3.68 |
| | (10) | (7.97) | (4.9) | (1.55) |
| N | 180 | 180 | 180 | 180 |
| R-sq | 0.089 | 0.092 | 0.164 | 0.243 |
| AIC | 740.8 | 732.1 | 735.4 | 729.4 |
| BIC | 772.8 | 751.3 | 783.2 | 796.4 |

The dependent variable, perceived level of corruption, was regressed against the frequency of e-government usage by citizens, the efficiency of e-government, the speed of e-government services delivery, the quality of e-government services, the reliability of e-government, mediating variables, and control variables.

**Age** has a significant positive impact on perceived corruption (M1: $\beta = 0.470$, $p < 0.01$; M3: $\beta = 0.447$, $p < 0.01$; M4: $\beta = 0.506$, $p < 0.001$), suggesting that older respondents tend to perceive higher levels of corruption.

**City** categorization indicated that living in Astana, Almaty and Shymkent is significantly associated with higher perception of corruption (M1: $\beta = 1.452$, $p < 0.05$; M3: $\beta = 1.354$, $p < 0.05$; M4: $\beta = 1.525$, $p < 0.05$).

**Work** categories showed that being self-employed and employed is significantly associated with a lower perception of corruption (M1: $\beta = -2.584$, $p < 0.01$ and $\beta = -1.846$, $p < 0.01$, respectively).

The e-government variables showed varied impacts:

**Frequency of e-gov usage** did not show a significant relationship with perceived corruption across all models.

**Efficiency of e-gov services** was not significantly related to the perception of corruption, although the direction of the coefficient was positive in M2 and M3, it turned **negative** in M4 (M4: $\beta$ = -0.778).

**Speed of e-gov service delivery** was consistently not significant with a mixed direction in the coefficients across models.

**Quality of e-gov services** showed a significant positive relationship in M1 ($\beta$ = 0.426, $p <$ 0.05), indicating that higher quality is perceived as lower corruption.

**Reliability of e-gov services** did not reach statistical significance, though it had a positive coefficient indicating a trend where higher reliability may be associated with lower perceived corruption.

The **MO_sum**, which represents the average of sum of four mediating variables between e-gov variables and corruption level, showed a non-significant positive coefficient across all models.

The interaction terms of MO_sum with the e-gov variables provided additional insights:

**c.MO_sum#c.Freq_egov** was not significant, suggesting that the interaction between frequency of e-gov usage and the mediating variables does not significantly affect the perceived level of corruption.

**c.MO_sum#c.Efficiency** also did not yield significant results.

**c.MO_sum#c.Speed**, **c.MO_sum#c.Quality** and **c.MO_sum#c.Reliability** interaction terms were not significant, indicating that the multiplicative effects of the mediating variables with e-gov service speed, quality, and reliability are not strong predictors of corruption perception.

In terms of model fit, the R-squared values indicate that the models explain between 8.9% to 24.3% of the variance in perceived corruption levels, with M4 showing the highest explanatory power. The Akaike Information Criterion (AIC) and Bayesian Information Criterion (BIC) values suggest that M4, despite being the most complex, provides a better fit to the data compared to simpler models.

As models M1-M4 did not yield significant results for the variables of interest, we have conducted SEM analysis to more thoroughly examine the interrelationships and correlations between e-government variables and corruption.

**Table 5**

SEM analysis

| | Coef. | OIM Std. Err. | z | P>|z| | [95% Conf. Interval] | |
|---|---|---|---|---|---|---|
| Structural | | | | | | |
| corrupt_lvl | | | | | | |
| MO_sum | 0.1684925 | 0.0326554 | 5.16 | **0.000** | 0.1044891 | 0.2324959 |
| Freq_egov | 0.5052494 | 0.1585919 | 3.19 | **0.001** | 0.1944150 | 0.8160837 |
| Efficiency | -0.0031929 | 0.2484581 | -0.01 | 0.990 | -0.4901619 | 0.4837761 |
| Speed | 0.0595243 | 0.2114300 | 0.28 | 0.778 | -0.3548709 | 0.4739195 |
| Quality | 0.3604662 | 0.2454437 | 1.47 | 0.142 | -0.1205945 | 0.8415270 |
| Reliabilty | 0.1872049 | 0.1885107 | 0.99 | 0.321 | -0.1822692 | 0.5566791 |
| Age | 0.5053402 | 0.1422430 | 3.55 | **0.000** | 0.2265490 | 0.7841314 |
| Gender | 0.1960564 | 0.2771249 | 0.71 | 0.479 | -0.3470985 | 0.7392113 |
| Education | 0.2267004 | 0.1835534 | 1.24 | 0.217 | -0.1330576 | 0.5864585 |
| Income | -0.0079174 | 0.0679179 | -0.12 | 0.907 | -0.1410340 | 0.1251992 |
| City | 0.6746820 | 0.2821452 | 2.39 | **0.017** | 0.1216877 | 1.2276760 |
| Work | -0.1522783 | 0.1220079 | -1.25 | 0.212 | -0.3914094 | 0.0868528 |
| _cons | 0.0000000 | (constrained ) | | | | |
| MO_sum | | | | | | |
| Freq_egov | 0.1412021 | 0.3601760 | 0.39 | 0.695 | -0.5647299 | 0.8471342 |
| Efficiency | 0.9494442 | 0.5019292 | 1.89 | 0.059 | -0.0343190 | 1.9332070 |
| Speed | 0.0172741 | 0.4466695 | 0.04 | 0.969 | -0.8581820 | 0.8927302 |
| Quality | 0.1228331 | 0.5041392 | 0.24 | 0.808 | -0.8652616 | 1.1109280 |
| Reliabilty | 0.9802431 | 0.3897711 | 2.51 | 0.012 | 0.2163058 | 1.7441800 |
| _cons | 11.0668900 | 1.2066270 | 9.17 | 0.000 | 8.7019400 | 13.4318300 |

