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ОЦЕНКА ЭФФЕКТИВНОСТИ АДАПТИВНОЙ АНТЕННОЙ РЕШЕТКИ ПРИ ДИСКРЕТИЗАЦИИ ВЕСОВЫХ КОЭФФИЦИЕНТОВ

Представлена аналитическая оценка среднего коэффициента потерь при дискретизации квадратурных составляющих нормированных весовых коэффициентов в адаптивной антенной решетке. Определена требуемая разрядность весовых коэффициентов адаптивной антенной решетки в зависимости от отношения суммарной мощности помех к мощности внутреннего шума на входе полосового фильтра. Это сделано исходя из допустимой величины уменьшения среднего выходного отношения сигнал/помеха+шум.

Ключевые слова: дискретизация квадратурных составляющих, весовые коэффициенты, антенная решетка, коэффициент потерь.

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A COMPARISON OF THE E-GOVERNMENT SYSTEM ARCHITECTURE IN JORDAN WITH THE E-GOVERNMENT SYSTEM OF THE UNITED STATES

Дане дослідження націлене на вивчення структури системи електронного уряду в Йорданії і її зіставлення з системою Сполучених Штатів. Дослідження показує, що система електронного уряду в Йорданії поліпшила надання послуг громадянам, оскільки вона забезпечує своєчасні, менш дорогі і ефективні послуги. Однак дана система схильна до інформаційних загроз і потребує постійного поліпшення шляхом додавання нових технологій та інфраструктури.

Ключові слова: архітектура системи електронного уряду, сервіси електронного уряду, система електронного уряд Йорданії.

1. Introduction

In the past decade, governments across the world have been under intensive pressure to adopt and use technologies that improve service delivery to their citizens. In particular, the increasing use of information and communications technology (ICT) as well as the related practices in the education, commercial and organizational sectors and the penetration of the internet among the citizens have increased the need for governments to move at par with the dynamism of the society. Currently, most governments across the world are leading societies that are increasingly globalized, interconnected and information

consuming. Most people look upon electronic services and expect their governments to provide the same. Further, the governments are increasingly making efforts to meet the expectations of their citizens. They look to provide electronic based services as a means of improving public service, increasing efficiency, increasing the degree of transparency, and above all, cutting costs. They face a major problem because they have to come up with effective e-government system that services the people as they would like but also meets the objectives of the government, especially in terms of reducing costs [1]. Further, the e-government system must be safe from threats as well as retain their use over a lengthy period or allow

the government to make frequent changes for improvement, with the main idea being moving along with the dynamic technologies that the citizens, businesses and organizations are applying every day [2].

Further, e-government systems play a crucial role in enhancing and promoting the enterprise sector in any country. For instance, it encourages e-procurement, which consists of the government, the supplier and the e-procurement institution or department. In this way, procurement services are provided online and are faster, effective and transparent. Investors are more likely to move in and invest their money in a country that has an effective e-procurement system, thus improving the enterprise. Secondly, an e-procurement system allows a fair market to exist and competition is also fair since transparency reduces prices of goods and services as they are obtained through batch procurement.

Consequently, it has become evident that electronic systems for delivery of public services are necessary in running governments across the world. Therefore, many governments across the globe are seeking to enhance their service delivery methods through e-government systems. But not every system is effective. Rather, an effective e-government must meet the expectations of the government and the needs of the citizens. As such, an important aspect of an e-government system is its structure or architecture, which defines its layout and ability to work and meet the expectations as well as the needs of the citizens. Further, e-governments adopted by various nations across the globe exemplify marked differences in their architectures, especially because the level of hierarchy is different in various public service provision systems. Jordan, one of the emerging economies in the Middle East, is an example of the nations that have adopted e-government system to enhance their service delivery. Also, Jordan is one of the nations in the region that has recently adopted the technology, implying that, compared to other countries in Europe and America's, the e-government system is relatively recent. Consequently, it is important to examine the e-government system in the country, but also more imperative to determine how it compares with that of a developed nation like the US in order to develop a good understanding of effective e-government system architecture. Currently, few researchers have attempted to develop a good analysis of the Jordanian e-government system architecture, especially by making comparisons with those of developed nations like the US. Consequently, there is a knowledge gap in this field, which should be filled by analyzing the nation's e-government system architecture and comparing it with that of a developed nation.

