

ANALYSIS OF THE USE OF INFORMATION AND COMMUNICATION TECHNOLOGIES IN PUBLIC ADMINISTRATION

Nataliia Gavkalova¹, Viktoriia Hryshyna², Jain Pradeep Kumar³

¹Doctor of Science in Public Administration, Professor of the Department of Public Administration and Regional Economy, Simon Kuznets Kharkiv National University of Economics, Kharkiv, Ukraine, e-mail: ngavl@ukr.net, ORCID: <https://orcid.org/0000-0003-1208-9607>

²Ph.D., lecturer of the Department of Public Administration and Regional Economy, Simon Kuznets Kharkiv National Economic University of Economics, Kharkiv, Ukraine, e-mail: IVictoria77@gmail.com, ORCID: <https://orcid.org/0000-0001-8341-1486>

³Post graduate student of the Department of Public Administration and Regional Economy, Simon Kuznets Kharkiv National Economic University of Economics, Kharkiv, Ukraine, e-mail: Dzchain.Pradip.Kumar@hneu.net, ORCID: <https://orcid.org/0000-0003-1208-9607>

Abstract. *The article examines the index of network readiness ranked among the countries of the world, which symbolizes the readiness of society to change in the implementation of information and communication technologies. The arguments became the basis for determining the purpose of the study as an analysis of the current state of use of information and communication technologies in public administration. To achieve this purpose it is necessary to solve the following tasks: to study the index of network readiness by rating among the countries of the world; to analyze the current state of use of information and communication technologies, in terms of receipt of appeals to the Government Contact Center. In most developed countries, information and communication technologies have been identified as the main means of modernizing government activities to improve governance, public services, including access to information on the activities of state and municipal authorities. Ukraine has all the prerequisites for the formation of information infrastructure and widespread use of information and communication technologies in all areas. The article analyzes the introduction of information and communication technologies in public administration in Ukraine. This will allow a comprehensive approach to the substantiation of the hypothesis, which is the assumption that the use of modern information and communication technologies in public administration is a key factor in effective communication at all levels of public administration. It is proved that effective communicative activity of local self-government bodies enables large-scale dialogue of government and civil structures, forms a favorable image of local self-government bodies, allows monitoring of social processes using feedback mechanism, and provides formative influence on state-society relations.*

Keywords: *public administration, information and communication technologies, digitalization.*

JEL Classification: *C81, H10, H79, K10, M10*

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Introduction. In the period of reforming and developing many spheres of Ukrainian society, the issue of information and communication support for the effectiveness of public authorities of the state occupies a prominent place in the field of research in various fields of knowledge. The state is the main subject of information space development and information policy formation. The competence of state power as a subject of state information policy includes determining its essence, strategy and tactics of implementation, formation and development of legislation in the field of information activities - one of the main tools for its implementation.

Determining the state course for economic development according to the innovative model means that the main source of economic growth of the country should be new scientific knowledge and processes of their expanded production and

commercial use. At the same time, the state realized the need to intensify efforts to address this issue. This led to the legislative recognition of the need for scientific, technological and innovative activities, the approval of innovative models of economic development as one of the leading priorities of national security. In the context of information society development in Ukraine, the transition to priority scientific, technical and innovative development requires first of all the introduction of information and communication technologies (ICT) in all spheres of society and the state, directing efforts of public authorities to create favorable conditions for ICT development programs of Ukraine, involvement in solving the problem of information society development of a wide range of specialists from relevant fields and the public. The degree of introduction and use of ICT in various spheres of society is becoming a decisive factor in the progressive economic and social development of states.

Literature Review. Many Ukrainian researchers such as O. Amosov, N. Gavkalova, V. Hryshyna, N. Drahomyretska, S. Kvitka, N. Novichenko, N. Gusarevich, N. Piskoha, O. Bardakh, G. Demoshenko, etc. have studied information and communication technologies, their role in public administration, the use of the Internet, as well as promising areas of digital transformation of public administration. P. Bourdieu, L. Grossman, R. Dahl, N. Negroponte, H. Reingold, M. Hermann paid attention to the analysis of forms, mechanisms and prospects for the use of information and communication technologies in public administration. Given the important research of the above authors, it should be noted the need to analyze the current state of information and communication technologies in public administration.

Aims. The arguments became the basis for determining the purpose of the study as an analysis of the current state of use of information and communication technologies in public administration. To achieve this purpose it is necessary to solve the following tasks:

to study the index of network readiness by rating among the countries of the world;

to analyze the current state of use of information and communication technologies, in terms of receipt of appeals to the Government Contact Center.