| | | | | | |
|---|---|---|---|---|---|
| var(e.corrupt_lvl ) | 3.1780010 | 0.3349875 | | 2.5848200 | 3.9073080 |
| var(e.MO_sum) | 14.3782600 | 1.5156010 | | 11.6945000 | 17.6779000 |

LR test of model vs. saturated: chi2(7)   =     22.02, Prob > chi2 = 0.0025

SEM analysis complemented the regression findings and offered additional insights:

**MO_sum** showed a significant positive effect on corruption perception, indicating that as the mediating factors such as transparency and accountability improve, the perception of corruption decreases.

**Freq_egov** had a substantial positive direct effect, suggesting that increased e-gov usage correlates with lower corruption perception.

**City** confirmed the regression results, with significant location-specific effects on corruption perception.

However, SEM also highlighted some direct effects that were not apparent in the regression models:

**Efficiency**, **Speed**, and **Income** were non-significant in SEM, similar to their non-significant regression results.

**Gender**, **Education**, and **Work** were not significant predictors of corruption perception in the SEM framework.

The SEM further revealed significant indirect effects:

Interactions between **MO_sum** and e-gov variables such as **Efficiency** and **Reliability** showed significant relationships, suggesting that the impact of these e-gov variables on perceived corruption is mediated by transparency and the reduction of intermediaries.

Model Fit and Considerations:

The SEM exhibited a good fit, providing a relatively strong framework for understanding the dynamics at play.

However, both the regression models and SEM faced limitations due to non-random sampling, modest sample sizes, and low R-squared values, which highlight the potential for bias and question the generalizability of the findings.

In sum, the results from both analytical approaches suggest that while certain demographic factors like age and location are significant, the influence of e-gov variables on corruption perception is more complex and mediated by factors aimed at increasing governance transparency and efficiency. These findings emphasize the importance of quality in e-gov services and suggest that enhancements in e-governance could be a strategic component in reducing the perception of corruption. However, the presence of unexplained variance in both the regression and SEM analyses indicates the need for further research to uncover additional factors influencing corruption perception.

# DISCUSSION

The investigation into the factors that shape perceptions of corruption in Kazakhstan has been guided by a set of hypotheses concerning the role of e-government. The empirical analyses, encompassing regression models (M1-M4) and Structural Equation Modeling (SEM), were conducted to test these hypotheses.

**Hypothesis 1 (H1)** posits that the level of e-government negatively correlates with the perception of corruption level. This hypothesis is partially supported by the results of the SEM analysis, which indicated that certain e-gov variables, namely the frequency of e-gov usage and the sum of mediating factors (MO_sum), have a significant relationship with corruption perception. While the regression models provided mixed results for e-gov variables, the SEM analysis suggested that higher engagement with e-gov services might be associated with lower corruption perception, affirming the hypothesized negative correlation.

**Hypotheses 2a through 2d (H2a-H2d)** articulate the mediating role of factors such as the elimination of intermediaries, increased transparency, enhanced accountability, and the reduction of the information gap between government and citizens in the relationship between e-government and corruption. The SEM analysis offers substantive evidence in support of these hypotheses. It showed that the mediating factors collectively captured by MO_sum have a significant positive influence on corruption perception, thereby supporting the idea that improvements in these areas could strengthen the negative relationship between e-government and corruption perception. Specifically, the SEM's indication of significant interactions between MO_sum and e-gov efficiency and reliability suggests that the hypothesized mediators do, in fact, play a crucial role in shaping the relationship between e-gov and corruption.

The integration of these mediating factors into the SEM framework highlights their potential to compound the effects of e-government variables, thereby providing an understanding that was not as apparent in the regression models. This supports the premise that e-government's impact on corruption perception is not solely direct but is significantly influenced by these intermediary mechanisms.

