E-Government and COVID-19: An Empirical Study in Greece

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Abstract. E-government and the implementation of ICT technologies in the public sector has been in the center of interest for a few decades now, but it is a fact that the Covid-19 pandemic and the worldwide lockdowns have given a boost on their prosecution in our everyday lives. The aims of this study were to i) examine the implementation of digital transformation best practices utilized by the governments globally and ii) take a thorough look in the case of Greece, to determine whether and to what extent the Greek government adopted similar practices and initiatives, allowing the use of online digital services to citizens in a wide array of public sector areas during the Covid-19 pandemic. Initially, we sent a questionnaire to 202 people in Greece, via email and social media platforms. In response, 150 useable questionnaires were received with response rate of 74%. We gathered responses were gathered between May and June 2021, and data gathered were analyzed with PSPP statistical program. The results showed that the majority of the practices used by the government were well communicated, as most of the digital services were acknowledged by the participants even if they had not used them. In particular, the taxation portal and the central digital portal for governmental services were used in percentages of 76% and 66% respectively. In terms of use and satisfaction, responses were also quite encouraging, with 72% of the participants mentioning being very satisfied with the speed and quality of the new digital services, though leaving room for further research to conclude on improvement methods. After in-depth examination of the global and Greek progress of digital transformation during the COVID-19 pandemic, it is essential to state that all governments have shown tremendous improvement in order to cover citizens' needs, while using the majority of the available digital channels.

Keywords: E-government · Digital government · Digital services · Public sector · Greece

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1 Introduction

The evolvement of world wide web in the last decades has caused tremendous effects in all business environments, with more and more companies adopting web-based technologies for the automation of their everyday tasks. In the contrary, although there have been several models for incorporating such a change in public organizations, governmental agencies have been more conservative and idle to adopting new technologies [1]. To be more accurate, the idea of citizens being treated as customers has been introduced in 1992, by Osbourne and Gaebler [2], to convince public organizations to adopt a more customer centric point of view while delivering their services. Although in 2005 Torres et al. refer to e-government being a global trend with new web-based technologies [3], we can now say there has been little change in the public sector, until e-government has become an absolute necessity with the Covid-19 outburst.

Luckily, the Digital Agenda for Europe had set among its targets the development of more efficient public services since 2010, with the last decade being essential for the positive exploitation of Information and Communication Technologies (ICT) in all private and public sectors for foreseeing problems and opportunities of the digital outburst [4], which was crucial for the confrontation of all physical, economical, and managerial boundaries caused by the worldwide Covid-19 lockdowns. It is undoubtable that despite the difficulties, the majority of businesses, organizations and people had the appropriate background in ICT, both knowledge wise and in physical infrastructure, so that most of their everyday tasks will not be ceased but continue to occur with the most normal possible flow in a digital form. The aim of this paper is to study and present the boost of the ICT usage in public sectors and e-government progress, and how their operations transformed through the Covid-19 outburst, setting Greece under the microscope to acknowledge the work done so far and identify best practices for future adoption.

2 Background

Analyzing some studies on the e-government implementation, it is observed that in the first steps of incorporating ICT in public organizations some findings come to an opposition to the overall e-government vision and scope, which has always been the elimination of discrimination between citizens, the provision of equal, fast services and treatment for all, and the performance excellence of public administration providing services with convenience, efficiency, and transparency [5].

In a general view of e-government implementation, Mishra analyzes the “Digital India” program, a program which aims to make India a truly and fully digital country after the Covid-19 outbreak and the new demand rules it has brought, introducing the implementation of ICT with a series of policies, initiatives, and excellence centers, that would offer services to citizens on demand [6]. During this program India has managed to digitize all departments to achieve the offering of digital services to all citizens, though several other problems are presented for the full success of the program, such as infrastructure, connectivity in rural areas, the amendment of restrictive regulations and most important, the digital literacy both of the citizens and the governmental employees [6]. Furthermore, Burlacu et al. [7] and Scupola [8] analyze the Covid-19 e-government

management in Romania and Denmark respectively, and identify similar issues. In the first study, it is suggested that effective e-government practices can be implemented in a 5-step process, which includes the creation of webpages for all organizations and institutions, the extent of information coverage, the online availability of forms or facilities requested by citizens, followed by the possibility of obtaining/issuing important documents via the internet, and the overall expansion of services offered digitally [7]. Though the problems identified in both studies also concern the socio-economic status of a big portion of both countries' population, meaning that there are cases of inefficient knowledge or infrastructure to access those services [7, 8] – to be more accurate, apart from concerns on data protection in Romania, public workers have proven not to be ready to completely embrace such a change [7] and more than a quarter of Denmark's population still lacks basic digital skills [8].

