Artificial Intelligence, Blockchain Technologies, and Digital State Services in Georgia

General Overview of Georgian E-government Environment

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Abstract

The paper will describe the general state of e-government in Georgia based on various secondary sources. It will present the official digital services, representing forms of digital government, including G2C (Government to Citizen), G2B - (Government to Business), and G2G (Government to Government). In the framework of the article, the State digital products in Georgia will be discussed in the context of the existing theories about e-government.

Although the paper will be descriptive in nature, where Georgian e-services will be grouped according to fundamental theories about e-government, the article is of great international importance. It is the first English-language paper to reflect the most Georgian state digital services. Existing international researches on e-government are based on assessments of the situation by local and international experts and does not describe the digital services available in the country. This paper will provide the international scientific community with information about public e-services in Georgia and present them in the context of the existing theories of digital governance.

Key Words: E-governance; G2C; G2G; G2B; Digital services; Artificial Intelligence; Blockchain.

Introduction

The development of modern technology has brought the world to Electronic Governance. With the broadest sense of the mentioned term- E-governance is a bilateral communication between government and society. There are many ways governments are trying to implement modern technologies in the governance process.

Digital technology accelerated the progress of humanity and, in many countries, improved the governance process. One of the main benefits of E-Government is a digital system of public service delivery (Bashar, 2011). Governments are using modern technologies to provide citizens with electronic services online in developed states. Although the e-governance phenomenon is quite a novice, there are several well-established theories about the forms of online interactions between the government and society: Government to Government (G2G), Government to Business (G2B), and Government to Citizens (G2C) (P. Paramashivaiah, 2016; Belanger, 2005).

G2C form of e-government enables the communication between the public and government, thus increasing the efficiency and flexibility of the process (Liu, 2018). Governments are trying to provide citizens with as many public e-services as possible, which reduces bureaucratic costs and increases the efficiency of public management (Kazmi, 2010). Citizens can access public services online without leaving their homes, which reduces the cost and time of services and increases the effectiveness of communication.

G2B form of E-government- refers to the digital communication between the government and the business sector. Implementation of modern technology allows businesses and the government to communicate without the need for any middleman directly. Besides G2B initiative offers significant advantages like more transparency and ease in doing business (Thakur 2020).

According to the article "E-Governance Dimensions and Performance Measures: Conceptual Framework regarding G2B Initiatives" published in 2020, the "government focused on G2C initiatives in the beginning years, but now the emphasis on G2B has increased. From the literature search, it was found that very few studies have been published on G2B, but since now G2B interactions has grown-up due to its various advantages some authors have explored this area" (Joseph, 2009).

G2G form of e-government aims to enable governments and organizations related to them to work together more efficiently and better serve citizens within key lines of business (Laskaridis, G., 2008). This is a category of e-government that focuses on interactions between a government and its various agencies to support transactions such as horizontal and vertical integration (Joseph, R. 2009)

Digitalization of the government process increases the transparency and accountability of the authorities (Nawafleh, 2012). In many democratic countries, a particular legislative framework exists that obliges government agencies to disseminate public information regularly; citizens have the right to request additional data digitally.

In the 21st century, information is one of the main cornerstones of democracy. If citizens do not have information about the ongoing processes in the country, they will not be able to participate, and democracy does not work without public participation. On the other hand, implementing digital tools in this process encourages citizens' engagement in political and social activities (Manoharan, 2012).

A well-informed and socially aware individual is an active and engaged citizen with sufficient motivation, knowledge, and the ability to be actively involved in social and political processes. E-government is an opportunity for involved citizens to influence the political decision-making process in various ways (Koneru, 2007).

The electronic form of communication and citizens' involvement in the decision-making process increases the government's legitimacy and trust (Tolbert & Mossberger, 2006), as the society itself becomes a participant and co-author of the decisions (Wihlborg, 2014).

Besides the fact that e-government is a tool to engage citizens in the political process, it can also be an effective tool for gathering information about citizens' needs and demands (Liu, 2018). Electronic means of communication allow the government to replace traditional referendum and plebiscite forms, which demand financial resources and human capital (Wright, 2012).

