

The role of e-government in the smart city ecosystem

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Abstract:

Smart cities represent a multidisciplinary field that is constantly being shaped by technological advances and urban development. In the literature, smart cities are defined as an ecosystem, that is, they form a system where the whole is more than the sum of its parts and has system properties. Smart city initiatives can also include human capital investments aimed at promoting the learning and innovation capacity of municipalities, supporting and motivating local people in education, and improving their own lives. In the smart city ecosystem, different stakeholders play different roles in their activities, and governments / municipalities can facilitate the cooperation of different actors. Stakeholders in new ecosystems play a different role and are therefore forced to transform their business models; which also raises new business models in managing smart cities. One of the determining factors is the large amount of data. E-government is an essential part of a smart city that uses information and communication technologies to transform the relationships between government agencies and citizens, businesses and other government agencies to improve better government services, better interactions and the efficiency of government operations. Integrated information technologies play a vital role in smart cities and offer advanced services in the areas of intelligent transport systems, building management, energy and environmental monitoring, security, public safety and e-commerce.

Government and local governments, who have huge amounts of data, can make more effective cooperation between citizens, businesses and administrations through the proper use of big data technologies, which can increase material and social well-being, competitiveness and affect all conceivable areas of life equally. How can the government / local government utilize the - structured and unstructured - masses of data that are produced, shared or made available by the population and companies of the municipality in the course of its activities in the management of public administrations and municipalities? .

Only part of the data is produced directly by the government / municipality, the other part may be indirectly - as a result of data collection based on a targeted strategy - owned by the government and municipalities, but can be classified as public data (data assets).

Approaching data management from the point of view of information technology, data management can be defined as a set of procedures that ensure the management of data existing in digital form by IT means. With regard to data management, primary use of data means that data recorded or collected by public service bodies in the performance of public tasks are used by the state and the municipality, regardless of which body recorded or collected or uses these data. In contrast, we oppose secondary data processing if, for some reason, external actors want to provide access to public data. Professional planning of data management requires the development of a data asset strategy.

In the study, we are primarily looking for the answer to that

- how governmental / administrative responsibilities relate to the smart city ecosystem,

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- which tasks can be supported by e-government,
- which e-government data sets may be affected by the data management and what relationships can be defined between them,
- What are the data protection challenges in data management?

The method used in the preparation of the study is primarily a literature search, resp. secondary data analysis. The processing method follows primarily a descriptive method and takes a critical approach.

Keywords: smart city, e-government, PSI reuse

Introduction

Smart City initiatives include promoting a city's capacity for learning and innovation, supporting and motivating local people in education, and improving citizens' own lives by attracting and retaining other valuable inputs from the outside. The goals of building a smart city are to encourage talented and highly skilled individuals, innovative businesses, investors and entrepreneurs to invest with financial and human capital to start new businesses.²

In addition, many other aspects of city life are mentioned in connection with the term smart city, such as safety / secure, green, efficient and sustainable, resource-saving, and so on.

All of these features and related disciplines pose new challenges to security and privacy, as users implicitly expect systems to be secure and meet data protection considerations. One of the critical elements is what role (s) the city will play as a player in an increasingly complex value network. New players are entering the market, players are changing their existing business strategy, thus changing the roles of market players. As a result, different types of platforms are emerging and competing for market dominance. Technological developments are also creating new threats and new opportunities. An element related to the trend of platforming is cloud computing, which is playing an increasingly important role in communication and helping the private sector to reduce costs and increase efficiency. One particular challenge is related to open data business models.³

² Caragliu, Del Bo, & Nijkamp (2009): *Smart Cities in Europe*. Proceedings of the 3rd Central European Conference in Regional Science—CERS 2009, Kosice, 7-9 October 2009, 49-59. https://www.researchgate.net/publication/46433693_Smart_Cities_in_Europe last download: 2021.09.15.; Correia, L. M., Wüstel, K. (2011): *Smart cities applications and requirements*. White Paper. Net., 9. https://grow.tecnico.ulisboa.pt/wp-content/uploads/2014/03/White_Paper_Smart_Cities_Applications.pdf, last download: 2021.09.10.; Giffinger P., Fertner C., Kramar H., Kalasek R., Pichler-Milanovic' N., Meijers E. (2007): *Smart Cities: Ranking of European Medium-sized Cities*, Centre of Regional Science, Vienna 2007, http://www.smart-cities.eu/download/smart_cities_final_report.pdf, last download: 2021.09.10.; Hollands R.G. (2008): *Will the real smart city please stand up? Intelligent, progressive or entrepreneurial?*, "City", 12 (3) 2008. https://www.researchgate.net/publication/248930334_Will_the_Real_Smart_City_Please_Stand_Up last download: 2021.09.10.; Toppeta, D. (2010) *The Smart City vision: How Innovation and ICT can build smart, "liveable", sustainable cities*, The Innovation Knowledge Foundation. http://www.thinkinovation.org/file/research/23/en/Toppeta_Report_005_2010.pdf last download: 2021.09.15.

³ Correia, L. M., Wüstel, K. (2011): *Smart cities applications and requirements*. White Paper. Net., 9. 3. https://grow.tecnico.ulisboa.pt/wp-content/uploads/2014/03/White_Paper_Smart_Cities_Applications.pdf, last download: 2021.09.10.

The aim of the study is to review the change in the concept of smart cities in the light of the development of smart cities, to define the functions of e-government in the operation of smart cities, and to examine the data protection challenges related to the performance of these functions.

1. Conceptual development of the smart city, definition of terminology

The intelligent concept was gradually extended from a material (micro) object to an entire city, which is considered a holistic system, an ecosystem. The term smart city is used in a multidisciplinary approach. Each discipline uses the professional language of the relevant discipline and defines the measures to achieve the specific objectives. Therefore, there is no definition that includes all aspects of a smart city.

The term smart city was first used in 2007.⁴ In this approach, in the context of the economy or jobs, Smart City is used to describe a city with a smart industry. This applies in particular to information and communication technology (ICT) industries and other industries that integrate ICT into production processes.

