QUALITY MANAGEMENT APPLIED IN COMPUTER SYSTEMS IMPLEMENTED IN PUBLIC ORGANIZATIONS PROVIDING SERVICES TO CITIZENS

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Abstract: The scientific paper proposes a pragmatic perspective of presenting some theoretical and practical aspects regarding the place and role of the management of the information system within a public organization providing services to citizens. IT system management cannot function without proper quality management. The point of view presented is a small part of the possibilities of implementing information technology and an information system. For an overview, general aspects about the classification and principles of an information system as well as notions about the structure and ways of classification of an information system were also presented. A pointed aspect is a use of information technology in e-government and the description of the information system of e-government within a public organization. In the last part, a point of view was presented on how to implement an information system within a public organization providing services to citizens through an analysis of the components of an information system and possibilities of creating an information system adapted to the specific context of the organization public.

Key words: information system, computer system, management, e-government.

1. INTRODUCTION

In recent years, we are witnessing a rapid development of the technological side, especially in the field of information technology. The development of information technology brings an important change, in which industrial values with an emphasis on machines and energy are moving towards information values with an emphasis on information and robotics. In this context in all activities, information technology becomes essential based on modern electronics, informatics, and communications.

There is a trend in reducing the costs of computer systems due to the reduced costs of hardware and software. The decrease in hardware costs is obvious, more and more high-performance equipment is becoming more and more affordable. The development of computer systems, increasingly based on high-level software platforms, contain basic software functions and functions specific to the organization's applications. The basic software functions define and solve common problems in a large proportion, and the specific software defines the additional functions, specific to the organization. In this way, unique, customized software is no longer designed for a single organization. Such a system, with basic software functions and specific functions, can be implemented for several organizations, leading to a reduction in costs for each implementation.

The increasing supply of IT equipment, applications, and the lower price for their purchase has led to the connection of computers through networks, helps the processing of data for use in an organization. The current trend is to use the technology of computer systems, interconnected, based on computer networks. An important factor in this direction of network development was the development of the Internet, which allows access to information and

communication at any point in the world connected to the Internet. Development trends and the emergence of new protocols and communication media have led to the development of networks, which allows more and more device connections at data transfer speeds of the order of gigabits per second, the use of wireless data transmission media, satellite connections, etc.

Another trend is the development of object-oriented databases due to the need to store information with a complex structure, with data types that cannot be represented in classical systems. Multimedia brings new elements, graphics, photographic images, video images, sound, which can not be treated in a tabular system, with names and numbers. Classic or relational databases provide too little support for unconventional data types. Object-oriented databases allow the creation of complex objects from simple components, each with its attributes and its behavior, so they manage to provide solutions to the problems and applications mentioned.

2. IMPLEMENTATION OF COMPUTER SYSTEMS WITHIN A CITIZEN PUBLIC SERVICE ORGANIZATION

In the current context of globalization in which society is increasingly competitive, information and knowledge have an increasingly important role to play. Current digital technologies make it easier to acquire, access, store and transmit information. In this context in which the economy is digitalizing, information is becoming more and more an essential resource within an organization.

Within a public organization providing services to citizens managers, regardless of the hierarchical level, need the information to plan, organize, coordinate, control, and make decisions. From the point of view of systems, an organization can be considered a system consisting of several subsystems which, in turn, can be seen as systems - leading or driven. The management of an organization to be able to manage all activities needs information to describe the processes, phenomena, and events that take place at the level of the operational

subsystem. This information is received from the information system (subsystem). The information system connects all the components of the organization.

O. Nicolescu and I. Verboncu consider that the managerial information system can be defined as the set of data, information, information flows and circuits, procedures, and means of information processing meant to contribute to the establishment and achievement of objectives organization [19].

To function normally, the following activities take place in organizations (figure 1):
- Collecting data on the environment and the state of the general system of the organization;
- Transmission of data through information channels in data processing points;
- Data processing and obtaining information that used in the decision-making process;
- Decision making and transmission to enforcement bodies;
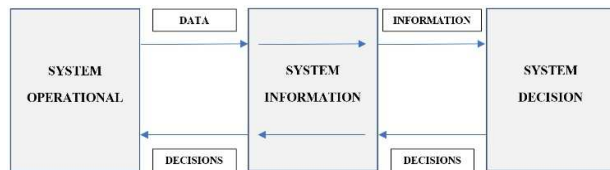- Ensuring control and monitoring the implementation of decisions.

