

## Article

# The Use of ICT by Local General Administrative Authorities during COVID-19 for a Sustainable Future: Comparing Five European Countries

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**Abstract:** The COVID-19 pandemic has significantly reshaped administrative relations and put emphasis on the digital transformation of public administration that is urgently needed to support a sustainable recovery from the pandemic crisis and future sustainable development in the post-pandemic era. This paper presents a comparative study on the ways the first wave of the COVID-19 pandemic impacted general administrative authorities on the local level with respect to various aspects of their functioning and digitalization in five European countries. With a sample of 926 respondents from the Czech Republic, Germany, Poland, Romania, and Slovenia, the study shows that the pandemic-imposed changes are very similar in these countries. The results reveal that, except for Germany, the biggest problems of pandemic-related regulations are their obscurity. For all countries under study, parties to the procedures are shown to be the main driver of digitalization and not the public administration itself, generally lagging behind in this sense. Nevertheless, the pandemic has also created several potential opportunities, whereby public managers, especially in Germany, have acknowledged the importance of digitalization right after the protection of health, as confirmed by the wider use of ICT equipment, particularly in Germany and the Czech Republic. Moreover, Germany and Romania exhibit the greatest potential to accelerate digitalization. Finally, the critical factors influencing accelerated digitalization after the pandemic are also identified. The paper's evidence-based findings could prove useful while formulating recommendations for the sustainable practices of public administrations during this and any future pandemic crisis.

**Keywords:** digitalization; public administration; public managers; public servants; COVID-19; sustainability; European Union

## 1. Introduction

The coronavirus outbreak was so unprecedented that, with few exceptions, governments around the world had no previous experience or benchmark to rely on. A quick and multi-faceted response was required, forcing governments to impose extraordinary, stringent, and restrictive measures to handle the unusual situation [1]. It has also meant that governments must perform in radically uncertain circumstances. Governments have faced difficult trade-offs between economic, social, and health challenges. More than half the people on the planet have experienced a lockdown with strong containment measures. Besides the health and human tragedy of the pandemic, it has triggered the most serious economic crisis since World War II [2,3]. Such impacts already negatively affect rich countries, making it likely they are felt more strongly across developing nations given their lack

of capacity or resources to cope with the economic, social, and health challenges of the pandemic [4].

The COVID-19 crisis also has a strong territorial dimension. Regions and municipalities in countries are on the battlefield of crisis management and recovery and are challenged by the virus' health, social, economic, and fiscal impacts. Some regions have been more affected than others, for instance large urban areas and, within them, deprived areas more than less deprived ones. The risks vary considerably, depending on where one lives. Governments on all levels have rapidly introduced policy responses and implemented measures in response to the COVID-19 crisis. Regarding the health situation, many countries have adopted a territory-distinct approach to policies on lockdowns and the wearing of masks. On the central level, many countries have also announced substantial public investment recovery packages, larger than the packages adopted during the 2008 crisis. These recovery packages focus on three areas: (i) strengthening health systems; (ii) accelerating the transition to a carbon-neutral economy; and (iii) digitalization [2].

The conversion to digital is essential for adjusting to the overall sustainability objectives [5]. The transformation towards sustainability must be harmonized with the opportunities and dynamics of the digital revolution. At the same time, digital transformation will fundamentally alter all dimensions of global societies, their governance systems and economies, thereby changing how the sustainability paradigm itself is interpreted. Digitalization is not only an "instrument" significantly contributing to resolving sustainability challenges; it is also crucial as a driver of disruptive change [6–8]. There are no substitutions for sustainable, digital, and smart concepts. From the policy perspective on the strategic level of the European Union, it is expected to contribute to digitalization in public administration, which is in a wider sense often viewed through the lens of so-called Digital Era Governance, emphasizing contemporary ICT technologies as crucial drivers of innovative and competitive governance [9,10]. The COVID-19 crisis has thereby become an additional accelerator of digitalization [11]. Namely, the pandemic-related restrictions have led to the situation in which being digital is no more only a fashion for public administration but rather a condition for operating. Consequently, many large-scale digital innovations (e.g., telework, online education, virtual trainings) have been implemented at unprecedented speed. In order to further develop these advancements on different levels of public administration, central governments, as crucial policymakers, have put the digital transformation at the front and center of policy agendas. This refers also to government–citizens relationships, including the provision of public services, which have been fundamentally affected by the pandemic [11]. This applies especially to local public administration, carrying out tasks within rules and systems set by central governments, which is necessary to assure equality among parties across individual countries. Therefore, general administrative authorities can be considered as an intermediate link between decision makers (central government) and parties (users of public services). Accordingly, especially e-communication, including web portals and other digital communication channels, is relevant when addressing the digitalization of relationships between local public administration and citizens rather than general dimensions of the digital transformation, which are a domain of central government [2,12].

Further, the crisis has led ministries and agencies to switch over en masse to teleworking as the new *modus operandi* and governments have reorganized how they meet and make decisions [12]. Parliaments have continued to function, but the focus of their work has shifted to crisis-related issues, with the parliamentary work method being adjusted, including the introduction of online meetings (particularly for the committees). New coordination structures were initially set up or activated in centers of government to manage the emergency. Public service delivery has continued, although it has often been limited to the urgent needs of citizens and businesses and has heavily relied on the capacities of digital government. New administrative simplifications have been introduced to make the agencies–citizens interaction easier. The judicial systems have reacted similarly to public administration; in some countries, they have radically reduced the handling of

cases to urgent ones only; in other countries, there has been a less radical decrease in their activity [13].

The COVID-19 pandemic has shaken the world and, as described in the above paragraph, set in motion a myriad of changes and affected how public sectors and governments everywhere function, including on the national and local level. Our research is concerned with establishing how territorial administrative authorities have been affected, leading to this paper's first research question:

RQ 1: How has the first wave of the COVID-19 pandemic affected the ways general territorial administrative authorities in selected European Union countries have been functioning?

It is undeniable that the pandemic has significantly reshaped almost every aspect of societal relations, including administrative ones, and that the digitalization of public administration has proven to be critical. Indeed, in unprecedented circumstances like the COVID-19 crisis, public services cannot be suspended and must then be delivered online, relying on the available digital technology. Accordingly, public administration has faced the pressing need to assess its current digital technological capabilities while also having to rapidly deal with technological adoption and solution implementation. In other words, the COVID-19 pandemic may be considered to be an accelerator of digitalization in the delivery of public services [11]. The COVID-19 pandemic has put the spotlight on the digital transformation of public administration, which also holds the potential to support overall sustainability [8,10,14]. Hence, the paper also seeks to answer the following research question:

RQ 2: How has the COVID-19 pandemic affected the pace of digitalization of the selected administrative authorities that are needed for sustainable development?

