THE APPLICATION AND INTEGRATION OF ICT IN THE PUBLIC SECTOR: an overall literature review focused on the EU environment

A APLICAÇÃO E INTEGRAÇÃO DAS TIC NO SETOR PÚBLICO: uma revisão geral da literatura voltada para o ambiente da UE

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Abstract

The aim of this article is to examine the importance and acceptance of Information and Communication Technologies (ICT) in the public sector. Nowadays, the government, businesses and citizens are going through an era of rapid technological developments which is an excellent opportunity to overcome the reluctance of change and to transform the public sector in such a way that it serves the public interest more efficiently and rapidly, so that it leads to a citizen–friendly society. Through the literature review, an attempt is being made to examine the level of utilization of the offered data information systems and infrastructure and to identify the factors that lead to the adoption or avoidance. Following most recent developments in the European community and CEE countries governments are restructuring their formation to evolve and provide modern digital services. Through a reformation program EU aims to secure an efficient and future proofed e-governance.

Keywords: Information and Communication Technologies (ICT), public sector, digital transformation, e-government, European Union, CEE countries, ICT adoption

Resumo

O objetivo deste artigo é examinar a importância e aceitação das Tecnologias de Informação e Comunicação (TIC) no setor público. Atualmente, o governo, as empresas e os cidadãos estão passando por uma era de rápidos desenvolvimentos tecnológicos que é uma excelente oportunidade para superar a relutância da mudança e transformar o setor público de tal forma que sirva ao interesse público de forma mais eficiente e rápida, de modo que conduza a uma sociedade amiga do cidadão. Através da revisão da literatura, está sendo feita uma tentativa de examinar o nível de utilização dos sistemas e infraestrutura de informação de dados oferecidos e identificar os fatores que levam à adoção ou rejeição.

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Seguindo os mais recentes desenvolvimentos na comunidade europeia e nos países da CEE, os governos estão reestruturando sua formação para evoluir e fornecer serviços digitais modernos. Através de um programa de reforma, a UE tem como objetivo assegurar um governo eletrônico eficiente e à prova de futuro.

Palavras-chave: Tecnologias da Informação e Comunicação (TIC), setor público, transformação digital, governo eletrônico, União Europeia, países da CEE, adoção das TIC.

1 Introduction

The evolution of human existence and way of thinking has led, over time, to the invention of tools, systems and techniques aimed at the safest, most efficient and complete facilitation of human needs and activities. From ancient times, human evolution process consists of a series of successive changes, determined by a combination of genetic and environmental factors. Hieratically, first is the need for survival and then the natural momentum of man, to look for ways to improve his living conditions and to prosper, gave impetus to an evolutionary path, which resulted in a series of inventions and innovations which finally led to the development of scientific knowledge. In terms of information, ICT have evolved to a valuable ally of administrative personnel and decision makers. The usage of ICT simplifies the process of timely collection of information - both from the internal and external environment. While additionally the evaluation and correlation of information with the problem to be solved, achieves better organization and utilization in administrative decision making (SPACEK ET AL., 2020).

2 Research methodology

Moreover, as specified by researchers (XIAO&WATSON, 2017; SNYDER, 2019) conducting a literature review is equivalent to conducting a research study, with the information that the literature reviewer collects representing the data. More specifically, as is the case for all studies, the literature review involves four steps including, conceptualization, planning, implementation, and dissemination. The model used to conduct this research, relies on the thematic approach. Thematic reviews of literature are organized around a topic or issue, rather than the progression of time. Nevertheless, maintaining sequence of time is still an important factor in a thematic review (HART, 1998). This was considered throughout this review and it was organized chronologically reflecting recent developments in the European community and CEE countries in Information and Communication Technologies. Multiple recent articles and resources were studied and their findings were included in a descriptive cumulative review.