Fig. 1 Activities at the level of an organization specific to the approached subject

Most of the stated activities are provided by the information system. It is the intermediary between the operating system and the management system.

The information system can be considered as a set of material and human resources that are part of an organization in order to take over and process data to obtain information that will be used by all levels of management, control, and decision making of the organization. In other words, the information system can be seen as the totality of data, information, information flows and circuits, information processing procedures, and their means of application for the design, development, and implementation of the organization's objectives.

The information system through its structure ensures the collection of data and information, their processing, their transport through an ascending or horizontal flow. Following this data and information, decisions are made which are distributed in a horizontal or downward flow.

The need to apply an information system in an organization is found in the support it provides in development, by providing support for activities and operational processes for decision-making within the organization, for the implementation of strategies in the competitive market.

If we emphasize the roles they have within an organization, information systems can be grouped into two categories: support systems for operational processes and support systems for management:

a) Support systems for operational processes, with the role of ensuring the efficient processing of the organization's transactions, controlling industrial processes, supporting communication and collaboration within the company, and updating its databases;

b) Management support systems are information systems that provide information and support to managers to make effective decisions.

To solve the needs of citizens, to provide public services at a high level, in addition to material and human resources, the information system must fulfill three functions: the documentation function, the decision-making function, and the operational function:

- Documentation function - has the role of recording information necessary for staff within the organization to achieve the proposed objectives. It helps to enrich the knowledge of officials. It is known that there are many documents in public administration. Documents can be classified according to several criteria: date, alphabetical, content, form, source, etc.;

- Decision-making function - the information system must provide the information elements necessary for decision-making;

- Operational function - ensures the operationalization of documents.

To achieve its specific functions, documentation, decision-making, and operational, the management information system in public institutions is based on a set of principles [2]:

a. The principle of designing and restructuring the information system according to the management requirements of a public organization. The design and rationalization of the information system are based on the specific requirements of the management of a public organization that is closely correlated with the systems of needs and interests of society. The need for the information system is to ensure the information base necessary for the efficient development of both management and execution processes within a public organization;

b. The principle of close correlation of the information system with the organizational and decision-making system in public institutions. In designing the organizational structures specific to administrative institutions, it must be taken into account that each component of the system represents both a sender and a beneficiary of information, that the types of organizational relationships that occur between positions, between compartments, between institutions, and/or authorities of public administration describes information circuits. Each component of the system has, to achieve the assigned objectives, certain means of processing the information and must use certain information procedures;

c. The principle of methodological unity of information processing. To ensure the compatibility between the components of the information system of the public administration, it is necessary that the way of collecting and processing the information be unitary from a methodological point of view. Such an approach ensures extra rigor and facilitates its functionality. Unitary processing of information allows the transition to automatic data processing. The application of such a principle attracts the appeal to civil servants specialized in the IT field;

d. The principle of focusing on essential information. According to this principle, information must be transmitted, whenever possible, selectively as it means saving time, resources, and efficiency in substantiating decisions and/or preparing administrative documents. The transmission of essential information ensures the relief of the information system from irrelevant information, which affects the quality of the processes of registration,

transmission, and processing of essential information;

e. The principle of ensuring an adequate reaction time to the components of the information system of the public administration. The development of the processes of activities in public organizations has temporal characteristics, and the reaction speed of the system components is different. The time to collect, circulate information and substantiate documents must be differentiated. This is done through the use of various procedures and means for processing information;

f. The principle of ensuring maximum information from a limited fund of primary information. Administrative documents are based on final information. Efficient use and processing of information from local government and other third sources are required. The normative acts issued by the institutions of the central administration are based on synthetic information, especially final, which are the result of an ample process of administrative documentation;

g. The principle of flexibility. It involves the continuous adaptation of the parameters of the information system in the public administration to the characteristics of the external environment. A modular approach to the information system in the administration is needed in this regard. Access to relevant information would be quick and selective. It is possible to constantly update the data and information that make up the system at a given time.

Information technology helps all types of organizations to increase the efficiency and effectiveness of decision-making processes, economic processes, collaboration within the members of the organization. Information systems are becoming an indispensable component of an organization. The delimitation between the information system and the information system is increasingly difficult to do in the conditions in which the use of computers has become a widespread practice, Information and Communication Technology (ICT) is used in all activities of public organizations.

The computer system is part of the information system in which the processing of data and information is largely automated. Computerization, if properly planned and conducted, comes with the following benefits in the organization's activities: it increases the

quality of services and reduces costs. The computerization strategy becomes an important component of the general strategy of the public organization and the information and communication technology represents the technical basis of the information system.