1. Digital State Services in Georgia

Since 2011 Georgia has been engaged in the international program "Open Government Partnership"- OGP – in which the country has already carried out 3 action plans and implemented dozens of state digital services. The electronic services implemented in the framework of the OGP that are most suited to the G2C form are classified in the given part of this article.

From 2012 to 2019, Georgia has implemented three OGP action plans. According to the documents, the country has developed e-government services based on four challenges, including:

- Challenge I: Improving Public Services
- Challenge II: Increasing Public Integrity.
- Challenge III: better management of public resources.
- Challenge IV: Creating Safer Communities

As part of these challenges, 46 digital services were identified that needed to be introduced and implemented.

Overall, the analysis of OGP action reports shows that the government has been able to fully or "mostly" introduce 36 out of the mentioned 46 services. Services represent mainly a model for e-government (G2C), which in turn can be divided into three main areas: informational, public service delivery, and participatory.

According to the analyzed reports of the three action plans, from 2012 to 2019, the government has (fully or mostly) fulfilled 10 obligations, addressed to increase informational digital services (Administration of the Government of Georgia 2020).

Most services were introduced in the public service delivery sector. In the last ten years, the government has fulfilled 17 obligations (Table N1), including the introduction of dozens of e-services that allow citizens to receive public services online, including digital portal of state procurements system - "procurement.gov.ge," government auctions online portal - "e-auction.gov.ge," etc.

One of the most important outcomes of the OGP implementation process - digital signature and online authentication, made it possible for any citizen of Georgia to manage official activities and conduct business remotely using the citizen's electronic portal- "my.gov.ge," which is in turn divided into

different categories and includes dozens of services, such as health care, social issues, business registration, etc.

In implementing the G2C form, OGP's action plans also included the e-services that would allow citizens to be involved in decision-making. Ichange.gov.ge is the state e-portal of e-petitions, allowing customers to participate directly in political processes by initiating electronic petitions. It must be noted that the obligation to introduce this portal was not implemented within the framework of several action plans, and it was implemented only in 2017.

Table N1 E-services implemented in the Framework of OGP Information/monitoring Digital services Electronic participation

Information/monitoring	*Digital public services*	*Electronic participation*
– State portal of e declarations. E-declaration.gov.ge. – Creating a monitoring system for public declarations. – Innovations for more transparency and efficiency of public procurements. – Increasing citizens' engagement in the public finances monitoring process. – Increasing accessibility of the national archive documents. – Creating catalogs of the Ministry of internal affairs (MIA) archive. – Reports of political parties. – Publication of financial reports of parties in a processable format – Implementation of the portal "Zugdidi-INFO."	– digital system for state procurements: www.procurement.gov.ge; – state auction online system: www.eauction.ge – Creating mobile app of emergency service- "112" – Digital signature; and online authentication. – Creating alternative ways to contact emergency service – "112 ". – Adapted version on the MIA page. – Creation and running the Citizens portal My.gov.ge. – Development of "my.gov.ge"- +15% of users; + 10% of electronic service. – Portal for companies to present their reports online. – The introduction of digital services in selected pilot municipalities. – Develop an electronic system for up to 10 services within the competencies of local self-government. – Configurations electronic document management system in the municipality.	– Creation and running of the digital portal of petitions- Ichange.gov.ge. – Implementation of the petition portals on Zugdidi city hall official webpage. – Creation of electronic portals for Budget planning in several municipalities (Batumi, Ozurgeti, Kutaisi, Akhaltsikhe);

Even though most Georgian State digital services were implemented under the OGP action plans, there are dozens of e-services in Georgia established in the frames of various programs and projects. For example, the web- portal of Service Development Agency – SDA.gov.ge unites 37 G2C type digital services which are not connected to the central portal of e-services- My.gov.ge