During the beginning of the pandemic, China has demonstrated a few successful practices on the improvement of everyday life though e-government too [9–13]. Studies have shown that most online interaction happens though mobile phones, online health information seeking behavior has also increased – especially during Covid-19, where isolation was essential, and hence many governments attempted to achieve social media presence by even using celebrities and word of mouth as a tool, in order to provide health guidance to people [9]. The role of e-government and word of mouth on spreading messages has proven to be very effective during quarantine, as the Chinese government has taken full advantage of the ability to be online present, and not only spreading messages for personal hygiene and social distancing, but also for promoting even more digital transactions [10, 11]. Though it should be mentioned that Chinese government had already incorporated basic e-government operations in one of Chinas most popular social media platforms/applications, WeChat, before the pandemic. Such mechanisms included messaging for payments and similar electronic transactions, thus the online presence of government increased the usage of this service [11]. Additional practices that were used since 2018 in 80% of China's republics also included distance education and health, and were already suggested as best practices to be adopted by other countries too, though they require an extended combination of e-governance innovative use on advanced technologies and citizen participation to maximize the advantages of this effort, and the effective confrontation of the fact that 85% of the global population are still using the 3G network, which in many cases may not be quite efficient [11, 12]. Agostino et al. have also identified social media as a more powerful tool for the digitization of public service deliveries over other ground-breaking tools, focusing on the digitization of cultural services. In their study they have identified that the usage of social media has changed from simple communication with users in a more creative and effective way, such as performing virtual tours or educational initiatives in order not to fend off their core operation [13].

Some further best practices that were identified in the public sector focus on the development of communication strategies and initiatives performed online, also based in the fact that most of the world population uses the internet and social media for fast and up to date information retrieval. In order to avoid miscommunication and the spread

of misleading information regarding Covid-19, many governments proceeded with collaboration with digital companies and mass media [14]. Furthermore, some governments have even developed multi-purpose applications, such as the case of Italy, where collaboration with private companies was accomplished in order to provide free online services and internet access to the public during the lockdown [14]. Most of the countries have even developed mobility tracing applications to contact tracing of people entering the country and ensure that all quarantine measures were kept, as well as ensuring that the appropriate Covid-19 tests were performed so that people could act accordingly [15]. Regarding public sector capacity though, studies have shown that governments need to be more adaptive and attentive to people's needs, aligning public services to emergency situations. For instance, investment and coordination in public and private health sectors working remotely has proven to be effective, but public sector workers' needs should be taken more seriously under consideration, since there has been tremendous change in the way they work, and assistance was substantial [16, 17]. Schuster et al. support that surveys of public servants are an important tool for such an implementation, as they can identify problems and provide solutions on online and remote interactions that are now needed for the completion of their everyday tasks. Furthermore, technical equipment and safe remote workplace environments can be more easily ensured, as well as best practices can be identifying by keeping constant communication and satisfaction measure of public workers [17]. In addition to this opinion, Cohen et al. suggest that user-friendly e-learning programs need to be organized by universities, for accounting systems in the public sector to acquire technical support, efficiently qualified staff and to achieve bridging the gap of academic and practitioner knowledge on the digital environment that navigates the current operation of the system [18].