Methods. In the course of the research the method of general scientific analysis was used for the analysis of scientific sources and state documents regulating communicative activity in public administration. Statistics and data processing methods were used in the processing of materials to reduce subjectivity.

Results. Transformation processes in public administration are accompanied by the use of information and communication technologies. Today, the development of information and communication technologies is perceived not only as a necessary condition for increasing the competitiveness of the domestic economy, expanding opportunities for its inclusion in the world economic system, but also as a means of improving public administration and local self-government. The peculiarity of public administration is that the population in this system acts both as a subject of government, participating in the management process, and as an object of

government, determining the need for public goods. E-government includes three main types of e-government: government-government (G2G), government-business (G2B) and consumer-government (G2C). The use of information and communication technologies lead to a qualitative transformation of society based on the principles of civil and information society, contribute to building new relationships, the formation of a new style of communication between society and government. The key to effective cooperation is to ensure the rights of citizens to freely search and receive information, the dissemination of technical and technological means that expand opportunities for public participation in public administration. At the same time, the government itself, its political structures and institutions are undergoing significant transformations. Government agencies are beginning to master PR communications and other modern methods of communicating with civil society, maintaining interaction with partners.

The interaction between public authorities, the public, business representatives are changing, with the advent of global Internet, traditional models of governance. The development of information and communication technologies has rapidly invaded people's daily lives, dramatically influencing the transformation of public administration in many countries. The main emphasis in the implementation of information and communication technologies in many countries, public administration is to achieve social unity as a whole of European society and its constituent entities [1]. At the same time, as the main danger, the representatives of the countries consider the disparity between the number of citizens of states that do not have the competencies and opportunities to use the Internet and the progressive young generation. The information society is now a means of preserving multinational wealth in the form of human capital.

Criteria for evaluating the activities of leading countries in the field of implementation of information and communication management technologies are:

- availability of public services in electronic form;
- user-friendliness (interface);
- providing feedback to consumers of information and communication technologies in the field of public administration;
- the principle of one window;
- design of the Web-portal, user-oriented [2].

Today, one of the world's leading indices of information and communication technology and impact on the development of the country as a whole is the Network Readiness Index (NRI). Since network readiness is a multidimensional concept, the Network Readiness Index (NRI) is a composite index constructed with three levels. The primary level consists of four pillars that make up the fundamental dimensions of network readiness. Each of the fundamental pillars divides into additional sub-pillars that constitute the second level. The third level consists of individual indicators distributed across the different sub-pillars and pillars of the primary and secondary levels. All indicators used within the NRI belong to a pillar and a sub-pillar. The first four pillars in the NRI include technology, people, governance and impact, each of

which has its own sub-indices, forming a second level of indicators. The third level consists of individual indicators, of which there are 60 indicators in total (Fig. 1).

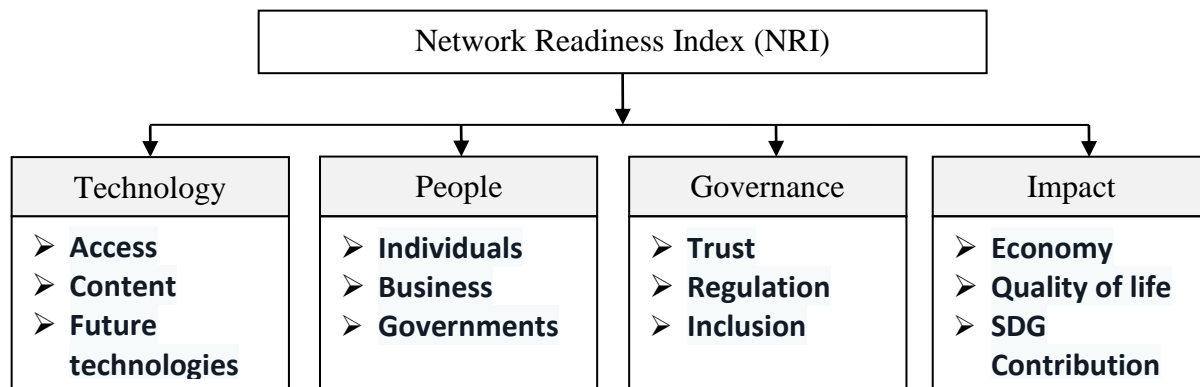


Figure 1. The Network Readiness Index model

Source: systematized by the authors

The general index "Technology" is aimed at assessing the level of technology, which is a condition for the country's participation in the world economy. The People Index identifies the availability and level of technology in the country under study and identifies access, resources and skills for their productive use. The Management Index is carried out in the context of the network economy, regulation and coverage of public space by digital technologies. The Impact Index as a result of the readiness of the network economy is a means of improving growth and prosperity in general and economically. The new NRI model is based on the ability to assess not only the level of development and availability of digital infrastructure, individual perception of the implementation of a particular technology (public services, e-health tools, etc.), but also how to assess the level of harmonization of human and technological integration [3].

