

# 04

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## ASSESSMENT

OF THE APPLICATION OPPORTUNITIES OF ARTIFICIAL INTELLIGENCE IN DIGITAL GOVERNMENT IN AZERBAIJAN

## EVALUACIÓN DE LAS OPORTUNIDADES DE APLICACIÓN DE LA INTELIGENCIA ARTIFICIAL EN EL GOBIERNO DIGITAL EN AZERBAIYÁN

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### ABSTRACT

The application of tools and methods based on artificial intelligence in the public sector management process has become a priority issue. Considering this, the objective of this paper was to analyze its use in the field of government and services in Azerbaijan. In the study, the sample study method, the comparative statistical analysis method, the evaluation method and the questionnaire-survey methods were used. A questionnaire with a total of 26 questions was administered to 200 respondents to measure the attitude towards the use of electronic services and digital government applications in the field of administration in Azerbaijan, and the results were analyzed with the SPSS 16.0 program. It was found that despite significant advances in the country in this field, there are still areas of opportunity to work, and it is necessary to educate the population more. The practical importance of the use of modern information and communication technologies in state agencies is justified by their proven benefits; however, their limitations and potential difficulties in their implementation cannot be underestimated.

**Keywords:** smart management, e-government, digitalization, artificial intelligence

### RESUMEN

La aplicación de herramientas y métodos basados en inteligencia artificial en el proceso de gestión del sector público se ha convertido en un tema prioritario. Considerando esto, el objetivo de este artículo fue analizar su uso en el campo del gobierno y los servicios en Azerbaiyán. En el estudio se utilizaron el método de estudio por muestreo, el método de análisis estadístico comparativo, el método de evaluación y los métodos de cuestionario-encuesta. Se administró un cuestionario con un total de 26 preguntas a 200 encuestados para medir la actitud hacia el uso de servicios electrónicos y aplicaciones de gobierno digital en el campo de la administración en Azerbaiyán, y los resultados se analizaron con el programa SPSS 16.0. Se encontró que, a pesar de los avances significativos del país en este campo, aún existen áreas de oportunidad para trabajar, siendo necesario educar más a la población. La importancia práctica del uso de las modernas tecnologías de la información y la comunicación en los organismos estatales se justifica por sus probados beneficios; sin embargo, no se pueden subestimar sus limitaciones y posibles dificultades en su implementación.

**Palabras clave:** gestión inteligente, gobierno electrónico, digitalización, inteligencia artificial

## INTRODUCTION

Artificial intelligence (AI) is a branch of computer science and engineering that aims to create intelligent machines that can perform tasks that typically require human intelligence, such as visual perception, speech recognition, decision-making, and language translation. AI involves the development of algorithms and computer programs that can learn from and make predictions or decisions based on data (Lu et al., 2018). AI can be categorized into different types based on the intelligence it demonstrates, such as analytical, human-inspired, and humanized AI, which correspond to cognitive, emotional, and social intelligence. Alternatively, AI can also be classified according to its evolutionary stage, namely Artificial Narrow, General, and Super Intelligence. However, regardless of the type or stage, when AI becomes widely used, it is often no longer recognized as true AI. This phenomenon is known as the AI effect, where observers undermine the capabilities of an AI program by asserting that it lacks genuine intelligence. As Arthur Clarke, a British science fiction writer, once stated, "Any sufficiently advanced technology is indistinguishable from magic." Yet when one understands the technology, the magic disappears (Haenlein & Kaplan, 2019).

According to Zhang & Lu (2021), some of the applications of AI in industry include intelligent risk control, intelligent consulting, credit rating, and image recognition for foreign exchange trading charts. However, there are many other potential applications of AI in various fields such as medicine (Hamet & Tremblay, 2017; Johnson et al., 2018), marketing (Davenport et al., 2020), tourism management (Li et al., 2021). Furthermore, there is a lot of excitement about using artificial intelligence (AI) technologies to improve government operations and public services. Opportunities in the public sector stem primarily from the innovative disruptive power of AI in three areas: (1) improving internal public administration efficiency, (2) improving public administration decision making, and (3) improving citizen-government interaction, including the provision of better and more inclusive services and the enhancement of citizen participation in public sector activities. AI, as a potentially disruptive sociotechnical phenomenon, is important to the full range of government activities, both as a regulator and a stimulus for R&D (governance of AI) and as a user (governance with AI or AI in government) (Medaglia et al., 2023). However, recent research on eGovernment has revealed that there are still significant barriers to public sector organizations embracing innovations, particularly when it comes to information and communication technologies (van Noordt & Misuraca, 2022).

