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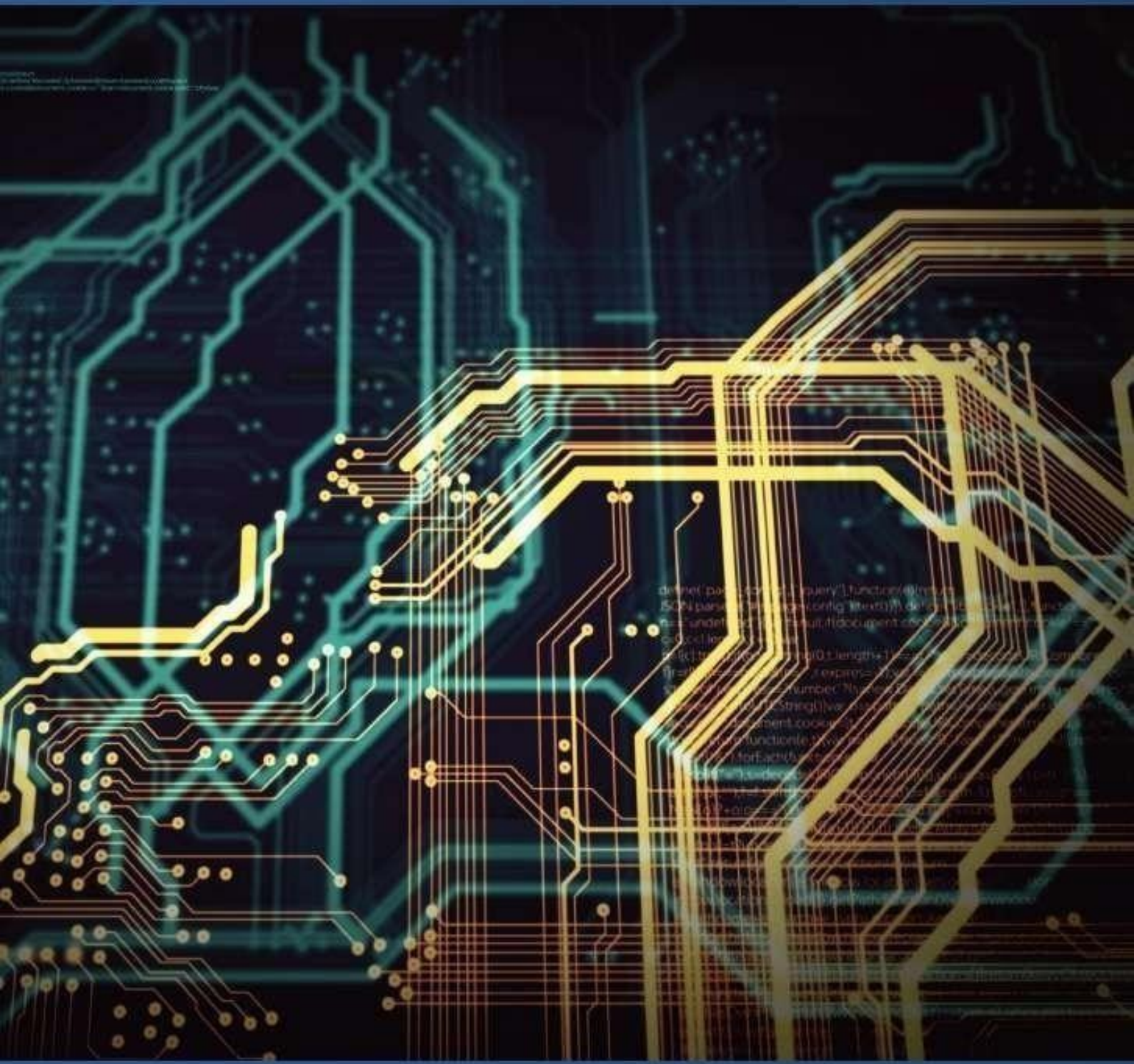

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Preface

The IEEE Russia North West Section, IEEE Russia Section and Saint Petersburg Electrotechnical University "LETI" are pleased to present the Proceedings of the 2021 IEEE Communication Strategies in Digital Society Seminar (2021 ComSDS) held in St. Petersburg, Russia on April, 14, 2021. This Seminar is proudly hosted by Saint Petersburg Electrotechnical University "LETI". The Organising Committee believes and trusts that we have been true to the spirit of collegiality that members of IEEE value whilst also maintaining a high standard as we reviewed papers, provided feedback and now present a strong body of published work in this collection of proceedings.