The Network Readiness Index is surveyed by the non-profit organization Portulans Institute in partnership with the World Information Technology and Services Alliance. The authors of the project assume that there is a close link between the development of digital technologies and economic prosperity, and therefore the impact of digital information and communication technologies on the economy, quality of life and achieving the UN Sustainable Development Goals is to be assessed.

The latest results and rankings of the 2021 Network Readiness Index (NRI) show how countries around the world are using information technology to emerge from the COVID pandemic and become ready for the network. The Network Readiness Index for 2021 is estimated at a total of 130 countries, which together account for almost 95 percent of world gross domestic product (GDP). Among the leading countries that implement a significant number of programs and projects through the use of ICT and are among the three most "network-ready" companies is the Netherlands (82.06), which took 1st place and overtook Sweden, which was the leader in results in 2019 and 2020. In 2021, Sweden took 2nd place (81.57) and Denmark - 3rd place (81.24), which in 2020 rose from sixth place to second in the index this year, lowering Singapore and the Netherlands by one position to third and

fourth, respectively. This makes Europe (with eight countries in the top ten) the most productive region in the world in the Index. Succeeded by the United States (4th place), which rose from eighth to fourth place in the indexes this year, overtaking Singapore (7th place) and Switzerland (6th place) from the top five. The United States remains the world leader in technology. China, ranked 29th overall, is a leading player in areas such as artificial intelligence, e-commerce and 5G [3]. Ukraine is ranked 1st in the group of lower-middle-income countries in 2021 compared to 2020, ahead of Vietnam in 2021 (Table 1). In the overall calculations of the Network Readiness Index (NRI) rating in 2021, Ukraine ranked 53rd with a total of 55.70.

Table 1. Top 3 Countries by Income Group in 2021

High Income Countries	Upper-Middle Income Countries	Lower-middle Income Countries	Low Income Countries
1. Netherlands (1)	1. China (29)	1. Ukraine (53)	1. Rwanda (101)
2. Sweden (2)	2. Malaysia (38)	2. Viet Nam (63)	2. Tajikistan (111)
3. Denmark (3)	3. Russian Federation (43)	3. India (67)	3. Gambia (113)

Countries ranged from 121 countries in 2019 to 134 countries in 2020 and 130 countries in 2021. Given that the Network Readiness Index in Ukraine in 2021 has risen significantly in positions compared to 2019 and 2020 (Fig. 2). Analyzing the index of network readiness in terms of four pillars, we note the presence of barriers to the development of information and communication technologies in the country (Fig. 3).

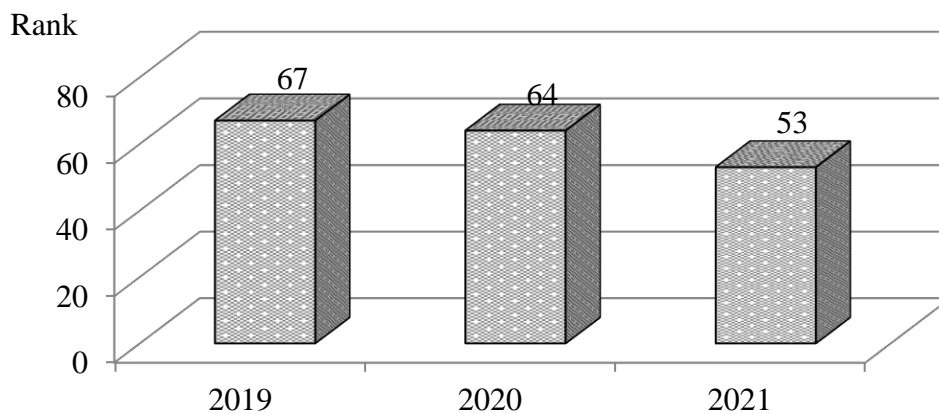


Figure 2. Dynamics of Ukraine's rank according to the network readiness index for the period 2019-2021

The explanation for this is certain indicators of the third level. Thus, the sub-index "access" of the "Technology" index contains low indicators in the categories "population covered by at least 3G mobile network" (97th place) and "phone prices" (103rd place), which characterize the inaccessibility and inability to use ICT by some groups population. Regarding the category "People", it is worth noting the positive indicators of the third level sub-index "individuals", the indicator "adult literacy level", which took 1st place.