3 Information and Communication Technologies (ICT)

The term ICT refers to a wide range of technologies, applications, networks, software, and equipment, such as computers and televisions (FARHADI ET AL., 2017; EUR-LEX,

2021). More specifically, these can be distinguished in "old" technologies such as television and radio and in "new" ones such as mobile cellular communications. Various telecommunications networks, such as the Internet and telephony, are part of these technologies, as well as, intranets, synchronized communication and messaging applications, document and task management applications, information portals, and data repositories (POUR, 2018). The category of networks includes land telecommunications and optical fibres, cellular networks, wireless networks, and satellite connections.

Within the range of ICT there are also included the use of human-computer interactions, such as multimedia, but also a number of applications, such as information systems, video conferencing and distance learning. Internet connection hardware, telephones, and computers, along with software, are the basis for a variety of wireless services, such as electronic file transfer, computerization, and e-mail, which are also included in ICT.
Internet connection is crucial as it allows the rapid transfer of many forms of information representation with symbols, sound, image and video, from one computer to another or within a network of computers. The result of connectivity is the exponentially increasing access of individuals to information (EUR-LEX EGOVERNMENT, 2021).

In developed or developing countries, ICT users have access to the full range of offered possibilities and facilities, at a low price. Their use improves private and / or working life by saving time and money (EUR-LEX, 2021). It also changes the way people manage information, communicate, educate and work. Inevitably, this kind of technology also enters into the environment of public administration (GREEK MINISTRY OF DIGITAL POLICY, 2021). Under these conditions and in an unprecedented way, information is disseminated, as well as knowledge, in various areas of common interest, significantly increasing economic and social interaction. The revolutionary nature of ICT is based on this very ability to share information. Their great acceptance has not only led to the most important transfer of information and knowledge that has taken place up to this date, but has also created new perceptions about information, knowledge, professional activity, administration and governance (EUR-LEX EGOVERNMENT, 2021). ICT contributed substantially to the ability to store large volumes of information in "digital" form, to process using advanced hardware, to search information and utilize insights using computers. This phenomenon took place in local, national and international level in a direct and economic way, eliminating any geographical restriction. Their influence on a social and economic level is undoubtedly important and the benefits of their development and integration are multiple. At the same time, they are particularly beneficial, when organizational level changes are attempted (GREEK MINISTRY OF DIGITAL POLICY, 2021). They are distinguished as technological innovations for contributing their catalytic character, after the Second World War, reconstituting the socio-economic web and businesses, as they facilitated the conditions for production, distribution, trade, administration, education, and communications. It tends to be accepted by sociologists, economists and geographers that their continued diffusion combined with the development of strategic planning are enhancing the world economy into far-reaching structural changes (ARDOLINO ET AL, 2018).

3.1 *ICT as a factor of production*

Concerning productive resources (inputs) these can be considered all those necessary resources - natural and human - that are utilized, in a society for the production of goods and services (PAPAILIAS, 2020) and at the same time contribute to the creation of the production and the development process. More specifically factors of production are: human resources (according to Ricardo (RICARDO, 1817) the only factor of production), natural resources and fixed assets used for investment, as well as capital, as added by Smith (SMITH, 1776), entrepreneurship and technology as argued by Schumpeter (SCHUMPETER, 1934). Technology, in a sense, belongs to the factor of capital, but it is examined separately, because of its capacity, since any alternation can change all the other factors of production. Incorporated entrepreneurship encapsulates the concept of innovation and, according to Schumpeter (SCHUMPETER, 1942), it creates by destroying. In his statements about the "gale of creative destruction" the innovation in the production methods or the produced product is introduced and at the same time the out-dated elements are withdrawn (KORRES, 2015).

The fact that productive resources are limited, leads to a mandatory procedure for optimization of their use, their best possible distribution in the production process in order to produce the largest possible quantity using the least means. Frequently, the use of reduced units by one resource and the greater use of another can increase the quantity produced. Increasing the production units can lead to the improvement of the educational level, the volume of the capital, the quality of the organization, as well as the development of the research (VAVOURAS, 2019). The increase of the produced quantity and resource productivity are factors of economic growth, with work operation, capital and technological progress being the most important (VAVOURAS, 2019). In combination with the institutional framework and the size of the market, they determine the development process and the economic growth.