More specifically, during the COVID-19 crisis, public administration has applied a range of digital-based strategies, techniques, and communication channels to continue fulfilling its tasks vis-à-vis citizens, as well as to efficiently organize its own work [15]. The turbulent problems exposed by the COVID-19 pandemic, therefore, call for digital and sustainable solutions that are sufficiently adaptable, agile, and pragmatic to ensure that a particular goal or function is upheld in the face of longer disruptions. However, reaction time has varied from industry to industry. In public administration in general, gradual digitalization is inevitable, yet agonizingly slow. This happens for several factors like the transparency of public procurements, insufficient system readiness, or inadequate staff qualifications. Finally, a huge amount of sensitive data is sent while communicating with public officials, meaning emphasis must also be placed on cyber security and data protection. Public sectors in many countries often encounter the problem of outdated systems that have not been improved/changed for many years. Another long-discussed issue is the interconnectivity of individual systems that do not communicate with each other [16,17]. In contrast, while some countries started planning their digitalization years ago but had not achieved any great progress, the COVID-19 pandemic saw the digital change becoming an imperative in all aspects of society. In Japan, for example, COVID-19 caused the government to rapidly establish a digital transformation policy: civil court proceedings, the traditional hand-carved seals custom, and the submission of administrative documents to government agencies have also been dragged forward to the digital age by COVID-19. One could say the crisis has acted as the catalyst for many countries' shift to digital transformation, which is certainly a necessary step to support sustainable development, especially in the post-COVID-19 era [8,10,18,19], and, therefore, this paper will also attempt to answer a third research question:

RQ 3: Which factors will help ensure that the pace of digitalization promotes the sustainable development of administrative processes after the COVID-19 pandemic?

The purpose of the paper is to ascertain the first wave of the COVID-19 pandemic's impact on the functioning and digitalization of general administrative authorities on the local level, its implications for public service delivery and how they are designed during the COVID-19 pandemic and beyond. To demonstrate any differences between five European

countries, an explorative approach was used. The digitalization of general administrative authorities is necessary for a sustainable recovery from the COVID-19 crisis. There is still a lack of systematic and empirical research on this topic. Accordingly, this paper will contribute to a current research gap with broad international empirical research with primary data gathered through a unique and comprehensive questionnaire that considers several aspects: regulations and competences of administrative authorities, procedures and services, challenges for public managers, cost management, and future challenges after COVID-19.

The remaining sections of the paper are organized as follows. The materials and methods are presented in the next section, including the study participants and procedure, measures, and statistical analysis. The third section describes the main empirical results of the public administration survey and the findings of regression analysis. The paper ends with a discussion and conclusion where the main findings, limitations, and future research directions are presented.

## 2. Materials and Methods

### 2.1. Study Participants and Procedure

The data for this paper is part of an international survey, intended to examine the impact of the COVID-19 pandemic on territorial public administrations. The online questionnaire consisted of 26, mainly closed-ended questions, organized into six segments (general, procedures and services, human resource management, economic and financial aspect, time after the pandemic, demographic data). The questionnaire was translated into the national languages of the participating countries. An online survey was launched at the start of June 2020 via the open-source web application 1KA (One Click Survey; [www.1ka.si](http://www.1ka.si), accessed on 1 August 2021) and remained open until the end of August 2020. In this period, most countries involved encountered the great threat of the pandemic, resulting in comprehensive restricting measures imposed by the lockdown.

The target population entailed public managers responsible for managing public administration authorities competent for conducting administrative procedures and providing public services as general administrative territorial authorities on the local level. The sampling technique used is non-probabilistic, convenience sampling facilitated by the use of information communication systems and channels [20]. Participants were assured that the survey was strictly confidential and anonymous. The final sample consisted of 926 participants from five European countries (see Table 1). The response rate varied, ranging from 27.2% in Germany and 28.0% in the Czech Republic to 58.2% in Romania and 66.2% in Poland and even to 100.0% in Slovenia. These countries are Central European and EU member states, sharing the majority of political-administrative dimensions and strong (Germanic) administrative traditions in the recent public governance context, making them a comparable group of countries as opposed to other groups of European countries having completely different administrative traditions, especially Francophone and Scandinavian countries. Namely, several elements of the strong administrative tradition originating from Germany can be observed also in four new EU member states, especially in Slovenia and the Czech Republic, to a lesser extent also in Poland and Romania. However, their local public administrations are characterized by different levels of rule of law, resulting in some differences in traditions, responsibilities, and management styles, thus, the sample still captures diversity within selected groups of countries. Finally, the respondents were not required to fully complete the questionnaire, hence the number of respondents varied across questions. Consequently, a complete case analysis approach was generally used to alleviate issues related to missing data [21]. Given the assumption of “missing completely at random”, namely, that the complete cases are a random sample of the originally identified set of cases, a complete case approach is considered as the most common method for handling missing data in many research fields, including epidemiologic [22] and public administration research [23], especially in large-scale comparative studies (see Aristovnik et al. [24]).

**Table 1.** Socio-demographic and geographic characteristics of the respondents.

Socio-Demographic and Geographic Characteristics	Number (%)
Years of employment	
less than 1 year	44 (6.8)
1–5 years	201 (31.1)
6–10 years	141 (21.8)
11–15 years	103 (15.9)
16–20 years	72 (11.1)
more than 20 years	86 (13.3)
Years of work experience	
less than 10 years	39 (5.9)
11–20 years	159 (24.0)
21–30 years	262 (39.5)
31–40 years	203 (30.6)
Size of general administrative authority (no. of employees)	
less than 20	54 (8.0)
21–40	101 (14.9)
41–60	46 (6.8)
61–80	5 (0.7)
81–100	144 (21.2)
more than 100	328 (48.4)
Size of the general administrative authority (no. of inhabitants)	
small administrative authority (up to 18,000 inhabitants)	143 (40.5)
medium administrative authority (18,000–50,000 inhabitants)	19 (5.4)
large administrative authority (50,000–100,000 inhabitants)	71 (20.1)
one of the largest administrative authorities (over 100,000 inhabitants)	120 (34.0)
Coverage area of the general administrative authority	
predominantly urban area	231 (34.3)
predominantly rural area	442 (65.7)
Country	
Czech Republic	60 (6.5)
Germany	109 (11.8)
Poland	420 (45.4)
Romania	279 (30.1)
Slovenia	58 (6.3)

Note: The final sample comprises 926 respondents. The number of respondents may vary due to missing values.

## 2.2. Measures

The data were collected using an online comprehensive questionnaire composed of 26, mainly closed-ended, questions. The questionnaire was primarily separated into six thematic sections. The first section contained three general questions on the characteristics of legislation, cooperation within public administration, and unethical behavior. The second section was about procedures and services and included eight questions on how the COVID-19 pandemic had affected good governance as well as the implementation and digitalization of administrative procedures and services for sustainable development. This was followed by a section containing six questions on human resource management, including employment practices, work–life challenges and positive outcomes of the COVID-19 pandemic. The fourth section concerned economic and financial aspects and contained three questions on the utilization of material resources, expenditure on the selected budget items, and material costs. The next section concerned the time after the COVID-19 pandemic with one question about the likelihood that the changes/best practices arising from the COVID-19 pandemic will also remain once COVID-19 is behind us. Finally, the last section covered demographic data on the public managers' years of employment and work experience as well as the size and coverage area of their general administrative authority.