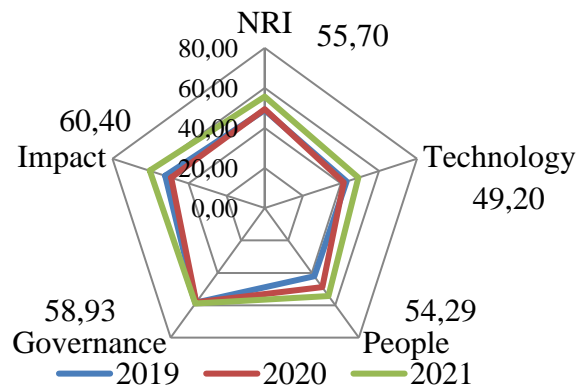


Figure 3. Dynamics of the network readiness index and sub-indices for the period for the period 2019-2021

This indicates are the competence and readiness of the population for further implementation of information and communication technologies in the life of the country. An example of a developed country in the IT industry is Estonia, which is currently considered a country - a leader in digital technology by the government, has fully electronic and remote interaction with the state. Following the experience of Estonia, which has taken a course in IT and building an electronic society, Ukraine, at the initiative of the Ministry of Digital Transformation in October 2019 began cooperation with a private partner - IT specialists of EPAM Kharkiv region on a volunteer basis. The result of such cooperation is the introduction in 2020 of the application "Action", which is currently used more and more, thanks to the introduction of additional options and is popular with the population. Figure 4 presents, as a comparison, the network readiness index and the sub-index of Estonia and Ukraine for 2021.

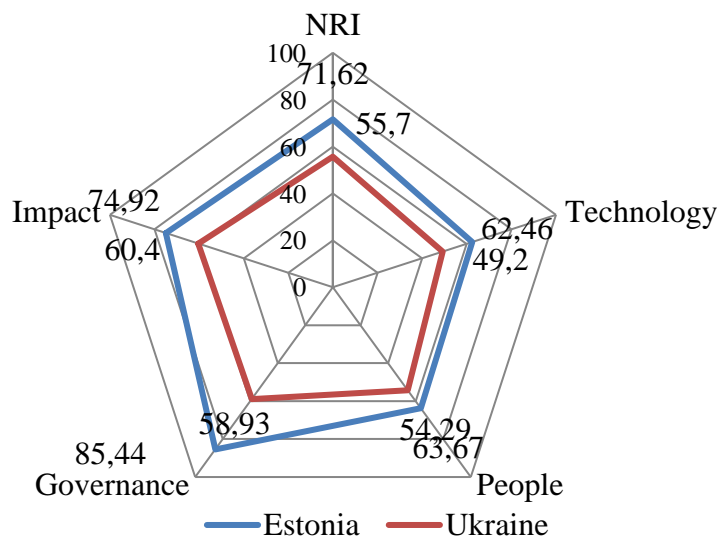


Figure 4. Dynamics of the network readiness index and sub-indices in Estonia and Ukraine in 2021

Based on the indicators, we note the high level of network readiness index in Estonia., Estonia ranks 23rd in the world as a high-income country. Ukraine has only recently embarked on the path of intensifying the introduction of information and

communication technologies. Ukraine ranks the 71st in the world as a low-income country. Analyzing the interest of the government in the development of ICT, consider the indicators of the sub-index "Government", which, in turn, is part of the overall index of network readiness in Ukraine and Estonia (Table 2). Confirmation of the leadership in the field of digital technologies by the Government of Estonia is the ratings in the position "Public online services" (2nd place) compared to Ukraine (87th place) and R&D spending by governments and higher education (18th place) compared to Ukraine, which took 80th place in the overall ranking of 130 countries. Despite the fact that the development of digital technologies by the government in Ukraine is slow, there are areas where the country has achieved significant success. Thus, according to the indicator "Publication and use of open data" Ukraine took 45th place compared to 44th place in Estonia. Despite the fact that in Ukraine the development of digital technologies by the government is slow, but there are areas where the country has achieved significant success. Thus, according to the indicator "Publication and use of open data" Ukraine took 45th place compared to 44th place in Estonia. The positive dynamics is the encouragement of the state to invest in new technologies. Thus, in 2021, according to this indicator, Ukraine took 42nd place compared to 34th place in Estonia.

