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Digital Government as Exponential Organization: New Technologies of Communication*

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ABSTRACT

The article explores the exponential transformation of the digital government. Exponential organizations are the common model of management that characterized by the use of the informatized environment, third-party resources and digital platforms to scale processes and create new markets. The digital government is a complex of institutions for structuring social relations and conflicts in a network environment. The coupling of exponential organization and digital government models is realized through the focus on technologies of communication that allow the exchange and integration of surrounding knowledge into the system of management. The article presents the typology of technologies of communication with external and internal communities depending on the type of environment (internal/external) and options of access (inclusive/exclusive). The typology systematizes technologies of communication and demonstrates its capabilities for solving various tasks, including involving new agents in the field of public policy, organizing access to institutions, creating/extracting value, reducing the cost of information exchange between management structures. Technologies of communication allow the government to move to the policy of identifying and interacting with the diversity of the environment. The effects of the introduction of these technologies are evaluated on the example of Estonia. In conclusion, it is possible to consider the digital government as the exponential organization due to the information connectivity of the system, but it is difficult to unambiguously conclude the explosive growth of the value creation/extraction due to the functioning of the state as a non-equilibrium adaptive system.

Keywords: digital government; exponential organization; communication technologies; public services; e-residency; smart-cards; e-voting

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PROBLEM STATEMENT

Among recent technological developments, attention is focused on self-integrating systems, digital agents, physical neural networks, cloud platforms, real-time incident management centers (https://www.gartner.com/smarterwithgartner/3-themes-surface-in-the-2021-hype-cycle-for-emerging-technologies). In this context, organizational innovations become relevant, enabling the use of new technologies for information integration of management systems and interaction with environmental diversity.

One of the most common models are exponential organizations, capable of significantly increasing productivity through access to internal and external information resources. Digital environment favors the emergence and development of exponential organizations, because offers new tools for analyzing and modelling the development of the organization and extends the range of possible third-party resources in the form of big data, community engagement, integration with other platforms. The introduction of platform and cloud solutions also allows for the offsetting of intermediate levels of organization management, further reducing transaction costs.

Exponential organizations are becoming a common model, which can also be extended to the structures of the digital state. From this perspective, the digital state is seen as a platform, into which system are included integrated information systems and omnichannel communication technologies, this reduces operating costs and opens up opportunities for personalized and proactive public services. Taking into account structural characteristics, the state as a complex institution the introduction of technologies of exponential organizations, provides the state with additional instruments of transaction management, formation of institutions, creation of value and income, stimulating civic innovation and improving public sector efficiency — thus, the consequences of exponential transformation may be larger than the creation of an "invisible state", "client-oriented state", "states as services".

Conjugation digital state and exponential organization models raises several issues:

1) the extent to which the characteristics of exponential organizations can be directly transferred to the digital state level;

2) what complex of digital state technologies is formed in accordance with the exponential transformation and the solution of what tasks they are aimed at;

3) what political and socio-economic effects does the introduction of this complex of technologies have on the examples of specific empirical cases.

The article successively addresses the issues listed.

EXPONENTIAL ORGANIZATIONS: TECHNOLOGY TO INCORPORATE THIRD-PARTY RESOURCES INTO THE WORK OF THE ORGANIZATION

A central role for exponential organizations is played by an informational environment that concentrates a variety of data sources and flows. The advantages of exponential organizations include in the ability to generate and absorb data flows, focusing on the quality of information management and by refusing from the bureaucratic machine model to flexible network/platform structures.