The theme for this seminar was chosen as a mean of bringing together the orientations of Digital Society research and teaching providing a basis for discussion of issues arising across the community in relation to humanitarian aspects and electronic engineering.

The aim in these proceedings has been to present high quality work in an accessible medium, for use in the teaching and further research of all people associated with Digital Society studies. To achieve this aim, all abstracts were blind reviewed, and full papers submitted for publication in this journal of proceedings were subjected to a rigorous reviewing process.

Dr. Viktor Sheludko
Chair, IEEE Russia North West Section – Technical Program Seminar Chair

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Surveillance City. Digital Transformation of Urban Governance in Autocratic Regimes

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***Abstract*—A new sociotechnical governance model "digital autocracy", has appeared and started to spread throughout the world in the recent years. Its appearance became possible by reason of structural transformation of neoliberalism: a formation of platform economy based on digital infrastructure and big data. The emergence of digital autocracies was not a result of the governing class's initial plan to use the internet politically. This is a constellation of many factors that formed in the process of adaptation of political regimes in a number of countries to external (global economic competition, external political conflicts) and internal (political destabilization) challenges. The article is devoted to studying the place and role of smart cities in the sociotechnical governance model of digital autocracies. The smart city functioning specifics in an institutional landscape of political regimes that use a digital infrastructure as a tool to control society have been analyzed on a number of examples. Separately, the article analyzes problems related to the use of data in urban governance: excessive data extraction and non-transparency of state information systems.**

Keywords—digitalization from above, urban governance, smart city, autocracy, big data

I. INTRODUCTION

One of the effects of governmental policies to control population mobility in the coronavirus pandemic was that many people became aware of the mechanisms of monitoring and control of everyday life through digital infrastructure. In the recent years, many studies described various negative effects of digitalization: increasing state and corporate control over people's lives [1],[2], growing economic inequality [3] and non-transparency of digital algorithms [4]. The majority of such studies are devoted to the states classified as democracies by various indices (Polity IV, Freedom House).

There are studies devoted to the Chinese social credit system, but the phenomenon itself of using digital technologies by various autocracies (one-party, electoral) has not yet been comprehended enough conceptually. A number of existing studies demonstrate that digitalization gives autocracies new governance and social control techniques [5]. Empirical studies of the mechanisms of functioning of digital autocracies implemented in a number of countries have appeared in the recent years [6],[7]. To name this new model, political scientists use various notions: "digital authoritarianism", "network authoritarianism"[8]. The problem of "rise of digital authoritarianism" has been noted as a major one in an annual report of Freedom House [9]. Events of the recent years demonstrate that the ruling autocratic elites have chosen digitalization from above as one of the mechanisms for stabilization of the political regime.

II. THEORETICAL FRAMEWORK

Genealogy of digital autocracies. In the 1990s – early 2000s, debates about the effects of internet and digitalization were dominated by an optimistic point of view. The internet was described as a decentralized system forming a new progressive model of economy (open, collaborative) and politics (revival of direct democracy) [10]. Autocracies with their censorship systems had no place in this digital world; they unable to survive under the conditions of freely circulating information flows. At that period, few researchers noted an ambivalent role of the internet in the processes of democratization. S. Kalathil and T. Boas wrote: "Based on a systematic examination of evidence from eight cases China, Cuba, Singapore, Vietnam, Burma, the United Arab Emirates, Saudi Arabia, and Egypt we argue that the Internet is not necessarily a threat to authoritarian regimes. Certain types of Internet use do indeed pose political challenges to authoritarian governments, and such use may contribute to political change in the future. Still, other uses of the Internet reinforce authoritarian rule, and many authoritarian regimes are proactively promoting the development of an Internet that serves state-defined interests rather than challenging them" [11].

The formation of digital autocracies was not a result of the political elite initial plan to use the internet politically. This is a constellation of many factors related to transformation of neoliberalism and adaptation to this of states in various regions, technological development of big data economy. Before proceeding to analyze digital autocracies, it is necessary to describe economic changes which have formed a digital infrastructure for big data economy. As a methodological basis for studying the transformation of neoliberalism, formation of platform economy, we use the conceptions of: platform capitalism [12] and surveillance capitalism [13]. The basis of a business model for platform capitalism (or surveillance capitalism) is monetization of user data. To extract data, they mainly use products and services provided to users for free (social networks, search engines, various apps).