From the aspect of public services in healthcare, education and news media, China was once again an example to follow, as great technological evolution occurred in a very short period of time to effectively confront the emergency situation. Numerous artificial intelligence (AI) and 5G applications were developed as a window to a whole new world of possibilities. 5G smart hospitals were established, with their operation being mainly based on cloud-working robots to eliminate human interaction. Their role was to perform important everyday actions such as temperature measurement, disinfection and cleaning of medical spaces and drug delivery, mainly with drones and especially to vulnerable populations [19–21]. Moreover, with 5G offering wider and faster connectivity, many private companies have cooperated with governments introducing innovative health applications accompanying existing services. For example, there were cases of ambulances converted to smart ambulances, that would offer pre-hospital emergency treatment using video consultation during the transmission to the hospital, and what is even more worth mentioning is that during the pitch of the pandemic they performed even double daily trips than the traditional ambulances [20, 22]. Similarly, many applications were also developed to provide eHealth literacy in older adults and their families or caregivers, ensuring that as vulnerable populations they would not be left sidelined [23]. In terms of e-learning capabilities, the necessity of remote education was also highlighted by the use of 5G, as there have also been cases of private companies cooperating with governments for providing full access to 5G networks and custommade platforms, for live distance classrooms or clouds, aiming to better connectivity and synchronized classes without technical issues [19, 24, 25]. It is worth mentioning though that the pandemic has effected not only the traditional classroom operation, but also the adjacent

functions supporting education. Research conducted in Bridgewater State University Library clearly presents the adjustments made in the academic library sector to continue operating as an auxiliary pillar to student's distance education, with a series of tasks including digitization of automated tasks, launching new digital services in the library's web page and even through social media, and online research consultations [26].

3 Research Method

Research methodology in this study was designed aiming to acknowledge digitization best practices adopted by governments around the world, and dive in the case of Greece, to identify similar practices and explore whether and how efficiently enough, Greek government established initiatives enabling the usage of online digital services to citizens in various public sector areas, during the Covid-19 pandemic. Empirical studies are an important methodology for evaluating real-life phenomena on specific issues, thus was identified as the best choice for performing research to evaluate public opinion on the extend of performance excellence this digitization attempt had throughout the last year. For this aim, quantitative research was conducted, and primary, descriptive data were gathered and analyzed with PSPP statistical program (2018 version).

For the development of the questionnaire a thorough search was conducted in governmental sites, aiming to identify the practices used for the digitization of existing services and the development of new digital functions for remote citizens' service. A questionnaire of 17 questions was developed based on the eGovernment practices identified, including only closed-ended questions of mainly 'yes' or 'no' answers, multiple-choice questions (with single and multi-selection answers), and Likert scale questions for the measurement of satisfaction of the services (full questionnaire available in the Supplementary file).

Survey questionnaire was created in Greek, data were collected via Google Forms, and distribution of the questionnaire occurred via e-mail and social media platforms. The questionnaire was initially tested with 10 people, and once finalized distributed to the public, in 202 people in total. Usable responses from 150 people were gathered between May and June 2021. Several covariates were used in the analysis included sociodemographic characteristics (sex, age, number of kids, working in private or public sector etc.) to identify the use of public services of each participant in accordance with their needs. The questionnaire was divided into six sections (including demographics), referring to measures related to eGovernment practices on information spread for Covid-19 pandemic, public agencies & remote services, public health services, cultural services, and remote work and education. Participation in the research was voluntarily and completion of the questionnaire was anonymous. All questionnaires were fully responded, and hence all data gathered were included in the analysis.

4 Results

In order to identify whether the eGovernment practices followed during the Covid-19 pandemic in Greece were well communicated to citizens and successful in substituting the physical services, a total of 150 questionnaires were included in the analysis. To

begin with, 72% of the participants were female, and almost half of the total sample (44%) were people aged between 19–25 years old. Regarding the occupation area of the participants, sample was split in three parts, were almost one third were private sector employees (34.67%), second part was students (34%), and the third part was distributed between public sector workers (16%), self-employed (8%) and unemployed (7.33%) people (Table 1).

Table 1. Demographics (N = 150).

	N	%
Sex		
Male	39	26
Female	108	72
Prefer not to say	3	2
Age		
<18	6	4
19–25	66	44
26–35	45	30
36–45	9	6
>46	24	16
Occupation		
Public sector worker	24	16
Private sector employee	52	34.67
Self-employed	12	8

Table 2. Citizen's familiarization on e-government practices for information spread during the covid-19 pandemic evolution (N = 150).

Digital means of information	Yes		No	
	N	%	N	%
TV/radio advertisements	117	78	33	22
Cooperation with celebrities (Word of Mouth)	84	56	66	44
New governmental websites (e.g., live COVID-19 map)	50	33.33	100	66.67
Email/phone/SMS for increased risk areas	64	42.67	86	57.33
Social media governmental profiles	76	50.67	74	49.33

The second section of the questionnaire was related to eGovernment practices for information spread during the Covid-19 pandemic evolution. Participants had the option to choose multiple means of information and practices that they were familiarized with.

