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Data processing for administrative systems

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Abstract
Digitization of public services is a necessity for the development of administration, especially in big cities. Many studies show that citizens need fast and transparent public services. The process of digilatization has different degrees of development in different countries. Although progress still need to be made, Romania's administrative digitization has developed in recent years. The concept of big data and artificial intelligence algorithms are part of Romanian digital administrative systems. This paper describes the stages of a taxpayer registration in an electronic administrative system in Romania. A case study is also presented in order to highlight the evolution of the state of digitization in Romania during the Covid-19 pandemic when it was necessary to avoid traveling to administrative offices.

Keywords: Algorithms, public administration, data processing

1. INTRODUCTION

The degree of digitization of public administration differs from one country to another [1, 4, 6, 8, 9]. There are various comparative studies of the state of digital transformation of EU member states. The gaps and differences, combined with other political and economic indicators, forced the EU states to invest in this field and undertake specific actions according to the existing context in each country [9]. The digitization of public institutions ususlly has three stages. The first stage consists in examining the institutional changes that have taken place as a result of digitalization. In the second stage, we must evaluate how these changes in the institution affect the staffs situation and working conditions. In the last stage, we must examine the reactions of the citizens and the possible differences between their expectations and the results obtained [3].

In some European countries there is a real success of digital services for citizens, and in other countries there is even a movement of resistance to technological progress. Some works claim that digitization brings benefits but also problems [5, 6]. The desire to keep archaic administrative services has several reasons: budget constraints, lack of IT devices, not knowing the benefits of new IT technologies, lack of knowledge about the new administrative procedures that may appear, lack of computer knowledge, or the fear that administrative staff could lose jobs due to the reduction of workload. Most of the time, organizational problems must be solved before technological ones. However, studies have shown that the success of digitization is directly correlated with citizen satisfaction [2, 7, 10, 11].

The digitization of the public administration in Romania started even before the accession to the EU because it was necessary to adapt the legislation and institutions to the new requirements of the integration [1]. However, the digitization in Romania process is just at the beginning and the already implemented digital services do not have too many users.

The paper contains three important sections. The first part presents the flow of data and documents for the tax payment in public administration in Romania. The second section is a case study

regarding the evolution of the number of access requests in a Romanian public administration unit in 2022. The last section is dedicated to the conclusions.

2. DOCUMENT FLOW FOR TAX PAYMENT

Figure 1 reveals the steps required to register a person in the tax payment system of a municipality. Although the physical presence at the administrative offices is no longer needed, it is necessary that a specialized inspector to check the documents and decide if they are valid and correct.

The first stage of the process consists in creating the account and authentication. After completing the data, a request to access the system is send, an inspector checks the access request and, if it is valid, approves it. The second stage consists in choosing the type of activity in the system, such as: declarations of cars, buildings, land, obtaining tax certificates, completing electronic forms. Each application must be checked by an inspector and, if valid, it is approved and the related fees are generated.