However, the discussion must also account for methodological constraints such as non-random sampling and limited sample size, which could influence the results and their interpretation. The modest explanatory power of the models, as indicated by the low R-squared values,

suggests that there are additional factors at play, not captured by the current analysis, that may further illuminate the dynamics of e-government and corruption perception.

In light of these findings and the limitations acknowledged, the implications for policy are manifold. The evidence lends support to the strategy of enhancing e-government platforms with features that promote transparency, accountability, and direct interaction between government and citizens. Such improvements could potentially diminish the perception of corruption by fostering an environment that discourages corrupt practices and enhances public trust.

Future research should strive to address the limitations of the current study by employing randomized sampling, increasing the sample size, and considering longitudinal designs. Qualitative research could also unravel the specific aspects of e-gov services that contribute most effectively to reducing corruption perceptions, guiding the development of more refined e-governance interventions. The mediating roles identified in H2a through H2d should be explored further to confirm their impact and to understand how they might be leveraged to optimize the design and implementation of e-government initiatives.

# CONCLUSION

In general, digitalization is recognized worldwide as an anti-corruption tool since it reduces direct contact points between citizens and public officials as well as increases "the trust in decision makers and public institutions" (Kossow et al., 2018). This study explores if digitalization correlates with a decrease in corruption rates in Kazakhstan. While some studies suggest digitalization can increase transparency and reduce some forms of corruption, although its impact on grand corruption is limited, others argue that success in fighting corruption through digitalization depends on factors like political will and citizen involvement. Our study, in turn, focused on analysis of public perception of interrelations between digitalization and corruption. Survey with 180 responses was conducted to collect data for the regression model that analyzes the impact of digitalization, efficiency of e-government services, and effectiveness of mediators on the corruption level. General findings indicate that in Kazakhstan digital tools and e-government efficiency do not necessarily lead to lower corruption rates without the presence of mediators.

Based on our findings, we came up with the following recommendations:

➢ Establish broad anti-corruption framework, which includes general ICT access especially in rural and less-developed areas, iCT infrastructure, institutions to enforce transparency, accountability and an independent judiciary.

According to Kossow, "to be truly effective, digitalization needs a functioning accountability framework that includes an independent judicial system, press freedom and an active civil society". The Kazakhstani system, definitely, needs the whole circle of these elements in order to provide the functionality of digital governance.

Given the fact that political will and coordinated policies are detected as success factors and tools to increase citizen involvement, whereas ICT infrastructure was identified as a barrier to digitalization in Kz, the building of accountability framework could be determined as a fundamental in the complex anti-corruption strategy.

➢ Based on the survey findings of corruption perception that corruption prevailing in police and law enforcement, judiciary, and healthcare systems it is recommended to focus on these areas in terms of digital tools introduction. Certain online-services as goszakup, e-otinish, etc. that have already proven its effectiveness might be used as a prototype for similar online-tools in police and law enforcement, judiciary, and healthcare areas.

➢ Considering bribery, embezzlement, and abuse of discretion the most widespread corrupt activities (according to survey) policy measures should concentrate on elimination of that particular factors. In this regard, mandatory tax declaration of all categories of citizens would result in ensuring transparency and reducing informal sectors of economy, as a consequence, in eliminating corruption level.

➢ Given the small number of responses, the further research with large random sampling could identify significant variables in the correlation between digitalization and corruption

The abovementioned policy measures are expected to contribute to the anti-corruption state policy to eliminate corruption from our daily lives while progressing in terms of digital and technological development

The study might create room for the further discussion on a causal relationship between digitalization and corruption. Qualitative research may shed light to several factors of e-government's influence on lowering the number of corruption incidents in the country, and onward research may be dedicated to measuring the extent of such impact. Since issues linked with corruption are addressed internationally, this research may be helpful to fill some of the gaps of the topic in the Central Asian context, and lead to the development of effective policies on accelerating the process of digitalization and fighting corruption.

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# APPENDIX

**Survey on Digitalization and Corruption Rates in Kazakhstan**

1. How old are you?
    - Below 18
    - 18-24
    - 25-34
    - 35-44
    - 45-54
    - 55 and above

2. Your gender:
    - Male
    - Female
    - Prefer not to say

2. Where do you live?
    - Astana, Almaty, Shymkent
    - Other cities (more than 200 thousand people)
    - Rural areas (less than 200 thousand people)

2. What is your highest level of education?
    - No formal education
    - Primary education completed.
    - Secondary education completed
    - College/technical training
    - Undergraduate degree holder
    - Postgraduate degree holder
    - Doctorate or professional degree
    - Others: _____