According to a later 2010 literature⁵, that smart city uses information and communication technology (ICT) to improve its livability, viability, and sustainability. Simply put, this technology has three functions: collection, communication, and processing. First, the smart city collects information about itself through sensors, other devices, and existing systems. It then communicates and transmits the data using wired or wireless networks. Third, it analyzes and processes this data. The purpose of the analysis is to assess the situation, describe the current state and plan for the future state to be achieved.

The idea of smart cities is rooted in the creation and interconnection of human capital, social capital and information and communication technology (ICT) infrastructure. Aiming for greater and more sustainable economic development and a better quality of life for urban citizens. In other literature, the term smart city refers to the relationship between city management, administration, and citizens. Good governance, as an aspect of smart administration, often also refers to the use of new communication channels by citizens (e.g. “e-government” or “e-democracy”).⁶

In the smart city ecosystem, different stakeholders play different roles in their activities, and governments / municipalities can facilitate the cooperation of different actors.⁷ Stakeholders in new ecosystems play a different role and are therefore forced to transform their business models; which also raises new business models in the management of smart cities. We find that the use of certain management elements changes in the developmental stages of the smart city ecosystem. Management structures to strengthen internal relations are key in the initiative phase. Elements such as trust, commitment and common goals are important in this phase as they help

⁴ Giffinger P., Fertner C., Kramar H., Kalasek R., Pichler-Milanovic' N., Meijers E. (2007): Smart Cities: Ranking of European Medium-sized Cities, Centre of Regional Science, Vienna 2007, http://www.smart-cities.eu/download/smart_cities_final_report.pdf, last download: 2021.09.10.

⁵ Smart Cities Council. Smart cities readiness guide, The planning manual for building tomorrow's cities today, 2013, <http://smartcitiescouncil.com/> , last download: 2021.09.12.

⁶ Giffinger, R., Fertner, C., Kramar, H., Meijers, E. & Pichler-Milanovic, N.: Smart cities – Ranking of European medium-sized cities. http://curis.ku.dk/ws/files/37640170/smart_cities_final_report.pdf 10.o.

⁷ S. Zygiaris, Smart City Reference Model: Assisting Planners to Conceptualize the Building of Smart City Innovation Ecosystems, J. Knowl. Econ. 4 (2013) 217–231. https://www.researchgate.net/publication/328610664_Smart_city_reference_model_Assisting_planners_to_conceptualize_the_building_of_smart_city_innovation_ecosystems) last download: 2021.09.12.

to create a common foundation. In the growth phase, the ecosystem focuses on building external relationships with other parties, such as competitors and suppliers.

In this phase, management elements such as a co-creation strategy and a dedicated promotional organization become increasingly important as these elements facilitate communication with external parties.

In a 2014 study⁸ in which the expectation was that cities with more advanced technological and economic development are likely to be more active in launching and implementing smart city initiatives. In contrast, Neirotti and colleagues found the exact opposite. On the one hand, cities in richer countries (in terms of GDP per capita) were found to be more active in developing infrastructural and technological areas than cities in less economically developed countries, but less active in projects that support their innovation capacity and human capital. Similarly, cities in countries where internet services are more widely used by the local population are more active in initiating initiatives in the areas of human capital development, and in particular in the areas of government and economic governance. This reaffirms the crucial importance of telecommunications and human capital infrastructure in the implementation of e-government and e-democracy initiatives based on increased transparency and citizen empowerment. This reaffirms the crucial importance of telecommunications and human capital infrastructure in the implementation of e-government and e-democracy initiatives based on increased transparency and citizen empowerment.

2. The functions of e-government in the smart city ecosystem

2.1. Characteristics of smart cities

Smart governance is one of the characteristics of smart cities, having its roots in e-government, in the principles of good governance, and in the assumptions of citizens' participation and involvement in public decision-making. A prerequisite for the development of efficient and effective e-government is the proper IT design of public administration systems, which is a tool for effective communication and rapid response. Transnational authentication systems for citizens and businesses, the development of a data protection framework in line with existing legislation, and the sharing, collection and processing of personal and business data are key. Smart cities need to be able to integrate into national, regional and international infrastructures.⁹

According to Csáki-Hatalovics „EU-wide services strengthen the digital single market and complement existing legislation in areas such as e-identification, e-procurement, e-justice, e-health, mobility and social benefits while bringing tangible benefits to European citizens, businesses and governments.”¹⁰ As Molnár points out, „the

⁸ Neirotti, P., De Marco, A. Cagliano A. C., Mangano, G. & Scorrano, F. (2014): Current trends in Smart City initiatives. *Cities*. 38. 25-36.

https://www.academia.edu/24462582/Current_trends_in_Smart_City_initiatives_Some_stylised_facts last download: 2021.09.19.

⁹ F. Russo, C. Rindone, P. Panuccio (2014): The process of Smart City definition at an EU Level. 191. *The Sustainable City IX*, Vol. 2. 979-989. WIT Press ISSN 1743-3541. <https://www.witpress.com/elibrary/wit-transaction-on-ecology-and-the-environment/191/29574> download: 2021.09.19.

¹⁰ Csáki-Hatalovics, Gyula. 2014. eGovernment in the Past Few Years in Hungary. *ACTA UNIV. SAPIENTIAE, LEGAL STUDIES*, 3, 1, 10. ISSN 2286-0940, <http://www.acta.sapientia.ro/acta-legal/C3-1/legal31-1.pdf> download: 2021.09.19.

European Smart City Initiative is a comprehensive system under the wings of the European Union, which brings together the various smart city projects funded by the Union, creating a common platform.”¹¹ The common platform facilitates access to e-public services and unification efforts. With the development of e-health, online commerce services will play an increasing role as the demand for related services increases. The demands placed on information technology are increasing, and the immediate data transmission needs have an impact on the development of mobile and fixed networks. An integrated perspective on health solutions can be foreseen in the short to long term, bridging the gap between health care and the technological development of communication.