Continuous data growth allows exponential organizations to continuously scale processes (which reflects the exponential function used as a metaphor [1]). Examples of such organizations include companies Airbnb, Quirky, Valve, Tangerine etc. These companies combine the growth of market capitalization per employee and a faster product development cycle, which makes it possible to classify them as exponential organizations [2]. In addition, these companies create new markets, so exponential growth is often provided by the "pioneer effect" and early entry into the market before the saturation process begins. Supporting growth and

Table 1

Technologies of exponential organizations

Technologies to maintain stability and control the organization	Technologies of growth and deal with uncertainty
• Interfaces • Dashboards • Experimenting • Autonomy of structural units • Social technologies	• Personnel on request • Internal and external community • Using algorithms • Using third-party assets and resources • Stakeholder involvement

Source: compiled by the author.

faster product development requires the introduction of certain technologies that can be divided into two groups (*table 1*).

Features of exponential organizations can be illustrated by the example of the company Quirky, past way the start-up to one of the market leaders of "smart" houses [3]. Through the digital platform, the company collects consumer ideas about the need for different technologies for automation and improvement of convenience of life, experts then assess their prospects of becoming a real product. If a product was created on the basis of the idea, the name of the proposer is indicated on the package and he gets his part from each sale of the proposed technology. Quirky also has an agreement with Uber to marketing its products, where users can buy Quirky products through the Uber app, and the products will be delivered to the customer without having to pay for the delivery. As an exponential organization, Quirky uses community ideas, pool of experts and technological resources of other companies to reduce development costs and product marketing, actively implementing interfaces and electronic services in management processes to track processes in real time. Analysis of other companies with exponential growth in new markets shows similar technologies [4–7]. Dematerialization of the value creation process and democratization of user/customer access to corporate services are further emphasized [8], which allow exponential organizations to abandon cumbersome management structures.

Thus, an exponential organization as a common management model for organizations of different sizes encompasses two dimensions: aggregation and analysis of data using algorithms and online tools, as well as involving various internal and external communities, resources, services. Information openness and connectivity allow exponential organizations to use a variety of third-party resources, predict market trajectories and create complex products/services in emerging markets, supporting continuous growth.

Exponential organizations are seen as a management model available for adaptation by organizations of different sizes. However, account should be taken, that exponential transformation requires combining the principles of exponential organizations with the established structural characteristics of the most transforming organization. This interface often involves revising and adapting the technologies of exponential organizations to solve their own tasks; therefore, the results of exponential transformation are unique for different types of organizations. The digital state can be considered as a separate type of organization, in view of the multidimensional scope of the State as a complex system of institutions, its exponential transformation is associated with increased information openness and connectivity not only of the management apparatus, but also infrastructure for citizens and business. As a consequence, the exponential transformation of the digital state requires the prior identification of the interface between these types of organizations.

CONJUGATION EXPONENTIAL ORGANIZATION AND DIGITAL STATE MODELS

Transfer of technologies of exponential organizations to the level of the digital state is possible with preliminary identification of features of the state as a system of interconnected institutions. The multiplicity of structural characteristics of the State determines the variety of analytical optics and ways of describing them. In domestic and foreign literature, the digital state is often considered in the context of preserving democratic institutions and procedures in the new technological environment [9–11], this is due to uncertainties in the impact of digital management tools and the need to specify their capabilities. However, for the purposes of this research, it is relevant to consider the digital state in a broader theoretical perspective, taking into account the structural characteristics of the state as a set of institutions. Despite the emergence of some articles on rethinking the theory of the state in the digital environment [12, 13], offering theoretical optics for explaining the logic of digital state actions and the method of applied systematization of digital state technologies remains in demand.

To define the interface between the digital state and the exponential organization, seems promising a combination of political-economic [14–17] and critical [18–20] approaches to the study of the State, with an emphasis on new practices and strategies, especially in the digital State. The State appears to be a consolidated agent of the management, whose tasks include: creation of a system of representation of the management space, expertise of knowledge, decision-making and management of social conflicts, as well as the establishment of institutions/structures to legitimize and protect property rights, create and extract value, share risks and reward public sector investment. Different digital State results — e-government, services and platforms — form a network infrastructure and are conductors for solving these problems in the new technological reality.