An digital infrastructure gradually including a traditional physical infrastructure has been formed. "In the industrial age economic activities were built on a physical infrastructure represented by railroads, motor roads, and airports. Digital technologies require a new information infrastructure: networks and cloud computing. The development of digital economy has expanded the concept of digital infrastructure by including broadband, wireless networks, as well as digitalization of a traditional physical infrastructure, such as installation of sensors on a water pipe

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mainline, digital disconnection systems, digital transportation systems" [14]. In the recent years, the data extraction infrastructure has become multilevel. At the lower level there are products capable of extracting data from individuals' daily lives (smartphones, smartwatches). At the medium level they are a so-called smart home or integrated ecosystems of the internet of things. The upper level is included into the existing separate elements of a system of smart cities (video surveillance cameras, Wi-Fi, system of sensors).

Under the conditions of digital autocracy as a specific assemblage institutional complementarity is being formed: a digital infrastructure the objective of which is data extraction, it efficiently functions as part of a set of tools for social control for the state and a profit earning mechanism for companies. Autocracies can configure various models of controlling a digital infrastructure from the "sovereign internet" to softer forms through IT companies affiliated with the state. Autocracies legitimize projects of digitalization fromabove by means of a number of narratives: technocratic (technological innovations), public security, sometimes as in East and South East Asia – civilizational ("asian values") or, lastly, geopolitical (digital sovereignty as a protection from external enemies).

In the American context smart city projects are mostly initiated by the largest IT companies, since it is platforms that control digital infrastructure. For them, it is a tool of domination in the market, their market and political power is based on network effects from digital infrastructure. In the institutional landscape of autocracies, the role and functions of a smart city are transformed, it partially retains the logic of the business model of platform companies, but its functionality is integrated into a sociotechnical model of governance controlled by the state and companies affiliated with it. A digital autocracy extracts and analyzes citizens' data and forms on this base a system of "inverted accountability". Digitalization from above reinforces information asymmetry, since it makes more transparent not the government, but society. Data-driven urban governance in autocracy is not really limited in the use of acquired information. Information systems in digital autocracies extracts amounts of data which are excessive in terms of governance needs. Besides, state information systems themselves are non-transparent, citizens do not know who uses their data and how they are used.

The most known example of digital autocracy is the People's Republic of China. Judging by the indices estimating the level of digitalization, the China occupies quite high places, when technological or economic indicators are evaluated [15], [16], [17]. In indices and ratings of the net and press freedom the state of affairs is quite different [18]. The main example of political use of digital infrastructure byautocracies on national level - "Great Firewall of China". This is a system for web content filtration, initially it allowed for blocking domain names and IP addresses, then a technology of filtration by keywords appeared, and recently the main attention has been given to fighting the bypassing the filtration system with the aid of VPN. One of the turning points in the formation of the Chinese model of the internet control was the prohibition and blocking of foreign social networks and services (Facebook, Instagram, Twitter), search engines (Google), video hosting services (YouTube). The blocking of these services was accompanied by the development of Chinese alternative products technologically and legally embedded into the national system of the Internet control (Renren, Baidu, Sina Weibo, Youku).

TABLE I. SURVEILLENCE STATES. 47 COUNTRIES RANKED BY PRIVACY LAWS AND GOVERNMENT SURVEILLANCE

Country	Total	Score card	1	2	3	4
China	1,8	Extensive Surveillance	2,1	1,3	1.2	2.7
Russia	2,1	Systemic Failure to Maintain Safeguards	1.3	1,9	1,4	2,6
India	2,4	Systemic Failure to Maintain Safeguards	2,4	2,3	1,8	2,3
Malaysia	2,6	Some Safeguards/Weakened Protection	2,6	2,4	2,7	2,9
Thailand	2,6	Some Safeguards/Weakened Protection	2,8	2,5	2.2	2,3
Slovenia	2,7	Some Safeguards/Weakened Protection	2,6	2.8	2,7	2,6
Singapore	2,7	Some Safeguards/Weakened Protection	2.8	2.8	2,3	3,2

1. Data sharing 2. Visual surveillance 3. Communication interception 4. Privacy enforcement

4.1-5.0 = Upholding privacy standards on a consistent basis
3.6-4.0 = Significant safeguards and protections
3.1-3.5 = Adequate safeguards against abuse
2.6-3.0 = Some safeguards but weakened protections
2.1-2.5 = Systemic failure to maintain safeguards
1.6-2.0 = Extensive surveillance
1.1-1.5 = Endemic surveillance

Comparitech [19]

The development of the digital infrastructure created conditions for a social credit system, an indicator of evaluation of people's behavior based on big data processing. It acquires and processes digital footprints left by a individual in various spheres (bills, taxes, loans, purchases, internet search). The social credit system has been designed on the basis of a product of Alibaba (Sesame Credit). The central element of cooperation of the state and private IT companies in the social credit system is a program of development of smart cities. It has encompassed about 500 cities; almost all of them are provincial centers and cities at the level of autonomous prefectures. The government integrated a network of state and private surveillance cameras equipped with a face recognition technology into the social credit system. The protests that began in Hong Kong in 2019 demonstrated new models of protest under digital autocracies. The protesters in Hong Kong understood that a digital infrastructure, such as street cameras equipped with a face recognition technology is a repressive tool used by police.