The common guideline while measuring most items was to compare the ways the general administrative authorities had been working during the COVID-19 pandemic as



opposed to their normal operations. Accordingly, the extent of individual aspects/elements was measured on a 5-point Likert scale, namely: 1—significantly less; 2—less; 3—the same; 4—greater; 5—significantly greater. Similarly, selected individual aspects/elements related to the general administrative authorities' operations in the future or the likelihood of selected changes continuing after the COVID-19 pandemic were measured as follows: 1—not likely at all; 2—small likelihood; 3—medium likelihood; 4—likely; 5—very likely. The Likert scaling method for measuring responses to a statement is very common in the social sciences, including public administration research [25]. Statistical tests (one-sample *t*-test) were calculated using country-level weights allowing for an equivalent comparison between countries while other empirical considerations (analysis of variance (ANOVA) and ordinal regression analysis) were grounded on unweighted respondent-level survey data. The full version of the questionnaire, including a short description of the survey, is available from the authors.

### 2.3. Statistical Analysis

The data preparation, aggregation, and cleaning processes were conducted in the Python programming language utilizing the Pandas and Numpy libraries [26], which are often utilized in management of large databases (see Aristovnik et al. [24]). These libraries were also utilized to present the sample's socio-demographic and geographical characteristics. This refers to the public managers' years of employment and years of work experience as well as the size of their general administrative authority by the number of employees, the number of inhabitants, coverage area, and country. To examine changes in the functioning of general administrative authorities during the COVID-19 pandemic, a one-sample *t*-test was used. This methodological approach compares the mean of a sample to a hypothesized value and tests for any deviation from that value [27]. In this case, the hypothesized value of 3 reflected an equal extent of individual aspects/elements before and during the COVID-19 pandemic or a medium probability that the selected changes will remain or be introduced after the COVID-19 pandemic. Namely, any value below 3 reflects a decrease, while any value above reflects an increased extent or likelihood of individual aspects/elements of general administrative authorities' operations. The computed *p*-values were adjusted using a Bonferroni correction [28]. The Python libraries Scipy and Statsmodels were used to test statistical hypotheses [29]. The results of testing the hypotheses are presented in comprehensive figures (see Figures 1–5), where red bars show statistically significant differences at a significance level of  $\alpha = 0.01$ . Using the same software and statistical parameters, ANOVA was performed to examine the differences between countries, thereby supplementing the analysis with additional country-level empirical evidence.

To analyze which factors influence accelerated digitalization leading to a sustainable outcome after the COVID-19 pandemic, ordinal logistic regression analysis was performed. This methodological approach is the best-fitting and most appropriate for models with ordinal outcomes and has often been used in large-scale comparative studies (see Aristovnik et al. [24]) and public administration research [30]. Ordinal logistic regression analysis was, hence, the ideal estimation technique since the dependent variable (accelerated digitalization after the COVID-19 pandemic) is ordinal in nature (1—not likely at all; 2—small likelihood; 3—medium likelihood; 4—likely; 5—very likely). The standard interpretation of the ordinal logit coefficient is that a 1-unit increase in the predictor means the response variable is expected to change by its respective regression coefficient in the ordinal log-odds scale while the other variables in the model are held constant. Specifically, a positive coefficient indicates the chances of a respondent with a larger score for the independent variable being observed in a higher category. Conversely, a negative coefficient indicates the chances of a respondent with a lower score on the independent variable being observed in a lower category [24,31]. Moreover, independent variables covering different aspects/elements of general administrative authorities' operations were included in a 5-point, Likert-scale form to measure their extent (1—significantly less; 2—less; 3—the same;

4—greater; 5—significantly greater). Finally, since some of the independent variables are nominal (countries), they were considered as dummy variables [32]. The ordinal regression analysis together with a Spearman correlation matrix and checking for multicollinearity were conducted in SPSS 26.0 [33].

### 3. Results

#### 3.1. Overview of the Questionnaire Findings

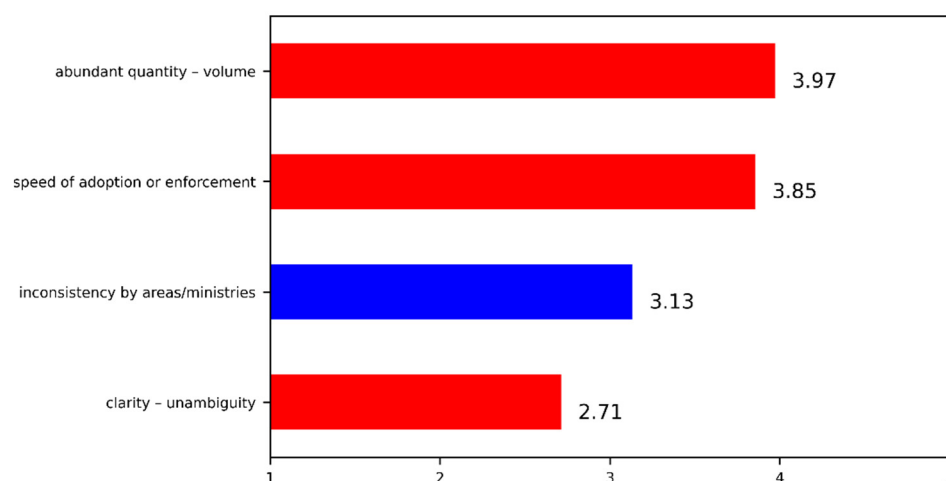
The results of the survey concern different aspects, including elements of the functioning and the digitalization of general administrative authorities, e.g., regulations and competences (Section 3.1.1), procedures and services (Section 3.1.2), challenges for public managers (Section 3.1.3), and cost management (Section 3.1.4) during the COVID-19 crisis as well as future challenges (Section 3.1.5) once the crisis has subsided.

##### 3.1.1. Regulations and Competences of Administrative Authorities during COVID-19

The emergence of COVID-19 has clearly required a more active role from general territorial administrative authorities as the implementers of public governance legislation and strategies. In search of an efficient response to the existing and new needs of public services users, especially the external relations between administrative authorities and parties to the procedures should be redefined to be performed in a smoother and more digitalized way. Here, digitalization serves not only as a tool to modernize public administration and cut red tape, but digitalized external relations offer a way of minimizing people's chances of becoming infected with COVID-19 if procedures are to be run distantly while continuing to provide public services [34,35]. The digital transformation provides entirely new and enhanced capacities and is, thus, as a major force for shaping both the systemic context of transformative change and future solutions [36]. Besides giving a much-needed means to minimize infection levels during COVID-19, it symbolizes the convergence of innovative technologies, many of which currently make ambiguous contributions to sustainable development [3,6,8,37].

It was expected that, among others, the statutory and secondary regulation, which is what administrative authorities implement, are adopted in crises significantly faster and are less data-based and coordinated than in the times of normal operations. To test this assumption, the heads of territorial administrative authorities in all five countries were asked whether a change had been observed in both the quantity and quality (as a consistency) of regulation that defines these authorities' jurisdiction alike. As expected, the main finding confirms there has been a considerable increase in the quantity of relevant regulations, indicated by the highest average of 3.97 for this element (Figure 1).