Mobility needs in urban areas result in a number of problems, such as reducing congestion and energy consumption through the use of intelligent transport systems. An increasing number of projects are being launched with the aim of building vehicle-vehicle and vehicle-infrastructure communication networks and upgrading existing ones. Data managed in these areas (geological, GIS, transport) may be relevant in other areas as well, which increases their further use.

A smart city is defined using six characteristics in which such a city “performs forward”¹²: a smart economy, smart people, smart governance, smart mobility, a smart environment and a smart life. These six characteristics of a smart city are closely intertwined, and it is important to note that each influences, influences the others, albeit to varying degrees. For example, smart government will make citizens more informed, as e-government will provide greater government transparency and free access to public data (through open data or online information). Making decisions. Public consultation with citizens (e-counseling) can have an impact on the services provided by e-government, in particular with regard to health and safety (smart living) and the infrastructure to be implemented. Just as communication (smart mobility) stimulates innovation and entrepreneurship (smart economy), the environment (smart environment) or scientific, cultural and social activities (smart living). And these factors greatly improve satisfaction and quality of life.

The concept of the smart city goes beyond the concept of the digital city as a self-learning and self-improvement system, which is why the concept of ecosystem is used. In addition to the relevance and importance of information and communication technologies (ICT), another aspect in the design of smart cities is the sustainable development and growth of modern cities, and the improvement of their economic productivity and competitiveness.¹³ This most often means a high level of use of technologies in the following areas:

- Safety,
- Communication infrastructure,
- Transport,
- Health,
- Education,

¹¹ Peter, Molnar (2019): Smart City Initiatives in Hungary. *Jegyző és Közigazgatás*. 2019/1. 20. https://www.academia.edu/41680282/Okos_V%C3%A1ros_Kezdem%C3%A9nyez%C3%A9sek_Magyarorsz%C3%A1gon last download: 2021.09.06.

¹² Correia, L. M., Wünstel, K. (2011): *Smart cities applications and requirements*. White Paper. Net., 9. https://grow.tecnico.ulisboa.pt/wp-content/uploads/2014/03/White_Paper_Smart_Cities_Applications.pdf, last download: 2021.09.10.

¹³ Andrea Caragliu, Chiara Del Bo & Peter Nijkamp (2011): Smart Cities in Europe, *Journal of Urban Technology*, 18:2, 65-82, DOI: 10.1080/10630732.2011.601117, download: 2021.08.10.

- Government¹⁴

However, the concept of a smart city goes beyond technology and is also linked to other determinants of sustainability and urban growth, namely:

- Human capital,
- Education,
- Social and relational capital,
- Sustainability and environmental.¹⁵

One of the critical elements that will become increasingly important for the smart cities of the future is what role (s) the city will play as a player in an increasingly complex value network. The ecosystems of mobile and fixed telecommunications services are in an ever-changing state, as is the goal of commercial and government organizations to find strategic fits while adapting their business models.

The implementation of e-government should be extended to lower levels of government, in particular: regional, municipal and local levels. These levels of government are only slowly and on a larger scale adopting what is set as a goal at the national level. In addition, these administrative bodies and institutions at the levels do not have the same financial, technological and human resources as the main government bodies and institutions. Csáki-Hatalovics also highlights the advantages of this in one of his studies: "In our opinion, e-government can bring a new quality to the administrative and democratic conditions of local communities. While tasks can be performed more efficiently in a centralized way, citizens interested in the local community or a local community can become more directly involved in the decision-making processes that are important to them."¹⁶

2.2. Application of data management technologies

One of the most determining factors is the large amount of data generated. E-government is an essential part of a smart city that uses information and communication technologies to transform the relationships between government agencies and citizens, businesses and other government agencies to improve better government

¹⁴ Bernardo, Maria R. M. (2017): Smart City Governance: From E-Government to Smart Governance. In L. C. Carvalho (Eds), Handbook of Research on Entrepreneurial Development and Innovation Within Smart Cities 290-326. IGI Global. DOI: 10.4018/978-1-5225-1978-2.ch014
<https://repositorioaberto.uab.pt/bitstream/10400.2/8947/1/Excerto%20de%20art%20Smart%20Governance.pdf>
 last download: 2021.09.10.; Giffinger P., Fertner C., Kramar H., Kalasek R., Pichler-Milanovic' N., Meijers E. (2007): Smart Cities: Ranking of European Medium-sized Cities, Centre of Regional Science, Vienna 2007, http://www.smart-cities.eu/download/smart_cities_final_report.pdf, last download: 2021.09.10.; Jucevicius, Robertas & Patasiene, Irena & Patašius, Martynas. (2014). Digital Dimension of Smart City: Critical Analysis. Procedia - Social and Behavioral Sciences. 156. 10.1016/j.sbspro.2014.11.137.
https://www.researchgate.net/publication/275544739_Digital_Dimension_of_Smart_City_Critical_Analysis/citation/download last download: 2021.09.08.

¹⁵ Cohen, B. (2012): *6 Key Components for Smart Cities*. Retrieved April 12, 2016 from http://www.ubmfuturecities.com/author.asp?section_id=219&doc_id=524053 last download: 2021.09.10;
 Walravens, N. (2015). *Qualitative indicators for smart city business models: The case of mobile services and applications*. Telecommunications Policy, 39 (3-4), 218–240.
<https://isiarticles.com/bundles/Article/pre/pdf/40645.pdf> last download: 2021.09.10

¹⁶ Gyula Balázs, Csáki-Hatalovics (2019): Efficiency anomalies in the operation of local governments and their attempts to solve them after the change of regime, with special regard to the spread of e-government solutions. *Glossa Iuridica* VI/3-4. 200.
https://www.researchgate.net/publication/340117739_A_helyi_onkormanyzatok_mukodesenek_hatekonysagi_a_nomaliai_es_azok_megoldasi_kiserletei_a_rendszervaltozast_kovetoen_kulonos_tekintettel_az_elektronikus_kozigazgatasi_megoldasok_elterjedesere/link/5e79eebba6fdccceef9732c46/download last download: 2021.09.20.

services, better interactions and the efficiency of government operations. Integrated information technologies play a vital role in smart cities, offering advanced services within the intelligent transport system, building management, energy and environmental monitoring, security, public safety and e-commerce.¹⁷

Government and local governments are the holders of huge amounts of data, so, with the proper use of big data technologies, they can be able to make cooperation between citizens, businesses and public administrations more efficient, which can increase material and social well-being, competitiveness and it affects every conceivable area of life alike. How can the government / local government utilize the - structured and unstructured - data masses that are generated in the course of its activities at the state administration bodies and in the management of settlements, and are produced, shared or made available to them by the settlement population and companies?