2. The object of research and its technological audit

The research analyses and examines the concepts associated with the architecture of the e-government system in Jordan as the objects of the study. Specifically, the research examines all the layers of the e-government system, that is, the access layer, the e-government layer, the e-business layer, and the infrastructure layer. In addition, the research examines the UML (Unified Modeling Language) model of the system. Further, there is a comparison of the architecture with that of the United States.

The research further shows that, despite being an effective e-government system, the Jordanian architecture

has some inherent disadvantages in that it requires continuous improvement and is relatively weaker than that of the US. In particular, its weakness is associated with the high level of hierarchy in the government service delivery system in the country.

3. The aim and objectives of research

The aim of research is to examine how different governments have adopted different e-government architectures and how these are effective.

To achieve this aim the following problems are solved:

1. To analyze the e-government architecture adopted in Jordan (a developing nation).
2. To determine the challenges facing the architecture in the country.

4. Research of existing solutions of the problem

Electronic Government Interoperability, also known as e-GIF, is an important approach to solving problems that affect e-government systems [3]. The method, which was developed in early 1980's, is primarily a method of standardization of ICT, especially designed to respond to concerns that are related to proprietary systems [4]. The e-GIFs are a set of guidelines as well as standards that provide or define a common language to attain coherent flow of information across all the systems [5]. The UK is an example of a nation that has used this approach to develop an effective e-government system [6]. The author states that the UK uses the European Interoperability Framework (EIF) to standardize its e-governments system and solve various problems associated with the standards [7].

Nevertheless, as indicated in the research [3], adopting these standards does not necessarily mean that all the problems associated with the e-government system [8]. The authors [8] argue that adopting the standards does not guarantee interoperability. For instance, the authors use the UK example, where the interoperability remains despite having reached version 6.1 in 2005 [9].

According to the research [4], one of the most important and effective approaches to solving the problems of e-government architecture is to adopt the relevant or appropriate framework that meets the need of the specific country. For instance, the Electronic Government Interoperability, widely known as the Enterprise Architecture (EA), is an effective approach to solving most of the problems that most e-government systems face. The EA emphasizes on the management as well as planning all the assets as well as architectures together with their processes and structures.

Consequently, it is important for Jordan to use the EA approach in developing its e-government because it allows the use to develop processes and structures based on the individual needs of the specific nation. Therefore, it is suggested that Jordan use this approach as she seeks to develop an effective e-government system and meets the needs and expectations of the citizens [10–12].

5. Methods of research

The adopted study is qualitative, implying that a qualitative approach is used to obtain information about the

e-government system architecture in Jordan. An explanatory type of research, a qualitative approach seeks to develop an understanding of motivations, opinions or even reasons that underlie a given phenomenon of interest. The idea is to gain insights into the problem or the occurrence of the phenomenon of interest or develop hypothesis or ideas about that particular phenomenon. The researcher may also be seeking to uncover the trends in ideas or even thoughts, opinions and motivations behind the observed phenomenon. To gain these types of information, a qualitative approach uses semi-structured or unstructured techniques for collective data, which is, therefore, qualitative type of data. Qualitative data is mostly in statements that describe the phenomenon or the qualities of it and its occurrences, including the reasons, opinions and motivations that may underlie it. Thus, it is unlike the quantitative data that is always in form of numerals or data that can be transformed into statistical forms. To gain qualitative data, the researcher uses focus groups, individual interviews, observations and participations. In addition, the researcher can use qualitative analysis of an object, a phenomenon or an occurrence to gain information about it or its occurrence. Thus, this research uses an analytical approach to examine and analyze the architectural set up of the e-government system adopted by Jordan.

6. Research results

6.1. Framework for E-Government Architecture.

Adopting and putting in application an effective and efficient electronic management system is not an easy task, neither is it cheap. A public sector organization seeking to adopt an effective e-government system must first ensure that it evaluates its process model and select the most appropriate technology that not only meets the needs and expectations of the citizens, but also deliver on the government policy [1].

6.2. The architectural design. It should be noted that government organizations have different compositions and business processes, there are several aspects of technologies and system infrastructure that government organizations must adopt in common as a way of providing facilities for system integration, which should give them the appropriate platforms on which knowledge resources and information is shared. For instance, there is need for a common and integrated architecture framework with the capacity to enable different organizations, administrative units and agencies to share data, regardless of the difference devises, format and the e-government architecture used [2].