Within a public organization, Information and Communication Technology (ICT) has several aspects:

- Information and communication technology for a public organization is a strategic resource;
- The IT system is an integral part of the organization and must respond to decision-making and operational needs. It can make the connection between computer science and management;
- The human side is the most important factor in a public organization on which the efficient use of the computer system depends.

The computer system of a public organization contains:

- techniques and means for automating office activities;
- automatic procedures for the collection, processing, archiving, and transmission of data and information;
- computer applications for optimizing the decision-making process, for economic management, for leading technological processes, for assisting decisions;
- electronic communication tools (electronic messaging, databases accessed through the Internet, audio-conference and video-conference systems, etc.);
- database management systems (DBMS), for the creation and management of classical data, intended for decision-making and execution processes;
- techniques for automating production processes: computer-aided design, design, manufacturing and assisted maintenance, etc.).

An IT system within a public organization is structured in four categories of components: the human component, the organizational component, the technological infrastructure component, the IT applications component.

The human component is the most important component for a high level of efficiency of the computer system. The success of an IT system depends on adapting the other components to the

level and preparation of the existing human resource.

Within the human component, there are three categories:
- beneficiaries - those to whom the information generated or transmitted within the computer system is addressed. There is a tendency to increase the demand for information due to the increase in the number of beneficiaries;
- users - those who use ICT directly to obtain information. There is a tendency of rapprochement between users and beneficiaries;
- maintenance and development staff - a highly qualified human resource that is difficult to obtain and expensive.

The organizational component consists of the organizational structure specific to IT activities. This structure includes all the means and methods of an organizational and methodological nature used to manage IT activities and how the connection between the IT system and the rest of the organization is made.

The infrastructure component largely overlaps with Information and Communication Technology and represents the physical support, hardware, and software infrastructure necessary for the operation of the entire system. Represents all devices, circuits, and equipment used for processing and transmitting information, together with operating systems, communication protocols, and basic programs necessary for the operation of the equipment.

Computer applications and modules represent the totality of computer programs and computer applications that implement information procedures specific to the activities carried out within the organization.

Depending on the range of activities they serve, applications are classified as follows:
- Applications for top management (Business Intelligence, programs that implement methods to substantiate the decision);
- Functionally developed applications (CRM);
- Applications for automation of activities (accounting program, e-services);
- Trans-functional applications (ERP, Document, and workflow management);
- Applications for integrating one's own IT system with the IT systems of some partner institutions (SCM);

- ″Service″ type applications (SaaS and SOA).

The computer system of a public organization can be classified:
a) According to the purpose pursued:
- computer systems for automating routine activities;
- IT systems for operational, tactical, and strategic management;
- computer systems for decision support;
- computer systems for automating communication processes.
b) According to the degree of dispersion of the system resources:
- local computer systems (operable on independent computers or in a network);
- distributed information systems (based on territorial criteria).
c) According to the specifics of the activity it automates:
- management information systems;
- computer systems for optimizing the decision-making process;
- computer systems for managing technological processes;
- information systems for public management.
d) By degree of integration:
- island computer systems (singular);
- partially integrated IT systems, at the level of the organizational structure, which can be horizontal, at the same decision-making level and vertically, at the level of basic activities (economic, legal, public services, public relations, technical secretariat);
- fully integrated IT systems that can be horizontal, at all decision-making levels and vertically, at the level of the overall activity of the organization.
e) According to the type of network on which the computer system is developed:
- computer systems based on LAN (Local Area Network);
- computer systems based on MAN (Metropolitan Area Network);
- computer systems based on VPN (Virtual Private Network).
f) According to the treatment process:
- computer systems with online processing, characterized by the existence of a process of data transmission and processing, without the intervention of the human factor;

- computer systems with real-time processing of works (including real-time systems) including those systems that receive data processing and return results, fast enough to be able to influence at that time, the environment in which it operates;

- computer systems with simultaneous multiple access (time-sharing), through which several users and/or processes are connected simultaneously, interactively, through a terminal, to the computer system. It allocates, through a special regime, time segments to each process launched by users, thus using simultaneously the resources of the computer system.

3. GLOBALLY KNOWN IMPLEMENTATION TECHNIQUES AND METHODS

Within the public system, e-government is a constantly evolving phenomenon, with a strong influence on public sector activities. E-government seeks to solve the problems of public administration. E-government means the use of information technology by public sector organizations [5].