1. Passport
2. Reception of the finished document by mail service
3. Certificates of birth, marriage, change of name and/or surname, adoption and death; Primary birth and death certificates
4. Issuance of a certificate on the absence of obstacles to the marriage
5. Granting Georgian citizenship by exception
6. Renounce Georgian citizenship
7. Recruitment for consular registration
8. Residence permit
9. Granting the status of a compatriot living abroad
10. Compatriot document
11. Consent - Expression of permission required by a person to act within the authority of the Agency
12. Power of attorney - granting a representative authority to a third person required to act within the authority of the Agency
13. Information card
14. Certificate of total head of livestock;
15. On-site service
16. Check the place of registration
17. Check the status of the document
18. Apostille / Legalization Email. Registry
19. Electronic register of applications
20. Change of name and/or surname
21. Verification of the validity of the certificate
22. Emigration Permit
23. Registration and assignment of a personal number of a person legally residing in the Autonomous Republic of Abkhazia or the Tskhinvali region
24. Postponement of the obligation to leave Georgia
25. Maintaining Georgian citizenship
26. Determining the citizenship of Georgia
27. Granting Georgian citizenship based on the temporary right by way of restoration
28. Notification on termination of the basis of the residence permit
29. Legal recognition of a name change
30. Interesting statistics
31. Change of place of registration
32. Electronic Apostille
33. Booking ritual services in advance

34. Neutral ID card
35. Register of Deregistered Persons
36. Electronic ID card
37. Neutral travel document[1]

Most G2C e-services are connected with My.gov.ge; For example, if a citizen of Georgia wants to use one of the digital services offered by the National Agency of Public Registry (NAPR), after choosing a service on the NAPR.GOV.GE, they are forwarded on the central digital portal My.gov.ge. NAPR offers approximately 200 e-services, united under the 8 primary directions[2]:

1. Real Estate Registry
2. Registry of Entrepreneurs and Non-Entrepreneurial (Non-Commercial) Legal Entities
3. Information Services and Chancellery
4. Registry of Economic Activities
5. Registry of Public Legal Restriction and Tax Pledge / Mortgage
6. Pledge / Leasing Registry
7. Address Registry
8. Information from the technical accounting archive

To summarize, it can be said that Georgian citizen's portal My.gov.ge covers most of the digital state services offered to the population, even though not all digital state services are integrated on the mentioned portal. Therefore, the primary tool to implement G2C e-governance in the country is a web page created in OGP action plans.

As for the primary tool to communicate with the business sector, the portal of the legal entity – Revenue Service, which works under the Ministry of Finances of Georgia – is one of the most frequently used digital tools in the country. In 2021, more than 670 thousand taxpayers used the online services of the Revenue Service of the Ministry of Finance.[3]

[1] Remote Services of LEPL Service Development Agency https://sda.gov.ge/?page_id=4118
[2] Remote Services of LEPL National Agency of Public Registry https://napr.gov.ge/p/1934
[3] Remote Services of LEPL Revenue Service https://rs.ge/NewsArchive?newsId=533

2. Blockchain technology implementation

The National Agency of Public Registry (NAPR) uses blockchain technology to provide citizens with a digital land title certificate. According to a European Commission report – "NAPR partnered up with Bitfuri Group, which provides solutions based on the Bitcoin protocol, and the project started in April 2016. The aim of using blockchain is to increase public confidence in property-related record-keeping. It helps Georgia fight corruption and resolves disputes over property claims.

The following steps can characterize the process of adding or changing a land title:

1. A citizen can initiate a request to the service hall or a notary to register or verify a land title extract, just as in the traditional system.

2. The notary registers the land title on the private Exonum blockchain.

3. The private Exonum blockchain hashes are anchored on the public Bitcoin blockchain. This guarantees the integrity of all transactions in the Exonum blockchain, up to the latest anchored block in the Bitcoin blockchain.