6.3. What is an e-government architectural design? The e-government architecture refers to the components, standards, technologies, guidelines, applications and business or process model for an electronic commerce that government organizations apply to facilitate their interactions as well as enhance productivity. It should be noted that the presence and use of e-government systems is a relatively new idea, which means that it is also new in research work and academia [1].

Therefore, it is necessary to borrow research-based information from related areas such as e-commerce, e-business and e-services as well as the wide area of information technology when discussing e-government.

Currently, e-government architecture is based on a framework that has four layers connected through bidirectional arrows. It represents the hierarchical levels of implementing e-government systems. It also shows the logical connection of the layers, which allows data and services transmission in both directions. The access layer is the first and the top level of the framework and illustrates the parties that use the government services as well as the specific channels of accessing them. The second layer is e-government and its purpose is to integrate all the information as well as services from the different organizations or departments [1]. The e-business layer is the third and its purpose is to manipulate as well as integrate the data sources across the various bodies and organizations. It also functions to make information available to the e-government portal. The fourth and the final layer is the ICT infrastructure of e-government, which is built to communicate with all the government arms and parts and thus provide support to the government operations as well as effective and efficient services to the citizens [2].

6.4. Outline of the e-government system architecture adopted by Jordan.

6.4.1. The Access Layer. This layer describes the channels through which users can access government services. In this case, the term 'users' refers to the various parties such as the citizens, business organizations, government employees, community members or organizations and departments in other governments. They are important components of any government (Fig. 1).

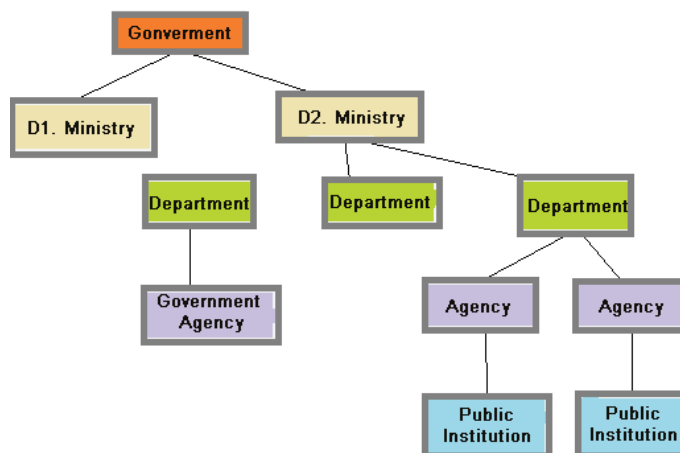


Fig. 1. UML Model for E-government Architecture

They are the channels through which information and services are accessed, used and shared through many technologies. Access layer is the most simple of all the four layers in the framework [1]. It is managed as well as controlled by the users. Nevertheless, the organizations in the public sector are required to provide a common method or means of finding and accessing all government services and information, develop a common appearance and texture across the different channels and comply with the technical standards. In addition, they are supposed to maintain a common method for coordination of the channels.

6.4.2. E-Government Layer. The purpose of the e-government layer is to integrate digital data of the various organizations into a common web-portal of government services. The idea is to integrate these organizations into a web-portal that represents a one-stop e-government por-

tal (Fig. 2). The objective is to improve and enhance the ability of the various users to access government resources and reduce the cost of processing services. As well, it seeks to enable the organizations to provide services that have high quality. The web-portals are important features in e-government systems as they are used in developing e-government initiatives. They also allow the creation of electronic interaction channels to allow the government and the other parties to communicate and interact in both directions. Basically, they allow electronic communication and interaction in four ways- government to citizens, government and government employees, government and business organizations and government and government. In addition, the layer serves the important role of enabling the users to use the web browser to access and obtain the government as well as corporate information they require through just one window. To link together the dispersed information sources, the portal has a web-based front-end application [2]. The layer also allows governments to manage all information. It also allows the government to enable the users customize the specifics they need from the data or information therein.