Table 2. Top Comparative characteristics of the indicator of the sub-index "Government" for 2021 of Ukraine and Estonia

Pillar: People	Ukraine	Estonia
	Score/Rank	Score/Rank
Governments	41,8/71	62,04/23
1. Government online services	67,2/87	99,39/2
2. Publication and use of open data	35,78/45	36,13/44
3. Government promotion of investment in emerging tech	47,89/42	52,01/34
4. R&D expenditure by governments and higher education	16,24/80	60,65/18

Along with the Network Readiness Index, there is the E-Government Development Index (EGDI) and the Electronic Citizens' Participation Index (EPI), which is key to measuring governance and one of the foundations of sustainable development. These indices characterize the state of development of e-government in the Member States of the United Nations. Along with assessing the country's website development models, the e-government Development Index includes access characteristics such as infrastructure and level of education to show how a country uses information technology to increase access and engage its population. The E-Government Development Index (EGDI) is a component of three important aspects of e-government, namely the Online Service Index (OSI) and the Telecommunication Infrastructure Index (TII) and the Human Capital Index (HCI).

According to the study, Ukraine in 2020 ranked 69th in the Index of e-Government Development, which is 13 positions higher than in 2018. The Electronic Citizens' Participation Index (EPI) is assessed by analyzing the level of development of national e-government portals or other government platforms related to providing

relevant information to citizens, public consultation and decision-making. According to the e-participation index, Ukraine ranked 46th in 2020, up 29 positions from 2018 [4].

The rapid penetration of information and communication technologies in the daily life of many people, the equipment of public administration, has led to the transition to the concept of e-Governance, which has strengthened the position of quality management. Recent achievements in the field of information and communication technologies, and, above all, the Internet, provide an opportunity to improve interaction between the state and citizens, the emergence of new forms and methods of this interaction, fully consistent with the goals of "quality management".

N. Gavkalova and N. Yushchenko will note that the factors of e-democracy development are interrelated but have different degrees of influence on the development of e-democracy depending on the stage of its development. The development and accessibility of ICT is a prerequisite for the implementation of e-democracy and e-government. In addition, the quality and level of information and communication support affects the efficiency of public administration and increases the economic potential of the country. At different stages of the development of e-democracy, various factors have a dominant influence [5].

According to the Law of Ukraine "On the National Informatization Program" [6], information technology is a purposeful, organized set of information processes using computer technology that provides high speed data processing, fast information retrieval, data dissemination, access to information sources regardless of their location.

There are the following functions of information technology in public administration:

1. expanding and simplifying access to information and knowledge;
2. acceleration and, accordingly, simplification and reduction of prices of any economic, legal and other operations;
3. promotion of innovation processes, development of intellectual economy in the state;
4. promoting cooperation and communication between elements of infrastructure, public sectors, development of civil society. The use of information technology is the basis of sustainable development in the areas of public administration, economic activity, education and training, health care, employment, environment, agriculture and science.

Modern information and communication technologies, creating virtual spaces, offer the state and its partners new ways and methods of interaction. The key to effective cooperation is to ensure the rights of citizens to freely search and receive information, the dissemination of technical and technological means that expand opportunities for public participation in public administration. Today, a common way of interaction between public administration bodies and the public is appeals received through various communication channels and registered by the Government Contact Center [7].

According to the Resolution of the Cabinet of Ministers of Ukraine of November 27, 2019 № 976, the procedure for cooperation between the Office of the President of Ukraine, state collegial bodies, executive authorities, the Secretariat of the Cabinet of Ministers of Ukraine and the Government Contact Center to ensure proper response to appeals by telephone and to the government hotline and using the Internet through the website of the Government Contact Center, the Unified Web Portal of Executive Bodies, as well as the website of the Official Internet Representation of the President of Ukraine [8].

Figure 5 shows the dynamics of the number of general appeals to the government hotline for 2018 - 2021, with the share of appeals received through various communication channels processed by the Government Contact Center, as well as provided advice and clarifications to applicants and provides background information and the share of appeals that need to be considered by the executive authorities (OVV), other state bodies, the Office of the President of Ukraine, the Secretariat of the Cabinet of Ministers of Ukraine (SCMU).

