INTELLIGENT REAL TIME INFORMATION SYSTEMS AS A TECHNOLOGICAL SOLUTION FOR SERVICE MANAGEMENT IN PUBLIC ADMINISTRATION

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Abstract: *In this paper, we present a new concept of offering services in public administration to its users, based on new technological solutions. We suggest using a new concept of intelligent information according to which public administration can offer the user a service at the right time. The service user can now get the service by going to the public administration at a certain time and place. Electronic and mobile service could provide customers with faster access to service or self-service, and the intelligent service we present can provide the right service to each user in real time. Here we present a new concept of intelligent information system that in real time, if effectively implemented, can provide public administration with offering services to its users. This will ensure that service users are less mobile during the pandemic. In this paper, we propose the implementation of data warehouses in public administration as a basic component of an intelligent information system. The data warehouse will contain all the necessary data and information necessary for personalized software agents to provide the necessary service to each user in real time. We will show that the concept of offering the right service, at the right time to a certain user, is based on the concept of electronic, mobile and intelligent public administration (e-Administration), i.e. electronic and mobile services (e-Services). The data warehouse will contain all the necessary data and information necessary for personalized software agents to provide the necessary service to each user in real time. We will show that the concept of offering the right service, at the right time to a certain user, is based on the concept of electronic, mobile and intelligent public administration (e-Administration), i.e. electronic and mobile services (e-Services). The data warehouse will contain all the necessary data and information necessary for personalized software agents to provide the necessary service to each user in real time. We will show that the concept of offering the right service, at the right time to a certain user, is based on the concept of electronic, mobile and intelligent public administration (e-Administration), i.e. electronic and mobile services (e-Services).*

Key words: *public administration, services, electronic, mobile, data, intelligent system*

INTRODUCTION

Time in which we live represents an intensive phase of development and application of new technologies. Modern information and communication technologies are technologies for collecting, storing, processing and transmitting information and knowledge. They abolish the boundaries of business and service, and open up unimagined opportunities in creating business and service benefits. The basis of modern administrative bodies stalks from their ability to make the best use of internal and external service data and turn them through well-conceived information systems into the basis for more modern work and service. In order for the public administration to be successful and to serve its users correctly, it is necessary to provide quality management of its service system. If they want to achieve that, they need to make quick decisions, and for that they need appropriate timely information and knowledge about the needs of the users of her services. In order to have the appropriate timely information and knowledge, the public administration needs appropriate, easily accessible data, as well as quality analyzes that can be used to obtain information about the needs of users for a particular service. With a lot of quality data on service users and their needs, the public administration can perform daily services more efficiently. The data warehouses that we will deal with here, among other things, are new concepts of collecting, organizing, storing and sharing data, information and knowledge for the purpose of offering public administration services to its users. A data warehouse deals with the processes of collecting or identifying the data, information and knowledge necessary to offer. In order to have the appropriate timely information and knowledge, the public administration needs appropriate, easily accessible data, as well as quality analyzes that

can be used to obtain information about the needs of users for a particular service. The concept of i n t e l l i g e n t information system in real time which we propose here is based on the necessary data on service users and their needs, and refers to the processes that help public administration to adapt, adapt and effectively reform the provision of services. It can achieve this by using appropriate software and data warehouses.

1. The term public administration

Public administration is a system of bodies, organizations and bodies and an interdependent set of competencies, tasks and duties, specifically related and guided by the goal of applying legal norms, organizational instruments, management methods, processes and procedures to meet the service needs of its users. Its basic functions are: service, regulatory, organizational and executive[20]. Term "Public administration" includes a larger number of performers of administrative activities as well as a broader content framework of these activities. This means that in addition to the classic performers of administrative activities (state administration bodies), this number also includes other holders of these activities, such as non-state entities (companies and institutions entrusted with public authority) and holders of administrative activities of local self-government units. cities, municipalities, etc.). Public administration is an extremely important area of contemporary political, legal and economic thought. Particularly important are the experiences of developed and prosperous systems that have recognized in a timely manner the need for good governance and quality governance. Modern, advanced and economically prestigious societies, with developed democratic standards, are continuously working on establishing new standards and procedures of service. [21]

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[20] Prof. Dr. Dragoljub Kavran: Public Administration, Belgrade, 2003.