Only a part of the data volume is generated directly by the government / local governments, the other part may be indirectly - as a result of data collection based on a targeted strategy - in the possession of the government and local governments, but can be classified as public data (data assets).

Approaching data management from the point of view of information technology, data management can be defined as a set of procedures ensuring the management of data existing in digital form with IT tools. It is envisaged that managing authorities that are willing to put cloud computing on the agenda of municipalities and smart cities as a means of changing the status quo and that are adept at promoting a culture of cooperation and innovation with their citizens and businesses will win their ambitions. to build a sustainable future.

With regard to data management, primary data utilization means the use by public service bodies of data recorded or collected in the framework of the performance of state and municipal public tasks, regardless of which body recorded or collected or uses these data. In contrast, we oppose secondary data processing if, for some reason, external actors want to access public data. The professional development of data management requires the development of a data asset strategy.

Operationally generated data from a large amount of connected devices can provide opportunities to address urban issues that have not previously been possible. With the help of this generated and continuously formed data, cities will be able to organize their lives and shape their natural and built environment in such a way that they can function as a sustainable, livable, modern, constantly evolving city.

As a matter of principle, data management requires a

- survey of data assets,
- determination of the value of the elements of the data asset,
- the draft of the utilization and re-utilization of the data assets, the development of its program,
- developing a business model for data asset recycling,
- development of competencies required during data management (institutional, personal)
- development of common data platforms and data warehouses.

Modern digital technologies provide the basis for decision support systems based on large amounts of data analysis. It is envisaged that managing authorities that are willing to put cloud computing on the agenda of municipalities and smart cities as a means of changing the status quo and that are adept at fostering a culture of

¹⁷ Ooms, Ward & Caniëls, Marjolein & Roijackers, Nadine & Cobben, Dieudonnee. (2020): Ecosystems for smart cities: tracing the evolution of governance structures in a dutch smart city initiative. https://www.researchgate.net/publication/339125970_Ecosystems_for_smart_cities_tracing_the_evolution_of_governance_structures_in_a_dutch_smart_city_initiative last download: 2021.09.10.

collaboration and innovation with their citizens and businesses can build a sustainable future.¹⁸ Big Data and Open Data are closely related, but not the same. While Big Data is determined by the amount and variety and unstructured nature of data, Open Data is primarily characterized by free access. Big Data analytics “refer to data sets and analysis techniques in applications that are so large (from terabytes to exabytes) and complex (from sensor to social media data) that require advanced and unique data storage, management, analysis, and visualization.” Thus, data analysis plays a role in data processing by providing in-depth insight and influencing the decision-making processes of government organizations and citizens. These decisions determine the further use of resources, i.e., they have an indirect impact on the creation of products and services in smart cities.

Features of Big Data data analysis:

- advanced data storage, management, analysis technologies,
- visualization technologies that traditional business analytics cannot.

These technologies include merging of various data sources, real-time analysis, online analytics processing, business performance management, data mining, machine learning, cloud computing, distributed processing, parallel algorithms, and parallel database management systems (DBMS).¹⁹

Thus, Big and open linked data (BOLD) data plays a significant role in smart city data management. In addition to public utility systems and traffic management, municipal and settlement-level data management has now been supplemented with a number of other ever-expanding areas (communication, services, public safety, economic data, etc.) and not only about the comprehensive operation of the systems, but almost all endpoints. real-time data is available.

3. Privacy challenges in the ICT system of a smart city ecosystem

3.1. Data protection rules of e-government

Public sector information is a specific source of data that can contribute to the development of the European internal market and the spread of new applications for users and legal entities. Public sector information is an important raw material for products and services with digital content and has become an increasingly important source of content with the development of digital content services. With the development of the application of artificial intelligence, the expansion of the use and recycling of digital data is becoming more and more urgent for the economy.

The Directive on Open Data and the Re-use of Public Sector Information, also known as the “Open Data Directive” (Directive 2019/1024/EU), entered into force on 16 July 2019. The new directive replaces the

¹⁸ Clohessy, Trevor & Acton, Thomas & Morgan, Lorraine. (2015). *Smart City as a Service (SCaaS): A Future Roadmap for E-Government Smart City Cloud Computing Initiatives*. Proceedings - 2014 IEEE/ACM 7th International Conference on Utility and Cloud Computing, UCC 2014. 836-841. 10.1109/UCC.2014.136. https://www.researchgate.net/publication/282238107_Smart_City_as_a_Service_SCaaS_A_Future_Roadmap_for_E-Government_Smart_City_Cloud_Computing_Initiatives last download: 2021.09.02.