Today, many member countries of the Organization for Economic Co-operation and Development and developing countries are formulating e-government strategies. The scientific developments achieved in the field of information technologies in the last century made this issue even more prominent. Work in the field of artificial intelligence is currently underway in the presence of many policy areas, such as ethical dilemmas, digital data management, privacy, national security, rational decision-making, technical superiority of global technology companies, legal framework, employment, and acquisition of new professional skills (Ahmadov & Mahammadli, 2015). The USA, China, Russia and European countries are the countries where we can see examples of these developments. Considering the case of Azerbaijan, the formation of "Electronic Government" in our country is based on international experience. In 2020, the Republic of Azerbaijan received a rank of 0.71 in the "e-government" index presented by the UN every two years (Milli Majlis of the Republic of Azerbaijan, 2004) which shows some advances although there is still work to be done.

Artificial intelligence has been researched for many years, and the main goals of this research can be classified as follows: 1) Digitization of traditional human activities, 2) Identification of models simulating these processes. In addition, there are different approaches underlying these goals, and these approaches can be both technical and human-related. Also, although the orientations, theoretical features and working processes of the approaches used are different, they are not mutually exclusive. In this regard, one of the goals in AI research is the creation of artificial intelligence products with the ability to think, and this process has gradually evolved although nowadays, there is no specific unifying theory that guides modern AI research. Considering the above, the objective of this paper is to analyze the possibilities of application of artificial intelligence in the field of government and services in Azerbaijan. For this, the development of the field of artificial intelligence is initially analyzed from a historical approach, and later, through statistical methods, inferences are made for its application in the country.

## MATERIALS AND METHODS

For conducting the research different methods were used. Initially, a review of the literature on the subject under study was carried out. Literature review plays a very important role in scientific research. Their role ranges from contextualizing and theoretically grounding the study, to identifying gaps in existing knowledge and formulating pertinent research questions. It also helps to avoid duplication of efforts and to design sound methodologies by

analyzing previous approaches. In addition, the literature review supports the conclusions and discussion by comparing results with previous research, thus contributing to the credibility of the work. By exploring diverse perspectives, you can also generate innovative ideas and fulfill an ethical responsibility to acknowledge and give proper credit to prior research.

Also, a questionnaire survey was conducted to measure citizens' attitudes towards the use of electronic services and digital government applications. The results were analyzed using the SPSS 16.0 program. During the research, a total of 26 questions were asked to 200 respondents. In the questionnaire, questions were asked about respondents' gender, age range, marital status, education, labor activity, region of registration, and monthly income in order to know the characteristics of the demographic sample. Among the 200 participants, half were men and half were women. The indicators of participation by age grouping of the persons participating in the survey were: 35.5 percent of respondents was 16-25, 27.0 percent was 26-35, 16.0 percent was 36-45, 12.5 percent was 46-55, and 9.0 percent as 56-65 years old. Most of the respondents who participated in the study come from Baku, Sumgait and Absheron regions.

To process de data different statistical methos were used. Cronbach's Alpha test was used to determine the reliability of the survey. "KMO and Bartlett's" Tests were also conducted to determine the factors and ensure their validity. In order to understand significant differences between group means in relation to a continuous dependent variable, the analysis of variance technique of a single factor, known as One-Way ANOVA, was also conducted. This is used in statistics and data analysis to compare the means of three or more independent groups. In cases where significant differences were found, the Scheffe test was used. Its main objective is to control the experimental type I error when making multiple comparisons between groups.

## RESULTS AND DISCUSSION

### Development of artificial intelligence field

Artificial intelligence is the ability of a computer, or a technical system controlled by a computer to perform human-like actions, thinking, and the study of these systems. The term artificial intelligence was first used by John McCarthy in 1956, although its beginning can be traced in 1943, when Warren Sterdjis McCulloch and Walter Pitts used artificial neural networks as a model in their research. This model was based on 3 theories that existed in the 20th century (Linna Jr. & Muchman, 2020, p. 29):

- theory of propositional logic.
- neuron theory.
- computational theory.