The model of digital autocracy or its elements have already started to spread. Freedom House studied export by chinese companies of technologies and their application practices by three points: digital infrastructure, systems of cameras with a face recognition technology, briefings for official persons and journalists. Digital infrastructure is supplied to 38 countries, integrated systems of cameras with a face recognition technology to 18 countries, and briefings of official persons and journalists are held in 36 countries [20].

III. RESEARCH

Within the framework of the study we use the methodology of comparative case study offered by A. Lijphart [21].

The Singapore case. The city-state Singapore is an important example of the functioning of the system for political use of a digital infrastructure. Many autocracies look up to it in building a similar sociotechnical control model. In the 1990s, the government of Singapore begins deregulating certain sectors to adapt the economy to the global neoliberal context, preserving therewith the basic institutes and practices of a development state. The liberalization of the telecommunications sector for investors played a crucial role in the further development of digital infrastructure. Despite partial deregulation, the state continued to play the major role in developing the digital infrastructure, creating, among other things, special economic zones with a number of taxation, administrative preferences for IT startups. In 1998, the project Singapore ONE was launched, a "national initiative to offer a new level of interactive multimedia applications and services for households, enterprises, and schools throughout Singapore". It is important to note that it was one of the world's first networks of applications as part of "Singapore IT2000 plan, the objective of which was to transform the country into a Smart island" [22].

Studying the strategy of digitalization from above in a number of states (Singapore, Turkey, Malaysia), P. Howard noted that government "realized the economic benefits of having a modern information-rich economy. They have encouraged technology remanufacturing industries and have provided fi nancial incentives to start-up software and hardware businesses. They build economic zones for the high- tech sector, where companies are exempt from customs duties and pay fewer taxes. At the same time, they work actively to contain ICT use within the economic sphere. They develop policies for improving price signals and the transparency of markets; they aggressively discourage the use of ICTs to improve the transparency of the political process,or to support public opinion formation online" [23].

If one is to generalize the basic tools of social and political control in Singapore, the following may be underlined:

1. Control of the state and the IT companies affiliated with it over digital infrastructure, particularly internet and mobile providers;

2. The use of digital infrastructure as a tool to control society (a system of cameras with a face recognition technology, extraction and analysis of internet surfing data);

3. Special legislation operating under an autocracy as a political tool: a broadcasting act, Protection from Online Falsehoods and Manipulation law.

4. Control over digital infrastructure allows a new technologically equipped censorship model to be created (blocking of mass media websites, human rights and anti-corruption non-governmental organizations, deletion of content from streaming services).

In the process of adaption of the autocracies of East, South East Asia and other regions to the new information environment that arose due to the distribution of the internet, Singapore played a key role as well. S. Kalathil and T. Boas wrote that "Singapore, for instance, merits special consideration for its government's achievement of what many believed to be impossible: extensive ICT development with a negligible erosion of political control. The significance of this accomplishment is underscored by the fact that other authoritarian regimes, most notably China, have taken an active interest in learning from Singapore's example. (..) The case of Singapore may therefore illuminate the strategies that other authoritarian and semi-authoritarian regimes will adopt in the future" [24].

The Russian Federation case. In studies and various democracy indices the political regime existing in the Russian Federation is characterized as autocratic and hybrid [25]. Thus, one of the developers of the concept of electoral authoritarianism, A. Schedler, determined it as a regime that is not a democracy, but that does not use repressive practices regularly [26]. By a number of signs it can be seen that the Russian authorities have chosen the China and Singapore as successful models and examples of digitalization frome above. The capital of the country, Moscow, has become a laboratorywhere such a smart city system has been set up, in future it isplanned to copy this model in other large cities as well.

In 2008, S. Sobyanin was a supervisor of the program for digitalization of public services ("Information society"). Having become the mayor of Moscow, in 2012, he initiated a program to form a model of a smart city based on an integrated digital infrastructure and a data extraction and analysis system ("Information city"). The process of forming a digital infrastructure and a data pool began from public services and creating an intellectual transport system for traffic control. The digital infrastructure allowed data to be extracted continuously and almost from all actions of the city's inhabitants.