¹⁹ Janssen, M., Matheus, R., Zuiderwijk, A. (2015): *Big and Open Linked Data (BOLD) to Create Smart Cities and Citizens: Insights from Smart Energy and Mobility Cases*. In: Tambouris E., et al. (eds.) EGOV 2015. LNCS, vol. 9248, 79–90. Springer International Publishing, Cham. https://link.springer.com/chapter/10.1007/978-3-319-22479-4_6 last download: 2021.09.02.

legislation known as the previous PSI Directive, which amended Directive 2003/98/EC²⁰. The review process leading to the adoption of the Open Data Directive started in 2017, when the European Commission launched a public online consultation on the review of Directive 2013/37/EU (PSI Directive). “In the Member States, the public sector collects, produces, reproduces and disseminates information on a wide range of activities, including social, political, economic, legal, geographical, environmental, meteorological, seismic, tourism, business, patent and educational. Documents produced by the executive, the legislature or the judicial public sector organizations constitute a vast, diverse and valuable set of resources that can benefit society.”²¹(2019/1024 / EU, (8))

Data protection places particular emphasis on the rule of law, as public data collection is only possible if it is lawful, ie meets the conditions set out in the law. If there is no explicit legal authorization for a data collection, but it is carried out by the authority for its own operation, it is still obliged to comply with data protection rules. This is especially true if the record contains personal information.²²

Strict protection laws against individual data protection and data breaches are a matter of serious concern, preventing the processing of large amounts of data in the event that respondents to the data could be identified. Laws that protect the privacy of individuals or groups of stakeholders provide people with protection against misuse of their identities or related information. Smart cities can only be considered smart if they are able to provide the necessary level of security when using integrated IT systems. General security and privacy requirements include ensuring availability, integrity, data protection, access control, confidentiality, and denial. The smart city utilizes perceived data from physical spaces, which can contain confidential details about those living in a given environment. The path of this data begins at a sensor node and ends at the user application. Therefore, the smart city has unique security requirements because it is a system of interconnected systems that share data with each other. The architecture of a smart city can be described as a complex integration of different systems to provide different city-level services. Any data transmission device running on the software that is connected to the system is vulnerable from an IT point of view. This list of vulnerabilities grows rapidly when multiple devices connect to a network because the complex system can now be hacked remotely through the devices. Data anonymity-based algorithms are the most effective, practically applied solutions to preserve data protection, but researchers have demonstrated that an individual’s identity can be re-created using external sources and the anonymity algorithm cannot substantiate the issue of anonymity in a microdata release. In the world of secure Internet of Things (IoT), it is essential that no open data travels between sensors and servers, they are encrypted with keys that never appear on the network, so they cannot be stolen. Thus, of course, the question remains as to whether the same secure environment should be provided²³²⁴²⁵ at the level of providers of

²⁰ Directive 2003/98/EC of the European Parliament and of the Council of 17 November 2003 on the re-use of public sector information. <https://eur-lex.europa.eu/legal-content/hu/TXT/?uri=CELEX:32003L0098>

²¹ Directive 2019/1024 of the European Parliament and of the Council of 20 June 2019 on open access data and the re-use of public sector information. <https://eur-lex.europa.eu/legal-content/HU/TXT/PDF/?uri=CELEX:32019L1024&from=EN>

²² Csáki-Hatalovics, Gy. B. (2017): New trends in eGovernment in Europe, *Glossa Iuridica*, 2017. 3-4. 71-103.

²³ Gurstein, M. B. (2011): “Open data: Empowering the empowered or effective data use for everyone? Gurstein First Monday,” *First Monday*, vol. 16, 2, 1–8, 2011. last download: 2021. 06.08. https://www.researchgate.net/publication/220167404_Open_data_Empowering_the_empowered_or_effective_data_use_for_everyone

²⁴ Soria-Comas, J.; Domingo-Ferrer, J.; Sanchez, D. & Martinez, S. (2016): “T-closeness through microaggregation: Strict privacy with enhanced utility preservation,” 2016 IEEE 32nd Int. Conf. Data Eng. ICDE 2016, 1464–1465, 2016. last download: 2021.06.05.

centralized systems, often in the cloud, and in applications related to the use of systems at the level of individuals (eg mobile phone apps).

3.2. Evolution of demand for eGovernment services and new data protection challenges

Government portals that provide a wide range of information and services have significantly transformed the relationship between individuals and businesses and their government. (eg portals for filling in and submitting administrative forms and forms electronically) In 2014, 49% of individuals in OECD countries used the Internet to collect information on public authorities, and 33% filled in and provided forms on administrative portals. submitted electronically. In terms of individuals²⁶, the Nordic countries have the highest proportion of individuals using e-government services, while Chile, Italy and Poland have lower rates of use.

E-government services are used more by businesses than by individuals. As Molnár notes in his study, „digital public services reduce the administrative burden on businesses and citizens by making interactions with public administrations faster, making them more convenient, transparent and cheaper.”²⁷ In many countries, the use of the digital channel is mandatory for businesses. In the OECD, in 2013, on average, 83% of businesses stated that they had used the internet to obtain / fill in information / forms from authorities, and 78% had sent a completed form online. In addition to the Nordic countries, the use of online government portals is high in France and Ireland, while it is lower in Canada (where the submission of completed forms only applies to tax returns), Switzerland, Germany and Mexico. The OECD registers a growing number of companies in European countries who are an e-procurement system is also used. E-procurement facilitates access to public tenders and increases competition. It can also reduce government costs by reducing administrative burdens, shortening the cycle of procurement contracts and increasing the level of compliance. Among OECD European countries, in 2013, the proportion of companies using e-procurement systems to access documents exceeded 35% in Finland and Slovenia, and 18% in Italy, Spain and Hungary. The use of e-procurement systems is particularly high in Ireland (30%), Estonia (24%) and Poland (24%).