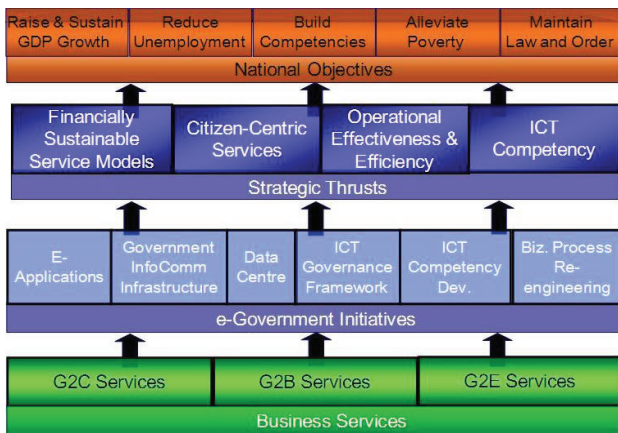


Fig. 2. E-government layer architecture

It is also important to note that the integrated portal in this layer is important in cutting the overhead cost and improving the flow of information. Previously, when most governments were using the traditional methods in managing information, citizens had a bulk of work and spend a lot of time accessing government information. In particular, if a citizen has moved from one location of residence to another, he or she was required to identify the specific organization to contact, complete and return a form showing the change of residence and address to every organization [2]. The process was difficult, time consuming and boring. The web portal solves this problem because a citizen is no longer needed to update information about the change of residence or address to every organization of interest.

Nevertheless, there are several challenges that affect the development of a single government portal to handle all government data and information. For instance, the size of the government is quite large, with every government consisting of a complex body of many organizations, departments, agencies, directorates, arms and other institutions. Secondly, it is sometimes difficult to determine the specific features or applications that are relevant in creating a government portal with the capacity to provide the best and most appropriate services. Further, there is a technical challenge to achieve a single portal because it requires all the public authorities to be interconnected and their system ought to be interoperable. In addition, it needs it requires sophisticated technologies and system integration. Moreover, it requires skilled manpower to operate, manage and sustain [1].

6.4.3. E-Business Layer. E-business layer (Fig. 3) focuses on ICT applications and tools.

It uses these aspects to develop a network of knowledge sharing and information process. The networks are built within and between organizations [2]. The baseline is to integrate front-end applications of the e-government layer with back-end activities.

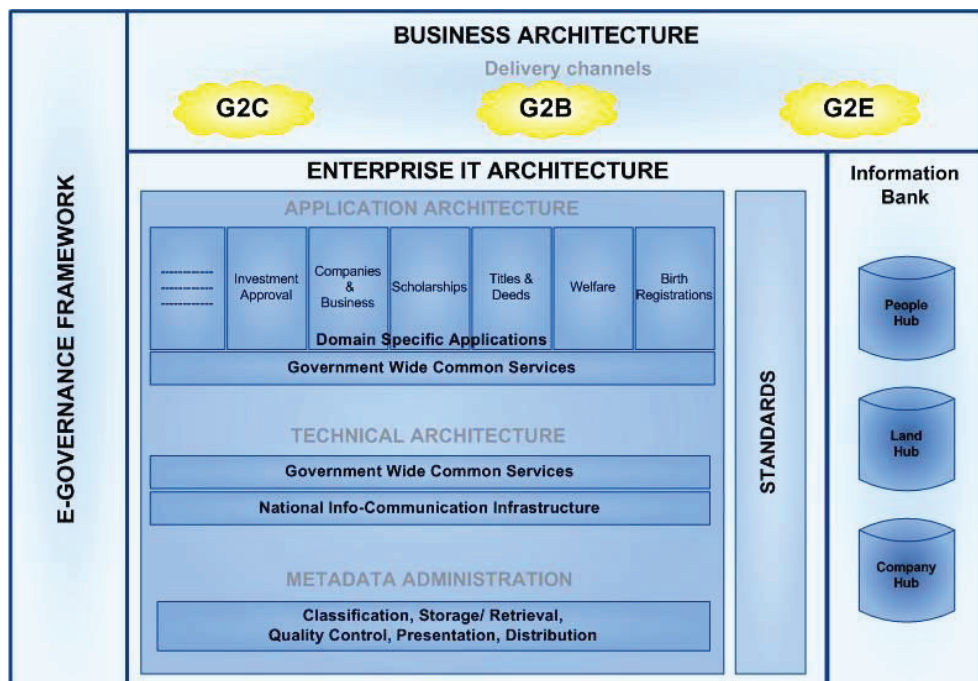


Fig. 3. Business Layer Architecture

The layer, once implemented, functions to provide a seamless, real-time and automated channel of communication between the organizations. It also enables government employees to interact with other departments, agencies and other bodies such as those concerning their welfare, human resource, news and updates. Consequently, the layer is effective in supporting effective decision-making processes, formation of value chains and enhancing business partner relationships through an electronic framework.