4. NAPR provides the citizen a digital certificate of their asset, supported with the cryptographical proof of the originality of the extract, published on the Bitcoin blockchain" (Allessie D, 2019). According to the statistic provided by the mentioned legal entity, from February 20, 2017, information on any real estate statement is automatically sent to the blockchain system. After integrating the system, more than 200,000 data have been posted in the blockchain. Blockchain data cannot be deleted, modified, copied, or illegally manipulated.[4]

3. Artificial Intelligence

According to the projects discussed above, it can be said that Georgia is trying to implement modern technologies to improve the quality of G2C, G2B, and G2G forms of E-governance. The country has introduced dozens of state digital services, but the question is if they are as effective as expected. Besides, Georgia has introduced blockchain and artificial intelligence systems to increase the effectiveness of state agencies. According to the report published by the organization "Institute for

[4] Information about Blockchin System of NAPR https://napr.gov.ge/p/1568

Development of Freedom of Information" (IDFI), six Georgian state agencies use AI technology in their activities. Bellow will be provided citations from the IDFI's report "Artificial Intelligence: International Tendencies and Georgia - Legislation, and Practice," describing each Agency's AI projects (IDFI 2021).

"Facial Recognition System of - the Expert-Forensic Main Division of the Ministry of the Internal Affairs, operates the automated face recognition systems application, which was purchased in 2013. The system is equipped with the functions of Deep Learning, 3D photo-robot creation, video analysis, and machine learning. The program is a habitoscopic identification system that performs face recognition by comparing two specimens, including subjective portraits (photo robots). According to the Agency, the program is used to provide informational support for the registered cases under investigation and carry out criminal proceedings.

License Plate and Face Recognition System - LEPL Public Safety Command Center of the Ministry of Internal Affairs - "112" has introduced software for recognizing state license plates in addition to facial recognition software. Both of the above programs are used to detect administrative offenses, safeguard public order, protect personal safety and property, and facilitate investigations. It should additionally be noted that the facial recognition program is integrated with a network of video cameras installed across the country and operates in real-time, captures the biometric data of the persons reflected on the video material, and compares them with the database of wanted individuals.

Ibm I2 Artificial Intelligence Analytical Software – In 2020, the prosecutor's office of Georgia implemented IBM 2 analytic program - I2. The program allows its users to integrate banking and telephone statements and other information obtained from various sources of different formats into the program. The program analyzes, sorts, and structures data and is able to detect connections between two or more networks, detect patterned behaviors and latent threats, and track criminal activity through automatization and visualization of dry data processed in a short period of time. It is possible to receive and process data in the system in real-time.

Automatic Analysis of Sentiments– In 2017, LEPL, the National Tourism Administration within the project "Emotions Are Georgia" framework analyzed and categorized public posts published on social networks by people visiting Georgia were. Artificial intelligence was used in two directions: for the identification and categorization of objects, locations, landscapes, and other figures depicted in public

photos, and the determination of the sentiments expressed within the texts of public posts (positive, negative, neutral) as revealed through their analysis.

Associative Data Analysis - LEPL The Education Management Information System uses Qlik sense analytics system for data visualization and reporting. It integrates a general education management information system and reporting (number of students and teachers in different contexts, such as according to the school year, school dropout rates, etc.). The program's official website reveals that it possesses the function of associative data analysis based on artificial intelligence.

Dlp And Translation Memory Module – LEPL, the National Center for Educational Quality Enhancement, uses Office 365 with a built-in DLP module based on artificial intelligence. DLP is a data loss prevention module that identifies sensitive and personal data through machine learning, classifies them, and performs automatic encryption whenever the risk of data loss is detected. It also provides automatic blocking of unauthorized intrusions into the system and automates various security processes. The artificial intelligence component is also in evidence with the translation software *SDL Trados Studio* - the software has so-called "Translation Memory," which is automatically filled in by translators/editors through the addition of new terms and then automatically offers various sentence translation suggestions for translators, which is a simple example of machine learning."

4. E-government Level in Georgia

Although the E-governance phenomenon is a novice, the study of the level of digital government according to the individual UN member states has started from 2001. The UN Department of Economic and Social Affairs (UN DESA) carries out a global e-government survey from 2001. The United Nations E-Government Survey, published bi-annually, is the most comprehensive and influential research, including the result of all UN member states, and analyzes the e-government development index worldwide. The results are based on the three main pillars - divided into many sub-pillars:

- Online resources.
- Informative communication infrastructure.
- Human capital.