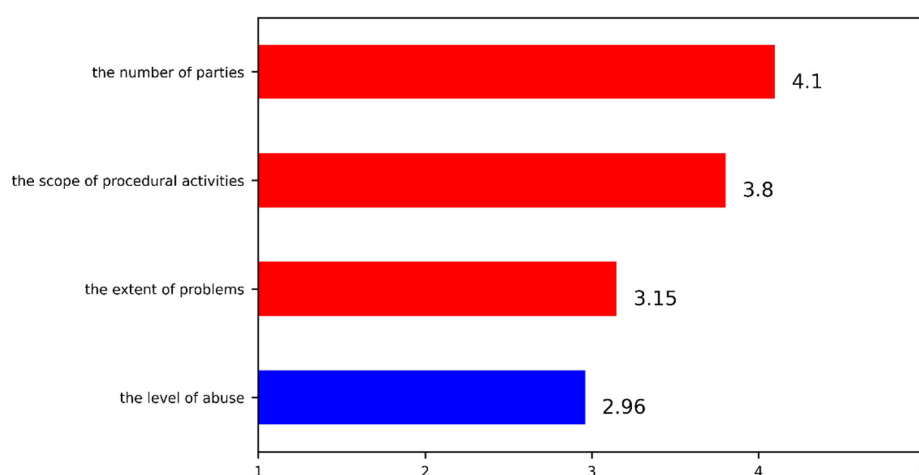
To elaborate in more detail, in all countries (with an average of 3.85), the speed of adoption of these regulations is significantly higher—according to expectations given the need to respond promptly. Namely, one finds the highest value of 4.59 in Germany and a score of 3.32 in Czech Republic. Consequently, the heads of these authorities report an abundant quantity of various items of legislation, sometimes causing inconsistencies among the regulations adopted by various ministries. Yet, this phenomenon is observed less [35,38–41] when a digitalized regulatory process has taken place that enables more transparent coordination.



**Figure 1.** Characteristics of adopted regulations and measures defining the administrative authorities' competences during COVID-19. Red bars show elements that are on average statistically significant different than the hypothesized value of 3 ( $\alpha = 0.01$ ), reflecting equal extent before and during the COVID-19 pandemic.

### 3.1.2. Procedures and Services during COVID-19

The survey also considered digitalization as a tool for achieving the objectives of a sustainable future and for simplifying the performance of administrative procedures typical of all European countries before and during the COVID-19 crisis [34,39,42]. Heads of territorial administrative authorities were asked to report on the scope, but even more importantly, the consequences of simplified procedures through their digitalization relative to public service users. As shown in Figure 2, the number of parties to the procedures using a digitalized mode, above all filing e-applications with or even without a qualified e-signature, grew significantly as indicated by the average value of 4.10, where the biggest increase is observed in Slovenia (4.55), then Germany (4.28) and Romania (4.02), and finally the Czech Republic (3.85) and Poland (3.79). Slovenia is, therefore, the smallest of the five countries, with a strongly centralized and unified but also broadly publicized ICT system in its administrative authorities [34,41], which is probably responsible for such a result. Moreover, administrative authorities engaged in digitalized activities as well, albeit somewhat less than parties, e.g., a value of 3.80.



**Figure 2.** The scope and consequences of simplified digitalized procedures. Red bars show elements that are on average statistically significant different than the hypothesized value of 3 ( $\alpha = 0.01$ ), reflecting equal extent before and during the COVID-19 pandemic.



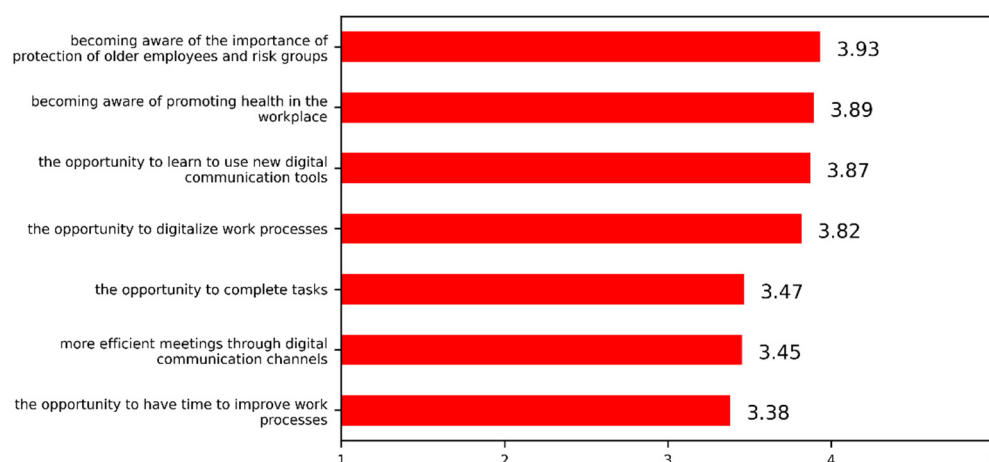
In addition, when the heads of the territorial administrative authorities were asked to identify any potential problems and abuses of digitally simplified communication concerning the parties, the level reported is surprisingly low. There is a slight increase in problems concerned with digitalized procedures (3.15), but these are connected to some additional burden on officials to verify the identity of parties or similar. This is quite a harmonized result for all five countries, with really small variations (from 3.36 in Poland to 3.03 in Romania). On the other hand, the level of abuse remained about the same or even decreased on average (especially in Romania) compared to pre-COVID-19 times, which might be due to the intense crisis when people simply wished to take care of their administrative matters, yet it might rise if the pandemic circumstances last much longer.

### 3.1.3. Challenges for Public Managers during COVID-19

The unprecedented situation caused by the COVID-19 pandemic's first wave has strongly shaken all types of organization and created many challenges also for public administration managers (heads) and employees. These heads of the administrative authorities reported having many challenges/troubles related to their role as a public manager. Our survey results show that the provision of material and spatial conditions (e.g., protective measures etc.) was the biggest challenge, followed by the more difficult coordination of urgent tasks in the absence of staff, the stress caused by the excessive expectations of both parties and employees. All of the above challenges are related to human factors (either employees or parties) while the information systems' failures were assessed the lowest, although they were still significant and more frequent than before the COVID-19 pandemic. It may be concluded that the technical factor, associated with digitalization (ICT), did not cause as much stress as the aspects relating to the employees and parties. In summary, we can say that the overall crisis, like the first wave of the COVID-19 pandemic, is chiefly about managing other people's emotions, especially fear.

During the first wave of the COVID-19 pandemic, the administrative authority heads had to find ingenious solutions to ensure their administrative authority's operations would continue and to help their employees cope with the extraordinary crisis. After adopting these solutions, the employees reported some positive outcomes of the COVID-19 pandemic (see Figure 3). Many of these experiences concerned digitalization, the key force leading to sustainability, e.g., (1) the opportunity to digitalize work processes faster and more efficiently than in normal circumstances; (2) the opportunity to learn to use new digital communication tools like Zoom, MS Teams etc., and (3) more efficient meetings through digital communication channels. Other positive outcomes of COVID-19, as assessed by the administrative authority employees, were: (1) becoming aware of the importance of protecting older employees and risk groups while designing work processes; (2) becoming aware of the importance of promoting health in the workplace; (3) the opportunity to complete tasks that would have been difficult to complete in the previous situation; and (4) the opportunity to have time to improve work processes.