The increased proliferation of e-government services and systems may indicate a general better quality of e-government infrastructure, but the link is not clear. Factors influencing this may be the percentage of households with an Internet connection in the country, the general willingness of the population to communicate with the

https://www.researchgate.net/publication/304456679_t-closeness_through_microaggregation_Strict_privacy_with_enhanced_utility_preservation

²⁵ Bayardo, R. J. & Agrawal, R. (2005): “Data privacy through optimal k-anonymization,” Proc. - Int. Conf. Data Eng., no. Icd, 217–228, 2005. last download: 2021. 06.10.

https://www.researchgate.net/publication/4133455_Data_Privacy_through_Optimal_k-Anonymization

²⁶ OECD (2014), Measuring the Digital Economy: A New Perspective, OECD, Paris, <http://dx.doi.org/10.1787/9789264221796-en>

²⁷ Péter, Molnár (2020): Measuring e-Government and e-participation. Prof. Dr. Miskolczi-Bodnár Péter (eds.): Jog és Állam 29. Károli Gáspár Református Egyetem Állam- és Jogtudományi Kar, Budapest, 3.

https://dl.wqtxts1xzl7.cloudfront.net/63084265/Measuring_e-government20200425-37559-1vllj7-with-cover-page-v2.pdf?Expires=1637700629&Signature=SHFf5vzWGt3y922uy0xFho82O76hPgPbUN0A0P7YxbFHLaKS2mh-VE2qiHGFK4kis4XO92IC7dnypOoPbODy4GjY0jFwT5dL70fUmdeQokuu6W7HCnT0v3-9ChVj0SN4mj2WpRsvO~gj6GIckEPDWna5Xfkbq8W0879IknR6idwdyftnL0r0oGUmBT1jxcVMLmL8XoAC2FYd2IYBbjt2PSJWsLzw7YxNUi22aU5IU77Mr~xvF1rcwYrgZ6nr9vnNt2bXZJFGOUizUTEF2FN6ej2w4doBlZyHWaZbLZ-jNYZRW7~XTEvzAM0A6rXIHifzNziERqOJANXqlz4NzrVWzw__&Key-Pair-Id=APKAJLOHF5GGSLRBV4ZA last download: 2021.09.05.

authorities electronically. Other, other factors may also influence the prevalence of e-government (e.g., social changes induced by technological change). Over the last 10-15 years, there have been a number of technological changes that continue to pose a significant challenge to data protection regulation:

- a) Technological changes, innovations
 - Emergence of Web 2.0 services
 - Emergence of cloud services
 - Increasing market concentration among online service providers
 - Dissemination of mobile devices and smart applications
 - Profiling and gaining behavioral marketing
 - Big Data phenomenon
 - Proliferation of camera and drone services
 - Development and spread of artificial intelligence
- b) Social change
 - The impact of technology on the private sector
 - Data security versus data protection in public data management
 - New technologies and services are creating new patterns of user behavior
 - loss of trust in data controllers
 - the actual behavior of users is not in line with their fears
 - the spread of digital solutions caused by a pandemic situation (health, education, home office, e-commerce..., etc.)

In response to these technical and social trends, the European Union has developed a Communication on a comprehensive approach to data protection, reviewing the main issues of data protection reform, by increasing the importance of data protection.²⁸

The Europe 2020 strategy must focus on three priorities²⁹:

- Smart growth - building an economy based on knowledge and innovation.
- Sustainable growth - promoting a more resource-efficient, greener and more competitive economy.
- Inclusive growth - stimulating an economy characterized by high employment and economic, social and territorial cohesion.

Europe needs to act in the following areas:

- *Innovation*: R&D spending in Europe is below 2%, lagging behind 2.6% in the US and 3.4% in Japan. This is mainly due to lower levels of private investment. It is not just the amounts spent on R&D that matter in absolute terms. Europe needs to focus on the impact and composition of research spending and improve the conditions for private sector investment in R&D across the EU. Our 50% lag compared to the United States can be explained by the lower number of high-tech companies.
- *Education, training and lifelong learning*: A quarter of students have poor reading skills, dropping out of education and training early in one week. About 50% graduate at secondary level, but this often does not match the needs of the labor market. Less than three out of three 25-34 year olds have a tertiary

²⁸ COM (2010) 2020 A strategy for smart, sustainable and inclusive growth. <https://eur-lex.europa.eu/legal-content/en/ALL/?uri=CELEX%3A52010DC2020>

²⁹ http://ec.europa.eu/eu2020/index_en.htm

education: 40% in the US and more than 50% in Japan. According to the Shanghai Index, there are only two Europeans among the top 20 universities in the world.

- *Digital society*: Global demand for information and communication technologies represents a market worth € 2 trillion, but only a quarter of this comes from European businesses. Europe is also lagging behind in the use of high-speed internet, which is hampering our ability to innovate, the online dissemination of knowledge and the online distribution of goods and services, including in rural areas.

Smart cities are showing new things to governments, hiding unprecedented economic opportunities, although new technologies are always associated with the possibility of security and privacy threats. A smart city requires a higher degree of networking and technological connection in order for a large number of devices with various software and hardware capabilities to have access to its services. Since all cities are governed by authorities, the government must offer smart cities services that result in smart governance. The primary goal of e-government systems is to provide online services to citizens, businesses and government bodies (departments) that help ensure sustainable development and create a better quality of life.³⁰ Government and businesses exchange information with each other, such as rules and regulations, the use of business licenses online, and so on. connection. Although many cities have adopted e-government systems as a means of providing efficient and effective services over the Internet, security and privacy threats, such as cyber identity theft and privacy breaches, remain a major concern.³¹ Citizens are not ready to connect to e-government services due to a lack of trust, which is identified as a major barrier to the introduction of e-government systems.³² If e-government systems are not properly secured, cyber-attacks and cyber-terrorism can damage e-government systems at any time and in many ways lead to loss and damage. The most common cyber attacks are denial of service attacks, unauthorized network access, theft of personal information, online financial fraud, website corruption, application attacks, and information system intrusion attacks. With regard to the proper recording and use of personal and other sensitive information collected for the purpose of monitoring citizens, the private sector has many concerns about governments, which many see as a violation of their privacy.³³ The concerns are not unfounded because there have been a number of serious leaks of information recently. In 2015, the U.S. government suffered massive cyber attacks against government systems that revealed sensitive information about 21.5 million people, including employees and their families.³⁴ The attacks resulted in the theft of personal information such as social security numbers, fingerprints, credit card information, addresses, health and financial

³⁰ Carter, L., Bélanger, F. (2005): The utilization of e-government services: citizen trust, innovation and acceptance factors. *Information systems journal*, 2005. 15(1):5–25, <http://cse1.eng.ohio-state.edu/productions/intel/research/trust/utilization%20of%20e-government%20services.pdf> last download: 2021.04.30.