6.4.4. Infrastructure layer. The layer focuses on those technologies that are required to provide government services in a reliable and effective manner. The purpose of the technologies is to support and integrate how the information systems operate in the e-business layer and in all the organizations involved. They provide the necessary standards and protocols through a well-defined network and communication approaches such as the internet and intranet. The basic technologies in this layer include LAN, the database as well as the hardware resources such as computers, routers, mobile phones and other gadgets.

6.5. E-Government Architecture in Jordan versus E-Government Architecture in the USA.

6.5.1. E-government system architecture in Jordan. Jordan, one of the developing nations in the Middle East region, has an e-government that was established in 2001. The e-government in the country was an initiative of the monarch, His Majesty King Abdulla II. The purpose of the program is to achieve greater efficiency government business and performance. It seeks to raise the level of service delivery to the people as well as investors from every part of the society in an easy, quick and accurate manner [13].

Under the National ICT Strategy of Jordan, the Kingdom of Jordan seeks to improve the life of the citizens through infrastructure and technologies. The National Agenda of Jordan is the foundation that seeks to meet the objectives of the National ICT Strategy [13]. The Industry Association of Jordan has facilitated the creation of the National ICT Strategy and describes how the nation will continue to move forward in harnessing the use of ICT and other technologies as a tool for driving the overall economic development and advancement in the country [13].

6.5.2. Level of Preparedness for E-government in Jordan. In September 2001, His Majesty King Abdulla II of the Hashemite Kingdom of Jordan launched the national e-government program [13]. The vision of the program is «to be an essential as well as active participant in the social and economic development through the use and application of information and communication and related technologies that enables easy and quick access to government information and services for the people and organizations, regardless of their economic status, geographic location and professional capacity».

Since then, the government embarked on developing an effective e-government system to achieve the objectives as per the vision of the program. It embarked on an e-government architecture that contains a number of services and subservices. It determined the hierarchy of the services and sub-services after intensive studies and a complete scan for all the government sites on the web. The scan was aided by a general knowledge of the hierarchy in the government and the government organizations [13].

The e-government in Jordan was established based on an architecture that supports the hierarchy of the government [14]. First, it supports communication services, which

include mail and parcel services, postal money order and postal banking services, express mail servicers, telephone and related services [13]. Secondly, it considers economic services such as trade mark registration, trade name registration, registration of patents, exports, importers, tax remission, new settlement and others [14]. Third, the architecture considers and supports education and training services including education certificate, transformation of scholars, registration of private schools and studies, student attendance registration and others [13]. Further, the health services were recognized and included in the framework and includes birth and death certification, certification of new medical constructions and others. In the industry service sector, the system, considers and supports industrial register entry, certification for new constructions and establishments and others.

Other services that are supported in the system include labor services, natural resources and environment services, population and human settlement services, tourism and antiquities and transport services [13].

Based on the knowledge of the service hierarchy in the government, the e-government architecture was designed [14]. The process of supporting and providing the above services was included in each stage, but the entire system has three tiers. The first tier connects each system with the authorized database centers responsible for each section. The second tier, known as the middle tier, is the business logic layer while the final tier represents credit cards and databases that are responsible for allowing and facilitating e-payment systems [15].

The e-government of Jordan has four pillars. The first pillar, known as the institutionalization pillar, is composed of the National e-government Steering Committee and e-government units within government agencies [13]. It allows regular reporting on the performance of the e-government system. In addition, it has the mechanisms for coordinating with the stakeholders [14]. The legal pillar establishes a legal working group and prioritizes the development of laws and regulations. In addition, laws are enforced and regulations made for standards of establishing e-government initiatives in each agency or department [15].

The ICT and infrastructure pillar is the actual pillar in which e-enterprise architecture and e-government national backbone are located. There is an operation centre development and expansion efforts to integrate e-government services under one portal [13]. In addition, the government agencies and departments and their services have been digitalized to ensure that all government information is found in electronic format and accessible to the citizens and organizations [14]. The business pillar allows citizens to transact with institutions and the government through e-payment methods. Infrastructure has been updated and integrated to support the e-government system, including improved access to effective ICT and related technologies and hardware such as computers, the internet and mobile phones [13].

The following algorithms have been specified for the e-government system in Jordan:

- Encryption: base64;
- MAC: This will be the HMAC-SHA1;
- Hash function: SHA.

6.5.3. E-Government Architecture Guidelines for USA Government Entities. In the USA, the government adopted e-government system is based on guidelines that are set to set the framework for the use the system by the

government entities. First, it is important to note that the system is based on Enterprise Service Bus (ESB).