Unlike corporations, the state does not consider infrastructure, services, production, communities as external resources. These resources are initially included in the public policy field as objects of management, and the State has higher costs than corporations to create value, build institutions and manage emerging social conflicts. If exponential organizations focus on third-party resources as a way to create/access new markets for explosive growth and scaling, that new technologies of interaction with existing and emerging objects of management are relevant for the digital state, their inclusion in the public interest through appropriate institutional status. Similarities between the digital State and the exponential organizations are linked to policies of engagement and coordination, therefore, the interconnection of these models depends on the allocation of the mechanism through which the implementation of such a policy is available.

Consideration the digital state as an exponential organization is possible in terms of the state's introduction of new technologies of communication with internal and external communities. In this case, communication is understood as interaction, exchange and integration of knowledge into the system of state representation of the space of management to create information connectivity. Communications cover the main operations of the State in the field of research and design of digital data based on their objects of management within the given theoretical optics. The results of such communication are public registers and services, information systems, data exchange platforms that accumulate information and provide a virtual management field. Communication is therefore becoming a means of linking digital state and exponential organization models (*fig. 1*): if for exponential organization of communication — a way to

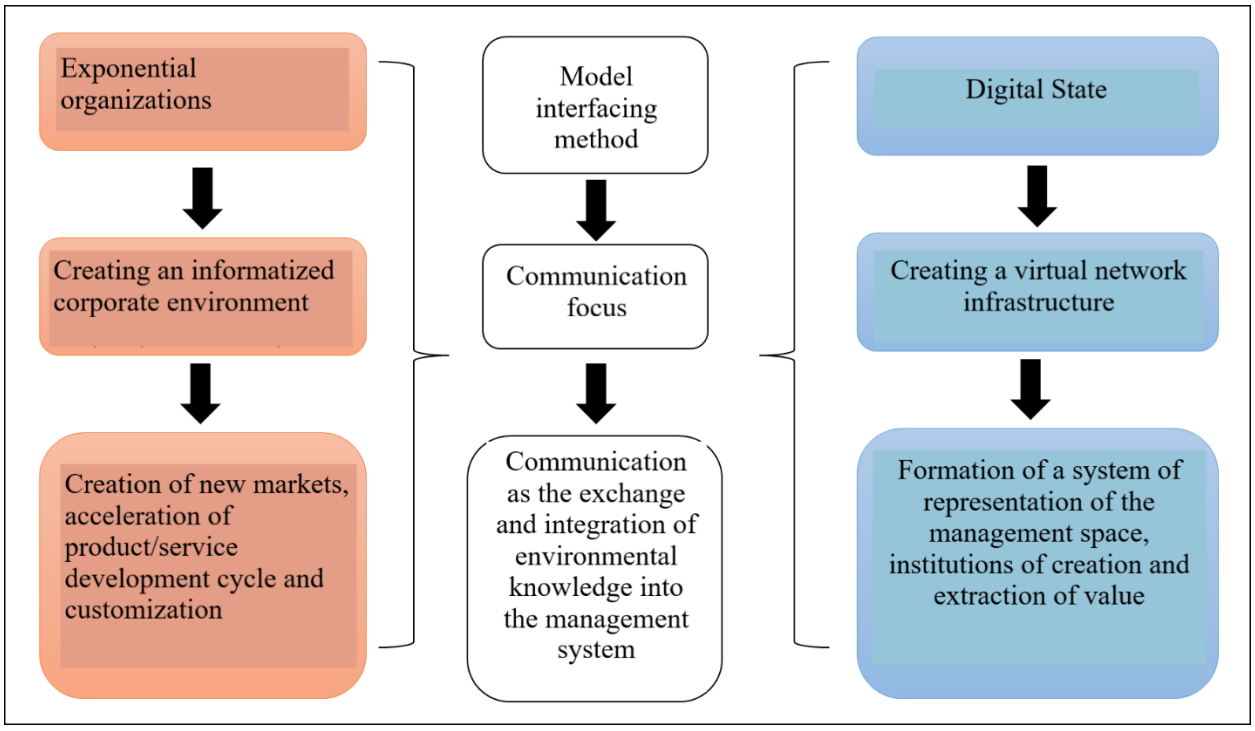

Fig. 1. **Coupling models of exponential organization and digital government**

Source: compiled by the author.