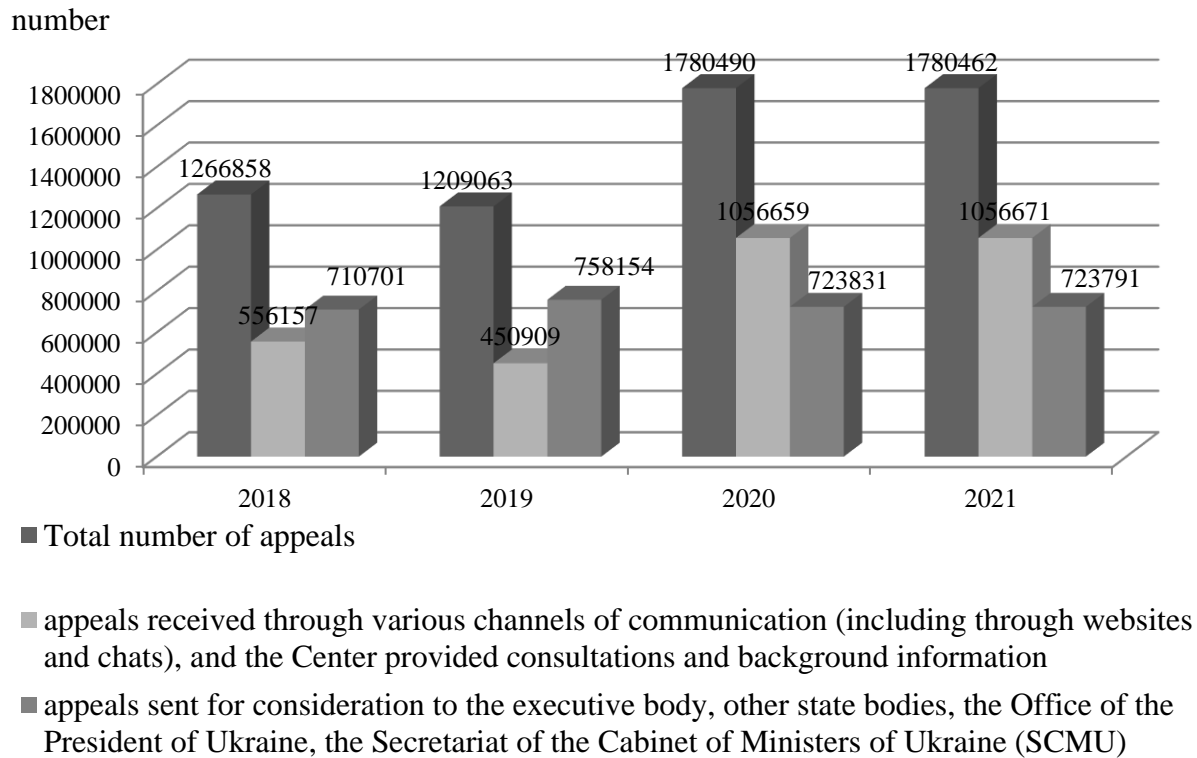


Figure 5. Dynamics of receipt of appeals to the government hotline for the period 2018-2021

Based on the indicators by year, we note that over the past two years (2020-2021), appeals have increased significantly. This is primarily due to the rapid introduction of information and communication technologies, which has influenced the rapid decision-making of public authorities and facilitated rapid feedback, which is provided in the form of advice and background information [15-22]. A number of

explanations were provided through the official page of the Government Contact Center on the social network Facebook.

It should be noted that appeals sent for consideration to executive bodies, other state bodies, the Office of the President of Ukraine, the Secretariat of the Cabinet of Ministers of Ukraine for the period 2018-2021 have almost the same indicators in terms of the number of appeals. Analyzing these appeals as a percentage of appeals submitted by applicants to the Government Contact Center, which did not require substantive consideration by executive authorities, other state bodies, the Office of the President of Ukraine, SCMU, in 2021 and 2020 the figure was 40.65% and 40, 7%, respectively, the highest figures in 2019, which amounted to 62.7% of the total amount of appeals, 56.09% - in 2018.

In recent years, starting in 2020, additional communication channels have been introduced, public awareness of new technological tools has increased, opportunities to process information have appeared, with additional chats for online consulting, a voice chatbot and a service to check the status of consideration appeals via messengers. This facilitated the timely response to the applicant's request.

The most relevant areas in the applicants' appeals for the period 2018-2021 (taking into account those processed by the Government Contact Center) were issues of social protection, which have the highest rates in the number of appeals in all years (Fig. 6).