One of the successful results of the model was that properly defined artificial neural networks were proven to be able to acquire perceptual habits. With this, two main approaches of artificial intelligence were shown (Semih et al., 2018, p. 60):

- symbolic artificial intelligence.
- cybernetic artificial intelligence.

These two approaches are currently discussed in terms of theory of mind and relational computing. Symbolic AI produces open symbol structures with the principle of consistency. The principle of operation of the programs used during its operation is to compare or change activities and behaviors. Algorithms applied in this model are executed at the same time, otherwise known as parallel.

The approach and methods used in the research of McCulloch and Pitts have had a significant impact on the field of artificial intelligence. However, besides these two approaches, there are other approaches of artificial intelligence. The working principle of the cybernetic intelligence approach, which is one of the main approaches in the field of artificial intelligence, is to create a similar or identical human mind and brain. This approach has been researched for many years, and the research is not only related to computer science and cybernetics, but also to neuroscience and physiology.

Chronologically, symbolic artificial intelligence was explored more in the 1960s, when cybernetic artificial intelligence was partially abandoned. Only 20 years later, cybernetic artificial intelligence research became a subject of research again. Research in the symbolic artificial intelligence approach increased in the 1950s with the development of digital devices and other technical means. During the research conducted at that time, it was proved that it is possible to reduce human intelligence to symbolic manipulation. Symbolic artificial studies were conducted in various research centers, each of which had a specific research direction, and these centers were as follows: Carnegie Mellon University, Stanford University, and Massachusetts Institute of Technology. "In the middle of the last century, machines using electronic networks were developed to replicate the human brain. W. Gray Walter's Turtle and Johns Hopkins Beast robots are examples of these" (Hilal, 2020, p. 28).

Marvin Minsky and Dean developed the first artificial neural network computer called SNARC in 1950. In this technology, a B-24 with 3000 vacuum tubes was used to

control a neural network consisting of 40 neural cells. With this mechanism, simulation of the brain of not only people, but also animals were shown. Thus, the brain of a mouse learning the way in the created labyrinth was imitated. Each nerve cell was associated with a point in the maze and showed that the “mouse” recognized itself at that point in the maze. Other nerve cells that were activated indicated which path the mouse could take.

In the middle of the last century, an article entitled “Computing machines and intelligence” by A. Turing was published in “Mind” magazine. This article examines the answer to one question: “Can machines think like humans?”. According to Turing, the machine would not think, but imitate. After that, the test would be conducted. The test had one volunteer participant, one survey specialist, and one computer. The request was made in secret, it had to be indicated either through the keyboard or the screen. Consecutive questions were asked, and as a result of the test, although the interviewer could not detect the respondent, the computer did. Discussions on this topic are still ongoing. One position in this debate was expressed by Newell and Simon in the physical symbolic system hypothesis.

Another such experience is called the “China Room”. In this experiment, a respondent who does not speak Chinese is placed in a room filled with baskets containing Chinese writing. A book is also given to the person. Outside the room there are people who carry out the manipulations described in the book and they know Chinese. The actions of the person in the room are similar to the actions of a computer to control the characters. In these experiments, different methods are used to solve a different problem. For example, neural networks can solve problems solved by pattern recognition techniques. But, if we talk about modern artificial intelligence, we should mention that Japanese scientists for the first time demonstrated a robot named Alter with artificial intelligence. The electrical signals used in this robot are similar to the neural networks in the human brain, so this robot could imitate a human. It should be noted that the theory of artificial intelligence used in the development of the robot belongs to Lofti A. Zadeh.

The approach that forms the basis of classical artificial intelligence has evolved into four main forms:

Cognitive simulation: In this approach, the specific problem faced by people and their attempts to find a solution were mutually explored in other forms.

Logic-based approach: John Carty, who analyzed the approach, believed that technical tools did not need to imitate the human brain, but rather that humans should

use artificial intelligence algorithms to try to find a solution to the problem they were facing. Classification, planning and application of the data to be used are key issues. A logic-based approach has been explored at Stanford University, the University of Edinburgh and elsewhere in Europe. LISP and PROLOG programming languages are one of the most important tools for this approach.