ICT, as a productive factor, represents entrepreneurship and innovation. They presuppose an investment and their usage influences other factors. The multitude of ICT products and services, at reduced cost, increases the return on natural resources and capital and improves performance as employees become more efficient. The introduction of ICT in the production process contributes to a profound reorganization of the production system and is a determining factor of economic growth. Their facilitative nature combined with the fact that they are a general-purpose technology has led to widespread diffusion affecting all economic sectors, resulting in the emergence of a new techno-economic paradigm (KALOGIROU, 2015).

3.2 *ICT & e-Government*

As is well known, efficiency and resource saving are key goals for both business and government. The former seeks to maximize their profits, while the latter seeks more effective governance, increased transparency, greater citizen participation in political life and, ultimately, the safeguarding of the public interest. According to the EU e-government is defined as the use of ICT in Public Administration delivering services to citizens and businesses. Combined with structural changes at the organizational level - in structures and processes - the strengthening of skills and the change of culture, can lead to the

improvement of public services, illuminate democratic processes and support the implementation of public policy (COUNCIL OF EUROPE, 2021).

The benefits from the implementation of e-government are multiple and are classified in the literature as following: 1) In increasing the degree of satisfaction with the service, for citizens and businesses, as they interact with government structures more easily, faster and more resourcefully, 2) in improving the level of productivity and efficiency of public structures and 3) strengthening transparency and participation (KALOGIROU, 2015). Examples of efficient resource management include e-invoicing, e-procurement, etc. It would be inconsiderate to overlook the benefits of cross-border digital public services, which make it possible to work and trade with public services beyond the geographical borders of each country. The European Commission, as part of its strategy, is planning actions to develop cross-border digital public services. In particular, for the creation of European interoperable platforms, such as a common framework for the management of citizens' electronic identity (eID), and the promotion of innovation through large-scale pilot funding (EUROPEAN COMMISSION EGOVERNMENT, 2021).

Utilizing economies of scale reduces operating costs per unit and decreases production and service costs, while increasing productivity - in this case the public sector - by saving resources and time. Cost-benefit analysis, accessibility and education of citizens have been key elements in the development of e-government services in EU, aiming to provide quality, fast and reliable services. As already mentioned, e-government concerns the use of ICT in combination with the organizational restructuring of public services, so that the relationship between government, citizens, businesses and organizations is direct and symmetrical while maximizing the benefits for trading parties (KARYONO ET AL., 2017). E-government applications are based primarily on the use of e-identity, with three functions: authentication, authenticity control and signature. In particular, the electronic identity functions as a key for access to public services via the Internet, but also as a certificate of citizen identification (FOUNDATION FOR ECONOMIC & INDUSTRIAL RESEARCH, 2018). The need to exchange of information between institutions and citizens, at national and European level, is growing since European citizens are increasingly accustomed to trading, traveling and working within the EU. The EU, taking into account that these digital means are now a key factor in sustainable development, has designed a series of action plans to lead the Member States to uniform application and development having as ultimate target the achievement of digital governance. All member states are gradually harmonizing their national ICT strategy according with the European directives. Within the framework of the ICT, government services are established, which are responsible to handle the integration plan and merge together new units with pre-existing IT and telecommunications structures. The main mission is to consolidate the digital environment of the public administration, to improve the services provided, through ensuring interoperability, and to reduce bureaucracy through the promotion of e-government (MINISTRY OF DIGITAL GOVERNANCE, 2021).

3.3 *Measurement of e-Government Services*

According to Deloitte & Touche Consulting (DIGITAL GOVERNMENT TRANSFORMATION, 2015), there are six crucial steps, for the government and local authority agencies, to move towards a successful e-government, so that they can inform themselves and be able to provide services that will minimize the service time and will eliminate distances.
The stages are as follows:

1. Publication of information / distribution of information
At this stage, government agencies and local administration organizations are invited to have an online presence and let citizens know about their digital presence. The purpose is the easy and fast identification of the appropriate public service from the citizens, with the least possible effort, in order to cover a specific need.