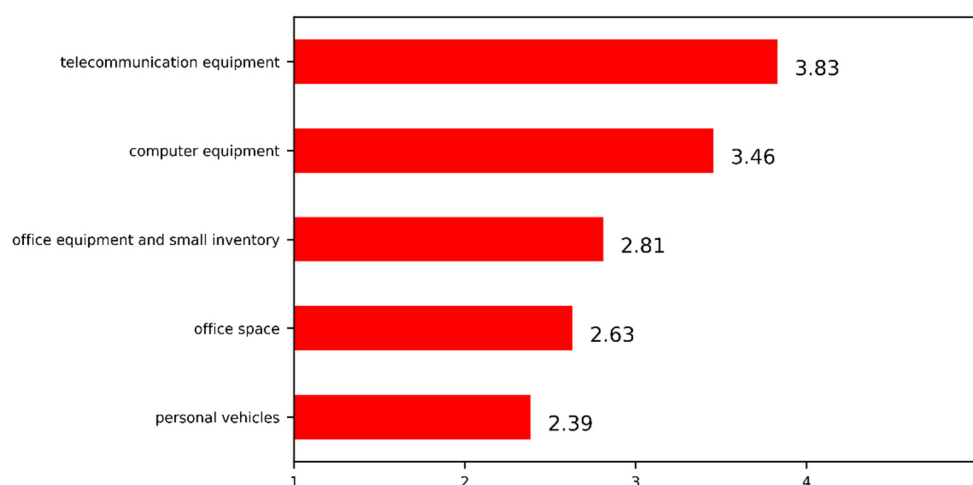
When comparing the results for the countries under study, the research shows that all of the studied positive outcomes of COVID-19 have raised the attention of public managers in all of these countries. While the most exposed positive consequences concerned health, great emphasis was also put on outcomes associated with digitalization, especially the opportunity to learn to use new digital communication tools like Zoom, MS Teams etc. (3.87) and the opportunity to digitalize work processes faster and more efficiently than in normal circumstances (3.82) with small variations among the countries, with Germany standing out in both elements. Compared to the importance of other positive outcomes, those related to organization seem to be the least emphasized. Accordingly, one may summarize that, public managers acknowledge the importance of digitalization, right after the protection of health, once the pandemic is over. Digitalization is and will also remain important, besides the issues related to the pandemic, for resolving sustainability challenges and driving the disruptive changes needed.



**Figure 3.** Employees' opinions on the positive outcomes of COVID-19. All elements are on average statistically significant different than the hypothesized value of 3 ( $\alpha = 0.01$ ), reflecting equal extent before and during the COVID-19 pandemic.

#### 3.1.4. Cost Management during COVID-19

The COVID-19 pandemic has affected the structure of material resource utilization in administrative authorities. Namely, for public administration employees, the new circumstances have not only altered the location of their work, but also their work tasks/demands. This situation entails a different cost structure than would otherwise exist in normal circumstances [43]. In the context of the COVID-19 pandemic, public managers reported that material costs were significantly higher than in normal operations. This is especially due to the rise in health protection costs (safety and health as well as security and cleaning) since material costs not related to health protection remained on the same level (e.g., postal services and office supplies) or decreased (especially travel costs, fees for employee training and representation) for the time of the COVID-19 pandemic. Salary costs and investment and maintenance costs (e.g., inventory repair and on-going maintenance) remained at the same level as prior to the COVID-19 pandemic. As regards other costs and costs related to paid printed materials, they were significantly lower for the time of the COVID-19 pandemic than in normal operations. The overall structure of the utilization of the administrative authorities' material resources has accordingly changed significantly during the COVID-19 pandemic (see Figure 4).



**Figure 4.** Utilization of administrative authorities' material resources during COVID-19. All elements are on average statistically significant different than the hypothesized value of 3 ( $\alpha = 0.01$ ), reflecting equal extent before and during the COVID-19 pandemic.

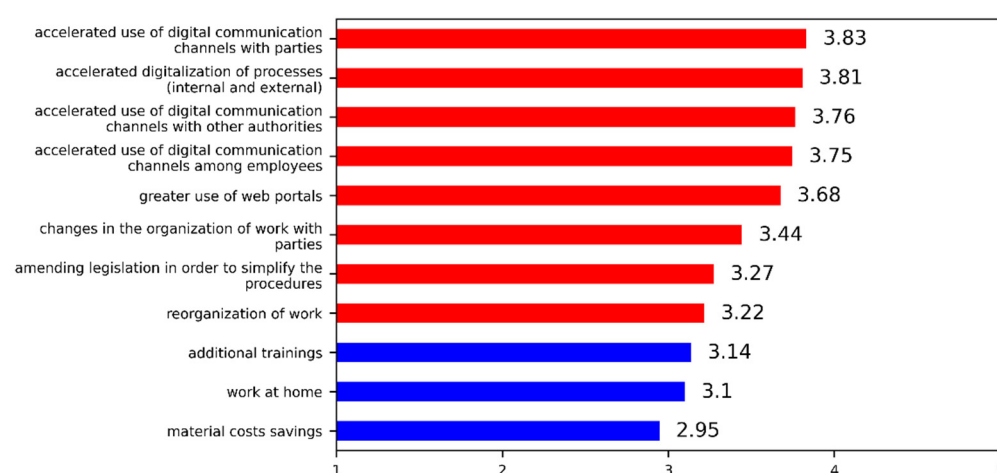
The results of our study show public managers expressing that ICT equipment has been utilized significantly more during the COVID-19 pandemic than before, as revealed by the highest average values for utilization of telecommunication (3.83) and computer (3.46) equipment, which was highly important not only to prevent infections, but to support overall sustainability. Considerably greater utilization of ICT equipment was observed especially in Germany (4.18 and 3.97 for telecommunication and computer equipment, respectively) and the Czech Republic (3.92 and 3.48 for telecommunication and computer equipment, respectively), where the highest shares (about 30%) of public administration employees were working from home during the pandemic. Interestingly, in Slovenia, ICT equipment (especially computer equipment) was utilized less during the first wave of the COVID-19 pandemic than usual (2.88), which can be explained by the country's lowest share (about 6%) of public administration employees working from home during the pandemic. As expected, non-ICT assets were significantly less utilized during the COVID-19 pandemic than before, more prominently in Slovenia (for office equipment and small inventory—due to less physical contact with parties, and personal vehicles—due to less business trips) and the Czech Republic (for office space—due to the relatively large share of employees working from home).

### 3.1.5. Future Challenges after COVID-19

The COVID-19 pandemic has considerably affected, even transformed, almost every aspect of societal relations, administrative ones included. It is highly likely that certain changes implemented during the pandemic will last long into the future. Our study results show that public managers of the administrative authorities are expecting the COVID-19 pandemic to also bring lasting changes to the functioning of their administrative authorities, especially in terms of further accelerated digitalization, which is fundamentally important for sustainable development (see Figure 5). The initial COVID-19 circumstances gave no choice but to utilize digital technologies in an attempt to reduce the virus' spread. Administrative authorities and many other institutions were forced to experience digital ways of providing services. This meant they were given insight into how efficient and effective digital operating can be. Besides expectations that the accelerated digitalization will remain after the pandemic, public managers of the administrative authorities also report the amended legislation in order to simplify the procedures as significantly likely to remain. In contrast, no major changes are expected compared to the time before the COVID-19 pandemic in the areas of additional training on stress management and a healthy life and of working from home. As the pandemic started, work life shifted over to telework as companies and institutions introduced this arrangement to keep their employees healthy and to safely continue with the delivery of services. The European Commission [44] policy brief reported that the transition to work from home may have been more challenging for those employees, institutions, and countries lacking the right ICT infrastructure or with little prior experience and, according to the policy brief, over one-half of those currently working from home, in several EU countries, had no prior experience. Working from home after the COVID-19 pandemic will depend on several factors, like its effect on productivity and working conditions. Evidence shows that, in normal conditions, working from home can even enhance employees' productivity, providing a better work–life balance. Nevertheless, in the current circumstances, working conditions and productivity might be declining due to the lack of childcare, ICT tools, and an unsuitable working environment [44].