Information-based approach: In the 1970s, with the development of computers with large amounts of memory, specialized systems and machines began to be developed in various fields. The idea of using more specialized software equipped with knowledge in a specific area of expertise, rather than a general-purpose program that can solve every problem it encounters, has led to a revival in the field of artificial intelligence. With this, specialist systems developed.

The orientation approach is a goal-oriented model that emerged at the end of the last century. Already during the 1960s, symbolic artificial intelligence approaches achieved great success in simulating high-level thinking in small-scale applications. However, during the 1980s, progress in research and discoveries in symbolic artificial intelligence stalled, and it was concluded that symbolic systems could never fully mimic all processes of human cognition. In particular, processes such as robots, machine learning and pattern recognition are examples of this. A group of researchers began to move toward “symbolic” approaches to certain AI problems. One of these approaches was the Nouvella Artificial Intelligence approach, whereby Robotics and AI researchers such as Rodney Brooks moved from a symbolic AI approach to making robots move and survive. But they gave up and started analyzing engineering problems.

It should be noted that researchers should consider all approaches, not just one approach. There may even be problematic issues that require the use of several approaches. Theoretically, we can group the inter-approach integration models as follows:

- symbolic.
- sub-symbolic.
- different approaches.

Connections with other fields can also be developed when using such models. Typical problems used in artificial intelligence theories are as follows (Herpig, 2019):

- Identification of writing and sound.
- Computer vision.
- Virtual reality and imaging.

- Game theory.
- Strategic planning.
- Making rational decisions

In the 1990s, artificial intelligence researchers developed sophisticated mathematical tools to solve certain subproblems, and these tools played an invaluable role in the development of artificial intelligence in various fields. Nowadays, artificial intelligence is one of the most relevant and developing fields in modern science. However, the development and application of artificial intelligence as a science has always been controversial, with various optimistic and pessimistic opinions about it (Milli Majlis of the Republic of Azerbaijan, 2010). As the leading user of artificial intelligence is the state itself countries should take a multilateral approach to this area. These aspects can be both positive and negative as shown in table 1. As can be seen from the table, these applications have both advantages and disadvantages, therefore, every country should perform planned and systematic activities in the field of artificial intelligence.

Table 1. Pros and cons of countries' approach to AI development.

Superiority	Difficulty
Artificial intellect in the field development should turn it into an investment direction	Privacy issue piece in attention should be
Distance in relations with citizens and time problems can be partially solved	Difficulties in data collection can persist
It can already save money	Gaps in the legal framework
Democratization and transparency can be ensured.	Changes in the labor market should be avoided.
Reduction of administrative burden	Risk management
Improve the work with databases	Control mechanism in decision-making

Source: owner elaboration

Assessment of possibilities of application of artificial intelligence in Azerbaijan

In modern economic conditions, artificial intelligence technologies and innovations in this field show their practical impact in many sectors. With the 4th industrial revolution, which has been on the agenda of the world community and the world of science since 2011, artificial intelligence has increased its share in the management of

both the private and public sectors. These changes have made most of the datasets, their quality indicators, their efficient and correct use more meaningful (Aliguliyev & Imamverdiyev, 2021)

The number of active users of digital services is increasing year by year. For example, if there were 45 million users of electronic services in the Republic of Turkey in 2019, the goal of increasing this number for 2023 is 53 million. The use of electronic services in Azerbaijan is also increasing year by year. The report of the Center for the Development of Electronic Government dedicated to the results of 2020 states that the number of users of "ASAN Login" increased more than 3 times compared to 2019 and reached 1 million 741 thousand. The number of registrations for 443 electronic services on the "E-Gov.az" portal increased by 175,000 to 1,266,000. On the "myGov" portal, the number of users increased 10 times compared to 2019 to 433,000. Based on the report of EHIM on the results of 2020, we can compile the statistical indicators for 1 year as in table 2. As can be seen, the number of users is increasing year by year.

Table 2. Use of the electronic government portal in the Republic of Azerbaijan in 2019-2020 and the number of users

	2019	2020
User account number	41520	433568
New users	41520	392048
Notices	82000	3249000
Total number of uses of the services	739000	11530000

Source. (Jafarov, 2020).