2. Official bidirectional transactions
Ensuring the confidentiality of personal information on a website, where citizens can safely enter personal information and trade is the mandatory condition to convert financial and bureaucratic transactions to digital form. Digital signatures and certificates can work to this direction.

3. Multipurpose portals
The benefit of using a multi-feature portal is to make multiple transactions with different government services and this process aims to inform and serve citizens from only one point.

4. Portal personalization
The possibility of personalizing a portal by combining the characteristics, properties, needs and personal needs of each citizen, makes it more friendly while at the same time is increases the degree of satisfaction. Consequently, enhances its use. Therefore, the registered personalization data are subject to analysis aiming at the further development of the portal. It is worth noting that, through personalization data, the needs for new services are detected and the citizen has the opportunity to interact with the public, through this feedback process, to shape, to some extent, the way to be served.

5. Grouping common services
The reorganization of services based on object and common characteristics is considered as a necessity. Especially, since citizens use the portals without knowing exactly the responsibilities of each service. Particularly effective in this case is the use of workflows, which facilitate the use of electronic services, without assuming that citizens know precisely the structure of the organizational unit or the sequence in the executive process.

6. Complete integration and transformation of businesses
The government has a fully equipped centre tailored to the needs of the citizen. As technology is integrated into the various services the distance from the base to the top of the organization is minimized.

3.4 *E-government and Digitalization in CEE Countries*

Looking at CEE counties, governments have advanced significantly in the e-government field by employing innovative technologies to expand efficiency and usefulness for their public services. According to Price Water House Coopers COVID-19 has accelerated development for governments in CEE to speedily forward their e-government alteration by employing ICT. Governments in the CEE region have made progress in digitalization although there is still room for improvement before they can completely take advantage of the rewards from digital transformation in the public sector. Mainly due to the fact that many countries are simply following the path that was set from other counties. Each country is necessary to modify their digital approach based on the local environment and mentality (EMMANUEL KOENIG, 2020).

According to a research concerning e-gov benchmarking reports from 2017 and 2018 released from European Commission the CEE countries are not fully benefitting from ICT opportunities. Therefore, it was recommended to further enhance digitalisation and dispersion by modernising to current technology front-and back office while motivating citizens to actively try electronic government services. Although, it has frequently been highlighted that electronic government services ought to be citizen-centred, the source for electronic organisational services for citizens is rather stuck in a pre-digital era. Additionally, electronic resources meant for the participation of citizens at local decision-making procedure are rather immature in some CEE countries. Although, countries such as, Czechia, Romania and Hungary are at the same level of electronic government development, this finding raises questions about the citizens being in the centre of e-government development. (SPACEK ET AL., 2020).

As stated on another study, it is essential for CEE countries to regenerate future-proof plans and models. A multitude of factors can suggest that there is an important advantage deriving from cooperation in the area by the means of digitalization. Particularly, virtually no important gap exists between CEE countries and other selected countries in Western Europe in terms of government. Embracement from the government can have an important role in term of development for the transition to digitalization and the economy. Numerous CEE countries have developed national digitalization strategies. Nevertheless, these strategies may not be congruous throughout the region, which can have a key impact and lead to variations in digitalization between countries (NOVAK ET AL., 2018).

Implementation of new and innovation technological combined with digital solutions is of the extreme importance factors leading to the overall integration of digital society. Accordingly, incessant strategies and development plans by governments having as a target the improvement of public services and further development of digital skills will mainly regulate the degree of a country's digital transformation (EMMANUEL KOENIG, 2020).