If, according to the public managers of the administrative authorities, working from home is not very likely to remain after the COVID-19 pandemic, all aspects regarding accelerated digitalization in the future are strongly expected to remain, with the most evident being the accelerated use of digital communication channels with parties to the procedures (3.83) to drive administrative authorities to make this shift. This is correlated with the changes expected in the organization of work with parties. The accelerated digitalization of processes (3.81) is also significantly likely to remain after the pandemic,

which correlates with the expected reorganization of work and amended legislation in order to simplify the procedures and with the agenda for a sustainable future. The tendency towards digitalization is also seen in the observation that the accelerated use of digital communication channels with other administrative authorities (3.76) and among employees (3.75) as well as the greater use of web portals (3.68) are also significantly likely to remain after the pandemic. The study results show high values for the likelihood of the digital changes remaining in place after the pandemic for all countries that participated. However, all of them score below the EU average when it comes to providing digital public services, which highlights the considerable room for improvement compared to the top providers in digital public services (e.g., Estonia, Spain, Finland). The significantly higher likelihood of accelerated digitalization after the pandemic was observed especially in Germany and Romania, which may be explained by the DESI report [44] as the two countries rank the lowest among the other countries participating in this survey (Czech Republic, Poland, Slovenia), when it comes to providing digital public services, enhancing the need for digitalization, even more so for a sustainable recovery from the pandemic crisis and future sustainable development in the post-pandemic era.



**Figure 5.** Likelihood of changes lasting after the COVID-19 pandemic. Red bars show elements that are on average statistically significant different than the hypothesized value of 3 ( $\alpha = 0.01$ ), reflecting medium probability that the selected changes will remain or be introduced after the COVID-19 pandemic.

### 3.2. Regression Results

Ordinal logistic regression was applied to empirically verify the influence of the selected factors on the functioning of general administrative authorities as well as the geographical factors on the accelerated digitalization after the COVID-19 pandemic (see Figures 1–5). Similar analysis was applied in other COVID-19 related studies (see Aristovnik et al. [24]). A regression model with ordinal dependent variable  $Y = \text{Accelerated digitalization after the COVID-19 pandemic}$  and  $p = 12$  predictors ( $X_1 = \text{Regulation clarity} - \text{unambiguity}$ ,  $X_2 = \text{Regulation inconsistency}$ ,  $\dots$ ,  $X_p = X_{12} = \text{SI}$ ) was analyzed (see Equation (1)). The model estimates the conditional probability  $P(X_1, X_2, \dots, X_p)$  that  $Y = \text{Accelerated digitalization after the COVID-19 pandemic}$  was less than or equal to  $j$  given the values of predictors  $X_1, X_2, \dots, X_p$ . Value  $j$  ranges from 1 to  $k - 1$  where  $k$  is the number of ordered categories of the dependent variable  $Y$ . In our case,  $k = 5$  (its values range from 1 = *not likely at all* to 5 = *very likely*). The formula of the ordered logistic regression used in the paper is:

$$P(Y \leq j | X_1, X_2, \dots, X_p) = \frac{1}{1 + \exp(\beta_0 - (\beta_1 \cdot X_1 + \beta_2 \cdot X_2 + \dots + \beta_p \cdot X_p))} \quad (1)$$

The task is to estimate coefficients  $\beta_1, \beta_2, \dots, \beta_p$ , which are related with predictors, and the intercepts  $\beta_{0j}$  for  $j = 1, 2, \dots, k - 1$ . Their interpretations of the intercepts are meaningless and are, therefore, omitted from Table 2.

**Table 2.** Spearman correlations between the variables.

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
(1) Accelerated digitalization after the COVID-19 pandemic	1.000								
(2) Regulation clarity—unambiguity	0.071 *	1.000							
(3) Regulation inconsistency	0.059	0.043	1.000						
(4) Use of simplified digitalized procedures by parties	0.280 ***	0.033	0.094 **	1.000					
(5) Abuses of digitalized procedures	−0.069 *	−0.008	0.056	−0.008	1.000				
(6) Difficult work coordination in the absence of staff	0.140 ***	−0.134 ***	0.004	0.169 ***	0.094 **	1.000			
(7) Opportunity to digitalize work processes	0.362 ***	0.082	0.062 *	0.350 ***	0.024	0.215 ***	1.000		
(8) Computer equipment utilization	0.292 ***	0.027	0.067 *	0.134 **	−0.038	0.054	0.175 ***	1.000	
(9) Telecommunication equipment utilization	0.273 ***	−0.052	0.083 **	0.193 ***	−0.006	0.178 ***	0.234 ***	0.647 ***	1.000

Note: Measurement: A 5-point Likert scale ranging from 1 (lowest value) to 5 (highest value). Significance: \*  $p < 0.10$ ; \*\*  $p < 0.05$ ; \*\*\*  $p < 0.01$ .

Before estimating the parameters, two vital assumptions of ordinal logistic regression were investigated, specifically the assumption of proportional odds and the issue of multicollinearity. The test of the proportional odds assumption was not significant ( $p = 0.054$ ), meaning that the regression slopes do not differ significantly across levels of the dependent variable. Further, multicollinearity was tested by checking the correlations between explanatory variables (see Table 2). A simple correlation between the explanatory variables did not indicate any strong linear relationship, implying absence of multicollinearity in the data [24,45].

The severity of multicollinearity was further examined by multicollinearity diagnostics with the variance inflation factor (VIF) ranging between 1.0 and 1.7, namely considerably below the threshold of 10 and, thus, confirming the absence of multicollinearity [46]. Due to the listwise deletion of missing values in the ordinal logistic regression, 325 valid full responses were considered in the analysis. Given the assumption that data were missing at random, we proceeded by estimating the parameters. The goodness-of-fit statistics for the proposed empirical model proved to be adequate, as suggested by a Nagelkerke  $R^2$  value of 0.350 [24,47]. The results of the ordinal logistic regression are presented in Table 3.