The given article analyzes all materials published within the framework of the UN study. To better understand the tendencies of the Georgian e-government development, all the indices from 2001 to 2018 assigned to Georgia will be visualized in diagrams.

4.1. UN Online service component

The Online Service Index (OSI) is one of the significant research areas in the United Nations e-government survey. It is based on a special questionnaire (The Online Service Questionnaire - OSQ), consisting of 140 questions. Local experts evaluate each country according to a pre-designed universal questionnaire. The online services index is determined by assessing the digital services, which on their side are divided into three levels:

- Informative level - a citizen can find certain public information on state portals.
- Service delivery level - digital public services available in the country.
- Possibility of engagement and conducting complex electronic operations - a citizen has digital access to be engaged in the decision-making process.

Local experts use more than 100 indicators to assess their countries' "electronic capabilities." Based on the data obtained, the online services index of a state is determined, which, together with indices of the ICT infrastructure and human capital, determines the ranking of e-government of the UN member states.

In the framework of the given thesis, all the indices that Georgia received during the nearly 20-year (2001-2018) study of e-government by the United Nations were analyzed. According to the UN survey, from 2003 to 2018, the Georgian e-services have been developing almost symmetrically, except for the 2008-2010 data (UN 2008). In August 2008, Russia attacked Georgia through military and cyber forces, occupying the country's territories and cyberspace. The hackers associated with the Russian authorities have shut down all major government portals. Georgia was not ready to repel a powerful cyber-attack. The 2008 cyber-attack on Georgian online space may be one of the reasons for the regression in the 2010 survey (UN 2010).

On the other hand, according to 2012 data, Georgia has made unprecedented progress in the development of e-services. This is the time (2011) when Georgia became a member of the Open

Government Partnership (OGP), an international project, and in the framework of OGP Action Plan 2012-15, began implementing digital e-services, results of which were reflected in the e-services development index.

According to the results of the 2018 survey, with an online service development index of 0.7 (out of a maximum of 1), Georgia has joined the list of countries with high levels of e-services. However, it should be noted that the research does not explain what type of e-services were implemented or the index of customer use of these services.

4.2. Level of ICT infrastructure

According to the UN survey, the second indicator for determining the e-government index is the development of information communication infrastructure (ICT) in the country. This index is determined based on 5 pillars:

- Number of Internet users per 100 people
- Number of fixed telephone line users per 100 people
- Number of mobile phone users per 100 people
- Number of mobile internet users
- Number of broadband Internet users.

The obtained data is weighed, and the information communication infrastructure index in the country is determined. Based on the data from the UN surveys, the development of ICT infrastructure in the country started in 2012 (UN 2012). As mentioned above, this is the period when Georgia began implementing the OGP Action Plan, which may be one of the main reasons for improving the country's ICT index. Besides, simultaneously with this process, internet provider companies started to spread broadband internet networks in 2011. According to the UN 2018 study, the ICT infrastructure index in Georgia is rated with 0.54 points.t should be noted that in collecting the ICT data, the UN itself is guided by secondary sources.

4.3. Human Capital

The third key indicator used to rank the world countries' e-government development index is human capital; in particular, this index measures the number of potential e-service users within a country. The index is determined based on the data of four components: adult literacy, gross enrolment ratio, expected years of schooling, mean years of schooling (UN, 2018).

The significant decline in the period 2010-2014 is due to the changes in the research methodology, in particular from 2012, the 3rd and 4th indicators- "Expected years of schooling" and "Mean years of schooling" were added as research tools to measure human capital in the country, which led to significant changes. Overall based on the 2018 report, Georgia's human capital index is 0.83330.

As was mentioned above, the overall E-governance index of the country is defined by the combination of the three components- The online service index, ICT infrastructure, and Human capital. In 2018 Georgian index of online service development was - 0.69440; ICT infrastructure- 0.54030; Human capital - 0.83330. Based on these results, Georgian EGDI (E-governance development index) was 0.6893, placed 60 out of 193 UN countries (UN 2018).

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