2. What is your employment status?
    - Employed full-time
    - Employed part-time
    - Unemployed
    - Retired
    - Student
    - Homemaker

- Self-employed
- Other__

2. What is your monthly income level on the net?
  - Less or equal to 70 000 tenge
  - 70 001-150 000 tenge
  - 150 001 – 250 000 tenge
  - 250 000 – 350 000 tenge
  - 350 001 – 500 000 tenge
  - 500 001 – 800 000 tenge
  - 800 001 – 1 500 000 tenge
  - Higher than 1 500 000 tenge
  - Prefer not to say

2. What is your marital status?
  - Single
  - Married
  - Divorced
  - Widowed
  - Separated
  - In a domestic partnership
  - Prefer not to say

2. How often do you use E-government platforms to access government services?
  - Daily
  - Weekly
  - Monthly
  - Rarely
  - Never

2. Which e-governance services have you used? (Check all that apply)
  - Online tax payment
  - E-voting
  - License renewals
  - Utility bill payments
  - Public grievance systems
  - Others: _____

2. How would you rate the efficiency of E-government platforms in delivering services?

- Very efficient
- Efficient
- Neutral
- Inefficient
- Very inefficient

2. Please rate the following aspects of e-governance services:
   - Ease of use: (Very Poor, Poor, Average, Good, Excellent)
   - Speed of service: (Very Poor, Poor, Average, Good, Excellent)
   - Quality of service (Very Poor, Poor, Average, Good, Excellent)
   - Reliability: (Very Poor, Poor, Average, Good, Excellent)

2. Any other comments or feedback on e-government services?

3. On a scale of 1 to 10, with 1 being "not corrupt at all" and 10 being "extremely corrupt", how would you rate the current level of corruption in Kazakhstan? _____

4. In which of the following sectors do you perceive the highest levels of corruption? (Choose up to three)
   - Police and law enforcement
   - Judiciary
   - Healthcare
   - Education
   - Public utilities
   - Tax and revenue collection
   - Others: _____

2. Which of the following types of corruption do you believe are most prevalent in our country? (Check all that apply)
   - Bribery: Offering, giving, receiving, or soliciting something of value to influence an official action.
   - Embezzlement: Misappropriation or theft of public funds or property entrusted to an official's care.
   - Nepotism: Favoring family members in matters of appointments or promotions.
   - Patronage: Granting favors, contracts, or benefits in exchange for support or loyalty.
   - Cronyism: Favoring close friends or associates in matters of appointments or promotions, irrespective of their qualifications.

- Fraud: Deception or misrepresentation to secure unfair or unlawful gain.
- Extortion: Coercing someone into providing money, property, or services against their will.
- Money laundering: Concealing the origins of illicit money to make it appear legitimate.
- Abuse of discretion: Misusing one's position or authority for personal gain.
- Favoritism: Unfairly treating some people better than others.
- Others (please specify): _____

2. Have you or someone you know personally experienced corruption in the past year?
- Yes
- No

2. How has corruption affected you personally? (Check all that apply)
- Difficulty in accessing public services.
- Financial loss
- Injustice in legal matters
- Loss of trust in institutions
- I have not been affected.

2. How would you rate the effectiveness of anti-corruption agencies in our country?
- Very ineffective
- Ineffective
- Neutral
- Effective
- Very effective

2. Do you believe that corruption has increased, decreased, or remained the same in the past five years?
- Increased
- Decreased
- Remained the same

2. Any other comments or feedback on corruption and its impact?

3. Using the E-government platform reduces the need for intermediaries (middlemen) when accessing government services.
- Strongly agree
- Agree
- Neutral

- Disagree
- Strongly disagree

2. Direct access to government services through the E-government platform minimizes opportunities for corruption.
   - Strongly agree
   - Agree
   - Neutral
   - Disagree
   - Strongly disagree

2. The E-government platform provides clear and open information about the processes within the public service system.
   - Strongly agree
   - Agree
   - Neutral
   - Disagree
   - Strongly disagree

2. You feel more informed about government activities and transactions due to the E-government platform.
   - Strongly agree
   - Agree
   - Neutral
   - Disagree
   - Strongly disagree

2. The E-government platform allows citizens to effectively monitor and evaluate the performance of public officials.
   - Strongly agree
   - Agree
   - Neutral
   - Disagree
   - Strongly disagree

2. Public officials seem more accountable for their actions and decisions because of the transparency provided by the E-government platform.
   - Strongly agree
   - Agree

- Neutral
- Disagree
- Strongly disagree

2. The E-government platform makes you feel more connected and engaged with the government.
    - Strongly agree
    - Agree
    - Neutral
    - Disagree
    - Strongly disagree

2. The E-government platform fosters a sense of collaboration and partnership between citizens and the government.
    - Strongly agree
    - Agree
    - Neutral
    - Disagree
    - Strongly disagree