It can say, that it is about the use of specialized equipment and programs and the internet, but it is not just that. Heeks appreciates that e-government present long before this term invented [6]. E-government was present through office applications, those of information reporting systems or expert systems implemented in public administration.

The e-Government approach can be done as an information system. In the schematic presentation in figure 2 are found the components of an information system: equipment, programs (software), data, people. The system collects, processes, stores data, obtains and communicates information, manages knowledge. The existence of information systems has not been conditioned by the use of information technologies - especially in public administration where even today a large part of the operations are performed manually. Thus, the use of information technologies does not define the information system but optimizes it.

Fig. 2 The structure of the information system in e-Government [2]

The diagram shows the data, information, and knowledge in the central part, in the core of the information system, then the IT components, which support their collection, processing, storage, and communication. For e-government to be an information system, in addition to data, information, and various technologies, people are added, which give meaning to the system and the organizational processes that are executed based on procedures.

According to the scheme in Figure 2, the term "socio-technological" system must be used in the definition of e-government [6], to indicate the importance of the social component (people). This is often insufficient or mismanaged in e-government projects - so many failures are due to this issue and not to technology issues. To point out the process component, the full term that should be used would be "socio-economic and technological system" [5]. Understanding organizational processes are very important for carrying out an e-government project.

The scheme illustrated in figure 2 lacks the environment in which the information system manifests, an aspect improved by the representation in figure 3.

The e-government information system is implemented in a public organization, which is individualized through organizational structures, management system, strategy, policy, organizational culture, economic processes, and available resources. In turn, the organization operates in an environment with specific economic, political, legal, socio-cultural, and technical aspects - a wide context of laws and

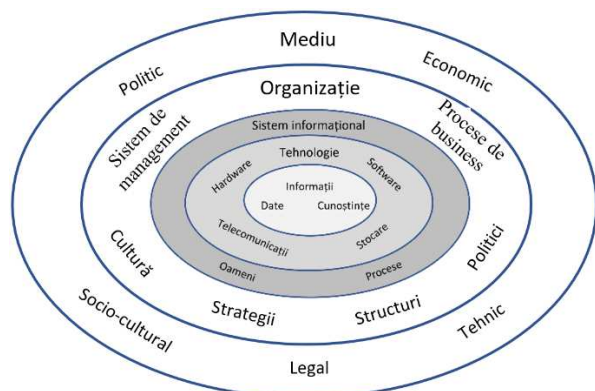values, economic systems, and technological innovations.

Fig. 3 *Complete e-Government model*
[6]

The description of an information system in general and the e-government system, in particular, means the presentation of all the components shown in Figure 3. To reduce the complexity, the practice of information systems has launched the idea of "checklists". Among the best known are ITPOSMO (Information, Technology, Processes, Objectives, Skills, Management Systems, Other Resources) and CIPSODA (Capture, Input, Processing, Storage, Output, Decision - making, and Action) which we will use next.

The presentation according to the ITPOSMO list supposes the study of the following dimensions:

- Information, referring to the formal information held by electronic and informal systems, used by the people involved in the system;

- Technology, mainly information technologies, but also others (telephone, fax, etc.);

- The processes corresponding to the activities carried out in the public administration, both the internal, management and those of interaction with partners and citizens;

- Objectives and values, which are very relevant because they indicate on the one hand the interests and organizational policy, and on the other hand aspects of organizational culture, but also the values valued by citizens;

- The establishment plan and its skills as users of the information system,

- Management and organizational structures;

- O - other resources (especially financial and time resources required).

To this list can be added the external environment, because the political, economic, legal, socio-cultural, and technological factors that significantly influence the information system of e-government.

The CIPSODA checklist points out the activities in the information system, which involve working with data, information, knowledge. We can talk about a different perspective on the information system than the structural one described above, oriented on information and their management. The CIPSODA checklist includes the following activities:

- Collecting and finding data;
- Entering data in the system;
- Data processing;
- Storage of data and processing results;
- Obtaining the results in the desired form;
- Decision, supported by information obtained through data processing;
- The implementation action, a materialization of the decision taken.

To these activities is added that of communication, essential for the good development of all the others.

An e-government system is a socio-technological system. Beyond the formal, concrete, technological aspects of an organization, the definition of the information system also covers the informal, qualitative, generally social aspects. The (erroneous) association of e-government with information technology can have undesirable effects in practice. The approach to e-government projects must be a hybrid one, combining the objectivity of information technology and the informal, flexible nature of public sector processes.