³¹ Bélanger, F., Carter, L. (2008): Trust and risk in e-government adoption. *The Journal of Strategic Information Systems*, 2008. 17(2) 165–176., https://www.researchgate.net/publication/222654837_Trust_and_risk_in_e-government_adoption last download: 2021.06.01.

³² Ramaraj P., Bhasker M. (2012): Security and privacy issues in e-government. In *EGovernment Service Maturity and Development: Cultural, Organizational and Technological Perspectives*, 2012. 236–248. IGI Global, https://www.researchgate.net/publication/287735159_Security_and_Privacy_Issues_in_E-Government last download: 2021.04.28.

³³ Van Zoonen, L. (2016): Privacy concerns in smart cities. *Government Information Quarterly*, 2016. 33(3) 472–480, <https://www.sciencedirect.com/science/article/pii/S0740624X16300818> last download: 2021.04.30.

³⁴ Bershidski, L. (2017): E-Government Sounds Great Until the First Hack. 2017. <https://english.aawsat.com/home/article/1096171/leonid-bershidsky/e-government-sounds-great-until-first-hack> last download: 2021.05.05.

records, and other private information. These events provide a basis for shaken citizens' confidence in e-government systems.

Methodology

The method used in the preparation of the study is primarily a literature search, resp. secondary data analysis. The processing method follows primarily a descriptive method and takes a critical approach.

Conclusions

Smart governance contributes to the efficient functioning of the smart city ecosystem through leadership and governance, which are essential for improving the lives of citizens. The literature emphasizes the role of technology in defining smart cities. However, a city cannot become smart by using technology alone, but technology is a catalyst for social, environmental, economic and cultural progress. As a result, it is important for smart cities to be able to amplify these factors through technology. The development of smart city services and the operation of established technological networks and devices cannot do without the data protection planning of data management, which requires a multidisciplinary approach. Smart cities are showing new things to governments, hiding unprecedented economic opportunities, although new technologies are always associated with the possibility of security and privacy threats. If e-government systems are not properly secured, cyber-attacks and cyber-terrorism can damage e-government systems at any time and in many ways lead to loss and damage.

References

1. Andrea Caragliu, Chiara Del Bo & Peter Nijkamp (2011): Smart Cities in Europe, *Journal of Urban Technology*, 18:2, 65-82, DOI: 10.1080/10630732.2011.601117, last download: 2021.08.10.
2. Bayardo, R. J. & Agrawal, R. (2005): "Data privacy through optimal k-anonymization," *Proc. - Int. Conf. Data Eng.*, no. Icd, 217–228, 2005. last download: 2021. 06.10.
https://www.researchgate.net/publication/4133455_Data_Privacy_through_Optimal_k-Anonymization
3. Bélanger, F., Carter, L. (2008): Trust and risk in e-government adoption. *The Journal of Strategic Information Systems*, 2008. 17(2) 165–176.,
https://www.researchgate.net/publication/222654837_Trust_and_risk_in_e-government_adoption last download: 2021.06.1.
4. Bernardo, Maria R. M. (2017): Smart City Governance: From E-Government to Smart Governance. In L. C. Carvalho (Eds), *Handbook of Research on Entrepreneurial Development and Innovation Within Smart Cities* 290-326. IGI Global. DOI: 10.4018/978-1-5225-1978-2.ch014
<https://repositorioaberto.uab.pt/bitstream/10400.2/8947/1/Excerto%20de%20art%20Smart%20Governance.pdf> last download: 2021.09.10.
5. Bershidski, L. (2017): E-Government Sounds Great Until the First Hack. 2017.
<https://english.aawsat.com/home/article/1096171/leonid-bershidsky/e-government-sounds-great-until-first-hack> last download: 2021.05.05.
6. Caragliu, Del Bo, & Nijkamp (2009): Smart Cities in Europe. *Proceedings of the 3rd Central European Conference in Regional Science—CERS 2009, Kosice, 7-9 October 2009*, 49-59.
https://www.researchgate.net/publication/46433693_Smart_Cities_in_Europe last download: 2021.09.15.
7. Carter, L., Bélanger, F. (2005): The utilization of e-government services: citizen trust, innovation and acceptance factors. *Information systems journal*, 2005. 15(1):5–25, <http://cse1.eng.ohio-state.edu/productions/intel/research/trust/utilization%20of%20e-government%20services.pdf> last download: 2021.04.30.
8. Clohessy, Trevor & Acton, Thomas & Morgan, Lorraine. (2015). *Smart City as a Service (SCaaS): A Future Roadmap for E-Government Smart City Cloud Computing Initiatives*. *Proceedings - 2014 IEEE/ACM 7th International Conference on Utility and Cloud Computing, UCC 2014*. 836-841.