In developed democratic systems and economically prosperous societies, the commitment to the advantages of gradually forming a good administration (effective, efficient and economical) prevailed in time, which can provide the service with the use of computer or mobile devices or by coming to the public administration office. Such administration establishes, develops and guarantees a fair, just and equitable relationship with each entity: foreigner, client, user, regardless of status and other differences that exist between them. It now offers self-service to some of its users, to use their own computers or mobile devices (e.g. forward their birth certificate if they enroll in an educational institution). The process of creating a modern public administration has been stimulated by the spread of new information and communication technologies, as well as the desire of public administration to provide different approaches to access to service to its customers[22]. Modern administration can provide services in the classic way, with the use of new technological solutions (computers or mobile devices), which offers an appropriate service to each of its users in real time.

2. Public services

Public services are a term that includes services delivered by the public administration (or public sector) to citizens, the economy (business), and all organizations and institutions. This can be done directly, or by using new technologies. The delivery of public services is associated with the social consensus that certain services must be available to everyone, regardless of things such as nationality, race, gender, personal income, etc.

According to the Treaty establishing the European Community from Amsterdam in 1999, public services (hereinafter referred to as "services of public interest") were designated as administrative activities of general interest, established by the public administration for which they are responsible, even when their management was transferred to public or private operator. Public services are those services that are provided to service users (citizens, and all business systems and organizations) by the public sector (public administration) and as such participate in the creation of public benefit. Perception of quality public service is a combination of many factors, such as the level of courtesy, where citizens, having experience in obtaining services from the private sector, impose requirements for the same level of courtesy to the public sector[23]. Unlike from state administration, which is characterized by a hierarchical relationship, subordination of lower bodies to higher and centralization in action, the primary features of local self-government are autonomy and independence, decentralization and democratization. Behind the actions of the state administration is always, at least potentially, coercion, and behind the local self-government is voluntariness. Local self-government is the one that provides the most services to users, and that is the type of decentralization in which its bodies are not appointed by higher bodies, but are, as a rule, directly elected by the citizens of a certain constituency. In many countries around the world, it is a successful combination of decentralization of power and democratization of social relations, in which a large number of public affairs are performed for the citizens of that area.

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[22] Lilic, S, Dimitrijevic, P, Markovic I, M, Administrative Law, Belgrade, 2006.

[23] Ivet Tooy, Electronic Government: Cross-sectoral Development of Information Technology in Central Government Administration, Boston, 2002.

Necessary pre-requirements for more efficient serving are [24]:

- Decentralization and devolution of power - transferring certain service jobs to the private sector, and ensuring efficiency and flexibility in their work.
- Reorganization - much stricter functional requirements, with appropriate control and clearly defined responsibilities.
- Human resource development - to train both service providers and users in a new way of providing and using services.
- More efficient computerization and data warehouses - Almost all countries allocate large funds for the informatization of public administration. More efficient service, and now the provision of services, would not be possible without information technology. They are a very important catalyst for change, especially in improving productivity and service quality.
- Promotions regulatory mechanisms -The process of change and improvements laws and bylaws are of great importance for the process of electronic, mobile and intelligent services (e-m-i-Services). Without an appropriate legislative framework, a concept of self-service and service provision cannot be fully put into practice.
- Construction knowledge system - provides the public administration to find out what users need and want, and to know what needs to change in order to be able to offer the right service in real time.

Knowledge enables employees in public administration to understand priorities, gathering information on what the needs of users are and how they change over time. Understanding the current, and especially future needs of users for the service is the basis for offering services. Building the knowledge system itself is a very complex process. Building a knowledge system should ensure continuous improvement of existing and creation of new knowledge, skills and attitudes of all employees for more efficient work and better service and offering services. New technological solutions can help the public administration a lot in obtaining the necessary information and knowledge.

3. Value of data, information and knowledge for public administration

Public administration has a huge amount of data that, using new technologies, can be used, processed and distributed more efficiently. Essential data and information are a treasure that should be effectively and efficiently managed and used in the service process[25]. New technologies can provide the information necessary for quality service and real-time service delivery. The value of collected data, information and knowledge grows with the number of employees who can use them. This achieves a better and simpler exchange of information and knowledge, and better cooperation within individual organizational units, especially in local self-government units. The more employees exchange certain data, information and knowledge about service and service users, they understand each other better, better understand the needs of service users, and propose and implement new
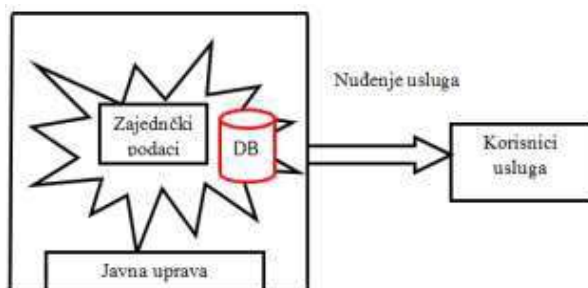
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[24] Radivojević, M., From electronic business to business intelligence in public administration. JU Službeni glasnik Republike Srpske, Banja Luka, 2012. ISBN 978-99938-22-28-8, COBISS.BH – ID 2411288.