The data pool acquired by the Mayor's Office on the city's inhabitants can be divided into several flows:

1. Geoanalytical data of mobile service providers. Since 2015, the Mayor's Office has been purchasing them from all the main providers (Tele2, MTS, Beeline, Megafon);

2. Data on movements around the city: public and personal transport, taxi, carsharing, bicycle rentals, parking lots. The intellectual transport system is equipped with video and photo shooting equipment allowing the location of any vehicle and its owner data to be determined online;

3. Data received from the free public Wi-Fi network. With the user's consent upon entering Wi-Fi, the provider uses the Deep Packet Inspection technology to analyze traffic, data on the user's actions are recorded in a cookie file. Later on these files are collated to each other, if the system believes that this is one and the same person. User profiles united by various parameters are formed. The Wi-Fi network provider has access to phone number bases and is able with the aid of an algorithm (contactless reusable card and connection through phone to the Wi-Fi) to identify the person.

4. Data of the official portals and their mobile versions mos.ru (Moscow State Services), ag.mos.ru ("Active Citizen") and gorod.mos.ru (Our City). Data are extracted using the STATS system (IP addresses, type of device and browser), it being specifically adapted to de-anonymization of users (fingerprint technology).

TABLE II. THE MOSY SURVEILLED CITIES IN THE WORLD 2020 (PER 1000 INHABITANTS)

№	Rank	City	Country	Number of cameras
1	1	Taiyuan	China	119,57
2	2	Wuxi	China	92,14
3	3	London	UK	67,47
4	4	Changsha	China	56,80
5	5	Beijing	China	56,20
6	6	Hangzhou	China	52,34
7	7	Kunming	China	45,01
8	8	Qingdao	China	44.48
9	9	Xiamen	China	40,32
10	10	Harbin	China	39,14
11	11	Suzhou	China	38,19
12	12	Shanghai	China	36,96
13	13	Urumqi	China	36,62
14	14	Chengdu	China	33,93
15	15	Shenzhen	China	32,37
16	29	Moscow	Russia	15,39
17	32	Singapore	Singapore	14,49
18	37	St. Petersburg	Russia	10.07

COMPARITECH [27]

Mayor's Office maintain that the data pool is anonymized, but experts believe that this is not consistent with the reality. Analyzing the "Personal Communications System" created in the metro they have demonstrated that according to a state contract with data provider (MaximaTelecom) the phone numbers are transmitted not in the coded format (hash) customary for the commercial market [28]. Under the contract they may be decoded and transmitted as an phone number. One of the most important elements of the digital infrastructure of Moscow as a smart city is video surveillance cameras equipped with a face detection function. They are all integrated into a uniform data storage and processing system. The cameras are located: in the streets, the metro, public institutions, in yards and entrances to buildings, hospitals, schools. It is important to note that during the pandemic control over population mobility has gained a new impetus. Phone geolocation data and the system of surveillance cameras were used to punish the violators of the lockout regime.

On 27 July and 3 August 2019, before the elections to Moscow City Duma protest campaigns related to the refusals of having many opposition candidates registered were held. On those days, shutdown of mobile internet and Wi-Fi networks of cafes and other establishments which are not far from the sites of the protest rally were registered.

The NetBlocks laboratory has identified that the "period of suspension of the service, according to the received documentation, was to be from 01:00 pm through 11:00 pm on 3 August. The actual suspension of the services of one of the providers was from 01:15 pm through 07:33 pm" [29]. It is noted in their report that the measurements from the Android Network Cell Info Lite application showed that part of the mobile providers' stations were operating in the GSM-only mode. A local disconnection of mobile internet occurred in the southern part of the central district of Moscow, it is there that the protest rally took place. On 23 and 31 January 2021, in those parts of Moscow where protest rallies were held for the support of A. Navalny, NetBlocks registered a similar shutdown of the Internet. Police have confirmed that participants of protest rallies were arrested in the metro using surveillance cameras [30].

IV. CONCLUSION

As conclusions, several main points can be noted:

1. In the institutional landscape of autocracies, the role and functions of a smart city are articulated differently, it partly retains the logic of the platform companies' business model, but its functionality is integrated into the socio-technical model of governance and social control. In this system of data-driven governance use of extracted and analyzed citizens data forms a system of "inverted accountability". The process of digitalization from above enhances information asymmetry, since it makes society, not the government, more transparent.

2. Data-driven urban governance has a number of features: information systems extract an excessive amount of data from the point of view of management needs, state information systems are not transparent, citizens do not know who and how use their data.

3. Politically motivated use of the urban digital infrastructure (internet shutdown, arrest of political activists using camera systems with face recognition technology).

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