All means and practices mention were identified, though TV and radio advertisements appeared to be more popular with 78% percentage of acknowledgement, while new governmental sites such as the live Covid-19 map streaming increased risk areas and restrictions, was in the last position with 33.33% (Table 2).

In relation with public agencies and remote services, an attempt was made to identify both the most frequently digital public service used, and user satisfaction. It is worth mentioning that 85.33% of the participants were not aware of digital transformation bible of Greece, which is a holistic digital transformation strategy for the Greek society and economy, but they were familiar with most of the digital services launched during Covid-19 pandemic (Table 3).

Table 3. Public agencies & remote services awareness (N = 150).

Awareness of the bible of digital transformation for Greece		N		%	N	%
Yes		22		14.67	22	14.67
No		128		85.33	128	85.33
Remote use of public services	**Total use**	**Degree of satisfaction**				
	N (%)	*Not satisfyied (%)*	*Slightly satisfied (%)*	*Neutral (%)*	*Satisfied enough (%)*	*Very satisfied (%)*
Digital services of citizen's service center (myKEPlive)	13 (8.67)	15.38	0.00	23.08	46.15	15.38
Digital services of manpower employment organization (myOAEDlive)	8 (5.33)	0.00	12.50	0.00	75.00	12.50
Taxation services (TaxisNet)	114 (76.00)	0.88	7.89	24.56	50.00	16.67
Central digital portal (Gov.gr)	99 (66.00)	2.02	7.07	25.25	47.47	18.18
Municipality digital services (myDimoslive)	5 (3.33)	20.00	0.00	20.00	60.00	0.00

(*continued*)

Table 3. (*continued*)

Awareness of the bible of digital transformation for Greece		N		%	N	%
Digital services for occupational safety (e-EFKA)	53 (35.33)	0.00	5.66	22.64	52.83	18.87
Public payments (e-fees, state pensions etc.)	50 (33.33)	4.00	8.00	20.00	52.00	16.00
ERGANI (portal for work insurances, movement certificates of employees etc.)	58 (38.67)	1.72	5.17	32.76	43.10	17.24
Comparison to physical presence use of Public services		**N**		**%**		
My request was successfully completed easier and faster with the online services		109		72.67		
My request was completed but the online services were complicated/not easy to use/took longer than usual		35		23.33		
My request was not completed, and I had to book a physical appointment with the service		6		4		

As mentioned in the table above, taxation services (TaxisNet) and the central digital portal (Gov.gr) were the most used digital services during the pandemic, with 76% and 66% use, respectively. From people using TaxisNet, 50% were satisfied enough with the portal, while 77, 19% mentioned that their request was completed easier and faster compared to the physical presence services in tax offices. Similarly, 47.47% and 18.18% of those who used Gov.gr were satisfied enough and very satisfied, while only 2.02% mentioned that their request was not complete through the portal. The least popular digital service was MyDimosLive, which is related to municipal issues and was used by only 3.33% of the participants. In the total point of view of satisfaction, users were satisfied enough with most of the digital services, and 72.67% mentioned that their request was completed easier and faster with the remote services. Regarding

user experience, ERGANI was rated as the one with the most successful services with a percentage of 81.03% completed requests.

The fifth section of the questionnaire was related to public health services, as they were transformed by the government to serve people with as less interaction as possible. The most used digital service related to health appears to be the self-test declaration platform (39.33%), followed by the individual electronic health record for intangible prescription via emails and electronic appointments with health scientists (26.67%). On the contrary, medicine delivery to remote areas was a service that the majority of the participants were not even aware of (62.67%), followed by the automated procedures initiated in specific hospitals (such as measurements and chatbots for the diagnostic initiation), with 54.67%.

On the cultural services, 92 of 150 participants were aware of digital events performance, and 53.33% of them mentioned that they did not attend any digital cultural event during the quarantines. Among the rest 46.67%, most people attended online concerts and live theater plays (33.33%), fewer attended virtual tours in museums (18%) and art exhibitions (6%), and only 6.67% attended an online reading event. Participants mentioned that they were satisfied with their digital experience in general, with the highest rates of satisfaction being in virtual tours in museums (48.15% were satisfied enough, and 40.74% very satisfied) (Tables 4 and 5).