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intelligent service delivery systems much faster and easier.

In order to achieve this, the public administration must have an appropriate strategy for offering services. Successful implementation of the strategy would ensure rapid and innovative change, which is the job of top management. No one can do that for them or for them. At the same time, this indicates the key responsibility for the success of the implementation of the concept of service provision.

With all the changes and more efficient use of new technologies that we are witnessing, the administrative bodies are welcoming very differently. Some will rely on the past, others enter the changes uncertainly and with fear, and still others enter confidently, having a significant number of plans and set goals that will later turn out to be unsuitable for the new times and offering services. Those who are more prone to risk will enter without thinking, relying on happiness and destiny. However, there are those who can be said with certainty to be successful new times, and who will be able to shape the future.

At the head of these bodies administration there are intelligent leaders who promote and develop a completely new concept of thinking and acting based on the concept of electronic, mobile and intelligent public administration (e-m-i-Administration), and e-m-i-Services and who can offer a service (Picture 1).

Taking in consideration that timely acquisition of quality information and knowledge is essential for intelligent real-time service, managers, and all employees in public administration must think about how to get them and how to adapt them to their needs[26].

For the needs of operational business management, classic databases are used, most often based on a relational model, which reflect the up-to-date, real state of administrative bodies. In order to make real-time decisions and offer services to users, it is necessary to have an insight into the time sequence of service events, so classic databases are not a satisfactory solution. Therefore, the creation of new forms of data organization in computer systems based on the concept of storage must be approached[27].

Such a data warehouse contains data collected from various sources, historical data on service users, on the service provided, as well as all necessary data from the external environment. Data from the external environment provide knowledge about activities that take place outside the public administration, and are of great importance for strategic decision-making, because they identify trends, opportunities for reform processes aimed at better service and offering services.

Picture 1. The concept of offering services

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[26] Dr. Tepsic,M: Electronic Administration, Association of Informatics of the Republic of Srpska, Banja Luka, 2009.

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New intelligent information in the real-time system in public administration should consist of two parts, operational (service) and data warehouse (analytical), which separates the process of providing services from the process of generating the service itself. This new concept brings the possibility of actively finding and offering the appropriate service, to a specific user, in a specific place in real time. Those administrative bodies that will use the new service concept provide a significant strategic advantage in the analysis of service models, trends, alternatives, reshaping of service processes. It is not a software solution that ensures that what has been done before is better done, but an appropriate means of doing what has never been done satisfactorily before.

Through efficient e-m-i-Administration system, public administration increases the quality of services provided to users in a simple, economical and effective way. It should always be borne in mind that developing and developed countries are introducing e-Government in quite similar ways, and that it has had a greater positive impact on the development of underdeveloped countries. Electronic government aims to improve and increase the availability of information and services through the use of information and communication technologies, the Internet, automation equipment and mobile devices.[28]

Automated administration focuses on increasing the transparency of public services, cooperation, participation of both providers and service users, as well as efficiency and effectiveness[29]. In order to be implemented, it was necessary to adjust the legal framework, improve the quality and accuracy of data, ensure privacy, security and controlled data flow[30].

New intelligent real-time information systems enable public administration to offer service users the services they really need. The provision of services will reduce the spread of the COVID-19 virus among users.

4. Data warehouses

While for the needs of operational business management, classic databases are used, mostly based on a relational model, for the implementation of reform processes it is necessary to have an insight into the time sequence of service events, so such databases are not a satisfactory solution. Therefore, we need to move on to creating new forms of organizing data in intelligent memories information systems based on data warehouses. The goal of data warehouse implementation is to identify and make operational information and knowledge that is "locked" in operational databases and connect them with information from other sources. The idea behind data storage is to keep all public administration data in one place, in order to ensure greater visibility of service processes, improve service and provided the provision of services. The basic function of the data warehouse is to collect and process data from internal and external sources, and to create logically integrated services that can be offered to the user. It must be designed to enable real-time search and, based on the obtained data, information and knowledge about the user's need for the service, to provide them with an intelligent real-time system and offer.