**Table 3.** Ordinal logistic regression for factors influencing accelerated digitalization after the COVID-19 pandemic.

Dependent Variable: Accelerated Digitalization after the COVID-19 Pandemic <sup>a</sup>	B	SE	Wald	Sig.	OR
Regulation clarity—unambiguity <sup>a</sup>	0.198 *	0.114	2.994	0.084	1.219
Regulation inconsistency <sup>a</sup>	−0.185 *	0.109	2.869	0.090	0.831
Use of simplified digitalized procedures by parties <sup>a</sup>	0.410 **	0.163	6.357	0.012	1.507
Abuses of digitalized procedures <sup>a</sup>	−0.227	0.158	2.063	0.151	0.797
Difficult work coordination in the absence of staff <sup>a</sup>	0.668 ***	0.146	21.026	0.000	1.950
Opportunity to digitalize work processes <sup>a</sup>	0.687 ***	0.170	16.402	0.000	1.989
Computer equipment utilization <sup>a</sup>	0.327 **	0.162	4.067	0.044	1.387
Telecommunication equipment utilization <sup>a</sup>	0.347 *	0.183	3.615	0.057	1.415
Germany <sup>b</sup>	1.294 ***	0.415	9.719	0.002	3.647
Poland <sup>b</sup>	0.684	0.553	1.527	0.217	1.981
Romania <sup>b</sup>	1.514 ***	0.339	19.974	0.000	4.544
Slovenia <sup>b</sup>	−0.029	0.406	0.005	0.943	0.971

Note: Abbreviations: B—regression coefficient; SE—standard error; OR—odds ratio. Measurement: <sup>a</sup> 5-point Likert scale ranging from 1 (lowest value) to 5 (highest value); <sup>b</sup> 1—Yes, 0—No. Significance: \*  $p < 0.10$ ; \*\*  $p < 0.05$ ; \*\*\*  $p < 0.01$ .

The results suggest that the regulations and competences of administrative authorities hold important implications for the accelerated digitalization of general territorial administrative authorities after the COVID-19 pandemic. They confirm that regulation clarity—unambiguity has a positive effect ( $B = 0.198$ ;  $OR = 1.219$ ;  $p < 0.10$ ), while regulation inconsistency has a negative effect on accelerated digitalization after the COVID-19 pandemic ( $B = -0.185$ ;  $OR = 0.831$ ;  $p < 0.10$ ). More specifically, a 1-unit (scale) increase in regulation clarity—unambiguity or regulation inconsistency leads to a 0.198-increase or 0.185-decrease in the log-odds of having a higher level of accelerated digitalization



after the COVID-19 pandemic, while the other predictor variables in the model are held constant. Equivalently, a 1-unit increase in regulation clarity–unambiguity or regulation inconsistency would increase or decrease the likelihood of overall accelerated digitalization after the COVID-19 pandemic by 21.9% or 16.9%, respectively, while keeping the other variables in the model constant.

Regarding procedures and services, the results reveal that use of simplified digitalized procedures by parties is an important driver of accelerated digitalization in the future as suggested by the positive and significant coefficient ( $B = 0.410$ ;  $OR = 1.507$ ;  $p < 0.05$ ), implying that a 1-unit increase in the extent of parties using simplified digitalized procedures would lead to a 50.7%-increase in the likelihood of being in a higher category of accelerated digitalization after the COVID-19 pandemic, while keeping the other model predictor variables constant. In addition, the negative coefficient abuses of digitalized procedures were not statistically significant, implying this predictor is not an important determinant of future accelerated digitalization.

Compared to other areas of operation, the challenges for public managers are also an important determinant of a future orientation to accelerated digitalization as established by the highest positive and highly significant coefficient for difficult work coordination in the absence of staff ( $B = 0.668$ ;  $OR = 1.950$ ;  $p < 0.01$ ) and opportunity to digitalize work processes ( $B = 0.687$ ;  $OR = 1.989$ ;  $p < 0.01$ ). This implies that a rise in difficult work coordination in the absence of staff and opportunity to digitalize work processes by 1 unit (with the other predictor variables in the model being held constant) increases the likelihood of being on a higher level of accelerated digitalization after the COVID-19 pandemic by a respective 95.0% and 98.9%.

With regard to cost management, the utilization of ICT equipment was found to be a driver of accelerated digitalization after the COVID-19 pandemic, as suggested by the positive and significant coefficient for computer equipment utilization ( $B = 0.327$ ;  $OR = 1.387$ ;  $p < 0.05$ ) and telecommunication equipment utilization ( $B = 0.347$ ;  $OR = 1.415$ ;  $p < 0.10$ ). This implies that a rise in computer equipment utilization and telecommunication equipment utilization by 1 unit (while the other predictor variables in the model are held constant) increases the likelihood of being on a higher level of accelerated digitalization after the COVID-19 pandemic by 38.7% and 41.5%, respectively.

Finally, the geographical perspective was also found to be important for explaining the variation in accelerated digitalization after the COVID-19 pandemic, especially in Germany ( $B = 1.294$ ;  $OR = 3.647$ ;  $p < 0.01$ ) and Romania ( $B = 1.514$ ;  $OR = 4.544$ ;  $p < 0.01$ ) for which a positive and significant coefficient was established. More specifically, the general territorial administrative authorities in Germany and Romania, respectively, may have 3.6 times and 4.5 times greater chances of attaining a higher level of accelerated digitalization after the COVID-19 pandemic compared to the general territorial administrative authorities in other countries, keeping the other variables constant in the model.

#### 4. Discussion

Public administration is a key societal subsystem affected and simultaneously shaped by any major social changes [35,48]. However, in a social environment, the changes are usually complex; yet, like in any crisis, external pressures can be seen as an opportunity to refine organizational goals and to improve the performance of public administration and its public value. In this context, public administration must be recognized as part of the executive branch of power, enforcing administrative procedures and providing services compliant with the legislation adopted by parliament and governmental guidelines. The relations among those holding power are nonetheless constantly modifying and even evasive when there is a need to respond to a crisis swiftly and in a coordinated top-down approach—like in the circumstances of the COVID-19 pandemic [34,40].

Such a trend is characteristic regardless of the otherwise strong administrative traditions in individual countries. Nevertheless, it was shown that the trends imposed by the pandemic are very similar in the Czech Republic, Germany, Poland, Romania, and Slovenia



since these countries are all Central European and EU member states, sharing the majority of political-administrative dimensions in the recent public governance context. This is also confirmed in several studies, in both general administrative reforms analysis or regarding specific administrative procedures, de-bureaucratization or digitalization [39,41,42,48]. According to our study, the biggest problems of pandemic-related regulations are, hence, not the speed and quantity of the regulations but their obscurity, because their consistency is lower in pandemic times than in normal operations before COVID-19. This is particularly evident for four of the five countries in the study, e.g., the Czech Republic, Poland, Romania, and Slovenia, while such unambiguity was apparently not so intense in Germany. This result may be attributed to a more *Rechtsstaat* (rule of law) oriented work mode, while the other four, all former socialist countries, have in the last few decades become used to responding to crises even with radical changes in terms of major political-administrative changes [48]. An obvious and omnipresent problem of a fast executive and, therefore, less coordinated rulemaking in the crisis is, according to our study, mitigated by two factors, e.g., a strong administrative tradition and more digitalized regulatory processes.

Especially in general administrative authorities, the procedural dimension is a crucial force that elevates parties while seeking various licenses, and for developing trust in the public administration as a resilient and agile organization [49,50]. Namely, a substantive law can rarely be deregulated if certain standards for public interest protection are to be met, but procedures can considerably support the easier exercising of citizens' rights in this respect. Digitalization has in this framework already been proven to be a key systemic innovation [34,35,39]. COVID-19 is clearly shown to be an important and functioning factor of modernization with ICT growth since the other characteristics of public administration did not change. The services provided have been based on almost the same legislation—with some minor adaptations such as allowing e-communication without qualified forms of identity [34,41]—and with quite the same ICT systems and resources as existed before COVID-19. More importantly, the experiences in practically all of the countries included in the survey—despite their differences—show that procedures have run more smoothly with almost no additional burdens or misuses.