attract third-party resources to accelerate product development and create new markets, then for the digital communication state — tool to consolidate different management information fields into one virtual environment to implement the tasks described above, related to institutional regulation and management of social conflicts. Communication focus allows critical assessment of the generality of the exponential organization model, because the diversity of communications in each individual case makes it possible to analyze the distribution of risks and benefits of technological transformation by the state.

COMMUNICATING THE DIGITAL STATE WITH EXTERNAL AND INTERNAL COMMUNITIES: TYPOLOGY OF TECHNOLOGIES AND CAPABILITIES

The digital state is often described through government service lines and includes three dimensions: "Government-to-Government" (G2G), "Government-to-Business" (G2B), "Government-to-Citizen" (G2C). These directions are not homogeneous and different groups exist in each dimension — public service consumers, therefore, it is possible to talk about the communication of the digital state with different external and internal communities, which are united by common demands and requirements to the state. Communication with these communities means that the digital State receives data to develop policies to provide access to public institutions and services and to engage in decision-making processes.

It is proposed to use parameters such as environment type and access options for typologizing digital state communication technologies with external and internal communities. The type of environment (external/internal) indicates whether the community is initially within or outside the territorial boundaries of the state: in the conditions of the creation of virtual ecosystems, the State is also able to communicate with citizens, and agents

Table 2

Technologies of communication of digital government with external and internal communities

Access options / Environment type	Internal	External
Exclusive	• Smart-Card Identification (ID-cards) • Electronic cards in the field of education, health, tax administration, etc. • Data embassy	• E-residency • Digital citizenship
Inclusive	• Open data • Inter-agency data exchange platform (X-Road) • Data marketplaces and other formats of collective data management	• Open data • Data marketplaces and other formats of collective data management • Citizen engagement platforms

Source: compiled by the author.

formally stateless, but their status and access to government online resources are different. In this regard, the previously studied phenomenon of digital citizenship [21, 22] is given a formalized status, which are claimed, among others, by representatives of other countries. Access options (exclusive/inclusive) reflect the direction of the engagement policy through data collection and analysis: exclusive communication technologies interact personally and are linked to participate in the process, inclusive implies collective management, information sharing and participation of different actors. Thus, the typology identifies the following communication technologies with external and internal communities (*table 2*).

These technologies are not a simple substitute for analog documents for electronic services and have more significant effects for the state to represent the management field. First, they combine a significant number of online activities available to citizens and organizations, reducing the cost of access to institutions and decision-making. Second, they reflect the local experience of users, allowing for adjustments in the planning and allocation of resources according to the real practices of citizens. Third, using the example of these communication technologies, it is possible to observe the embedding of state institutions into a virtual environment, which expands the space and number of management agents. However, each of the technologies in the table implements these benefits in different ways.

- **ID-cards** are considered as the basic communication technology of the digital state with the internal communities, primarily the citizens. In most cases, smart-cards contain a proof of identity function and the ability to use public services, however, add access to political institutions, including voting, citizen engagement and public participation platforms. The range of functions linked to a smart card varies between countries, but multifunctionality reduces citizens' costs of access to institutions and offsets intermediate levels of government, reducing the distance between the State and the population.
- **Data embassy —** are servers that support a country's critical infrastructure and are under its jurisdiction, but are geographically located in another country. Data Embassy combines basic data registers with personal and departmental data, and is created in the

event that a country cannot govern its own territory as a result of information attacks, natural disasters or military invasion [23]. Data Embassy is exclusive as it contains data linked to specific administrative authorities (court, the I.R.S, etc.) and does not involve collective management and sharing of data with third-party agents. Currently, the data embassy has a limited number of countries (Estonia and Bahrain) due to data retention risks.