[28] Dixon, Brian E. "Towards e-government 2.0: An assessment of where government 2.0 is and where it is headed." Public Administration and Management 15, no. 2 (2010): 418.

[29] Morabito, Vincenzo. "Big data and analytics for government innovation." In Big Data and Analytics,
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Data warehouses can reduce service costs, reduce the time to deliver high quality services, and enable the provision of certain services to customers[31]. However, some public administrations in some countries are still unsure of the benefits and significant effects of the introduction of a data warehouse and the benefits that can be achieved[32].

The main advantage of data warehouses is in providing the possibility to perform various data analyzes at high speed[33].

Gartner (2013) defines the concept of data warehousing as: "a large amount, which provides high speed access to information assets, and provides an improved innovative form of information processing that allows to improve cognition, decision making and process automation[34].

IBM defines warehouse data as: "Data coming from everywhere: from various sensors, posts on social networks and media sites, digital images and videos, purchase transactions, recordings of GPS signals, mobile devices - and this is a set of data that is unstructured and disorganized". Their efficient application with the use of advanced technologies enables the achievement of efficiency, necessary distribution, management and analysis of information[35].

Data warehouse characteristics are:

➤ They contain a large amount of data - which can be efficiently processed and used in a large number of applications. These are now the quantities of exabytes and zettabytes of data obtained from different sources[36].

➤ I can be from different internal and external sources. Data in the warehouse can be: structured, semi-structured and unstructured. Some of the unstructured data are: text, images, video, audio. Semi-structured data does not correspond to fixed fields, but contains tags for the distribution of data elements. Structured data that can be traditional databases.

➤ Data in the warehouse they can be quickly analyzed, generated, processed and distributed.

➤ Data they are accurate in the warehouse because they are collected from real and known resources.

They have data their value, and their large amount provides and added value to encourage public administration or the business system.

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5. Data warehouses and E-government

The data warehouse should be a significant and powerful public administration investment. From a large amount of data, public administration can detect trends and patterns of behavior of citizens and service users, and can offer them better, more efficient and effective services. The data warehouse offers public administration new opportunities to create value, discover and use business intelligence in service. It enables her to better understand the habits, interests and needs of service users and citizens. By analyzing applications on their mobile phones, social networking activities, their content views, specific clicks and retention on networks, various searches, purchase history, reservations, etc., public administration can understand the needs, habits, tastes, personalities and preferences of service users and citizens and all this can help her anticipate the needs and desires for the appropriate service she can offer them[37]. Public administration now needs large amounts of data, and now it can be generated faster than ever before[38]. This is the key to better understanding customer needs and getting to the service you need in real time faster. What the data warehouse can offer is the possibility of using it for different purposes, as well as anticipating the needs for the appropriate service of each user. Data warehouses in e-Government deals with the necessary predictions and assumptions of current needs for the services of its users and efficiently meet their needs. To be public management could realize the predictions and needs of its service users must use intelligent real-time information systems that can still provide it.

In public administration, data warehousing is a new concept and together with the corresponding new applications will enable public administration to offer and provide a service that is faster, more transparent, more efficient and more effective. New service opportunities will transform the traditional e-Government into a new powerful intelligent public administration. This will reduce the costs of its maintenance, improve the execution time of computer processes, and provide a high quality new service as a product that meets the requirements of service users39. In order to achieve that, a high level of development of appropriate applications and tools is necessary, as well as significant engagement of resources and people in public administration, but also service users. Such an implementation requires more appropriate technologies.

CONCLUSION

New technologies have traditionally been successful in achieving the goal of reducing labor costs, but have not been used effectively in shaping the concept of service provision in public administration.

Now intelligent information the real-time system should provide a service whose content, speed of access and display corresponds to the current needs of service users as well as employees in the process of offering services.

Large quantities data are collected in public administration every minute, every hour, every day, from a large number of different sources such as the Internet, social networks, computers, by giving or by requesting services and etc., and must be stored in a data warehouse.

Concepts which stand behind the data warehouse enable the public administration and service users to achieve various goals in a special way.

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Necessary significant investments can provide public administration with improvements in the provision and provision of services. This can provide more transparent services, better cooperation, more efficient e-m-Participation and much better efficiency in serving and offering services.

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