On the other hand, the pandemic has also created many potential opportunities in terms of the organization of administrative authorities, HRM, and leadership, such as the opportunity to digitalize work processes to make them faster and more efficient than in normal circumstances, the opportunity to learn to use new digital communication tools, the opportunity to complete tasks that would have been difficult to complete in the previous situation, and the opportunity to analyze and improve work processes [51,52]. It has increased awareness of the importance of promoting health in the workplace and the important need of protecting older employees and risk groups while designing work processes. Further, it has affected the structure of material resource utilization in administrative authorities. Namely, for public administration employees, the new circumstances have not only changed the location of their work, but also their work tasks/demands. This situation leads to a different cost structure than otherwise exist in normal circumstances. In addition, it is highly probable that certain changes implemented during the pandemic will last in the long term. According to the study results, public managers of the administrative authorities are also expecting the COVID-19 pandemic to bring lasting changes to the functioning of their administrative authorities, particularly in terms of further accelerated digitalization, which symbolizes the convergence of innovative technologies, many of which are currently making contributions to sustainable development.

As regards the focus of the research, these are external procedures and services in relation to citizens, namely, the users of public services who are obviously demanding a change in the direction of digitalization. During the COVID-19 pandemic, user-driven digitalization has been the case rather than internally, e.g., a government-led one, as principally observed before [40,45]. However, the existing administrative digitalization practices are relatively modest, merely enabling e-applications, video conferences, and public e-services, while any advanced use of artificial intelligence and learning algorithms [39,44] were not

detected in the analyzed authorities in any country included thus far. Practically, it can be concluded that the public administration is currently somewhere on the second stage of digital transformation, i.e., e-government 2.0., also sometimes referred to as “open” government [39]. When digitalized procedures simply reflect traditional bureaucracy, digitalization does not contribute to better governance—more in-depth changes are required. Despite some advancements in this area, accelerated by the pandemic, there is still room for improvement in digitalization of public administration in the post-COVID-19 era, especially when it comes to the local level. Namely, besides digital infrastructure and digital workforce in public administration, there are also other determinants such as regulation and coordination, which will lay the foundation for digital government for years to come.

Although the importance of digitalization seems to be universal across studied EU countries (Czech Republic, Germany, Poland, Romania, and Slovenia), still, these issues show that the digitalization of public administration is not an isolated dimension but must be promoted and enforced in compliance with the rule of law, related macroeconomic indicators of each country, and the EU as a whole. In this sense, the permanent digital transformation as a final outcome of contemporary administrative relations in general and procedures in particular [39,42,53,54] remains a goal requiring intensive work. Namely, the present simplifications based on the COVID-19 pandemic are temporary in nature and show there is potential yet also caveats to take care of while introducing a systemic approach. If, for instance, the legal guarantees to public service users are lowered because they are perceived to only be administrative barriers, the result in the long run could prove to be the opposite of good governance. The main factor in post-pandemic digitalization seems to be a comprehensive and interdisciplinary reform that considers the legal, political, technical, sociological, psychological, and organizational aspects of administrative relations.

Several limitations of the study should be recognized. First, the analysis is based on the respondents’ subjective evaluations, which might lead to misinterpretation of certain aspects/elements of the survey. It is reasonable to assume that some public managers might under/overestimate the extent or likelihood of individual aspects/elements of general administrative authorities’ operations. Second, the study is focused only on selected aspects/elements of digitalization of local public administration relevant within the context of general administrative authorities and their competences, which are more oriented towards public services provision rather than policy making in service digitalization. Third, the study was performed in various stages of the pandemic in different countries—in some countries it was advanced more than in others, with varying sizes of magnitude. Fourth, the portfolio of responsibilities on local public administration levels may vary within individual countries. Fifth, the analysis includes five EU member countries with comparable structure and functions of local general administrative authorities, however, caution should be taken while generalizing the results to those European countries not included in the sample. Finally, despite all studied countries (Czech Republic, Germany, Poland, Romania, and Slovenia) being members of the EU, the results do not necessarily just reflect the COVID-19 pandemic but also other factors (e.g., differences in digital transformation of public administration, economic development, performance of public administration, political circumstances etc.) as also proposed by the existing large-scale comparative studies (see Aristovnik et al. [24]).

Notwithstanding the mentioned limitations, our survey findings are extremely important given the obvious lack of comparative empirical studies that analyze the impact of the COVID-19 pandemic on the public administration by considering different aspects/elements and their implications for digitalization. Accordingly, the present study importantly fills this research gap and reveals the following avenues for future research: (1) focusing further empirical analysis on selected aspect/element related to the general administrative authorities’ operations separately in more detail from different and comparative perspectives on national, regional, and/or institutional levels; and (2) extending a comparable and/or complementary survey to other segments of the public administra-

tion by conducting a global study on the COVID-19 pandemic's impact on their views on digitalization.

## 5. Conclusions

The COVID-19 pandemic has significantly reshaped almost every aspect of societal relations, including administrative ones, and revealed that the public administration is facing turbulent problems characterized by the sudden emergence of inconsistent, unpredictable, and uncertain events. In this respect, this comprehensive study provides systematic meaningful insights into the first wave of the COVID-19 pandemic's impact on general administrative authorities on the local level on various aspects concerning functioning and digitalization in five EU countries.

The study reveals that the changes imposed by the pandemic are very similar in the five respective countries, but not necessarily in other, especially non-European, countries. The results show that, except for Germany, the biggest problems of the pandemic-related regulations are their obscurity. Moreover, for all countries under study it shows that parties to the procedures act as the main driver of digitalization and not the public administration itself, which is generally lagging behind in this sense, as confirmed by research on public administration issues before the pandemic as well as the comparison of external and internal relations. Nevertheless, the pandemic has also created several potential opportunities, with public managers, especially in Germany, acknowledging the importance of digitalization right after the protection of health, as further confirmed by the greater utilization of ICT equipment, particularly in Germany and the Czech Republic. Finally, it is shown that Germany and Romania hold the greatest potential to accelerate the digitalization of their administrative authorities, which is crucial for a sustainable recovery from the pandemic crisis.

The logic regression analysis results demonstrate that the better clarity and consistency of regulation as well as greater use of simplified digitalized procedures are important drivers of future digitalization. The results also reveal that general administrative authorities facing more challenges related to coordinating work and the digitalization of work processes in the presence of greater ICT utilization are more likely to accelerate their digitalization once the pandemic ends. Finally, Germany and Romania seem to be countries where digitalization will be even more pronounced in the future. Even though digitalization in public administration is more pronounced due to the pandemic, it generally remains on a relatively low level. Thus, while it is certainly not yet possible to talk about the digital transformation of public administration, the direction towards digital transformation is still correct, yet the path remains long and winding. Namely, local general administrative authorities may act as a "litmus paper" in terms of passing information from the parties to policymakers, who should work more on systematic and broader measures to achieve overall digital transformation of public administration, where there is still a lot of untapped potential for improvement. The evidence-based findings of the paper may help while formulating the recommendations for public administration management for this and any future pandemic crisis.

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