• **E-residence** is a new, largely experimental technology of business registration and operation in another country. Technically, electronic residence — a special smart-card confirming the right of foreign organizations to register a company, obtaining banking services and tax obligations in a given country without having to obtain citizenship or residence permits. E-residency is conducive to attracting foreign businesses to emerging markets, as well as transferring knowledge and innovation: IT-professionals, freelancers, business consultants and other service providers are the majority of e-residents [24], which allows you to assign technology to communication with external communities on an exclusive basis. Through e-residency technology, the digital state receives additional sources of innovation and value recovery without having to incur social obligations to citizens. However, as a precondition for the introduction of e-residency, it is possible to indicate the quality and trust of institutions that encourage foreign business to invest in the country.

• **Open data** contain information on the results and resources of the implementation of public policies, thus contributing to increased transparency of the authorities. Open data posting is available in various forms, including relevant sections on ministries' websites and specialized portals, however, it is becoming increasingly common to integrate open data into a single electronic/digital State platform. It should be noted that open data — is a consequence of the quality of institutions and civic engagement, since the publication and use of open data are designed to provide control and opportunity for public expertise, promote civil and commercial projects based on information provided. Accordingly, through open data technologies, the State enables citizens to provide requirements to the system, but at the same time creates a channel for civic self-organization and innovation for the economy.

• **X-Road** integrates information from public registers and databases, providing access to all governance structures and maintaining data privacy. These platforms aim to reduce transaction costs in the exchange of information between agencies, as well as reducing the financial costs of information systems by integrating them. From the point of view of the digital State's communication technology with the internal community, the inter-agency data exchange platform — a way to reduce the asymmetry between models for describing the management field of different structures and services: openness and access to basic registers and information systems implies coherent and proactive government policies.

• **Data marketplace —** is an approach to collective data management that allows citizens to sell or exchange their data for other data or services. Data are now becoming sources of value creation and retrieval, so the introduction of data marketplaces aims to provide equal advantages for use by both commercial organizations and citizens [25]. The task of the digital state is to regulate the activity of market-place platforms, as well as to change the legislation on data. Additionally, the introduction of data marketplaces requires the development of compatible systems for data transfer between different platforms, as well as the transparency of the algorithms used. In the future you can expect the implementation of a whole group of new communication technologies, related to collective data management, including data trusts, common database, etc.

Typologies and descriptions of digital government communication technologies with external and internal communities demonstrate different ways of bringing these communities into the public domain to implement coherent policies. These technologies allow the state to move from a policy of formalization of the management space (keeping it homogeneous) to action of identify and interact with environmental diversity. Also, based on communication technologies, it is possible to expand the virtual management space by including new agents. Given the growth of digital tools of public administration, the typology is open to supplement with new technologies.

In the digital State system, the considered technologies are integrated into a common architecture, therefore, technologies such as X-Road are becoming the basis for other communication technologies: platform are provide compatibility of smart-card identification data, e-residences, e-maps with medical and educational data, and allows agencies to collectively use them to deliver proactive public services, while reducing the cost to citizens of access to public sector institutions and organizations. However, the introduction of all these communications technologies is a complex political process, so far, their holistic set is the exception rather than the rule, although the digitalization projects of most countries indicate it as an expected result. For these reasons, Estonia has been chosen as the empirical material for testing the effects of the introduction of the communications technologies of the digital State, where most of the described technologies have been implemented in the electronic government system.