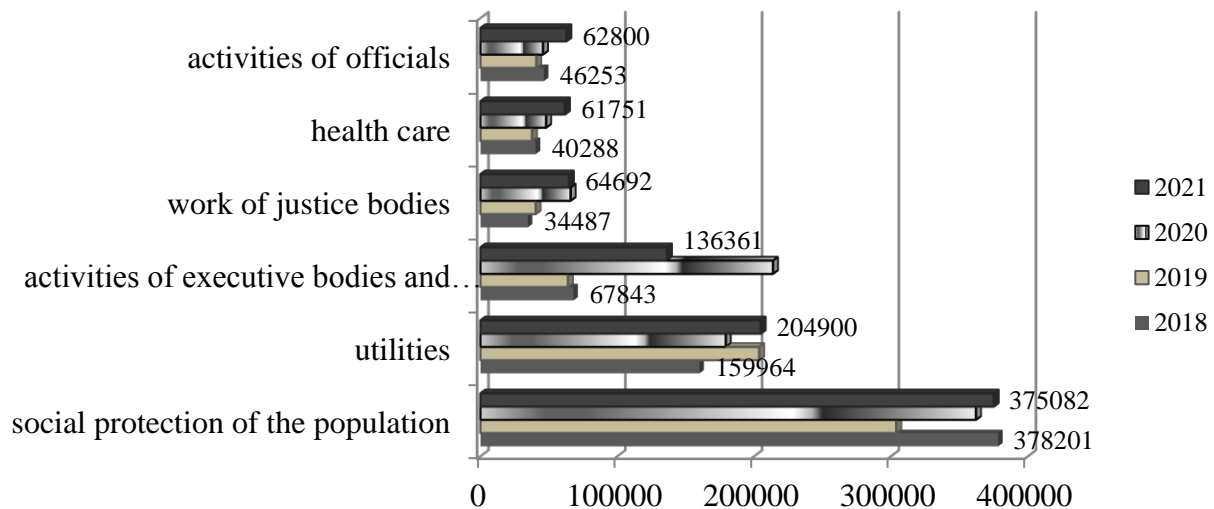


Figure 6. Dynamics of receipt of appeals according to the rating of urgency of received by the Government Contact Center the period 2018-2021

The highest indicator is issues of social protection with a value of 378201 the number of appeals in 2018. The second topical issue, with the exception of 2020, is the issue of public utilities, where the highest rate of 204900 appeals was in 2021. In 2020, the second position in the current area was taken by the issue of the executive authorities and local self-government bodies with the highest value of 213792 appeals compared to other analyzed years.

It should be noted that the largest number of appeals in the last four years is due to the socio-economic situation in the country, which has affected all spheres of life.

The activities of public authorities are topical issues, especially with regard to executive authorities and local self-government, namely their competencies and competencies.

The most common means of receiving and processing messages is chat bots, where you can use instant messaging to contact public authorities such as the Ministry of Foreign Affairs, the Ministry of Digital Transformation (the Digital Power project through the Action application and Entrepreneurship Support), the Ministry of Social Policy - on social protection, the Ministry of Environmental Protection.

The analysis of appeals received by the Government Contact Center for the period 2018-2021 allowed us to conclude that the most popular method of appealing to citizens for the period under study is appeals received by telephone to the government hotline and specialized hotlines.

This can be explained by the shortcomings of interaction between public authorities and citizens through Internet resources, and therefore the ability to promptly receive feedback on calls through specialized hotlines remains a priority than through online services on the Internet. Secondly, there are unresolved issues regarding the accessibility of the Internet by citizens [23-25]. Confirmation is the indicator of the network readiness index, where in the second level of the sub-index "Technology", the indicator "households with Internet access" ranks 78th with a coefficient of 65.82 in the overall standings.

A positive moment for the last 2020 - 2021 is the development and implementation of the project "Action" within the project "Digital State", which, since its launch, namely in February 2020, has gained popularity among the population. This is confirmed by the statistics on 1129685 citizens' requests processed in 2020, received within the framework of the Digital State project through the Action mobile application, and 12234557 citizens' requests processed in 2021. This is 413039 fewer requests than telephone calls to the government hotline in 2021, indicating a small gap, especially given that the Action chat is a "young" tool for public administration and public, compared to others. The reason for such a rapid growth in popularity is its mobility, ease of use, and the ability to get feedback in a short time.