4. HOW TO IMPLEMENT AN INFORMATION SYSTEM IN A PUBLIC ORGANIZATION PROVIDING SERVICES TO CITIZENS

The analysis of the components of an information system allows us to better understand how an information system works but also how to build an information system

better adapted to the context. At the same time, the results of the use of IT systems on management can be highlighted. Thus, the structuring of the information system, based on the use of information, is one of the most effective methods of identifying influences on management.

Figure 4, adapted from James O'Brian, shows a possible structure of the organization's functional information systems: [23]

There are still no information systems that fit perfectly into the specified structures, even the integrated systems. In financial accounting systems, the intervention of the human factor is manifested both in phase preparation and retrieval of data (transactions) and in the phase of interpretation and capitalization of the information obtained.

The operations of preparation and retrieval of data belong to the manual components or lately to the expert systems. Classical IT systems have taken into account repetitive, well-structured operations, namely data processing, storage, and management to provide relevant information to management factors or to communicate them to stakeholders. Later, through decision support systems and expert systems, the interpretation of the obtained results and the decision-making was the object of the integration in the computer systems.

The life cycle of a computer system is a way of ordering the activities of the computer system, comprising the time interval that begins with the decision to develop a computer system and ends with the decision to abandon it and replace it with a new system. computer science.

The development cycle of the computer system is included in the life cycle of the computer system. It includes the time interval from the decision to make a computer system to the moment of entry into the operation of the system.
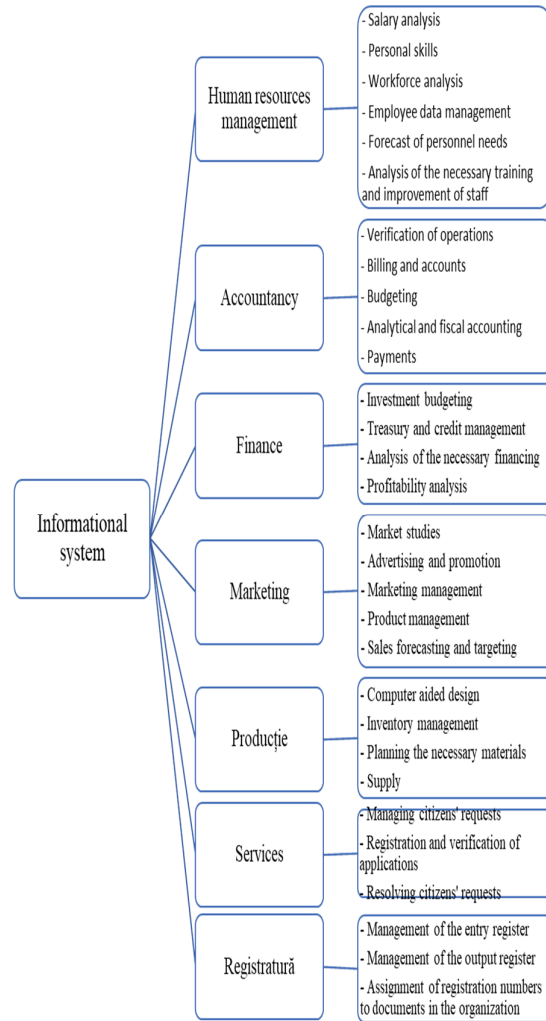

Fig. 4 Functional structuring of information systems (adaptation after James O'Brian) [23]

The life cycle components of software products are grouped into several ways, in stages or phases. One such grouping of life cycle components is as follows:

- The identification of the user's requirements implies the identification and formulation of the global requirements regarding the realization of the information system, as well as the justification of its necessity and opportunity;

- The analysis is the stage in which the functional and quality requirements of the system are analyzed, identifying, among others: what functions the system must fulfill, what data must be processed, what results must be obtained, what type of interface will be used. The question is, "What should the system do?" without taking into account the technology that will be chosen

for implementation. The quality of the results of this stage is particularly important, as they represent a bridge between customer requirements and the architectural and implementation models that will be achieved in the later stages;

- The design essentially answers the question of how the requirements identified in the analysis will be met, taking into account the particularities of the technology chosen for implementation. The design takes into account: the modularization and establishment of the system architecture, the way of organizing and structuring the data, the design of the necessary algorithms for processing, the detailed design of the user interface, etc.;

- System implementation

The development and implementation of a software product involve:

• Writing programs, which involve the actual writing of the application according to the specifications of the design stage. Each application module will be implemented and tested separately. At this level, the overall integration and testing involves integrating the modules implemented and tested in the previous stage, and then testing the system as a whole to verify the correct implementation of the relationships between the modules and the functionality of the system as a whole;

• Commissioning of the system, which involves installing the system and training users. Experimentation in real conditions is especially important because the system is validated using real data sets and in real operating conditions.