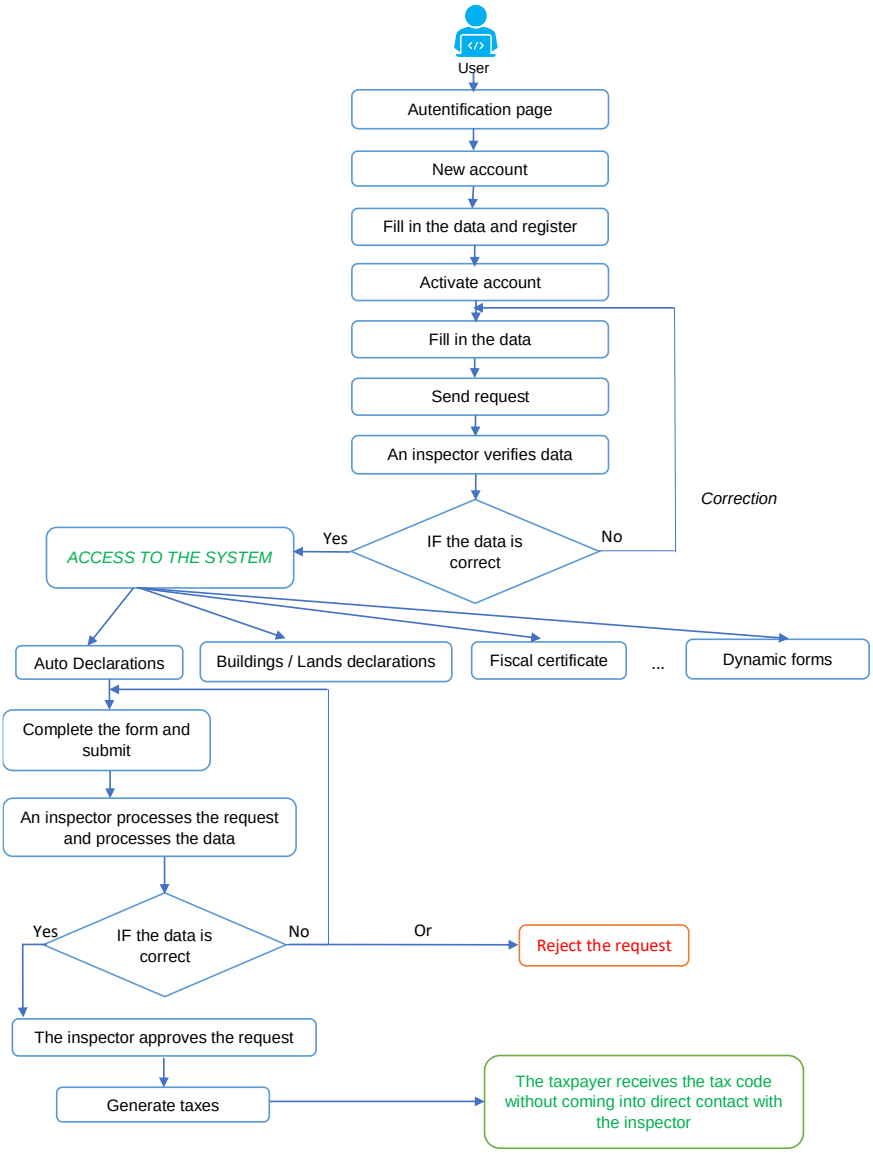

Figure 1. The flow of registration in the tax system

The software applications that implement the scheme in Figure 1. use the concepts of big data, machine learning algorithms and artificial intelligence. Big data in a public administration brings a series of important benefits for the organization. Regarding data entry, big data methods allow the storage of huge amounts of information that can often be displayed and processed in real time. Data processing can be done automatically by fast algorithms that use artificial intelligence. The concept of big data allows modern methods of displaying and aggregating large amounts of administrative information. The reasoning that led to a series of results can be described so that the staff can easily understand the reality of the administrative system [8].

3. CASE STUDY

Although there are still problems, the benefits of digitization are undeniable. In this section we will present some data of a case study undertaken as a result of the implementation of new technologies in an administrative system in Romania. The analysed period is February-December 2020. An increase in requests for access to the system is observed, especially since this period coincided with the COVID19 pandemic.

During this period, the fact that citizens did not have to go to the administration offices was a revolutionary factor. The access time also depends on the fact that the documents must be checked by a specialized inspector. Table 1 presents a descriptive statistical analysis of the number of access requests in the analysed period and the response time to a request.

Table 1. Descriptive statistics of data from a public administration in 2022

	Minimum	Maximum	Mean	Std. Deviation	Variance
Number de access requests	200.00	16249.00	2708.1667	4432.30947	19645367.242
Average response time (seconds)	56.92	273.60	137.9767	54.17212	2934.619

Table 2 presents a detailed statistical analysis of the response time (in seconds) for each month of 2022. We observe an average time to solve a request of less than 5 minutes, which is quite fast, especially if we take into account that it is no longer necessary to go to the administrative office.

Table. 2 Descriptive statistics for the average response time in 2022

Month	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Maximum
				Lower Bound	Upper Bound	
feb	56.92	71.649	5.066	46.93	66.91	378
mar	143.04	248.959	13.831	115.83	170.25	1238
apr	121.45	251.586	16.735	88.47	154.42	1727
may	86.72	296.477	10.169	66.76	106.68	2666
jun	273.60	731.140	26.877	220.84	326.37	3384
july	143.04	504.390	18.177	107.35	178.72	4118
aug	101.29	457.013	13.231	75.33	127.25	4903
sept	110.17	505.834	8.388	93.72	126.61	5565
oct	146.53	567.956	10.237	126.46	166.60	6308
nov	148.11	532.004	9.808	128.87	167.34	7047
dec	183.34	729.421	15.246	153.44	213.24	7791

The fact that there is no correlation between the number of requests in a month and the average response time (r = 0.043, p = 0.893 – Table 3) means that the resolution time may depend on the complexity of the requests and not necessarily on their number.