Table 4. Public health digitization services during covid-19 pandemic (N = 150).

	I am aware of this service and I have used it		I am aware of this service, but I have not used it		I am not aware of this service	
Remote use of public health services	*N*	*%*	*N*	*%*	*N*	*%*
Individual Electronic Health Record (for intangible prescription via sms/emails, electronic appointments, etc.)	40	26.67	58	38.67	52	34.67
Self-test declaration platform	59	39.33	71	47.33	20	13.33
Online appointments at Primary Health Care Units (idika.gr)	29	19.33	72	48	49	32.67
E-consultation/distance support of Covid-19 patients (EODY)	13	8.67	90	60	47	31.33
Medicine delivery to remote areas or vulnerable populations (with drones or other means)	6	4	50	33.33	94	62.67
Automated temperature measurements/chatbots as a diagnostic initiation	16	10.67	52	34.67	82	54.67

Table 5. Digitization of cultural services (N = 150).

	N (%)	Not satisfied (%)	Slightly satisfied (%)	Neutral (%)	Enough satisfied (%)	Very satisfied (%)
Virtual tours in museums	27 (18.00)	0.00	0.00	11.11	48.15	40.74
Virtual tours in art exhibitions	9 (6.00)	11.11	33.33	0.00	33.33	22.22
Online concerts/Live theater plays	50 (33.33)	4.00	8.00	28.00	34.00	26.00
Online reading events	7 (4.67)	14.29	42.86	14.29	14.29	14.29
I did not attend any event	80 (53.33)	–	–	–	–	–

Regarding remote work and education, it is observed that 66% of public sector employees did work remotely during the Covid-19 lockdowns, though only 31.25% of them mentioned that they received the appropriate technological and infrastructure assistance from the government so that they can be as productive as in their offices. For students and freelancers, it is observed that a percentage of 100% stated that they had to work or follow their courses remotely, while 40.38% of private sector employees (21 from 52 participants) proceeded with teleworking (Table 6).

Table 6. Remote work and education (N = 150).

	N	%
Performance of remote Working/education		
Private sector employee	21	40.38
Public sector worker	16	66.67
Freelancer	12	100.00
Student	51	100.00
Assistance of government for remote working in public sector workers		
Yes	3	18.75
No	13	81.25

Most used applications for teleworking and online education during the pandemic were zoom (63%) and webex (29%), while in Fig. 1 it is presented that eGovernment means assisting distance work and online education were not very popular among citizens. A total of 42.70% were not aware of any of these assisting tools introduced by the

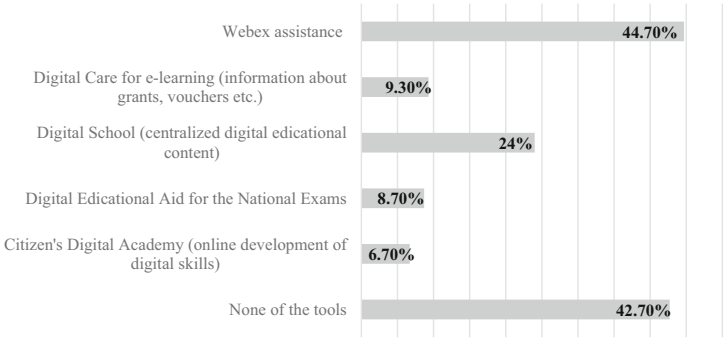

Fig. 1. Awareness of tools supporting remote working/education.

government, while from the rest 57.30% webex assistance gained cognition of 44.70% between participants, and the digital school 24%. On the contrary, the cognition percentages of citizens' digital academy (a tool for adult education on digital skills to be promoted for the pandemic needs) were very low (6.70%).

5 Discussion

The whole pandemic situation has caught everyone by surprise. It has exposed many deficiencies and brough up many functionality issues of everyday operations, while causing irreparable damages to the economy and society [27]. In the contrary, such situations that lead to radical changes usually cause versatile effects, both negative and positive ones. In the case of the pandemic, technological innovations and procedures have been rapidly sped up and it has been showcased how the next normal might look like, at least for the majority of our world.