• Operation and maintenance of the system.

In the life cycle models, the steps presented above are used in whole or in part, combined in different ways. There is a wide variety of such models.

Regarding the computerization strategies of the organizations' activities, it can be said that the strategies, approaches, and techniques for the development of information systems have been continuously renewed and improved. In the beginning, the development of computer systems focused only on the use of databases and programming languages. Gradually, commercialized components and software packages, as well as integrated ERP systems developed by software manufacturers have made their presence felt more and more on the market, offering organizations an alternative to the full development of information systems. By offering software in the form of services via the Internet (SaaS - Software as a Service), organizations can use software without having their applications installed.

There are two main strategies in computerizing the activities of organizations: the acquisition and construction of the system within the organization or outsourcing from an external software service provider.

The acquisition of the System is the first strategy to be considered. It involves the use of existing products by the organization, with the possibility of configuration and customization. Existing product categories: commercial software packages, integrated ERP systems, SaaS.

Commercial software packages are characterized by:
- They are available for sale or rent to the general public;
- It is generally addressed to small and medium-sized organizations;
- They often have a limited ability to customize for special needs.

Integrated Enterprise Resource Planning (ERP) systems come with the following features:
- Facilitates the integration of all business processes in the departmental units of the organization and manages connections with external organizations;
- Operates in real-time;
- Have a common database for all applications;
- They consist of a set of modules that can work independently;
- Involves a significant effort to configure and customize the solution;
- It addresses all types of organizations.

Software as a Service (SaaS) is characterized by:
- It is a way to provide software in which applications and their associated data are stored centrally by the service provider and are

accessed by customers via the Internet, using a Web browser;
- Can support configuration, less customization;
- Can be quickly updated;
- Many applications offer users collaboration and information sharing functions;
- They are hosted in the cloud, so response time and security issues are critical factors.

The construction of the System can be done inside the organization or it can be outsourced.
- Used for specific unique requirements of the organization;
- It is the method adopted by software and information technology developers;
- It is a time and resource-consuming solution;
- It involves going through all the steps specific to the development cycle of an information system.

5. CONCLUSION

This paper wants to make a general presentation on the management of the information system within a public organization providing services to citizens presenting theoretical and practical aspects.

The IT system within a public organization is structured in four categories of components: the human component, the organizational component, the technological infrastructure component, the IT applications component.

The human component is the most important component for the effectiveness and efficiency of the computer system. The success of an IT system depends on adapting the other components to the level and preparation of the existing human resource.

Heeks' concepts prove to be applicable. E-government is a constantly expanding phenomenon, with a sustained pace of development and a strong influence on public sector activities. E-government can be a solution to public administration problems.

The use of information technology by public sector organizations is a step towards e-government.

We consider that there is not yet an information system that fits perfectly into the classes of the functional structure of a specified information system, not even the integrated systems.

The implementation and development of the existing information system within a public institution providing services to citizens, are necessary to be used by the management of the organization within the information system, thus contributing to the efficiency of the administrative act and ultimately to increasing the quality of public services. to citizens.

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Managementul sistemului informatic în cadrul unei organizatii publice prestatoare de servicii către cetățeni

Rezumat: Lucrarea științifică propune o perspectivă pragmatică a prezentării unor aspecte teoretice și practice privind locul și rolul managementului sistemului informatic în cadrul unei organizații publice prestatoare de servicii către cetățeni. Punctul de vedere prezentat este o mică parte din posibilitățile de implementare a tehnologiei informației și a unui sistem informatic. Pentru o privire de ansamblu, s-au prezentat și aspecte generale despre clasificarea și principii ale unui sistem informațional precum și noțiuni despre structura și modalități de clasificare a unui sistem informatic. Un aspect punctat, este utilizarea tehnologiei informației în e-guvernare și descrierea sistemului informațional al e-guvernării în cadrul unei organizații publice. În ultima parte s-a prezentat un punct de vedere despre modalitatea de implementare a unui sistem informatic în cadrul unei organizații publice prestatoare de servicii către cetățeni, printr-o analiză a componentelor unui sistem informațional și posibilități de realizare a unui sistem informațional adaptat la contextul specific organizației publice.

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