Table 3. Correlations between number of requests and average response time in seconds

Pearson Correlation	0.043
Sig. (2-tailed)	0.893

The graphical representation of the data from Table 1 and Table 2 can be studied in Figure 1 and Figure 2. An accelerated increase in the number of requests to access the system is observed, with a slight decrease in the end months of the year, which may be due to the vacation period and the winter holidays. The average response time in each can be considered relatively constant. The lower value in the first month may be due to the lower number of applications.

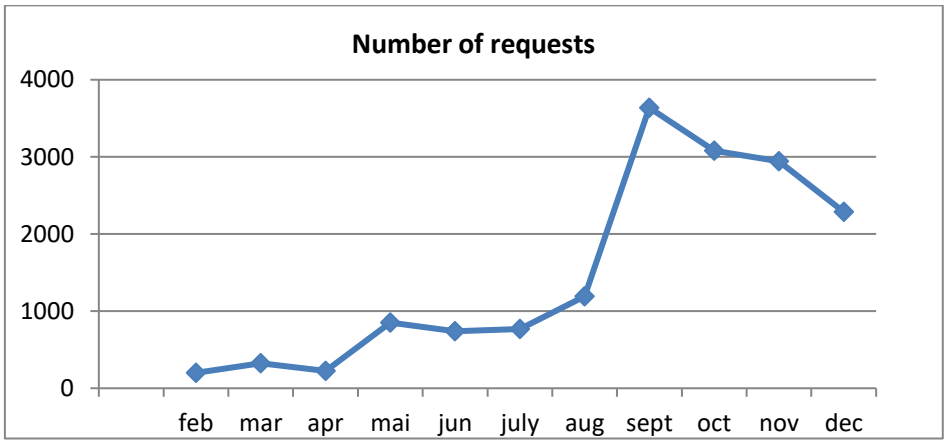

Figure 2. The evolution of the number of requests during 2022

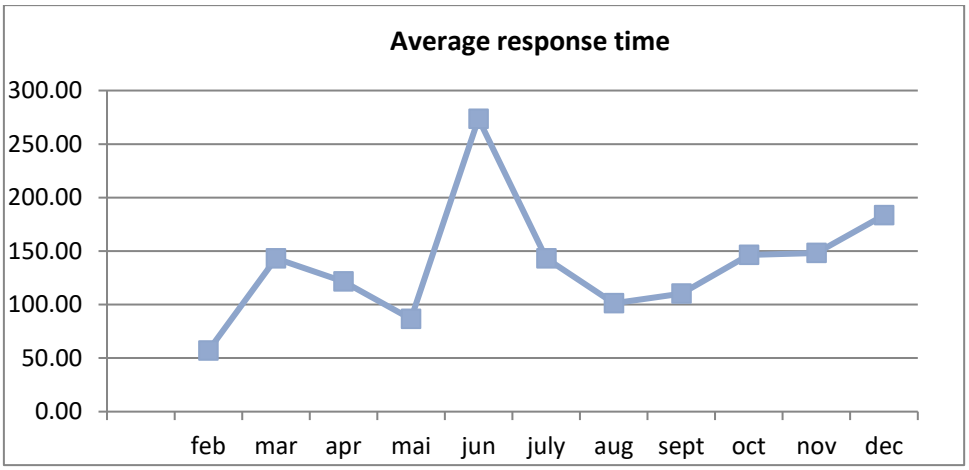

Figure 3. Average response time in 2022

4. CONCLUSIONS

Digitization is an important factor for the modernization of public administration. However, it brings a series of challenges in addition to benefits. The problems that may appear during the digitization process are mainly due to budget constraints and technical problems, but also the mentality of the population or the fear of employees in the administrative system that they could lose their jobs.

In the Romanian administrative system, progress has been made regarding the introduction of new technologies. There are administrative units where the submission of declarations and obtaining the certificates for tax payment can be done online after uploading the documents and their verification by a specialized inspector. Taxes can also be paid online. Applications implement the concept of big data and use artificial intelligence algorithms.

The case study presented reveals a constant increase in the number of requests for access to the electronic administrative system during the first three quarters of 2022. This suggests the desire of citizens to have access to modern public services.

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