In the Republic of Azerbaijan, the cost of developing software and providing advice in this field in the form of public services amounted to 7,202,000 thousand manats in 2003, and in 2019, this figure amounted to 22,745,000 thousand manats. Funds for data services in the Republic of Azerbaijan have increased 38 times over the past 15 years (Jafarov, 2020).

In particular, it should be noted that this number was twice as high in 2019 as compared to 2018. The growth of such services was manifested not only in the public sector, but also in the non-governmental sector. If the volume of information and communication services in the non-state sector was 812.7 million manats in 2009, in 2019 this figure was 1836.2 million manats. In the country's economy, domestic and foreign capital investments in the field of information and communication have been proportionally the majority in the past 2 years.

In 2019, the Republic of Azerbaijan ranked 64th in the global index of artificial intelligence assessment. In the study conducted by the United Nations every 2 years on the assessment of electronic government applications, the e-government index rate remained at 70 in 2020 compared to 2018. The e-participation index decreased by 6 points and became 73. Azerbaijan is behind the leaders of the region and sub-region (South Korea and the United Arab Emirates, respectively). However, Azerbaijan is higher than the global average indicators of providing electronic services and region-sub-region.

Artificial intelligence tools are applied in various fields of production. In manufacturing, artificial intelligence improves quality management and creates efficiency in the use of various resources. The application of artificial intelligence in various fields results in an increase in work speed, rational decision-making, and optimization of activities. Artificial intelligence-based applications used in production prevent deviations and lack of planning. In this sense, one of the main areas where artificial intelligence is used is the production of agricultural products. For example, artificial intelligence tools are used by the company "Abundant Robotics" in the United States, and information about the product is collected through drones when planting various types of products, such as apples and barley.

As said before, a questionnaire survey was conducted to investigate the citizens' attitudes towards electronic services and digital government. Cronbach's Alpha test was used to determine the reliability of the survey and as the test result was 0.854 the study has high reliability. "KMO and Bartlett's" Tests show the validity as it can be seen in table 3.

Table 3. Validity test

Adequacy		0,546
Bartlett's test		
	Chi-Square value	3,29E+03
		153
	Sig. The value	0

Source: Owner elaboration

According to the results of the "KMO and Bartlett's" test, the study is valid, and this indicator by factors is as follows (Table 4).

Table 4. Factors

Num	Initial values			Extraction of Quadratic Loads			Rotation of Quadratic Loads		
	Fri	Difference	Annual.	Fri	Difference.	Annual.	Fri	Difference.	Annual.
1	6,46	35,873	35,873	6,46	35,873	35,873	4,83	26,812	26,812
2	3,2	17,761	53,634	3,2	17,761	53,634	3,04	16,867	43,679
3	1,62	8,974	62,608	1,62	8,974	62,608	2,4	13,336	57,015
4	1,26	6,983	69,591	1,26	6,983	69,591	1,8	10,007	67,022
5	1,18	6,557	76,148	1,18	6,557	76,148	1,64	9,127	76,148

Source: Owner elaboration

Based on the results of the test, 5 factors were investigated in the study and this study, analyzing a total of 76,148 percent of our subjects. Later, reliability factor analyzes were performed, the results are shown in Table 5.

Table 5: Reliability mean analysis.

	Gender.	Number	Average	Deviations
Reliability	Woman	100	2.8650	,69215
	Man	100	2.9100	,87438

Source: Owner elaboration

According to the results of the test, there is no significant difference between gender groups on these factors. Then, equality of variances test was conducted. According to the test of equality of variances, there is no difference between the variances, and according to the t-test, the value of Sig. (2-tailed) is 0.687, so there is no difference between men and women on this factor. We also conducted the same test on the difference factor and obtained the following results (Table 6).