Thus, public administration is faced with the need for its modernization through the introduction and development of information and communication technologies, development of innovative technologies for managing public information resources and the development of communicative activities in public administration [26-29]. In the direction of implementing the e-government development program in Ukraine in 2018, the first strategic legal document "Concept of digital economy and society of Ukraine for 2018-2020" appeared, which identified areas of digital development of the country and in which a certain place was occupied by digital issues competencies that need to be taken into account when considering the skills needed to work in public authorities [9].

"Concept of development of digital competencies and approved action plan for its implementation" has approved by the Cabinet of Ministers of Ukraine in March 3,

2021 № 167-r, to identify the priority areas for improving regulatory and legal support, scientific and methodological support and information support [10].

The Ministry of Digital Transformation [11] is responsible for coordinating the implementation of the Digital Competence Development Concept.

Thus, the use of ICT in the public sector is increasingly changing the patterns of public service delivery. Technology has the potential to create new opportunities for people, promote participation and engagement, responsiveness, transparency, accountability, coherence, innovation and more sustainable policy outcomes. This can strengthen the overall legitimacy of governments. Scientific breakthroughs, innovations and advances in information and communication technologies in recent decades have proved indispensable for solving development problems [30-33]. Innovations in the provision of public services through ICT technology have allowed many governments to improve the quality and accessibility of public services, increase the competitiveness of the country as a whole. At the same time, good governance is not only influenced by technology and innovation, but also by technological development and innovation.

Countries that have an open and transparent public administration system have been able to promote better creativity, experimentation, learning and innovation. Technology and improved connectivity are seen as important tools for empowering people to hold governments accountable and to monitor progress towards the goal of development. The use of ICT in the public sector is increasingly changing the patterns of public service delivery.

Discussion. The formation of a digital government requires horizontal integration and interaction of state bodies at various levels of executive power [34; 35]. The implementation of structural and functional mechanism of information and analytical support of public administration requires a number of appropriate measures. Based on this, we propose to divide the tools for implementing the structural and functional mechanism of information and analytical support of local authorities into two groups: 1) means to ensure the appropriate organizational structure of public administration body, in particular, to ensure the functioning of a separate structural unit responsible for the implementation of information and analytical support of public administration; 2) funds aimed at the effective implementation of functions of information and analytical support of public administration. Although technology contributes to progress, the process of empowering people through the use of technology is not spontaneous. Many countries may need to invest in both infrastructure and human resources to benefit from capital. Technology can help countries leap forward in development, but it can also create a "digital divide", thus moving less developed societies and the poorest and most vulnerable people away from global progress [12;13].

Attention should be paid to minimizing information and communication barriers, which are considered to be persistent obstacles to the optimal flow of information procedures in communication management (collection, processing, accumulation, storage, retrieval and dissemination of information). Information and communication barriers are an inevitable side effect of the communication process,

which is consciously and rationally focused on the most efficient production, storage, distribution and use of information [14].

Ensuring physical access to technology is only one of the necessary conditions. Equally important are the skills of potential users and their ability to access, analyze and interpret information. In this sense, ICT should be seen as a means of empowering people, not as a goal. In addition, the development of ICT carries with it certain risks associated with the protection of private data and information. Taking advantage of information and communication technologies and the ability to involve people in governance processes, public administrations need to be as clear as they want and can involve people, balancing security, transparency, privacy and protection of personal freedoms

Conclusions. In public administration there is such an objective reality, when the introduction of information and communication technologies in the executive branch, the development of new forms of electronic communication with citizens and organizations became the basis for increasing the scale of information activities, the emergence of new directions, methods and methods, forms of implementation. The increased role of information resources produced by them and their demand from society became the basis for increasing the volume and scale of their communication activities, the emergence of new directions, methods and forms of implementation.

But the decisive factor in the effectiveness of communicative activities in public administration is a well-functioning public administration, staffed with highly qualified personnel to create a meaningful process of interaction with people. The communicative activity of public administration bodies carried out taking into account traditional methods and techniques, its traditional directions, is expanded through the use of modern information and communication technologies. Public administration is in need of new forms of interaction, namely on-line and e-government technologies. The importance of well-established communicative activity lies primarily in the fact that it leads to increased adaptation of its institutions to social change, and ultimately contributes to effective activities in public administration.

Widespread use of information and communication technologies in public administration through modern technologies such as online services, chat bots, "e-government", which effectively influences the formation of a new level and quality of communication activities of public administration, the interaction between public authorities and management, citizens and businesses.

Author contributions. The authors contributed equally.

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