EFFECTS OF INTRODUCTION OF NEW COMMUNICATION TECHNOLOGIES: ESTONIAN CASE

Estonia is one of the leaders in the digitalization of public administration, ranking third in the UN e-government development ranking. Detailed studies of the Estonian experience also demonstrate the technological diversity of the country's digital government architecture, allowing to increase the number of accessible publics online-services [26–28]. However, it is necessary to analyze the Estonian experience in order not to simply describe the nomenclature of current technologies, but also identify the effects of their implementation to determine the reality of the exponential transformation of the digital state (*table 3*).

It is important to assess, first of all, the effects of the following technologies:

- Smart-card identification, inter-departmental data exchange platform and its impact on access to public services and political institutions;
- E-residence and its impact on the diversity of management agents and cost recovery.

99% of Estonian citizens currently have a smart card. Combined with an interdepartmental data exchange platform, the ID-card increases the number of online services available for citizens and businesses, at the same time now all public services are available in online-form on the state portal. It also improves the quality of interaction between citizens and the public sector as a whole: with the introduction of electronic signature technology, the citizen saves an average of 5 working days per year. In addition, the compatibility of State information systems and the multifunctionality of the smart-card allow the provision of public services in a proactive mode without recourse to citizens — thus, public services have the same model of field and resource management. For example, the registration of a newborn child automatically leads to the provision of childcare benefits, and the tax register data determine to which bank account the funds should be transferred.

Smart-card identification is also used to access political institutions, the main one being elections. Since 2005 e-voting via

Table 3

Technologies of communication in structure of Estonian e-government

Technology	Implementation year	Functionality
Smart-card identification and electronic voting	2002 (smart-card) 2005 (e-voiting)	• identity ID • electronic signature • access to public services • e-voiting • registration of a company and submission of tax returns • access to health and education data • cross-border data exchange with Finland (from 2017)
E-residence	2014	• company registration • obtaining banking services • supply tax returns • digital signature and electronic workflow
Interdepartmental data exchange platform	2001 (X-Road)	• data exchange between public authorities and services due to the compatibility of information systems • common access to databases and registers
State portal — eesti.ee	2003	obtaining e-government services
Data embassy	2018	• contains 10 databases required by the State for the provision of public services in the event that the country cannot be governed • Estonian embassy is located in Luxembourg
Open data	2011 2018 (new open data portal)	• publishing of data on demography, socio-economic and scientific-technological development, legislation, infrastructure and public administration

Source: compiled by the author.

smart card is available for local and national elections in Estonia, as well as for elections to the European Parliament. *Fig. 2* shows the share of online voters in the total number of voters in the Estonian parliamentary elections, with an overall turnout of over 60% for all elections under consideration. Among other institutions, smart-card access to public discussion services should also be highlighted.

Estonia also became the first country, which introduced an e-residence to attract foreign business: together with tax incentives for the technology business in Estonia, the e-residence can be considered as a channel for technology transfer and additional value creation with minimal costs for the state. Among the countries leading in the number of electronic residents of Estonia, are allocated Finland (6 118 thous. people), Russia (6 019 thous. people), Ukraine (5 240 thous. people), Germany (5 189 thous. people), China (4 173 thous. people), UK (4 154 thous. people). It is also possible to assess the increase in the number of e-residents of Estonia from the introduction of technology to the present (*fig. 3*). At the same time, the growth rate of the number of e-residents has been declining since 2019.

The introduction of e-residency technology shows effects on tax revenues (as a% of GDP), but these effects are mixed (*fig. 4*). On the one hand, the overall share of tax revenue following the introduction of the e-residence is higher than in previous years, however, the