Table 6. Equality of variances test

		Variances		T-test						
		F	Num.	T	Df	Num.	Average	Std. Error	95%	
									Down	Up
Reliability	Equal variances are taken	7,556	,007	-.404	198	,687	-.04500	,11152	-,26491	,17491
				-.404	188,088	,687	-.04500	,11152	-,26499	,17499

Source: Owner elaboration

An Independent-Sample T-test was applied to analyze the awareness factor, which we considered as one of the factors that showed differences between men and women (Table 7):

Table 7. "Independent-Sample T" Test

	Variance test		T-test						
	F	Num.	T	df	Num. (2-tailed)	Mean difference	Std. Line difference	95% Confidence Interval of the Difference	
								Down	Up
Indifference	2,205	,139	,598	198	,550	,07000	,11696	-,16066	,30066
			,598	192,745	,550	,07000	,11696	-,16069	,30069

Source: Owner elaboration

According to the results of the test, the average answers of women and men to questions on this factor were 2.8650 and 2.9100. This shows that there is no significant difference. According to the results of the test, the average answer of women to questions addressed to this factor was 3.6480, and men's was 3.5200. Also, according to the results of the t-test, Sig. Since the (2-tailed) value is greater than 0.05, we can prove that there is no difference between women and men on this factor.

At the next stage of the research, the "Paired Sample Statistics" test was conducted. The main purpose of conducting this test is the mutual analysis of the reliability factor and the situation of encountering cyber-attacks during the Karabakh war, which is one of the current issues in Azerbaijan in the recent period. The average answer of the respondents to the question "I encountered a cyber-attack during the Karabakh war" was 2.1350, and the total value of the reliability factor was taken as 2.8875. As a result of the analysis, since the (2-tailed) value of 0.000 was obtained, we can note that there is a relationship between the question "Have I experienced a cyber-attack during the Karabakh war"

and reliability. Based on the results of the test, it can be noted that such cyber-attacks and other dangerous situations affect people's trust in artificial intelligence and digital services.

"One-way ANOVA" test was then performed to study the relationship between the reliability factor and the educational levels of the respondents. The results are shown in Table 8.

Table 8. ANOVA test for reliability

	Fri	Df	Average	F	Num.
Between groups	6,558	3	2,186	3,67	0,01
Groups are internal	116,66	196	0,595		
Fri	123,22	199			

Source: Owner elaboration

According to the results, there is a difference on this factor between groups of education levels. We used the Scheffe test to find this difference, and the results are shown in Table 9

Table 9. Multiple comparisons

Education	Education	Average	Error	Num.	95%	
Middle	Occupation	-0,077	0,275	0,99	-0,852	.6984
	Bachelors	-.06317	0,1525	0,98	-.4932	0,367
	Master.	0,33012	0,1568	0,22	-0,112	0,772
Professional	Middle	0,07703	0,275	0,99	-.6984	0,852
	Bachelors	0,01386	0,2583	1	-.7144	0,742
	Master.	0,40714	0,2608	0,49	-.3283	11.426
Will be.	Middle	0,06317	0,1525	0,98	-.3669	0,493
	Profession t.	-.01386	0,2583	1	-.7421	0,714
	Master.	,39329*	0,1252	0,02	0,0402	0,746
Master.	Middle	-0,3301	0,1568	0,22	-.7723	0,112
	Vocational education	-.40714	0,2608	0,49	-11.426	.3283
	Bachelors	-.39329*	0,1252	0,02	-.7463	-.0402

Source: Owner elaboration

According to the results of the test, the difference was noticeable between the bachelor's degree, the master's degree and doctoral degree. We think that the level of education has a great influence on such factors. Answers to a number of questions addressed to the respondents were analyzed by means of the "cross table" test. Thus, the answers of women and men to the question "I know my rights regarding the use of personal data" show that, there is no significant difference between the gender groups of the respondents on this factor. Through this test, the age of the respondents and the area in which they use digital services were also analyzed. According to the results of the test, there is a preference for digital services in the use of financial services.

The results of cross-tab tests shown that there is activity among the respondents in using financial services. However, on the use of health services, the respondents over 35 years of age is considerable low. It was also found that measures should be taken to achieve accessibility to electronic services from other regions. For this, educational events, special



videos can be prepared. At the next stage of the research, correlation and regression tests were conducted. First, the correlation between the respondents' opinions between focusing on the citizen and awareness factors during the provision of electronic services was established. Since the correlation index was 0.525, we can claim that there is an average level of correlation between the mentioned factors, and Sig. According to the (2-tailed) indicator, we see that there is a significant relationship between the factors. According to the results of the test, the correlation index drops from 0.353 to 0.343 when the level of education is not taken into account (Table 10). This is not a significant difference. Then, by means of the non-parametric "Spearman's rho" test, the models related between the educational levels of the respondents and the factors of reliability and religiosity were built.