Having proceeded with a closer look on the global and Greek landscape of digital transformation during Covid-19, it can be stated that all governments have done a remarkable effort, using multiple channels to cover citizens' needs. As multiply stated, during the pandemic the information flow was accelerated, making it difficult for many people to distinguish which information should be seriously taken under consideration and which not [28–30]. Undoubtedly, social media platforms have gained more ground with the passage of time and their purpose becomes more and more serious than just entertainment. According to our results, Greek government has taken good advantage of the opportunities they offer, although their high popularity of 50.67% among participants to ensure valid information on Covid-19 evolution may also be justified by the fact that almost half of the sample size (44%) in the research was aged among 19–25 years old, which is the most active group on such platforms [31]. Additionally, similarly to what is indicated by Yasir A. et al. [10], governmental appearance using the technique of Word of Mouth was also quite effective in the case of Greece, as it was acknowledged by 56% of the participants in the research. In Greece though, TV and radio advertisements still remain people's top choice when it comes to information, as they are by far the most approachable means of information.

The fact that taxation services (TaxisNet) and the central digital portal (Gov.gr) were the most used public digital services during the pandemic was expected, as both portals had been in use prior to Covid-19, specifically since the European Union financed 2014–2020 project of the Ministry of Digital Governance, and thus citizens were quite aware of their existence. It is a fact though that the pandemic operated as a cornerstone that sped up the enrichment, the functionality and processes offered for both portals, leading to higher popularity in a short period of time. In overall, the Greek government's online services seem to be effort and time effective compared to the physical use of them as 72.67% of the participants suggested.

In relation to health services, Greece did not proceed with any massive changes or disruptive technologies similar to the ones identified for the case of China [19–22]. In a few hospitals though innovative technologies such as automated measurements were established, but as they were isolated cases they were not widely spread and advertised, thus most of the citizens were not even aware of such services. Though an ambitious effort has been made with the introduction of the individual e-consultation services and self-declaration tests platform (73% and 86.66% of awareness respectively), as well as the individual electronic health record (65.34%) and the platform for online appointments at primary health care units (67.33%).

On cultural services point of view, even though the majority were aware with actions taken from organizations not to eliminate their presence in everyday life, participation rates were rather low. Regarding satisfaction of the alternatives offered, virtual museum tours achieved really high scores though satisfaction was neutral in relation to live concerts (28%) and low for reading events (42.86%), which means that virtual experience is far from replacing the real-life experience related to entertainment, although this might not be the case for all countries. For example, Bin E. et al. have performed a research of 750 people (mainly located in Italy, Sweden, and India) and identified that there is high likelihood of keeping their new habits related to free time after the pandemic period, too [32].

5.1 Limitations

This study has some limitations. First of all, further research could be done with a bigger sample size, also considering the confidence interval estimation, to ensure greater liability for our conclusions. Achieving a bigger sample size would also help to identify broader eGovernment practices, as according to what has already been mentioned, 44% of the current sample were students aged 19–25 years old, thus they might not have the same needs and demands on public services as working adults (for example on taxation on insurance services). Finally, due to limited possibilities of the PSPP statistical analysis package, dependent and independent variables were not taken under consideration during the analysis.

6 Conclusion

The Covid-19 pandemic has brought up enormous changes in everyday life operations, both in public and private sectors. It has to be acknowledged that all governments have

made huge efforts to correspond in the demanding situation and isolation requirements, without though seizing their activities. More or less measures taken around the world followed similar patterns, though differentiation in each country's background led to diverse results in each case. Factors such as infrastructure, economy, citizens' status and education should seriously be considered before the implementation and further development of digital services, in order for e-government not to result in being a means of discrimination. For the case of Greece, it could be mentioned that e-government practices were quite acknowledged by the public in relation to the hustle under which they were implemented, though for sure there is room for further improvement, as there has been observed a difference in citizens knowledge and satisfaction while using the e-government services.

6.1 Future Research

With this study a spherical point of view is presented on what digital means were implemented through the pandemic in Greece and whether they were well communicated with citizens, though since each service has multiple functions, it would require an indepth qualitative research to measure accurate satisfaction, and identification of flaws or strong points on their operation.

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