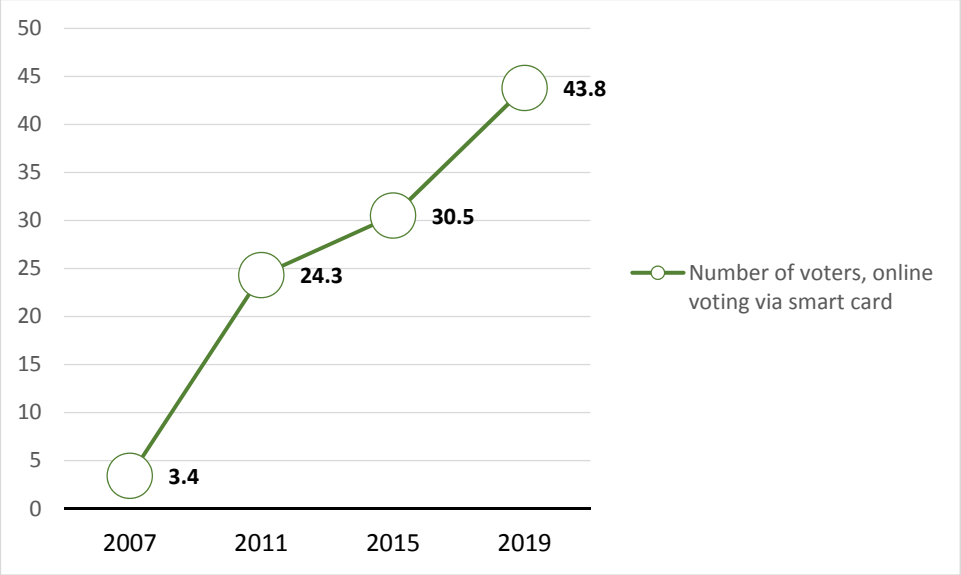

Fig. 2. **Share of voters who voted online via a smart card in parliamentary elections 2007–2019, %**

Source: Data of the State Electoral Office of Estonia, compiled by the author.

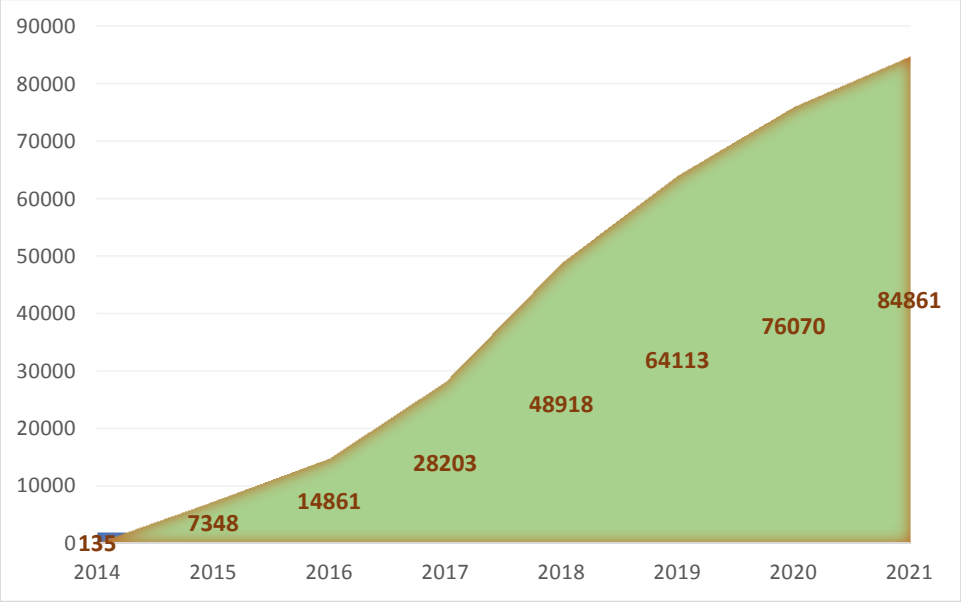

Fig. 3. **Dynamics of growth of electronic residents in Estonia**

Source: data of the e-residency portal of Estonia, compiled by the author.

increase in tax revenues is not constant and does not allow to speak of a clear impact of the technology in case on the recovery of value by the State. This can be explained, firstly, by the small share of e-residents among all taxpayers in Estonia, and, secondly, tax credits in Estonia for the IT-business, which is more than a third of all e-residents (39.4%).