- 10.1109/UCC.2014.136.
https://www.researchgate.net/publication/282238107_Smart_City_as_a_Service_SaaS_A_Future_Roadmap_for_E-Government_Smart_City_Cloud_Computing_Initiatives last download: 2021.09.02.
9. Cohen, B. (2012): 6 Key Components for Smart Cities. Retrieved April 12, 2016 from http://www.ubmfuturecities.com/author.asp?section_id=219&doc_id=524053 last download: 2021.09.10.
 10. COM (2010) 2020 A strategy for smart, sustainable and inclusive growth. <https://eur-lex.europa.eu/legal-content/en/ALL/?uri=CELEX%3A52010DC2020>
 11. Correia, L. M., Wünstel, K. (2011): Smart cities applications and requirements. White Paper. Net., 9. https://grow.tecnico.ulisboa.pt/wp-content/uploads/2014/03/White_Paper_Smart_Cities_Applications.pdf, last download: 2021.09.10.
 12. Csáki-Hatalovics, Gy. B. (2017): New trends in eGovernment in Europe, *Glossa Iuridica*, 2017. 3-4. 71-103.
 13. Directive 2003/98 / EC of the European Parliament and of the Council of 17 November 2003 on the re-use of public sector information. <https://eur-lex.europa.eu/legal-content/hu/TXT/?uri=CELEX:32003L0098>
 14. Directive 2019/1024 of the European Parliament and of the Council of 20 June 2019 on open access data and the re-use of public sector information. <https://eur-lex.europa.eu/legal-content/HU/TXT/PDF/?uri=CELEX:32019L1024&from=EN>
 15. F. Russo, C. Rindone, P. Panuccio (2014): The process of Smart City definition at an EU Level. 191. *The Sustainable City IX*, Vol. 2. 979-989. WIT Press ISSN 1743-3541. <https://www.witpress.com/elibrary/wit-transactions-on-ecology-and-the-environment/191/29574> download: 2021.09.19.
 16. Giffinger P., Fertner C., Kramar H., Kalasek R., Pichler-Milanovic' N., Meijers E. (2007): Smart Cities: Ranking of European Medium-sized Cities, Centre of Regional Science, Vienna 2007, http://www.smart-cities.eu/download/smart_cities_final_report.pdf, last download: 2021.09.10.;
 17. Gurstein, M. B (2011): "Open data: Empowering the empowered or effective data use for everyone?" Gurstein First Monday," *First Monday*, vol. 16, 2, 1–8, 2011. last download: 2021. 06.08. https://www.researchgate.net/publication/220167404_Open_data_Empowering_the_empowered_or_effective_data_use_for_everyone
 18. Hollands R.G. (2008): Will the real smart city please stand up? Intelligent, progressive or entrepreneurial?, "City", 12 (3) 2008. 303-320. https://www.researchgate.net/publication/248930334_Will_the_Real_Smart_City_Please_Stand_Up last download: 2021.09.10.
 19. http://ec.europa.eu/eu2020/index_en.htm
 20. Janssen, M., Matheus, R., Zuiderwijk, A. (2015): Big and Open Linked Data (BOLD) to Create Smart Cities and Citizens: Insights from Smart Energy and Mobility Cases. In: Tambouris E., et al. (eds.) *EGOV 2015*. LNCS, vol. 9248, 79–90. Springer International Publishing, Cham. https://link.springer.com/chapter/10.1007/978-3-319-22479-4_6 last download: 2021.09.02.
 21. Jucevicius, Robertas & Patasiene, Irena & Patašius, Martynas. (2014). Digital Dimension of Smart City: Critical Analysis. *Procedia - Social and Behavioral Sciences*. 156. 10.1016/j.sbspro.2014.11.137. https://www.researchgate.net/publication/275544739_Digital_Dimension_of_Smart_City_Critical_Analysis/citation/download last download: 2021.09.08.
 22. Nam, T., Pardo, T. A. (2017): The changing face of a city government: A case study of Philly311. *Government Information Quarterly*, 2017. 31., S1-S9. <https://daneshyari.com/article/preview/1024287.pdf> last download: 2021.05.03.
 23. Neirotti, P., De Marco, A. Cagliano A. C., Mangano, G. & Scorrano, F. (2014): Current trends in Smart City initiatives. *Cities*. 38. 25-36. https://www.academia.edu/24462582/Current_trends_in_Smart_City_initiatives_Some_stylised_facts last download: 2021.09.19.
 24. OECD (2014), *Measuring the Digital Economy: A New Perspective*, OECD, Paris, <http://dx.doi.org/10.1787/9789264221796-en>
 25. Ooms, Ward & Caniëls, Marjolein & Roijackers, Nadine & Cobben, Dieudonnee. (2020): Ecosystems for smart cities: tracing the evolution of governance structures in a dutch smart city initiative. <https://research.ou.nl/en/publications/ecosystems-for-smart-cities-tracing-the-evolution-of-governance-s> last download: 2021.09.10.
 26. Ramaraj P., Bhasker M. (2012): Security and privacy issues in e-government. In *EGovernment Service Maturity and Development: Cultural, Organizational and Technological Perspectives*, 2012. 236–248. IGI Global, https://www.researchgate.net/publication/287735159_Security_and_Privacy_Issues_in_E-Government last download: 2021.04.28.

27. S. Zygiaris, Smart City Reference Model: Assisting Planners to Conceptualize the Building of Smart City Innovation Ecosystems, *J. Knowl. Econ.* 4 (2013) 217–231.
https://www.researchgate.net/publication/328610664_Smart_city_reference_model_Assisting_planners_to_conceptualize_the_building_of_smart_city_innovation_ecosystems) last download: 2021.09.12.
28. Smart Cities Council. Smart cities readiness guide, The planning manual for building tomorrow’s cities today, 2013, <http://smartcitiescouncil.com/> , last download: 2021.09.12.
29. Soria-Comas, J.; Domingo-Ferrer, J.; Sanchez, D. & Martinez, S. (2016): “T-closeness through microaggregation: Strict privacy with enhanced utility preservation,” 2016 IEEE 32nd Int. Conf. Data Eng. ICDE 2016, 1464–1465, 2016. last download: 2021.06.05.
https://www.researchgate.net/publication/304456679_t-closeness_through_microaggregation_Strict_privacy_with_enhanced_utility_preservation
30. Toppeta, D. (2010): The Smart City vision: How Innovation and ICT can build smart, “liveable”, sustainable cities, The Innovation Knowledge Foundation.
http://www.thinkinnovation.org/file/research/23/en/Toppeta_Report_005_2010.pdf last download: 2021.09.15.
31. Van Zoonen, L. (2016): Privacy concerns in smart cities. *Government Information Quarterly*, 2016. 33(3) 472–480, <https://www.sciencedirect.com/science/article/pii/S0740624X16300818> last download: 2021.04.30.
32. Walravens, N. (2015). Qualitative indicators for smart city business models: The case of mobile services and applications. *Telecommunications Policy*, 39 (3-4), 218–240.
<https://isiarticles.com/bundles/Article/pre/pdf/40645.pdf> last download: 2021.09.10.