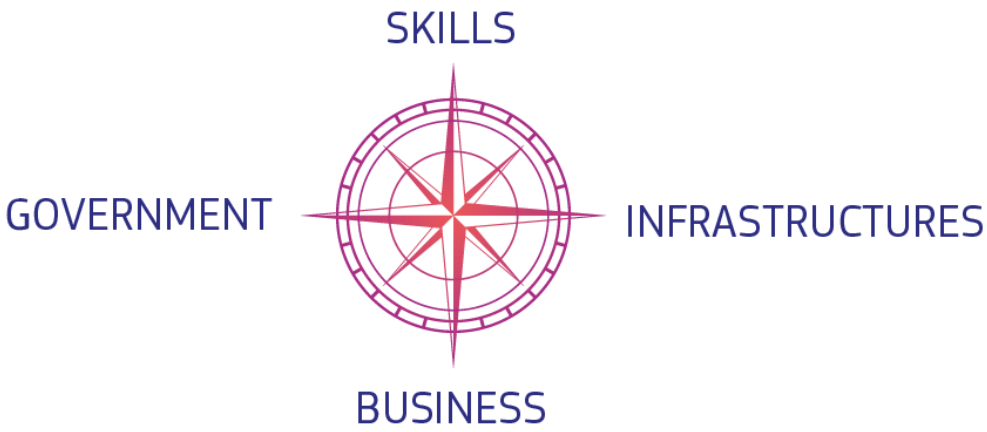
3.5 *Europe - The digital path from 2020 to 2030*

The Europe 2020 leading strategy has included a number of structural reformations aimed at fiscal consolidation and job creation. The financial crisis that preceded it was a test for the European economy, but also a springboard for progress which redefined its position

in the world market. The emergence of many factors such as, economic crisis conditions, structural backwardness, limited resources and the aging of population, created the need for transformation. On the other hand, the emergence of new economies, such as China and India, their remarkable investment in research, development and technology and their rapid growth, intensified global competition and highlighted the need for economic recovery. The desired development has a smart, secure and sustainable purpose, which intends to remove exclusions and to contribute in the transition to a green society. In particular, social and territorial cohesion and progress are sought, through a spirit of innovation, diffusion of knowledge and efficient employment of available resources. Strong economic governance is a prerequisite for achieving these desired goals (EUR-LEX, 2021).

The European Commission in March 2021 presented its plan for the European digital transformation by 2030. The main goal is the common governance structure, but also the transnational investments of the Member States and the private sector, through sustainable digital solutions, which will ensure the welfare of citizens. The strategic axes concern the development of digital skills, secure digital infrastructure and the evolution of the digital transformation of public services and enterprises, as shown in Figure 1 (EUROPEAN COMMISSION, 2021).

Figure 1 - Europe's digital targets for 2030.



Source: European Commission (2021).

In the context of these developments and in order to preserve and protect the values of the EU, it is expected that, through the consultation process, the digital principles and rights of the digital environment will be established. This point could be considered crucial, as the existing institutions are being transformed.

4 Conclusion

The continuing needs of citizens and governments to exchange and collect information, at both national and European level, have led to the expansion of multiple activities relying on ICT integration and acceptance. Digital culture and ICT can have a huge impact of the acceleration for digital transformation. Governments should work together for the development of digital policies and agreeing on common cross-border polices. Countries interested in improving their digitalization and e-government by employing ICT, could form an alliance at a European level to amplify their digital advancements and fully take advantage of the innovation and economic growth. Having as a vision the digital transformation and e-government, Public Administration defines its new principles and values. The main axes of operation are efficiency and effectiveness. Aiming, therefore, at its future, modern and strong position, Public Administration seeks for the unification of communications and the storage of knowledge, which will serve in the process of administrative and other decisions making processes, which will influence the way of governance. Enhancing digital skills, improved communication and better information management can maximize the benefits combined with a decentralized organization, can motivate employees to participate to the development of new knowledge. During the Covid-19 pandemic the most intense use of digital media was appeared. This emphasised the need for modern infrastructure and interoperability between organizations. While at the same time it was an incentive for local and regional authorities to adapt to the digital age.

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