Table 10. Correlation test between factors

Indifference	Correlation	1	0,35	-0,11	
		Significance	.	0	0,12
		Df	0	198	198
	Reliability	Correlation	0,35	1	-0,15
		Significance (2-tailed)	0	.	0,03
		Df	198	0	198
	Level of education	Correlation	-0,11	-0,15	1
		Significance (2-tailed)	0,12	0,03	.
		Df	198	198	0
Level of education	Indifference	Correlation	1	0,34	
		Significance	.	0	
		Df	0	197	
	Reliability	Correlation	0,34	1	
		Significance	0	.	
		Df	197	0	

Source: Owner elaboration

We hypothesize that there was a significant relationship between reliability and conscientiousness factors used in our study. According to the results of the test, the relationship between the factors is 12.5 percent and there is a significant relationship. Then, a regression relationship was established between awareness and reliability factors. Based on the obtained results, there was a relationship between reliability and awareness factors. We can note that this relationship is directly proportional. When using artificial intelligence tools, citizens and other persons should be aware of the rules of use, rights and duties, and safety measures. At this time, they can judge the reliability factor correctly. The fact that the respondents are aware of their rights regarding the use of personal data, the region in which they are registered, the ability to use electronic services from any region, and their awareness when they encounter cyber-attacks were analyzed through the following test. According to the Adjusted R Square indicator obtained as a result of the test, the model we built is a significant model of 76.9 percent.

A test was conducted to adjust the relationship of significance. According to the ANOVA test, there is a significant relationship between these factors (Table 11).

Table 11. Coefficient test between factors

M	standardize not raised	Standard- made	T	Num.	Collinearly			
	B	Error	Beta			Tolerance.	VIF	
One	(Constant)	1,406	,121		11,618	,000		

To use electronic services from any region I know	,156	,018	,311	8,898	,000	,949	1,053
Region	-,056	,058	-,033	-,982	,327	,998	1,002
Which authority should I contact in case of cyberattacks? I know	-,008	,022	-,015	-,380	,704	,731	1,368
Regarding the use of my personal data I know my rights	,540	,025	,888	21,963	,000	,709	1,411

Source: Owner elaboration

According to the results of the test, we can note that the awareness of citizens in the current field is significantly related to the questions “I can use electronic services from any region” and “I know my rights regarding the use of my personal data”.

Through this analysis, the question addressed to the citizens in the questionnaire, “Education measures should be held for citizens to use artificial intelligence tools”, and “Increased E -government services during the Covid-19 pandemic” were found the following (Table 12):

Table 12: Model summary of difference factor and other questions

Model	R	R squared	Corrected R	Std. Evaluation error
One	,743a	,553	,546	,46854

Source: Owner elaboration

The model explains 54.6 percent of the relationship between these questions and is a significant model. According to the results of the test, there are relationships between the awareness factor and the answers to the questions “I use e-government services more during the Covid-19 pandemic” and “Education measures should be held for citizens to use artificial intelligence tools “. According to the results of the ANOVA test, a significant relationship was established between the factors.

Based on the results of the analysis, it can be said that the perception of the supply and demand for digital services increased during the pandemic. And according to the efforts and the current tendency we can predict that this will also continue in the post-pandemic period. Considering this factor, citizens need to be constantly contacted by the relevant institutions and given the necessary information.

## CONCLUSIONS

The increasing use of Artificial Intelligence (AI) tools in government and public services has significant advantages, such as task automation, data-driven decision-making, service improvement, and fraud detection. However, it also has limitations, such as bias and a lack of transparency in the results, concerns about privacy and data security, as well as technological dependency. It is important to address these ethical and security challenges to ensure responsible and beneficial use of AI in public administration. During the application of artificial intelligence tools in the digital government, foreign and advanced practices should be mutually analyzed with indicators and opportunities in the country. One of the main goals here is to examine the impact of indicators on citizen-state relations. Also, the variability of growth

in the quality and speed of services in state institutions should be determined. Especially during the COVID-19 pandemic, various simplifications should be made regarding the application of artificial intelligence tools, which are used more intensively, but security measures should always remain in force. It should be taken into account that the application of artificial intelligence tools leads to saving financial resources and management costs, then the analysis of research in this direction and comparisons with the state budget over the years should show its role in state programs.

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