Web Services Integration: It requires that any government entity that wishes to publish its service through the e-government ESB should do so in accordance with the Interchange File Format (IFF) standards as described under IBM [16]. Further, such an entity should publish its service through the e-government ESB and as per the UDDI (Universal Method for Enterprises to Dynamically Discover and Invoke Web Services) standards [17] for it to be registered. The agent must also have a good understanding of the guaranteed delivery feature that is also supported by the ESB. As such, all architects must design the system when taking into consideration of the features. The government agent must further take a number of ESB capabilities into consideration when developing the services design. First, ESB must have support for Web Services Addressing (WS-Addressing). Second, it must also have support for WS-Policy, WS-coordination and WS-Brokered notification and WS-topics.

The second most important aspect of the guidelines involves portal integration. All government agent wishing to interface applications or portals are necessary. The producer and the implementers must be in a position to integrate with the e-government portal administration guidelines.

6.5.4. Challenges. Despite the efforts made to ensure that citizens and organizations access government information and services through digital technologies with ease and efficiency, the Jordanian government has faced several challenges that have delayed or limited the use and application of the system. In particular, the low computer and internet penetration rate in the country is a major challenge, which has affected many citizens [15]. Secondly, the rate of adoption of technical and security policies and standards has been rather slow. In addition, the rate of e-literacy has been slow, especially among the older people, uneducated and rural communities. Further, the problem of resistance to change is a major issue in the achievement of the national agenda for ICT development and e-government systems [14].

7. SWOT analysis of research results

Strengths. Based on the analysis, it is evident that there is a positive effect of using the e-government in providing services to the public. For instance, when e-government is applied, the citizens obtain services within a short time, they do not have to travel or queue and the costs are reduced. For instance, in Jordan, it has become easy to obtain driving license, identification certificates and revenue certificates within a short time and without having to travel to the public office to collect them.

Weaknesses. Nevertheless, it is evident that building, implementing and sustaining the new system requires a lot of resources and technological know-how.

Opportunities. The e-government system in Jordan is easy to improve by improving both technology and infrastructure, which means that it will continue to be better for the citizens.

It is economically feasible to implement improvements to the e-government system in Jordan. In particular, the e-government system is expected to add new concepts such as accountability, transparency and increase in citizen participation in government performance evaluation.

It provides the country a method through which government transactions are submitted online and make payments through electronic means where possible. The government will offer multiple business as well as technical services to the citizens with an idea of supporting interactions between government agencies and entities and their customers.

By enhancing transparency and accountability, the e-government system will seal loopholes that enable corruption. As such, money normally lost through corruption will be safe.

Threats. By using e-government systems, Jordan is over-relying on technology. As such, it is prone to information threats such as phishing, hacking and malicious programs and viruses.

When upgrading the system, it will pose a major threat because the developers will have to acquire government data and information from the old systems and synchronize it with the new system. When this is taking place, it might be possible for some information to be lost or leaked to inappropriate parties.

8. Conclusion

1. The analysis of the e-government system in Jordan provides evidence that even the developing nations have the opportunity to improve the quality, efficiency and effectiveness of the services and information that the government offers to the citizens.

2. The e-government initiative in Jordan shows that developing nations can move along with the developing nations in terms of adopting technologies that improve citizen service delivery [14]. Further, the e-government architecture in Jordan is based on turning the old service provision from analogue to digital, with the government providing the necessary support to the establishment of the infrastructure.

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СРАВНЕНИЕ СИСТЕМЫ ЭЛЕКТРОННОГО ПРАВИТЕЛЬСТВА ИОРДАНИИ С СИСТЕМОЙ ЭЛЕКТРОННОГО ПРАВИТЕЛЬСТВА СОЕДИНЕННЫХ ШТАТОВ

Данное исследование нацелено на изучение структуры системы электронного правительства в Иордании и ее сопоставления с системой Соединенных Штатов. Исследование показывает, что система электронного правительства в Иордании улучшила предоставление услуг гражданам, поскольку она обеспечивает своевременные, менее дорогостоящие и эффективные услуги. Однако данная система подвержена информационным угрозам и нуждается в постоянном улучшении путем добавления новых технологий и инфраструктуры.

Ключевые слова: архитектура системы электронного правительства, сервисы электронного правительства, система электронного правительства Иордании.

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