CONCLUSION

A review of the digital State's communications technology with external and internal communities leads to the following conclusions. On the one hand, communication technologies offer an opportunity to create new channels of access to institutions, introduce additional ways of creating

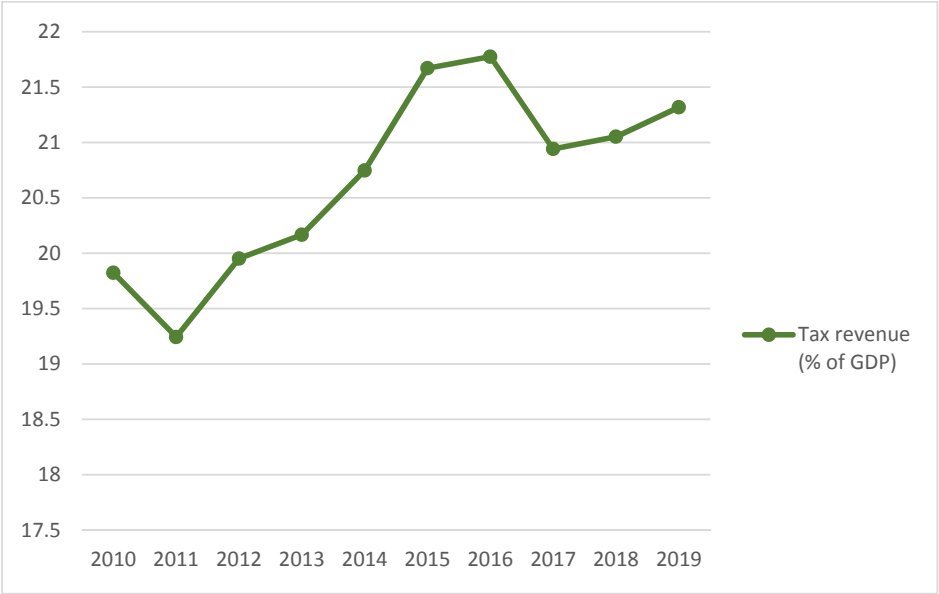

Fig. 4. **Tax revenues, % of GDP**

Source: Data of the World Bank, compiled by the author.

and extracting value, allowing them to characterize as exponential organizations from an information point of view. On the other hand, the results of the introduction of communication technologies do not lead to explosive growth in the extraction of value and the public services offered, due to the complexity of the social environment and the functioning of the State as an unequal system. Maybe, the use of communication technologies in larger economies may have other effects, however, so far, major economies have not adopted such a variety of technologies, limited to individual services and platforms.

At the moment it can be concluded that the digital state is an exponential organization in the technological aspect in terms of the use of communication technologies with external and internal communities to expand the management space, to create information saturation for policies on access to institutions, to reduce the cost of sharing information between departments and services. In the medium term you can expect to grow a variety of communication technologies depending on the type of environment and access options, as States increasingly adopt digital identity technologies, digital agents and duplicates, integrated information systems and platforms [29].

However, the digital State is not characterized by explosive growth in value recovery after the introduction of communication technologies, what is suggested by the exponent as a metaphor on the examples of corporations and start-ups. This can be explained by the fact that corporations have introduced disruptive innovations and created new markets, as a result, use the effects of early entry into the market and grow exponentially until the saturation period of the market, as they operate in a linear system. The state, including the digital one, functions in a system with positive feedback, in which exponential growth is not possible. At the same time, it is possible to allocate additional directions of search for exponential dynamics in the effects of the digital state policy: rate of diffusion of selected online-services and digital tools to the population, growth rate of online resources and services, speed of providing access to online resources.

Accordingly, further research on ways to conceptualize the digital state, taking

into account the analyzed communication technologies and the understanding of the digital state as an adaptive system are relevant.

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